OUTCOME BASED EDUCATION

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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Approved in Board of Studies Meeting on 15.11.2014 Approved in 49th Academic Council Meeting on 04.12.2014

THIAGARAJAR COLLEGE OF ENGINEERING
DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

Evolve into a **Centre of Excellence for Education and Research** in Information Technology.

MISSION

- Attaining academic excellence through well designed curriculum adaptable to dynamic technological needs, competent faculty and innovative teaching-learning process.
- Promoting collaborative research through special interest groups, state of the art research labs and Industry Institute Interactions.
- Facilitating value added courses to produce highly competent and socially conscious information technology professionals and entrepreneurs.

PROGRAMME EDUCATIONAL OBJECTIVES

- Graduates of the programme will be able to provide IT solutions to address the business and societal needs.
- Graduates of the programme will contribute significantly in the technological developments of Information Technology through research practices.
- Graduates of the programme will hone their professional expertise in quest for improved career opportunities through sustained learning.
- Graduates of the programme will be able to lead a team of diversified professionals with good communication skills, leadership virtues and professional ethics.

Specialization of B.Tech Information Technology Programme:

1. Data Engineering
2. Distributed Systems
3. Information Security and Management
4. Mobile Technologies
5. Software Design and Development

PROGRAM OUTCOMES

1. **Engineering Knowledge:** Apply knowledge of Mathematics, Science, Engineering fundamentals and core Information Technology Skills to the solutions of complex engineering problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development.
2. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/Development of solutions:** Design software solutions for complex engineering problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies for a given specification with appropriate consideration for the public health and safety, security, cultural, societal and environmental considerations.
4. **Conduct Investigation of complex problems:** Use research based knowledge and research methods in the design and conduct of experiments, organization, analysis and interpretation of data to identify patterns, produce meaningful conclusions and recommendations for complex problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development with an understanding of its limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development.
7. **Environment and Sustainability: U**nderstand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice in managing information technology resources and in providing IT solutions and services.

9. **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings to deliver reports, programs, projects, presentations and other deliverables related to information technology requirements of an organization.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a multidisciplinary team, to manage projects in Information Technology and related fields.
12. **Life Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.

PEO vs. PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
PEO1. Career accomplishments	S	S	S	M	S	M	M	S	S	S	S	S
PEO2. Research	S	S	S	S	S	M	M	S	S	S	M	S
PEO3. Sustained learning	S	S	S	S	S	L	S	L	L	L	L	S
PEO4. Transferable skills	L	L	L	L	L	M	M	S	S	S	S	S

Graduate Attributes defined by NBA

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

GA vs. PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
GA1	■											
GA2		■										
GA3			■									
GA4				■								
GA5					■							
GA6						■						
GA7							■					
GA8								■				
GA9									■			
GA10										■		
GA11											■	
GA12												■

Scheduling of Courses for B.Tech Information Technology – For Students admitted in the Academic year 2014-15

Semester	Theory						Theory Cum Practical	Practical		Special Courses	Credit
	1	2	3	4	5	6	7	8	9		
1	**14MA110** Engineering Mathematics-I (3)	**14PH120** Physics (3)	**14CH130** Chemistry (3)	**14EG140** English Commmunication (3)	**14ES150** Basics of Civil and Mechanical Engineering (2)	**14ES160** Basics of Electrical and Electronics Engineering (2)	**14ME170** Engineering Graphics (3)	**14PH180** Physics Lab (1)	**14CH190** Chemistry Lab (1)		**21**
2	**14IT210** Engineering Mathematics-II (3)	**14IT220** Problem Solving Using Computers (3)	**14IT230** Digital System Design (3)	**14IT240** Information Systems (3)	**14IT250** Environment Science (3)		**14IT270** Free Open Source Software: Practice (3)	**14IT280** Computer Programming Lab (1)	**14IT290** Workshop (1)		**20**
3	**14IT310** Discrete Mathematics (3)	**14IT320** Object Oriented Programming (3)	**14IT330** Computer Organization (3)	**14IT340** Data Structures and Algorithms (3)	**14IT350** Operating Systems (3)		**14IT370** Software Engineering (3)	**14IT380** Object Oriented Programming Lab (1)	**14IT390** Data Structures Lab (1)		**20**
4	**14IT410** Graph Theory and Combinatorics (3)	**14IT420** Java Programming (3)	**14IT430** Computer Networks (3)	**14IT440** Data Base Management System (3)	**14IT450** Engineering Design (3)		**14IT470** Professional Communication (2)	**14IT480** Java Programming Lab (1)	**14IT490** Data Base Management System Lab (1)	**14IT4C0** Capstone Course (2)	**21**
5	**14IT510** Probability and Statistics (3)	**14IT520** Web Technologies (3)	**14IT530** Network Security (3)	**14IT540** Data Mining (3)	**14ITPX0** Programme Elective-1 (3)		**14IT570** System Administration (3)	**14IT580** Web Programming Lab (1)	**14IT590** Network Management and Security Lab (1)		**20**
6	**14IT610** Accounting and Finance (3)	**14IT620** Cloud Computing (3)	**14IT630** Information Storage and Management (3)	**14ITPX0** Programme Elective-2 (3)	**14ITGX0** General Elective -1 (3)		**14IT670** Mobile Application Development (3)	**14IT680** Multimedia Lab (1)	**14IT690** Cloud Computing Lab (1)		**20**
7	**14IT710** Management Theory and Practice (3)	**14IT720** Wireless and Mobile Communication (3)	**14ITPX0** Programme Elective-3 (3)	**14ITPX0** Programme Elective-4 (3)	**14ITGX0** General Elective -2 (3)		**14IT770** Data Analytics (3)	**14IT780 User Interface Design Lab. (1)**	-	**14IT7C0** Capstone Course (2)	**21**
8	**14ITPX0** Programme Elective-5 (3)	**14ITPX0** Programme Elective-6 (3)	**14ITPX0** Programme Elective-7 (3)					**14IT880** Project (12)			**21**

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DISTRIBUTION OF COURSES WITH FOCUS ON SPECIALIZATION

Data Engineering	Distributed Systems	Information Security and Management	Mobile Technologies	Software Design and Development	Hardware/ Support Courses
PROGRAM CORE					
Data Structures and Algorithms	Computer Networks	Information Systems	Mobile Application Development	Problem Solving Using Computers	Digital System Design
Data Base Management Systems	System Administration	Network Security	Wireless and Mobile Communication	Free Open Source Software: Practice	Computer Organization
Data Mining	Cloud Computing	Information Storage and Management		Object Oriented Programming	Operating Systems
Data Analytics	Web Technologies			Software Engineering	
				Java Programming	
PROGRAM ELECTIVES					
Data Warehousing	Distributed Systems	Information theory and Coding	Ubiquitous Computing	Object Oriented Analysis and Design	Multi Core Architecture
Big Data Technologies	Service Oriented Architecture	Computer Forensics	Wireless Ad hoc and Sensor Networks	Software Quality Assurance	Embedded Systems
Social Network Analysis	Parallel Computing	Cloud Security	Internet of Things	Software Testing	Robotics
Semantic Web	Software Defined Networks	Applied Cryptography		Design and Analysis of Algorithms	Soft Computing
Information Retrieval	Network Administration	Ethical Hacking		Principles of Compiler Design	Artificial Intelligence
Decision Support Systems		Digital Watermarking and Steganography		Human Computer Interaction	Theory of Computation
Database Administration		Information Security Auditing and Management		C# and .NET Framework	Numerical Methods
					Operations Research

LIST OF ELECTIVES

DATA ENGINEERING:

1. Data Ware housing
2. Big Data Technologies
3. Social Network Analysis
4. Semantic Web
5. Information Retrieval
6. Decision Support Systems
7. Database Administration

DISTRIBUTED SYSTEMS

1. Distributed Systems
2. Service Oriented Architecture
3. Parallel Computing
4. Software defined Networks
5. Network Administration

INFORMATION SECURITY AND MANAGEMENT

1. Information theory and Coding
2. Computer Forensics
3. Cloud Security
4. Advanced Cryptography
5. Ethical Hacking
6. Digital Watermarking and Steganography
7. Information Security Auditing and Management

MOBILE TECHNOLOGIES

1. Ubiquitous Systems
2. Wireless Ad hoc and Sensor Networks
3. Internet of Things

SOFTWARE DESIGN AND DEVELOPMENT

1. Object Oriented Analysis and Design
2. Software Quality Assurance
3. Software Testing
4. Design and Analysis of Algorithms
5. Human Computer Interaction
6. Principles of Compiler Design
7. C# and .NET Framework

HARDWARE

1. Multi-core Architecture
2. Embedded Systems
3. Robotics

OTHERS

1. Soft Computing
2. Artificial Intelligence
3. Theory of Computation
4. Numerical Methods
5. Operations Research

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B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

SECOND SEMESTER

FOR THE STUDENTS ADMITTED IN THE

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2014-15 onwards)

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
14IT210	Engineering Mathematics – II	BS	2	2	-	3
14IT220	Problem Solving Using Computers	PC	3	-	-	3
14IT230	Digital System Design	PC	2	2	-	3
14IT240	Information Systems	PC	3	-	-	3
14IT250	Environment Science	HSS	3	-	-	3
THEORY CUM PRACTICAL						
14IT270	Free Open Source Software: Practice	PC	2	-	2	3
PRACTICAL						
14IT280	Computer Programming Lab	PC	-	-	2	1
14IT290	Workshop	ES	-	-	2	1
Total			**15**	**4**	**6**	**20**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
2 Hours Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B.Tech. Information Technology Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2014-15onwards)

SECOND SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	14IT210	Engineering Mathematics – II	3	50	50	100	25	50
2	14IT220	Problem Solving Using Computers	3	50	50	100	25	50
3	14IT230	Digital System Design	3	50	50	100	25	50
4	14IT240	Information Systems	3	50	50	100	25	50
5	14IT250	Environment Science	3	50	50	100	25	50
THEORY CUM PRACTICAL								
6	14IT270	Free Open Source Software: Practice	3	50	50	100	25	50
PRACTICAL								
7	14IT280	Computer Programming Lab	3	50	50	100	25	50
8	14IT290	Workshop	3	100	0	100	0	50

* CA evaluation pattern will differ from course to course 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 and subsequently be reduced to 50 marks for the award of terminal examination marks

		Category	L	T	P	Credit
14IT210	**ENGINEERING MATHEMATICS II**	BS	2	2	0	3

Preamble

Analytical or coordinate geometry explains geometric figures in terms of algebraic formulae. Partial differential equation is a differential equation that contains unknown multivariate and their partial derivatives. PDEs are equations that involve rate of change with respect to functions of several variables. Fourier transform expresses a mathematical function of time as a function of frequency. The inverse Fourier transform expresses a frequency domain function in the time domain function. Fourier transformation from the time domain to frequency domain transforms differential equations into algebraic equations and convolution into multiplication. Laplace transformation is a linear operator of a function $f(t)$ with a real argument t ($t \geq 0$) that transforms $f(t)$ to a function $F(s)$ with complex argument s. Laplace transform is used for solving differential and integral equations. The above topics are widely used in computer graphics, complexities in algorithms, image and signal processing, stability and control and etc.. Based on these, the course aims at giving adequate exposure in coordinate geometry, partial differential equations Fourier and , Laplace transforms.

Prerequisite

Higher Secondary level, I Semester B.E/B.Tech course - Differentiation, Integration , Elementary calculus and Elementary coordinate geometry.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Find the angle between the lines, shortest distance between the lines and its equation and the distance between parallel planes.	Apply
CO2:	Find the equation of the sphere with respect to the given conditions or background(points and plane).	Analyze
CO3:	Solve subsidiary equation by the method of multipliers.	Apply
CO4:	Solve homogenous linear PDE of nth order with constant coefficients.	Apply
CO5:	Obtain Fourier transform, Fourier sine and cosine transform of various functions such as algebraic, trigonometric and exponential etc.	Apply
CO6:	Apply Fourier transforms to solve boundary value problems.	Apply
CO7:	Apply Laplace transform technique to solve the given ODE.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	S	M	L	L	-	L	-	L	-	-	L
CO2.	S	S	M	L	L	-	L	-	L	-	-	-
CO3.	S	S	M	L	L	-	L	-	L	-	L	-
CO4.	S	S	M	L	L	-	L	-	L	-	L	-
CO5.	S	S	M	L	L	-	L	-	L	-	-	-
CO6.	S	S	M	L	L	-	L	-	L	-	-	-
CO7.	S	S	M	L	L	-	L	-	L	-	-	-

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	10
Understand	20	20	20	20
Apply	70	70	70	70
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. **Find the angle between two diagonals of a cube.**
2. Find the shortest distance and equations of the line of shortest distance between the lines $\frac{x-2}{2}=\frac{y+1}{3}=\frac{z}{4}; 2x+3y-5z-6=0; 3x-2y-z+3=0$.
3. Find the distance between the parallel planes $2x-2y+z+3=0; 4x-4y+2z+5=0.$
4. Find the equation of the plane through the line of intersection of the planes $x+y+z=1; 2x+3y+4z-7=0$ and perpendicular to the plane $x-5y+3z=5.$

Course Outcome 2 (CO2):

1. Find the equation of the sphere that passes through the circle $x^2+y^2+z^2+x-3y+2z-1=0, 2x+5y-z+7=0$ and cuts orthogonally the sphere $x^2+y^2+z^2-3x+5y-7z-6=0.$
2. Find the equations of the two tangent planes to the sphere $x^2+y^2+z^2-4x+2y-6z-11=0$ which are parallel to the coordinate plane $x=0.$
3. Find the equation of the sphere through the circle $x^2+y^2+z^2+2x+3y+6=0, x-2y+4z=9$ and the centre of the sphere $x^2+y^2+z^2-2x+4y-6z-7=0.$
4. Find the equation of the sphere passing through the points (3,0,2), (-1,1,1) and (2,-5,4) and having its centre on the plane $2x+3y+3z=6.$

Course Outcome 3 (CO3):

1. Form the PDE by eliminating the arbitrary function from $ax+by+cz=f(x^2+y^2+z^2).$

2. Form the PDE by eliminating the function f from $xy+yz+zx=f\left(\frac{z}{x+y}\right)$.
3. Find the differential equation of the family of spheres of radius 5 with centres on the plane $x=y$.
4. Find the PDE of the family of planes, the sum of whose x, y, z intercepts is unity.

Course Outcome 4 (CO4):

1. Find the general solution of $p\cot x+q\cot y=\cot z$.
2. Find the general solution of $x(y-z)p+y(z-x)q=z(x-y)$.
3. Solve $(3z-4y)p+(4x-2z)q=2y-3x$.
4. Solve $(D^3-2D^2D')z=\sin(x+2y)+3x^2y+e^x\cos 7y+e^{3x+y}$

Course Outcome 5 (CO5) :

1. Find Fourier cosine transform of $\frac{e^{-ax}-e^{-bx}}{x}$ and hence find the value of the integral $\int_0^\infty \left(e^{-ax}-e^{-bx}\right)\frac{\cos x}{x}dx$.
2. Find $f(x)$ if its sine transform is $\frac{e^{-as}}{s}$. Hence find $F_s^{-1}\left\{1/s\right\}$
3. Find the Fourier sine and cosine transforms of xe^{-ax}.
4. Using Fourier sine transform, prove that $\int_0^\infty \frac{a^2 da}{(a^2+a^2)(b^2+a^2)}=\frac{\pi}{2(a+b)}$.

Course Outcome 6(CO6):

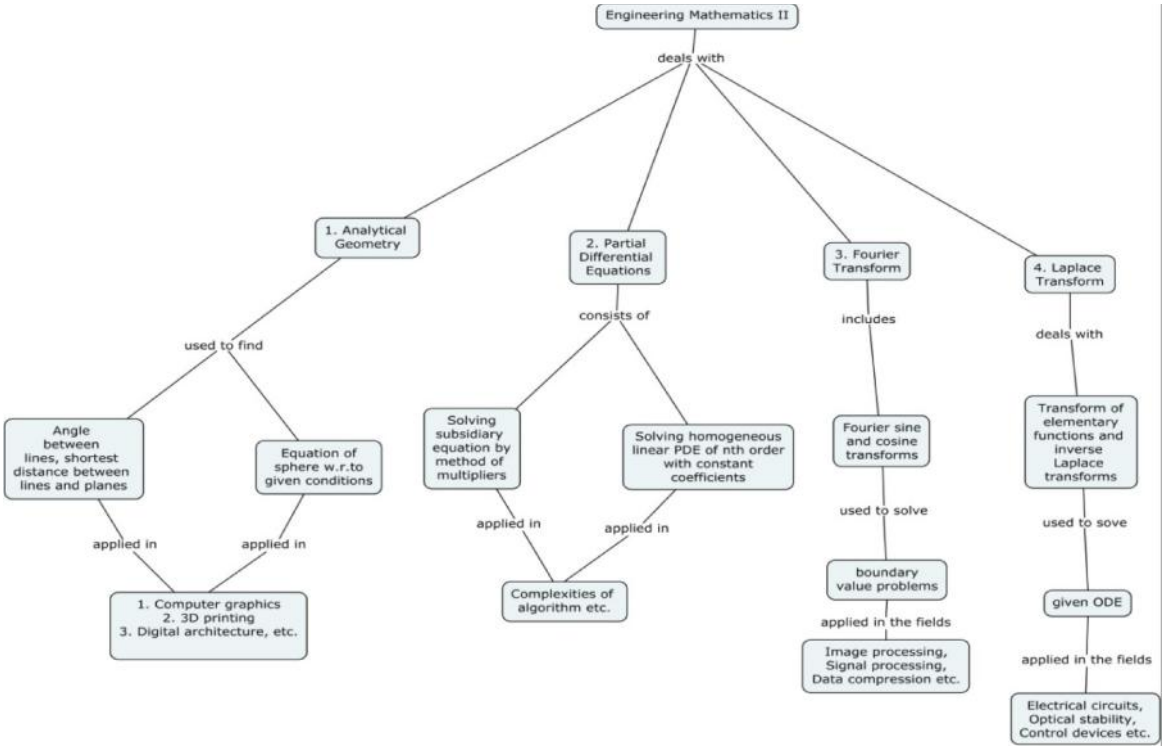
1. Solve $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}, -\infty<x<\infty, t\geq 0$ with conditions $u(x,0)=f(x), \frac{\partial u}{\partial t}(x,0)=g(x)$ assuming $u, \frac{\partial u}{\partial x}\to 0$ as $x\to\pm\infty$.
2. Solve $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial x^2}$ for $x\geq 0, t\geq 0$ under the given conditions $u=u_0$ at $x=0, t>0$ with initial condition $u(x,0)=0, x\geq 0$.
3. Using finite Fourier transform, solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$, given that $u(0,t)=0, u(4,t)=0 \& u(x,0)=2x$ where $0<x<4, t>0$.
4. Use the complex form of Fourier transform to show that $V=\frac{1}{2\sqrt{\pi t}}\int_{-\infty}^{\infty}\overline{f}(u)e^{(-(x-u)/ut)}du$ is the solution of the boundary value problem $\frac{\partial V}{\partial t}=\frac{\partial^2 V}{\partial x^2}, -\infty<x<\infty, t>0; V=f(x)$ when $t=0$.

Course Outcome 7(CO7):

1. Use Laplace transform to solve (i) $(D^3-3D^2+3D-1)y=t^2e^t$ given that $y(0)=1, y'(0)=0, y''(0)=-2$. (ii) $ty''+2y'+ty=\cos t$ given that $y(0)=1$.

2. Solve by transform method $(D^2-1)x = a\cosh t, x(0) = x'(0) = 0.$
3. Solve $(D^3-3D^2+3D-1)y = 0, y = 1, y' = 0, y'' = -2$ at $t = 0.$
4. Solve $(D^2+1)x = t\cos 2t, x = Dx = 0$ at $t = 0.$

Concept Map



Syllabus:

Analytical geometry: Direction cosines and ratios-Angle between two lines-Equation of a plane-Angle between planes-Distance between parallel planes-Equation of a straight line-Coplanar lines-Shortest distance between skew lines-Sphere-Tangent plane-Plane sections of a sphere-Cylinder

Partial differential equations: Formation of PDE-Solution of standard types of first order equations-Solution of first order equations reducible to standard types-Lagrange's linear equation-Linear homogeneous PDE of second and higher order with constant coefficients-Linear non-homogeneous PDE of second and higher order with constant coefficients.

Fourier transform: Fourier integral theorem-Fourier transform-Fourier Sine and Cosine transforms-Convolution theorem-Properties-Parsevel's identity-Discrete Fourier transform-Discrete time Fourier transform-Demonstration of Fourier transform and its properties using MATLAB.

Laplace transform: Laplace transform-Sufficient condition for existence-Transform of elementary functions-Basic properties-Transforms of derivatives and integrals of functions-Derivatives and integrals of transforms-Transforms of unit step function and impulse function-Transform of periodic functions-Inverse Laplace transform-Statement of convolution theorem-Initial and final value theorems-Solution of linear ODE of second order with constant coefficients using Laplace transform techniques.

Text Book

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.

2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons, 2009.
3. M.K. Venkataraman – Engg. Mathematics vol II– National Publishing Co.

Reference Books

1. T.Veerarajan, Engineering Mathematics, 3rd Edition, Tata McGraw Hill, New Delhi, 2004.
2. Thomas Phinny, Calculus, 13th Edition, Pearson Education, New Delhi,2005.
3. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill, New Delhi,2011

Course Contents and Lecture Schedule

Module No.	Topic	No.of Lectures
1	**Analytical Geometry**	
1.1	Direction cosines and ratios, Angle between two lines	2
1.2	Equation of a plane, Angle between planes, Distance between parallel planes	3
	Tutorial	1
1.3	Equation of a straight line, Coplanar lines	2
1.4	Shortest distance between skew lines, Sphere, Tangent plane, Plane section	3
	Tutorial	1
2	**Partial Differential Equations**	
2.1	Formation of PDE, Solution of standard types of first order equations	3
2.2	Solution of first order equations reducible to standard types, Lagrange's linear equation	3
	Tutorial	1
2.3	Linear homogeneous PDE of second and higher order with constant coefficients,	2
2.4	Linear non-homogeneous PDE of second and higher order with constant coefficients	2
	Tutorial	1
3	**Fourier Transformation**	
3.1	Fourier integral theorem, Fourier transform, Fourier Sine and Cosine transforms	3
	Tutorial	1
3.2	Convolution theorem-Properties, Parsevel's identity,	2
3.3	Discrete Fourier transform	2
	Tutorial	1
3.4	Discrete time Fourier transform, Demonstration of Fourier transform and its properties using MATLAB	3
4	**Laplace Transformation**	
4.1	Laplace transform, properties,	2
4.2	inverse Laplace transforms	2
	Tutorial	1
4.2	Periodic functions, convolution theorem, initial value theorem and final value theorem	3
4.3	Solution of differential equations and integral equations	3
	Tutorial	1
	Total Lectures	**48**

Course Designers:

1. Dr.M. Kameswari mkmat@tce.edu
2. Dr.T. Lakshmi tlakshmimdu@tce.edu

		Category	L	T	P	Credit
14IT220	**PROBLEM SOLVING USING COMPUTERS**	PC	3	0	0	3

Preamble

The course on problem solving using computers is intended to introduce the students to computational thinking, the methodology of programming with emphasis on modularity and the coding of computer programs. Upon completion of the course, the students would be able to master the principles of structured programming and demonstrate significant experience in problem solving.

Prerequisite

Nil.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Develop algorithm and flowchart for the given problem specification like design of encryptor/ decryptor ,calculator etc,.	Apply
CO2:	Apply appropriate problem solving strategies such as divide and conquer, merging, solving by analogy etc in design of simple applications.	Analyze
CO3:	Develop simple programs involving input and output statements, expressions, arrays, control and iterative statements by appropriate choice of data types, expressions and control structures.	Analyze
CO4:	Utilize structures and unions in development of simple applications.	Apply
CO5:	Deploy the concept of dynamic memory allocation and pointers for developing simple applications.	Apply
CO6:	Utilize the extensive set of library functions for creating and processing data files.	Apply
CO7:	Practice software engineering principles like analysis, design, coding, testing and maintenance in development of engineering applications using modular programming.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	L										
CO3	M	L	L									
CO4	M	L	L									
CO5	M	L	L									
CO6	M	L	L									
CO7	M	M	M		M			L	L	L	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Test 3	
Remember	20	20	20	10
Understand	40	20	20	20
Apply	40	50	50	50
Analyse	0	10	10	20
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of Course outcome 7 is evaluated through Mini Project which involves design and development of simple engineering applications using modular programming.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate a compiler and interpreter.
2. Draw the flowchart for generation of Fibonacci sequence.
3. Develop the algorithm for exchange of two variables.

Course Outcome 2 (CO2):

1. Determine the hierarchy of operations and evaluate the expression k=3/2*4+3/8+3 and convert the equation $z = \frac{\frac{8.8(a+b)2}{c} - 0.5 + 2a/(q+r)}{(a+b)*(\frac{i}{m})}$
2. Rewrite the following program using conditional operators.

```
main()
{
floatsal;
printf("ENTER SALARY");
scanf("%f",&sal);
if(sal<40000 &&sal>25000)
printf("MANAGER");
else
if(sal<25000 &&sal>15000)
printf("ACCOUNTANT");
else
printf("CLERK");
}
```

3. Evaluate the output of the following code:

```
main()
{
int x=4,y=0,z;
while (x>=0)
{
x--;
y++;
if (x==y)
continue;
else
printf("\n%d%d",x,y);
}
```

Course Outcome 3 (CO3):

1. A company needs a program to figure its weekly payroll. The input data, consisting of each employee's identification number, pay rate, and hours worked, is in the file datafile.dat in secondary storage. The program should input the data for each employee, calculate the weekly wages, save the input information for each employee along with the weekly wages in a file, and display the total wages for the week on the screen, so that the payroll clerk can transfer the appropriate amount into the payroll account. Discuss the problem solving approach you would follow to develop the program.
2. Design an algorithm using factoring technique to establish all the primes in first n positive integers.
3. In the Company Payroll Program, use means-ends analysis to develop the algorithm for calculating pay. What are the ends in the analysis? What information did we start with and what information did we want to end up with?

Course Outcome 4 (CO4):

1. Create a structure to specify data on students given: Roll number, Name, Department, Course, Year of Joining Assume there are not more than 450 students in the college,
   a. Write a function to print names of all students who joined in a particular year.
   b. Write a function to print the data of a student whose roll number is given.
2. A factory has 3 divisions and stocks 4 categories of products. An inventory table is updated for each division and for each product as they are received. There are three independent suppliers of products to the factory:
   a. Design a data format to represent each transaction.
   b. Write a program to take a transaction and update the inventory.
   c. If the cost per item is also given, write a program to calculate the inventory sales.
3. Create a structure called library to hold accession number, title of the book, author name, price of the book and flag indicating whether book is issued or not. Write code to list all the books by a given author and list the count of books in the library.

Course Outcome 5 (CO5):

1. Consider the following code segment:

```
inti,j=25;
int*pi,pj=&j;

……

*pj=j+5;

j=*pj+5;

pj=pj;

*pi=i+j;
```

   Each integer occupies 2 bytes of memory. The value assigned to i begin at the hexadecimal address F9C and the value assigned to j begins at address F9E. Compute the values of following:

   (a) &i (b)&j (c)pj (d) *pj (e)i (f) pi (g)*pi (h) (pi+2)
   (i) (*pi+2) (j) *(pi+2)

2. How many bytes in memory would be occupied by the following array of pointers to strings? How many bytes would be required to store the same strings, if they are stored in a two dimensional character array?
   Char *mess[] = {"DEPARTMENT""OF""INFORMATION""TECHNOLOGY"};

Can an array of pointers to strings be used to collect strings from the keyboard? Justify your answer.

3. Interpret the meaning of the following declarations involving pointers:
   in (*p[10]) (char a); int *(*p[10]) (char a); int *(*p[10]) (char *a);
   int *(*p) (char(*a)[]); int *p (char *a[]));

Course Outcome 6 (CO6):

1. Write a program to count the number of occurrences of any two vowels in succession in a line of text in a file. For Example, in the sentence "THIAGARAJAR COLLEGE OF ENGINEERING" such occurrences are EE,IA.
2. Write a program to read a file and count the number of characters, spaces, tabs and new lines present in it.
3. Write a program that will generate a data file containing the list of customers and their corresponding telephone numbers. Use a structure variable to store the name and telephone of each customer. Write code to determine the telephone number of a specified customer.

Course Outcome 7 (CO7):

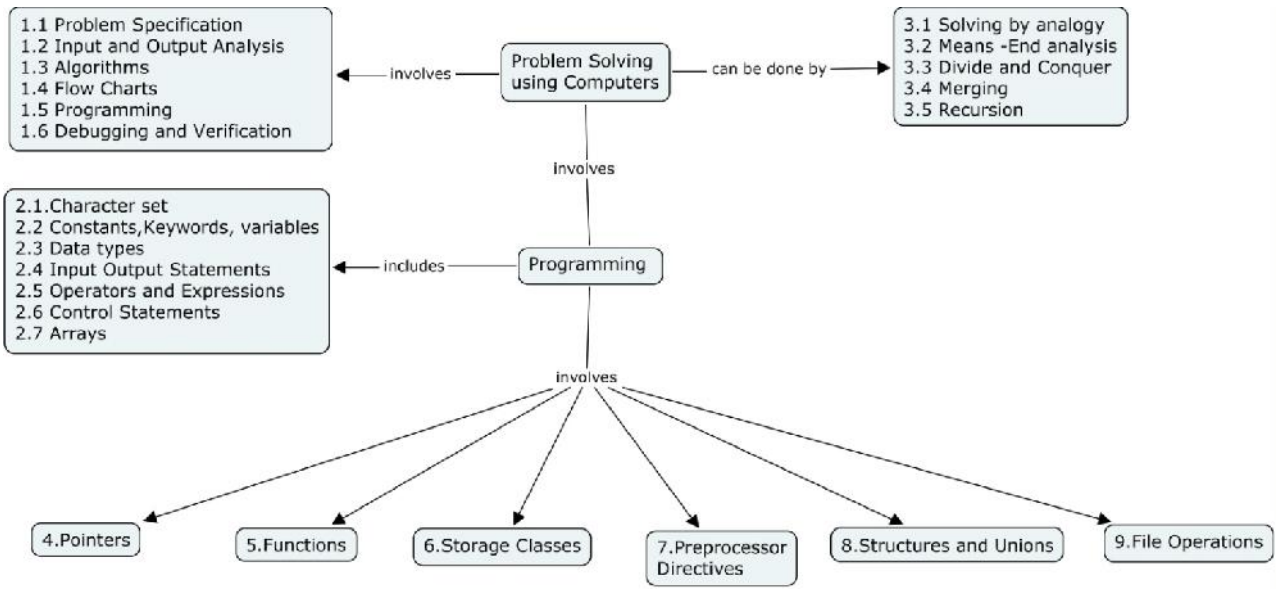
Design and Development of applications like

a. Encryptor/ Decryptor
b. Physics problem solver
c. Sudoku solver
d. Hospital management system
e. Random number generator
f. Electric circuit solver etc.
g. Scientific Calculator

Mini Project Details: (Team size: 5)

- Problem identification.
- Problem Analysis and Modular design.
- Develop algorithm/pseudo code and draw the flowchart – module wise individually.
- Develop programs module level, test and debug individually.
- Integrate the modular programs and present the results in a team.
- Documentation.

Concept Map



Syllabus

Introduction to Problem Solving – Problem Specification, input-output analysis, Algorithms – Design and Analysis, Flowcharts, Programming – High level languages, language translators, syntax, semantics, compilation and execution, Debugging and Program verification.

Fundamentals of Programming Languages - Character set, Keywords, Constants and variables, Data types, Input and Output statements, Operators and Expressions, Operator Precedence, Type Conversion, Type casting. Control Statements, Branching and Looping.

Problem Solving Techniques – Solving by analogy, Means-ends analysis, Divide and Conquer, Building Block Approach – Merging of Solutions.

Basic Algorithms – Exchange of variables, Counting, Summation of set of numbers, Generation of Fibonacci sequence, Number to character conversion.

Factoring Methods – Greatest Common Divisor of two integers, Generation of Prime numbers, raising number to larger power.

Array Techniques – Counting of array elements, array reversal, partitioning an array, removal of duplicates in an array –Single and Multidimensional Arrays.

Text Processing – Strings and pattern matching.

Pointers – Operations on Pointers, Pointers and one dimensional Arrays, Pointers and Multidimensional Arrays, Array of pointers, Dynamic Memory allocation.

Functions – Function Definition, Function Prototypes, Passing arguments to a function, Pointers to functions, Recursion.

Storage Classes – Automatic, External, Static and Register.

Preprocessor – Preprocessor directives and Macro Expansion with Conditional Compilation.

Structures and Unions – Definition, Processing a structure, Array of structures, Pointers to structures, Passing structures to Functions and Returning structure variables from functions, Self Referential Structures, Unions and Bit Fields.

Files – Reading and writing a file, processing a data file, Unformatted Files and Binary Files.

Text Book

1. R.G.Dromey, "How to solve it by Computers", Pearson Education India , 2008.
2. Byron S.Gottfried, "Programming with C", McGraw Hill Education (India) Pvt Ltd, Third Edition, 2010.
3. Al Kelley and Ira Pohl, "A Book On C", Addison-Wesley , Fourth Edition, 1997.

Reference Books

1. Donald Ervin Knuth, "The Art of Computer Programming : Fundamental Algorithms" Volume I, Addison-Wesley, Third Edition, 2002.
2. YashavantKanetkar, "Let us C", BPB Publications, 13th Edition, 2012
3. YashavantKanetkar, "Understanding Pointers in C", BPB Publications, 4th Edition, 2009.

Course Contents and Lecture Schedule

Module No	Topic	Hours
1	**Introduction to Problem Solving**	
1.1 1.2	Problem Specification Input Output Analysis	1
1.3	Algorithm – Design and Analysis	1
1.4	Flow Charts	1
1.5	Programming – High level languages, language translators, syntax, semantics, compilation and execution	1
1.6	Debugging and Program verification.	1
2 2.1 2.2 2.3	**Fundamentals of Programming Languages** Character set Constants, Variables and Key words Data types and Declarations	1
2.4	Input and Output Statements	1
2.5	**Operators and Expressions**	
2.5.1	Arithmetic, Relational, Logical and Conditional Operators, Bit wise Operators	1
2.5.2	Operator Precedence	1
2.5.3 2.5.4	Type Conversion Type Casting	1
2.6	**Control Statements**	
2.6.1 2.6.2 2.6.3	Branching Looping Break, Continue and Goto statements	1
2.7	Single and Multidimensional Arrays	1
3 3.1 3.2	**Problem Solving Techniques** Solving by analogy Means-ends analysis	1
3.3 3.4	Divide and Conquer Building Block Approach – Merging	1

3.5	Recursion	1
3.6 .1	**Basic Algorithms –** Exchange of variables, Counting, Summation of set of numbers, Generation of Fibonacci sequence, Number to character conversion.	1
3.6.2	**Factoring Methods –** Greatest Common Divisor of two integers, Generation of Prime numbers, raising number to larger power	1
3.6.3	**Array Techniques –** Counting of array elements, array reversal, partitioning an array, removal of duplicates in an array	1
3.6.4	**Text Processing** - Strings	1
4	**Pointers**	
4.1 4.2 4.3	Pointer to variables -Declaration and Operations Pointers and one dimensional Arrays Pointers to Strings	2
4.4 4.5	Pointers and Multi-dimensional Arrays Array of Pointers	1
4.6	Dynamic Memory allocation	2
5	**Functions**	
5.1 5.2	Function Definition and Function prototypes Passing Arguments to a function	1
5.3	Pointers to Functions	1
5.4	Recursion	1
6	**Storage Classes**	1
7	**Preprocessor**	
7.1 7.2 7.3	Preprocessor Directives Macro Expansion Conditional Compilation	1
7.4	Multiple File Inclusions	1
8	**Structures and Unions**	
8.1 8.2 8.3	Definition and Processing of Structure Array of Structures Pointers to Structures	2
8.4 8.5	Passing Structures to Functions, Returning structure variables from functions Self-Referential Structures	1
8.6 8.7	Unions Bit Fields	1
9	**Files**	
9.1	Reading and writing to a file	1
9.2 9.3	Processing a Data file Unformatted Files and Binary files	1
	Total Lectures	**36**

Course Designers:

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3. Mr.M.Thangavel mtit@tce.edu

		Category	L	T	P	Credit
14IT230	**DIGITAL SYSTEM DESIGN**	PC	2	2	0	3

Preamble

The main objective of this subject is to make the students to understand the basic building blocks of computers, logic gates, combinational and sequential circuits, and to provide the discussion of the memory and programmable logic. This course acts as prerequisite for Computer Organization.

Prerequisite

- Nil.

Course Outcomes

Upon successful completion of this course students will be able to:

Course Outcomes		**Bloom's Level**
CO1:	Explain different number systems and number base conversions.	Understand
CO2:	Simplify the Boolean expression using Map and Tabulation techniques to realize it using Logic gates. .	Apply
CO3:	Design Combinational circuits like BCD to Seven segment decoder, Code converter etc .	Apply
CO4:	Design Sequential circuits like counters, Sequence detector using different Flip-flops .	Apply
CO5:	Construct the different Programmable Logic Device that uses PAL, PLA.	Apply

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M											
CO2	S	M										
CO3	S	M			L							
CO4	S	M			L							
CO5	M	L										

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	20	10
Understand	40	40	40	40
Apply	30	40	40	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Do the following conversions
   a. $(934.89)_{10}$ to Binary
   b. $(101.111)_2$ to decimal
   c. $(939AB)_{16}$ to decimal
   d. $(86.37)_{10}$ into octal
2. Describe Binary codes.
3. Show that Excess-3 code and 2421 code are self-complementing.

Course Outcome 2 (CO2):

1. Simplify the following Boolean Expression using K Map.
   F(a,b,c,d) = ∑ (1, 2, 4, 5, 6, 7,8, 11, 12, 14) + ∑ (3, 10, 13)

2. Simplify the following Boolean Expression using Boolean theorems and postulates and construct the logical circuit.
   f(p,q,r,s) = pqrs + p'qrs+ pq'rs'+ pq'rs + p'q'rs' + pqrs' + pqr's + p'q'r's'

3. Simplify the following using QuineMc-Cluskymethod.. Construct the logic circuit for the expression.

$$f(w,x,y,z) = \sum 0,1,2,4,5,7,9,12,14,15 + \sum_{¤} 3,10,11$$

Course Outcome 3 (CO3):

1. Explain Magnitude comparator.
2. A combinational circuit is defined by the following three Boolean functions:
   F1=x'y'z'+xz
   F2=xy'z'+x'y
   F3=x'y'z'+xy
   Construct the circuit with a decoder.
3. Construct a four bit Combinational circuit 2'complementer.

Course Outcome 4 (CO4):

1. Consider a sequential circuit constructed with two D-Flip flops A,B and two inputs x, y and one output Z specified by the following next state and output equations:
   A(t+1)=x'y+xA

B(t+1)=x'B+xA

Z=B

Constructing a logic diagram,State table and State diagram**.**

2. Interpret a synchronous circuit that has a single input variable and single output variable. The input data are received serially. The output Z is to change only when three consecutive input bits have the same value.
3. Using JK Flip-flops, exhibit a counter with the following repeated binary sequence 0, 1, 2, 4, 6.

Course Outcome 5 (CO5):

1. Consider the following Boolean expression and construct a fuse map that implements PAL.

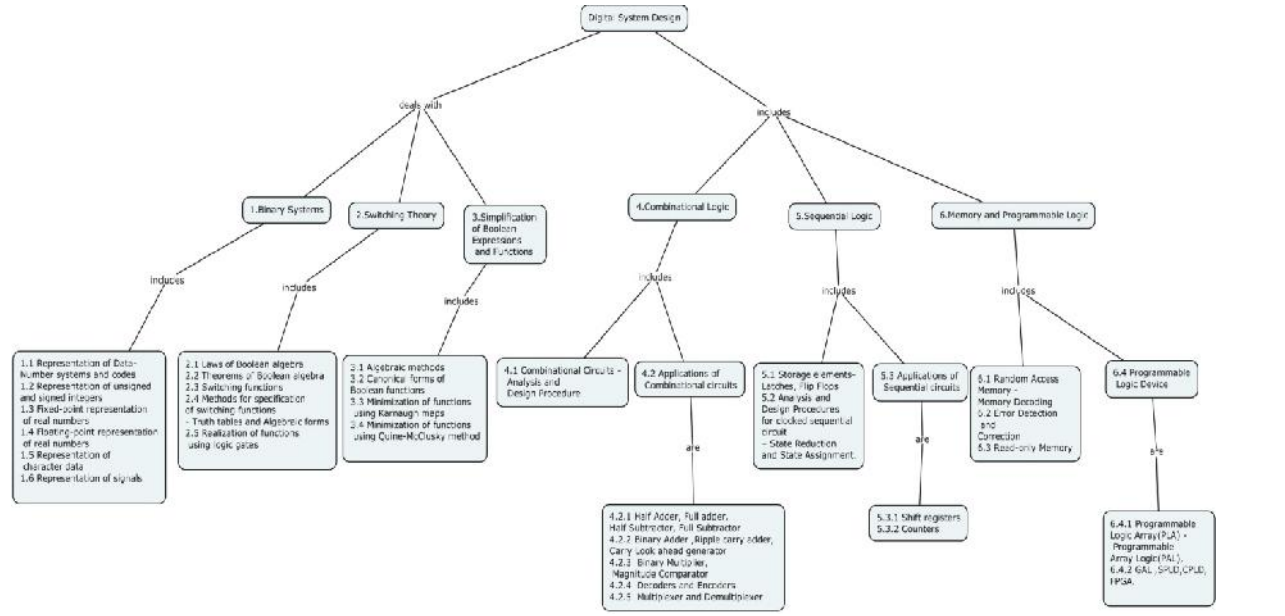
   W(A,B,C,D)=∑(0,2,4,6,8,11)

   X(A,B,C,D)=∑(1,3,5,7,9)

2. Differentiate PAL and PLA.

3. Explain Sequential Programmable devices.

Concept Map



Syllabus

Binary Systems: Representation of Data- Number systems and codes, Representation of unsigned and signed integers, Fixed-point representation of real numbers, Floating-point representation of real numbers, Representation of character data, Representation of signals.

Switching Theory: Laws of Boolean algebra, Theorems of Boolean algebra, Switching functions, Methods for specification of switching functions - Truth tables and Algebraic forms, Realization of functions using logic gates.

Simplification of Boolean Expressions and Functions: Algebraic methods, Canonical forms of Boolean functions, Minimization of functions using Karnaugh maps, Minimization of functions using Quine-McClusky method.

Combinational Logic: Combinational Circuits - Analysis and Design Procedure .Applications of Combinational circuits –Half Adder, Full adder, Half Subtractor, Full Subtractor, Binary Adder, Ripple carry adder, Carry Look ahead generator, Binary Multiplier, Magnitude Comparator, Decoders and Encoders , Multiplexer and Demultiplexer.

Sequential Logic: Storage elements-Latches, Flip Flops. Analysis and Design Procedures for clocked sequential circuit – State Reduction and State Assignment. Applications of Sequential circuits-Shift registers, Counters.

Memory and Programmable Logic: Random Access Memory - Memory Decoding - Error Detection and Correction - Read-only Memory. Programmable logic device- Programmable Logic Array(PLA) - Programmable Array Logic(PAL),GAL,SPLD,CPLD,FPGA.

Text Book

1. Morris Mano M. and Michael D. Ciletti, “Digital Design”, Pearson Education, Fourth Edition, 2008.

Reference Books

1. John F. Wakerly, “Digital Design Principles and Practices”, Pearson Education, Fourth Edition, 2007.
2. Charles H. Roth Jr, “Fundamentals of Logic Design”,Jaico Publishing House, Mumbai, Fifth Edition ,2003.
3. Donald D. Givone, “Digital Principles and Design”, Tata Mcgraw Hill, 2003.
4. Kharate G. K., “Digital Electronics”, Oxford University Press, 2010.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Binary Systems**	
1.1	Representation of Data- Number systems and codes	1
1.2	Representation of unsigned and signed integers	1
1.3	Fixed-point representation of real numbers	1
1.4	Floating-point representation of real numbers	1
1.5	Representation of character data	1
1.6	Representation of signals	1
2	**Switching Theory**	
2.1	Laws of Boolean algebra	1
2.2	Theorems of Boolean algebra	1
2.3	Switching functions	1
2.4	Methods for specification of switching functions - Truth tables and Algebraic forms	1
2.5	Realization of functions using logic gates	1
3	**Simplification of Boolean Expressions and Functions**	
3.1	Algebraic methods	1

Module No.	Topic	No. of Lectures
3.2	Canonical forms of Boolean functions	1
3.3	Minimization of functions using Karnaugh maps	2
3.4	Minimization of functions using Quine-McClusky method	1
4	**Combinational Logic**	
4.1	Combinational Circuits - Analysis and Design Procedure	1
4.2	Applications of Combinational circuits	
4.2.1	Half Adder, Full adder, Half Subtractor, Full Subtractor	1
4.2.2	Binary Adder ,Ripple carry adder, Carry Look ahead generator	2
4.2.3	Binary Multiplier, Magnitude Comparator	1
4.2.4	Decoders and Encoders	1
4.2.5	Multiplexer and Demultiplexer	1
5	**Sequential Logic**	
5.1	Storage elements-Latches, Flip Flops	2
5.2	Analysis and Design Procedures for clocked sequential circuit – State Reduction and State Assignment.	3
5.3	Applications of Sequential circuits	
5.3.1	Shift registers	1
5.3.2	Counters	2
6	**Memory and Programmable Logic**	
6.1	Random Access Memory - Memory Decoding	1
6.2	Error Detection and Correction	1
6.3	Read-only Memory	1
6.4	Programmable Logic Device	
6.4.1	Programmable Logic Array(PLA) - Programmable Array Logic(PAL),	1
6.4.2	GAL ,SPLD,CPLD,FPGA.	1
Total Lectures		36

Course Designers:

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2. Ms.R.Parkavi rpit@tce.edu

		Category	L	T	P	Credit
14IT240	**INFORMATION SYSTEMS**	PC	3	0	0	3

Preamble

This course aims to emphasis the need for Information system and provides coverage of various phases in building Information systems. It provides an overview of different kinds of Information Systems, describes how it relates to other computing disciplines. The goal is to help students for understanding the diverse application of Information Systems and the challenges inherent in the diffusion of Information systems.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome		**Blooms Level**
CO1:	Differentiate components of Information Systems like data, Information and System and then comprehend Transaction processing system and	Understand
CO2:	Discuss the components of Information system to support the different Business functions in a firm	Understand
CO3:	Prepare the System Requirement Specification document for a given system.	Apply
CO4:	Develop high level design for stated requirements using Data flow Diagram, Process description Tool, E-R Diagram	Apply
CO5:	Perform a feasibility analysis on implementation of Information Systems.	Apply
CO6:	Develop simple applications in team for any engineering problem with the knowledge of design of a information system	Apply

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											L
CO2	S	S	M	M								M
CO3.	S	S	S		S				M	M		M
CO4.	S		S			M		L	M	S	M	
CO5.	S	S		S					M	M	S	M
CO6.	S	M	M		S			L	L	L	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous			Terminal Examination
	1	2	3	
Remember	50	40	0	40
Understand	50	30	50	30
Apply	0	30	50	30
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of course outcome 6 is evaluated through mini project which involves design and development of simple applications using modular programming.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. State the difference between data and information.
2. Identify the various information systems.
3. State the system requirements in an information system.
4. List the differences between online transaction processing and Batch processing.

Course Outcome 2 (CO2):

1. While studying the information system in a textile industry with an aim of modernizing, the management gives the configuration of their existing hardware. Is it possible to develop information system considering the available hardware and defining only new software to meet their requirements. Illustrate giving example scenarios.
2. Apply the concept of accounting and financial information system for a retail showroom and provide a framework in which the entire process of information flows in the system.
3. Prepare an integrated framework with the entire Transaction processing system environment for a sales application.

Course Outcome 3 (CO3):

1. Prepare a Software Requirement Document for library management system
2. Use the requirements gathered from customer regarding online banking system and construct a Software Requirement Document.
3. Compare the Software Requirement Document produced for an agile development project.

Course Outcome 4 (CO4):

1. Can the name of a person be used as a code in a bank account? Justify.
2. Admission procedure in a University is as follows: An advertisement is issued giving essential qualifications for the course, the last date for receipt of application, and the fee to be enclosed with the application. A clerk in the Registrar's office checks the received applications to see if mark sheet and fee are enclosed and sends valid applications to the concerned academic department. The department checks the application in detail and decides the applicants to be omitted, those to be put in the waiting list, and those rejected. Appropriate letters are sent to the Registrar's office which intimates the applicant. Give physical and logical Data Flow Diagrams corresponding to the above problem.
3. Develop E-R diagram for the following:
   (i) Customer withdraws money from his account.
   (ii) Students write examinations.
   (iii) Students attend classes.
   (iv) Professors write books.
   (v) Driver drives a car.
4. The Process Description of a DFD Process block was described using a) Structured English and b) using Decision Table. Compare and contrast which one is better if the programmer involved is a novice person. Substantiate your stand.

Course Outcome 5 (CO5):

1. In an approach to automate a travels reservation operation, it was worked out that the capital cost was Rs. 2 lakhs. The project will be completed by 4 months and the salary for the people hired for this works out to Rs. 30,000 per month. The cost due of maintenance is Rs. 1500/- per month. The expected electricity charges are Rs. 6000 for two months. Analyze how the ROI will work out if they can save Rs.35000/month using:
   a. Simple pay back method

b. Simple payback method with interest if interest is 2% per month
c. Present value method with interest as 2 % per month

2. Describe the strategic, tactical, operational information required for an educational institution?
3. University administrator calls a systems analyst to improve the administration of sponsored research projects. The main problems are delay in giving latest financial position to project coordinators, reconciliation of advances given to coordinators, prompt demands not sent to sponsors to collect promised grants and lack of information to answer following questions:

i)Which areas of research get maximum grants?
ii)Which agency aids which type of projects?
iii)What trends can be seen in the nature of grants?
iv)Classify the above problems into missing functions, unsatisfactory Performance and excessive cost of operation.
v)Set the goals to meet the deficiencies and quantify them.

Course Outcome 6 (CO6):

Mini project details: (team size: 3)

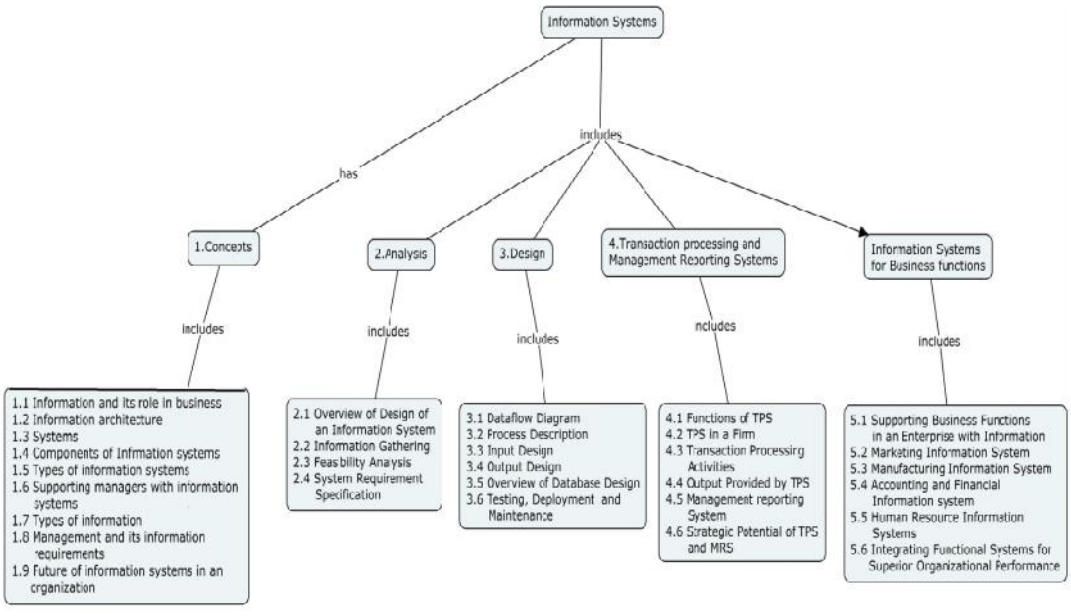
1. Problem identification.
2. Problem analysis and design.
3. Develop framework for the designed modules (eg. diagrams).
4. Integrate the modules and present the results in a team.
5. Document the above process as a SRS.

Mini Project

Design and Development of applications like

a. Library Management System
b. Banking System
c. Payroll System
d. Financial Information System
e. Marketing System

Concept Map



Syllabus

Concepts of Information Systems: Information and Its Role in Business , Information architecture, Systems , Components of Information Systems , Types of Information Systems Supporting Managers with Information Systems , Types of Information , Management and Its Information Requirements .

Information Systems Analysis: Overview of Design of an Information System, Information Gathering, Feasibility Analysis, System Requirement Specification.

Information System Design: Dataflow Diagram, Process Description-structured English, Decision tables, Input Design, Output Design, Testing, Deployment and Maintenance.

Transaction Processing and Management Reporting Systems: Functions of Transaction processing system, Transaction Processing Subsystem in a Firm, Transaction Processing Activities, Output Provided by Transaction Processing System, Management Reporting System, Strategic Potential of Transaction Processing and Management Reporting Systems.

Information Systems for Business Functions: Supporting Business Functions in an Enterprise with Information, Marketing Information System, Manufacturing Information System, Accounting and Financial Information System, Human Resource Information Systems, Integrating Functional Systems for Superior Organizational Performance- Case Study – integrated ordering and production system: fusion at Motorola, mass customization at Andersen

Text Book

1. V.Rajaraman, “Analysis and Design of Information Systems”, Second edition, Prentice Hall of India, 2010.
2. Vladimir Zwass, “Foundations of Information Systems”, Irwin / McGraw Hill International Edition, 1998.

Reference Books

1. Shouhong Wang, Hai Wang, “Information Systems Analysis and Design”, Universal Publishers, 2012.
2. Gary B. Shelly, Harry J. Rosenblatt, “System Analysis and Design”, ninth edition, Cengage Learning, 2011.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**Concepts of Information Systems**	
1.1	Information and Its Role in Business	1
1.2	Information architecture	1
1.2	Systems	1
1.3	Components of Information Systems	1
1.4	Types of Information Systems	1
1.5	Supporting Managers with Information Systems	1
1.6	Types of Information	1
1.7	Management and Its Information Requirements	1
1.8	Future of Information systems in an Organization	
2.	**Information Systems Analysis**	
2.1	Overview of Design of an Information System	1
2.2	Information Gathering	1
2.3	Feasibility Analysis	2
2.4	System Requirement Specification	1

Module No.	Topic	No. of Lectures
3.	**Information System Design**	
3.1	Dataflow Diagram	1
3.2	Process Description	1
3.2.1	Structured English	1
3.2.2	Decision tables	
3.3	Input Design	2
3.4	Output Design	1
3.5	Testing, Deployment and Maintenance	2
4.	**Transaction Processing and Management Reporting Systems**	
4.1	Functions of Transaction processing system	2
4.2	Transaction Processing Subsystem in a Firm	1
4.3	Transaction Processing Activities	1
4.4	Output Provided By Transaction Processing System	1
4.5	Management Reporting System	2
4.6	Strategic Potential of Transaction Processing and Management Reporting Systems	1
5.	**Information Systems for Business Functions**	
5.1	Supporting Business Functions in an Enterprise with Information	1
5.2	Marketing Information System	2
5.3	Manufacturing Information System	1
5.4	Accounting and Financial Information System	1
5.5	Human Resource Information Systems	1
5.6	Integrating Functional Systems for Superior Organizational Performance	1
Total Lectures		**36**

Course Designers:

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2. Mr.M.Arun Fera fera@tce.edu

		Category	L	T	P	Credit
14IT250	**ENVIRONMENT SCIENCE**	HSS	3	0	0	3

Preamble

This course provides the basic knowledge of structure and function of ecosystem and better understanding of natural resources, biodiversity and their conservation practices. It describes the need to lead more sustainable lifestyles, to use resources more equitably. It helps to create a concern for our environment that will trigger pro-environmental action, including activities we can do in our daily life to protect it. Furthermore, it deals the social issues and ethics to develop quality engineer in our country.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	**Bloom's Level**
CO1:	Explain the significance of the conservation of natural resources and Identify the significance of Environmental studies in the context of multiple disciplines.	Understand
CO2:	Demonstrate an understanding of different ecosystems and identify the influence of various factors in guiding the evolution of an ecosystem.	Understand
CO3:	Make use of an understanding of the types, values, hotspots of Bio-diversity and threats to Biodiversity in solving conflicts between organisms.	Apply
CO4:	Identify various causes, effects of environmental pollution and make use of various control measures to counteract the effects of pollution.	Apply
CO5:	Apply the environmental conservation concepts to achieve environment sustainability.	Apply
CO6:	Identify areas of Information and Communication Technology (ICT) that directly contribute to the Green House Gas Emissions and environmental pollution and develop solutions to reduce the adverse impact of ICT on the environment	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.						L	M					
CO2.						L	M					
CO3			L			M	S					
CO4			L			M	S					
CO5.			L			M	S					L
CO6		M	L			M	S					L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	40	30	30	30
Apply	40	50	50	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe the multidisciplinary nature of Madurai district.
2. Explain the necessity of food web.
3. Account for energy of pyramid of ecosystem always upright.

Course Outcome 2 (CO2):

1. List out types of ecological succession.
2. Demonstrate the regulation of ecosystem
3. Illustrate process involved in transformation of natural calamity affected place to fertile land.

Course Outcome 3 (CO3):

1. Demonstrate bio-geographical classification of biodiversity.
2. Distinguish between in situ and ex situ conservation.
3. Recall the term hot spots of biodiversity.

Course Outcome 4 (CO4):

1. Compare the major limitations of the wildlife (protection) Act, 1972 and Forest (conservation) Act, 1980. Provide the effective ideas for the successful implementation of our environmental legislation.
2. Analyze the pollutants in the atmosphere are responsible for green house effect of Earth.
3. Differentiate between recycling and reuse**.**

Course Outcome 5 (CO5):

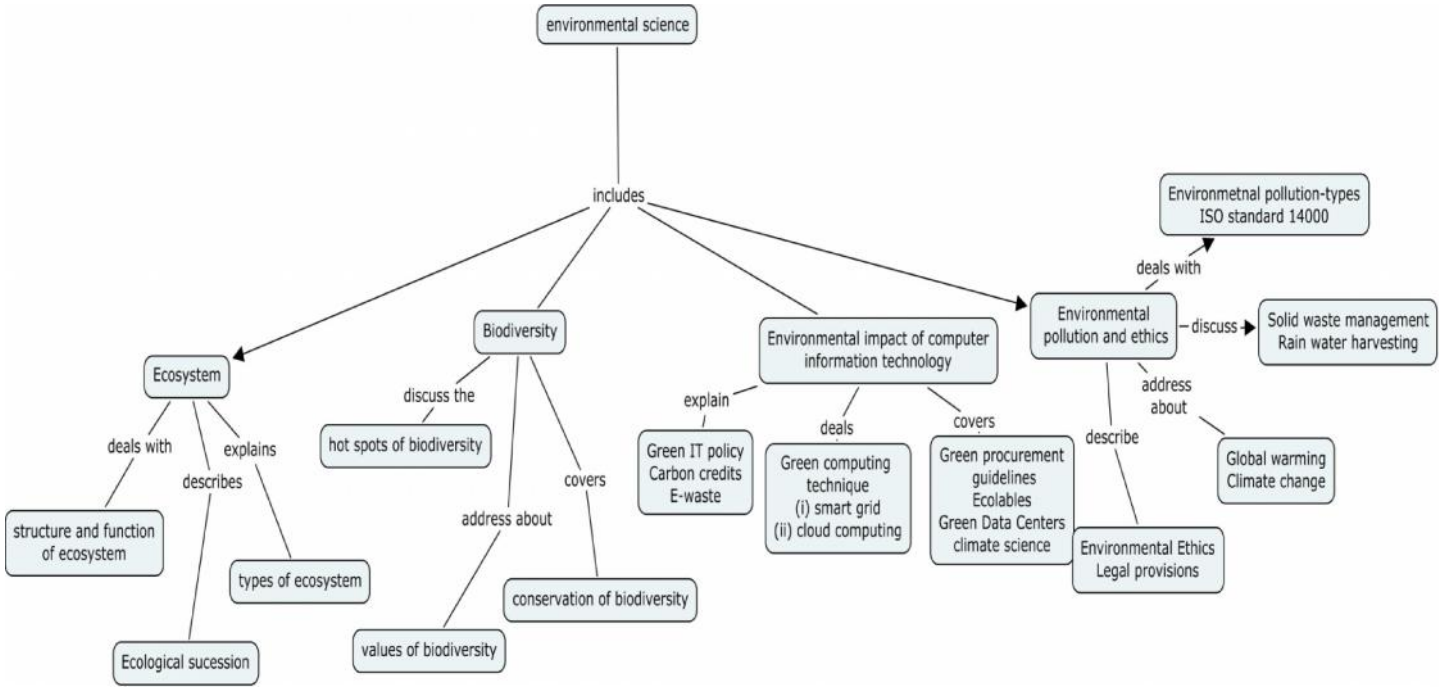
1. India faces problems repeatedly due to flood in the rainy seasons. Account the problem and suggst suitable remedial measures.

2. While water is generally collected, stored and conserved at the surface in the form dams, lakes, ponds etc. Why is it essential to go for rain water harvesting by individuals specifically in large and thickly populated cities?
3. Outline the term sustainable development

Course Outcome 6 (CO6):

1. Highlight the areas of ICT that are directly contributing to organizations GHG emissions.
2. Explain the role of green disk in computer related wastes
3. List out the green procurement guidelines for the purchase of a personal compute

Concept Map



Syllabus

Ecosystem: Multidisciplinary nature of environment- need for public awareness-Eco-system-Concept, structure, function, components, laws of Ecology, Energy flow in eco system - Food chains, food webs-Ecological pyramids-Ecological succession. Types of eco system-Loss of ecosystem and its estimation. **Biodiversity:** Biodiversity and its types, bio-geographical classification, Values of biodiversity - Hot spots of biodiversity-threats to biodiversity-Biodiversity Indices-Endangered and endemic species- conservation of bio-diversity, Natural resources-Types and their uses-over exploitation. Conservation. **Environmental impact of computer Information Technology:** Role and Importance of Green IT policy, Dangers of Green wash, Carbon Footprint Calculators, Carbon Offsetting and Carbon Neutrality, Carbon trading, Techno trash, (E-Wastes) Green disk-its management, Computational Energy Consumption, sustainable Green procurement guidelines, Ecolables. Green Data centers, Climate Science, Geomatics**.** Case studies on Green computing technology, Thin clients, Virtualization, Smart Grids, Cloud computing, RHW certification **Environmental Pollution and Ethics:** Environmental pollution-types, effects and control measures – ISO 14000 standards, solid waste management–causes, effects and control measures. Water conservation - Rainwater Harvesting-Global warming-climate

change and its effect on Environment – acid rain - ozone layer depletion-Environmental Ethics - sustainable development - Future aspects - Human and Animal rights-conservation of ethics and traditional value systems of India - Legal provisions-Environmental acts.

Text Book

1. Anubha Kaushik and C.P. Kaushik, Environmental science and Engineering, Fourth edition, New age international (p) ltd publishers. Reprint -2014.

Reference Book

1. Mark G O' Neill, Green IT for sustainable Business Practice, An ISBN Foundation Guide.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**Ecosystem**	
1.1	Multidisciplinary nature of environment- need for public awareness	1
1.2	Eco-system-Concept, structure, function, components	1
1.3	Laws of Ecology and Energy flow in eco system	1
1.4	Food chains, food webs-Ecological pyramids	2
1.5	Ecological succession and regulation	1
1.6	Types of ecosystem, and their Loss and estimation	2
2.	**Biodiversity**	
2.1	Types of biodiversity and their bio-geographical classification	1
2.3	Hot spots of biodiversity and biodiversity indices	1
2.4	Threats to biodiversity	1
2.5	Values of biodiversity	1
2.6	Endangered and endemic species of india	2
2.7	Conservation of biodiversity	2
3	**Environmental impact of computer Information Technology**	
3.1	Role and Importance of Green IT policy, Dangers of Green wash,	1
3.2	Carbon Footprint Calculators, Carbon Offsetting and Carbon Neutrality, Carbon trading	1
3.3	Techno trash, (E-Wastes) Green disk-its management	1
3.4	Green computing technology, Thin clients, Virtualization,	1
3.5	Smart Grids, Cloud computing, Computational Energy Consumption,	2
3.6	sustainable Green procurement guidelines, Ecolables.	1
3.7	Green Data centers, Climate Science, Geomatics**.**	2
4	**Environmental Pollution and Ethics:**	
4.1	Environmental pollution- types, effects	2
4.2	control measures – ISO 14000 standards,	2
4.3	solid waste management–causes, effects and control measures	1
4.4	Water conservation - Rainwater Harvesting-Global warming-climate change and its effect on Environment – acid rain - ozone layer depletion	3
4.5	Environmental Ethics - sustainable development - Future aspects - Human and Animal rights-conservation of ethics and traditional value systems of India	2

Module No.	Topic	No. of Lectures
4.6	Legal provisions-Environmental acts.	2
	Total Lectures	**36**

Course Designers:

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14IT270	FREE OPEN SOURCE SOFTWARE: PRACTICE	Category	L	T	P	Credit
		PC	2	0	2	3

Preamble

The main objective of the course is to introduce free open source software tools in Linux environment through installation of free software tools and hands-on practices on office suite, document and image editor software and multimedia application software. The course introduces writing of simple programs using shell scripts, HTML scripts and Python language.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Illustrate the installation of Linux distributions and other FOSS tools	Understand
CO2:	Demonstrate and navigate Desktop environment tools	Understand
CO3:	Interpret the use of Shell commands in Shell scripts	Apply
CO4:	Use office suite, image and multimedia applications, document editor and HTML scripting tools	Apply
CO5:	Write simple Python programs	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L				L							
CO2	L											
CO3	L				M							M
CO4	L				S							L
CO5	L				S							L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Test 3 (Practical)	
Remember	20	20	0	20
Understand	50	0	0	40
Apply	30	80	100	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO1, CO2 and CO4 are evaluated by laboratory sessions/assignments

CO3 and CO5 are evaluated by tests and laboratory sessions/assignments

Assignments are evaluated through rubrics. Some of the assignment problems include: *(but not limited to)*

1. Download any open source tool and interpret the working of the tool
2. Study on the use of open source tools used in any web application
3. Implement simple Linux library commands like cp, mv, etc
4. Include any Python module for solving the problem
5. Prepare report using Latex software

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List the various Linux Distributions.
2. Demonstrate the installation of Linux distribution in a system.
3. Solve the problems, if system does not start after Linux installation.
4. Explain the features of LILO and GRUB.
5. Choose the right application to manipulate image/multimedia files in Linux environment.

Course Outcome 2 (CO2):

1. List some components of GNOME.
2. State the uses of preferences menu.
3. Explain the functions of gdm and GNOME window manager.
4. Differentiate GNOME window manager Nautilus and Konquerer.
5. Differentiate GNOME and KDE desktop.

Course Outcome 3 (CO3)

1. State the need for shell script.
2. Write shell script to show various system configuration like currently logged user, his logname, current shell, home directory, Operating system type, Current path setting.
3. Write steps to configure user's SHELL.
4. Write shell script to change the file access permissions of file/directory for users.
5. Write the uses of special characters and their meanings in Linux Shell.

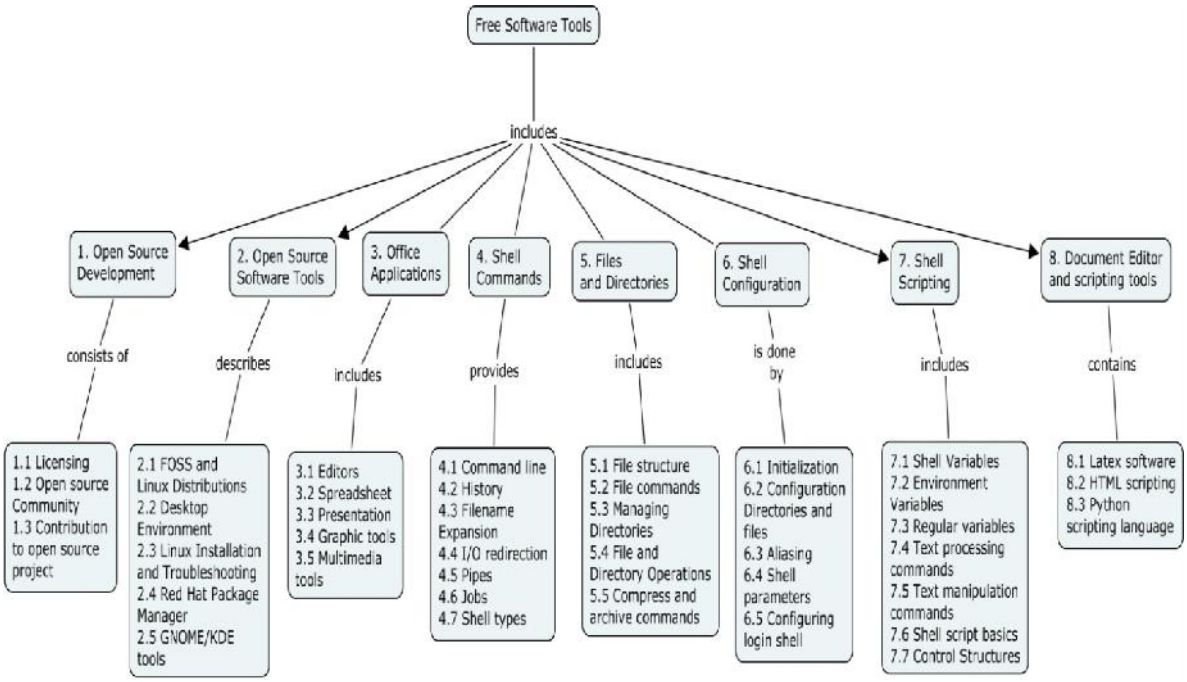
Course Outcome 4 (CO4):

1. List the GNOME office applications .
2. Explain the GUI User Management tools?
3. Generate a chart in OpenOffice.Writer using data in a OpenOffice.calc created by any equation.
4. Create a presentation about the college using Openoffice.impress.
5. Describe the features of Multimedia applications of Linux.

Course Outcome 5 (CO5):

1. Write python script to perform the functions in list type.
2. Mention the role of phython in FOSS.
3. Convert the temperature celcius to Fareheit using python script.
4. Write Python script to display first 10 Fibonocci series.
5. Write Python script to find the substring of a string.

Concept Map



Syllabus

Open Source Development: Licensing – Open Source Community – Contribution to open source project

Open Source Software tools: FOSS and Linux Distributions – Desktop Environment – Linux Installation and troubleshooting – Gnome/KDE tools – Red Hat Package Manager **Office Applications:** Editors – Spreadsheet – Presentation - Graphic tools - Multi-media tools

Shell Command line – History – File name expansion – Standard I/O redirection – Pipes - Jobs – Shell types

Files and Directories File structures – File commands – Managing directories – File and Directory operations - Compress and archive commands

Shell Configuration Initialization - Configuration Directories and Files - Aliasing – Shell parameters - Configuring login shell

Shell scripts and Programming Shell variables – Environment variables – Regular expressions - Text processing commands - Text manipulation commands (sed, awk) – Shell script basics - Control structures

Document editor and scripting tools Latex Software – HTML scripting – Python installation and set up – Basic Data types – Control flow statements – String Processing – Functions

Text Book

1. Richard Petersen, 'The Complete Reference Linux", 6th Edition, Tata Mcgraw Hill, 2008.
2. John M. Zelle, "Python Programming: An introduction to Computer Science", Franklin, 2013.

References

1. Richard Blum, “Linux Command Line and Shell scripting Bible”, Wiley Publications, 2008.
2. Cody Kackson, “Learning to Program Using Python”, 2nd edition, eBook.
3. www.linux-tutorial.info/
4. http://www.yolinux.com/TUTORIALS/
5. http://www.freeos.com/guides/lsst/
6. www.python.org
7. http://www.latex-tutorial.com/tutorials/
8. http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/GSWLaTeX.pdf
9. www.w3schools.com

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecture Hours
1	**Open Source Development**	
1.1	Licensing	2
1.2	Community driven development	
1.3	Contribution to open source project (sourceforge.net)	
2	**Open Source Software Tools**	
2.1	FOSS and Linux Distributions	1
2.2	Desktop Environment	
2.3	Linux Installation and trouble shooting	1
2.4	Red Hat Package Manager	
2.5	GNOME/KDE tools	1
3	**Office Applications**	
3.1	Editors (Openoffice.org)	1
3.2	Spreadsheet (Impress)	1
3.3	Presentation tools	
3.4	Graphics tools	1
3.5	Multi-media tools	
4	**Shell Commands**	
4.1	Command line	1
4.2	History	
4.3	Filename expansion	
4.4	Standard I/O redirection	1
4.5	Pipes	
4.6	Jobs	1
4.7	Shell Types	
5	**Files and Directories**	
5.1	File structure	1
5.2	File commands	
5.3	Managing Directories	
5.4	File and Directory operations	1
5.5	Compress and Archive commands	
6	**Shell Configuration**	
6.1	Initialization	1

Module No.	Topic	No. of Lecture Hours
6.2	Configuration Directories and Files	
6.3	Aliasing	
6.4	Shell Parameters	
6.5	Configuring login shell	
7	**Shell Scripts and Programming**	
7.1	Shell variables	1
7.2	Environment Variables	
7.3	Regular Expressions	
7.4	Text processing commands	1
7.5	Text manipulation commands (sed, awk)	
7.6	Shell script basics	2
7.7	Control structures	
8	**Document editor and Scripting tools**	
8.1	Latex Software	2
8.2	HTML scripting	2
8.3	Python scripting	
8.3.1	Python Installation and set up	1
8.3.2	Basic Data types	
8.3.3	Control Flow statements	
8.3.4	String processing	1
8.3.5	Functions	
Total Lectures		**24**

List of experiments include (but not limited to):

Ex. No	Topic	No. of Lab Hours
1.	Linux Installation and trouble shooting	1
2.	Navigation of GNOME/KDE tools	1
3.	Editors, Spreadsheet, Presentation tools	1
4.	Graphics and Multimedia tools	1
5.	Linux – simple commands, file commands	1
6.	Linux commands – Process, Redirection, History	1
7.	Shell variables, Simple shell scripts	1
8.	Shell scripts - Control structures	1
9.	HTML scripting	1
10.	Python installation, simple python programs	1
11.	String processing using python scripts	1
12.	Report writing using Latex software	1
Total Lab sessions		**12**

Course Designers:

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3. Ms.C.Santhiya santhiya.c@gmail.com
4. Ms.J.John Shiny shinyit@tce.edu

		Category	L	T	P	Credit
14IT280	**COMPUTER PROGRAMMING LAB**	PC	0	0	2	1

Preamble

The Computer Programming lab using C under windows and Linux environment aims at providing hands on for Computer Programming. Students will gain a practical insight in to structured programming concepts and improve their problem solving and programming skills.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Gain proficiency in developing simple applications using C language involving Arrays, Functions, Pointers, Strings, Structures and Files.	Apply
CO2:	Design a solution for a problem of moderate complexity using functional decomposition within the structured analysis and design methodology.	Apply
CO3:	Implement, test and debug the solution for a given problem using C programming language.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M										
CO2.	S	S	L		L	L	M	M	M			
CO3.	S	M	L									

S- Strong; M-Medium; L-Low

List of Experiments

1. Simple programs like
    a. To check whether the given number is i) prime or not ii) perfect or abundant or deficient
    b. Electricity bill tacking for different categories of users, different slabs in each category. (Using Nested If Else Statement).
    c. To evaluate the following using loops i) $1 + x^2 / 2! + x^4 / 4! +$... upto 5 terms ii) $x + x^3 / 3! + x^5 / 5! +$... upto 5 terms
    d. To generate the first n terms of the Fibonacci sequence. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
2. Use of Arrays
    a. To find the mean, mode, median, and variance of list of values by using one dimensional array.
    b. To sort the given set of numbers.
    c. To add, subtract, multiply the given two matrices.
3. String Manipulations
    a. To insert a sub-string in to a given main string from a given position.

   b. To delete n Characters from a given position in a given string.
   c. To determine if the given string is a palindrome or not
   d. To count the lines, words and characters in a given text.
4. Functions
   a. Do recursive and non recursive functions for towers of Hanoi, GCD, LCM
   b. Perform calculator operations using call by reference
   c. To read a list of numbers and search for given number using binary search algorithm and if found display its index otherwise display the message "element not found in the list" using functions
5. Pointers
   a. Number conversions (Decimal to binary)
   b. Compare, concatenate, reverse, copy with strings using pointers
   c. Find the transpose of a given matrix
6. Structures & Unions
   a. Medical shop automation
   b. Book shop automation
   c. Library management system
   d. Ticket management system
7. Files Manipulations
   a. Academic record management systems
   b. Birth and death certificate management systems
8. Macros
   a. Write a macro to swap(x,y) that exchanges the values of the two variables x and y assuming that both are of type t, e.g. int, and test it on machine.
   b. Define a preprocessor macro to select (i) the least significant bit from an unsigned char, (ii) the nth (assuming least significant is 0) bit from an unsigned char.
9. Dynamic Memory allocation
   a. Matrix Multiplication
   b. Implementation of Stack
10. Mini-Project

    Application Development for any Engineering problem in Teams

Course Designers:

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		Category	L	T	P	Credit
14IT290	**WORKSHOP**	ES	0	0	2	1

Preamble

This is the foundation practical course for the students of circuit branches (EEE, ECE, CSE and IT). The aim of this course is to impart fundamental hands-on skill in carrying out experiments at higher semester practical courses.

Prerequisite

14ES160 : Basic Electrical and Electronics Engineering

Course Outcomes

EEE

CO1: Select and use accurately various power supplies and meters.

CO2: Accurately discriminate and use fuses and Circuit breakers.

CO3: Select and make use of components in bread board and soldering in the PCBs.

CO4: Accurately use the AFO and CRO in electronic circuits.

CO5: Troubleshoot the electrical wiring and measure electrical parameters.

CO6: Realize the importance of earthing in electrical safety.

ECE

CO1: Identify various basic electronic components.

CO2: Understand specifications of basic electronic components.

CO3: Understand PCB terms and definitions.

CO4:Develop PCB layout for the given circuit schematic .

CO5: Fabricate PCB for the given circuit.

CO6: Solder and desolder the respective components on PCB.

CSE

CO1: Practice on different Unix and DOS commands.

CO2: Prepare configuration management of Windows operating system.

CO3: Practice on designing and preparing reports using word, Power-point and Excel applications.

CO4: Review on Rapid prototyping tools.

IT

CO1: Assemble/setup and upgrade personal computer systems

CO2:Use DOS Commands to manage files; troubleshoot system, software, and hardware problems; configure legacy devices; develop and maintain compatibility with other network operating system platforms; boot a computer when windows OS is not functioning; and install, configure, and troubleshoot network problems.

List of Experiments

EEE:

1. Realization and Discrimination of fuses and Circuit breakers
2. Earthling practices and its significances
3. Wiring practices and testing
4. Functionalities of RPS/AFO/CRO
5. Functionalities and Selection of Analog and Digital meters

ECE:

1. Identifying electronic components and understanding PCB glossary
2. Conversion of schematic into PCB layout and PCB fabrication
3. Practicing of soldering and desoldering

Computer Science and Engineering:

1. Practice on different DOS and Unix commands. Basic configuration management of Windows operating system.
2. Practice on designing and preparing reports using word, Power-point and Excel applications.

Information Technology:

1. **PC Assembling and troubleshooting**
   - Assembling a SMPS in a cabinet, fixing a processor in a mother board, assembling RAM in a motherboard, pinning a cooling fan in a mother board
   - Assembling a hard disc drive in a cabinet, assembling a CD/DVD ROM in a cabinet, fixing motherboard in a cabinet.
   - Connecting the cables from the SMPS to motherboard, hard disk, drives & etc, establishing data connection for to motherboard, hard disk, drives. Fixing wires for power restart switches, fixing wires for power & HDD LED's, fixing wires for external USB and Audio connections.
   - Installation and Configuration of CMOS Setup, HDD, CDROM, Keyboard, Mouse, Printers, Monitor, and SMPS.
   - Hardware trouble shooting.
2. **Software Installation and Internet configuration**
   - Operating System and Software Installation.
   - Configuration of Internet.

Course Designers:

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4. Dr.K.Hariharan khh@tce.edu
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6. Mr.C.Senthilkumar cskcse@tce.edu
7. Mr. M.Thangavel thangavelmuruganme@gmail.com

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

THIRD SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
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Approved in Board of Studies Meeting on 15.11.2014

Approved in 49th Academic Council Meeting on 04.12.2014

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2014-15 onwards)

THIRD SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
14IT310	Discrete Mathematics	BS	2	2	-	3
14IT320	Object Oriented Programming	PC	3	-	-	3
14IT330	Computer Organization	PC	2	2	-	3
14IT340	Data Structures and Algorithms	PC	2	2	-	3
14IT350	Operating Systems	PC	2	2	-	3
THEORY CUM PRACTICAL						
14IT370	Software Engineering	PC	2	-	2	3
PRACTICAL						
14IT380	Object Oriented Programming Lab	PC	-	-	2	1
14IT390	Data Structures Lab	PC	-	-	2	1
Total			**13**	**8**	**6**	**20**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
2 Hours Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B.Tech. Information Technology Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2014-15onwards)

THIRD SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	14IT310	Discrete Mathematics	3	50	50	100	25	50
2	14IT320	Object Oriented Programming	3	50	50	100	25	50
3	14IT330	Computer Organization	3	50	50	100	25	50
4	14IT340	Data Structures and Algorithms	3	50	50	100	25	50
5	14IT350	Operating Systems	3	50	50	100	25	50
THEORY CUM PRACTICAL								
6	14IT370	Software Engineering	3	50	50	100	25	50
PRACTICAL								
7	14IT380	Object Oriented Programming Lab	3	50	50	100	25	50
8	14IT390	Data Structures Lab	3	50	50	100	25	50

* CA evaluation pattern will differ from course to course 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 and subsequently be reduced to 50 marks for the award of terminal examination marks

		Category	L	T	P	Credit
14IT310	**DISCRETE MATHEMATICS**	BS	2	1	0	3

Preamble

Discrete mathematics is the branch of mathematics devoted to the study of discrete objects. A key reason of importance of discrete mathematics is that information is stored and manipulated by computing machine in a discrete fashion and hence knowledge of discrete mathematics is inevitable. **Logic** is the discipline that deals with the methods of reasoning. Logic provides rules to determine whether a particular reasoning argument is valid. **Logic** plays a special role in computer science and hence it is called as "**the Calculus of Computer Science**". **Propositional logic** is concerned with propositions and their interrelationships. Propositions are declarative sentences with values true or false and are concerned with the analysis of propositions. **Predicate calculus** deals with the predicates. It contains all the components of propositional calculus including propositional variables and constants. Predicate calculus is the generalization of propositional calculus.

Set is a collection of definite and distinguishable objects selected by means of some rules or description. A **relation** between two objects can be defined by listing the two objects as an ordered pairs. It can be extended to 'n' objects representing as n-tuple. The concept of a relation supports to arrange objects in a tuple format. A relational structure is essentially a relational database.

Function is a special class of relations. Relation in mathematics describes connection between different elements of the same set, whereas function describes connections between two different sets. General recursive function coincides with the function defined by a Turing machine. Lattice is a special kind of ordered set. **Lattices** deals with complexities of scheduling the individual activities needed to complete the very large projects.

Automata theory is a mathematical discipline concerned with the invention and study of mathematically abstract, idealized machines called automata. Word in a language can be combined in various ways. The **grammar** of a language tells whether a combination of words is a valid sentence.

These topics have wide range of applications in computer architecture, compiling techniques, model checking, artificial intelligence, software engineering, expert systems, software/hardware correctness problem, complexities, digital principles, DBMS, designing concepts, storage methods, managing databases etc.

Prerequisite

Higher Secondary Level – Set Theory, Logic Theory

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Prove implication problems using truth table method, replacement process, analyzation method, truth table technique, rules of inference.	Apply
CO2:	Obtain PCNF and PDNF of given logical expression	Apply
CO3:	Check the validity of the verbal or symbolic arguments using rules of inference	Apply
CO4:	Construct verbal arguments with predicates in symbolic form and also to validate them	Apply
CO5:	Represent the given relation in matrix, digraph and vice versa	Apply
CO6:	Verify a given function is bijective or not, and also to find composition of functions.	Apply
CO7:	Construct a DFA and NDFA which accepts a given language and convert the given NDFA to DFA	Apply
CO8:	Check whether the given grammar is regular or not using pumping lemma.	Apply
CO9:	Modify the given grammar into Chomsky and Greiback normal forms.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO2.	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO3.	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO4.	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO5.	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO6.	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO7.	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO8	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**
CO9	**S**	**M**	**L**	**L**		**L**			**M**	**L**		**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	10
Understand	20	20	20	20
Apply	70	70	70	70
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome (CO1):

1. Prove the following implication by analyzation method.
   $(PVQ) \wedge (P \to R) \wedge (Q \to S) \Rightarrow S \vee R$
2. Show that $(QV(P \wedge 7q) \vee (7P \wedge 7Q)$ is a tautology using replacement process.
3. Verify the following implication by truth table.
   $(P \to (Q \to R)) \Rightarrow ((P \to Q) \to (P \to R))$
4. Show the implication using CP rule if necessary. $7PVQ, 7QVR, R \to S \Rightarrow P \to S$.

Course Outcome (CO2):

1. Obtain CNF and DNF of $7(PVQ) \leftrightarrow (P \wedge Q)$
2. Obtain PCNF and PDNF of $(7P \to R) \wedge (Q \leftrightarrow P)$
3. Obtain principal disjunctive normal form of $P \to ((P \to Q) \wedge 7(7Q \vee 7P))$ and hence obtain principal conjunctive normal form.

Course Outcome (CO3):

1. Show that the following system of premises is inconsistent.
   If war is near, then the army would be mobilized. If the army has mobilized then labour costs are high. However the war is near and yet labour costs are not high.
2. Pick out free and bound variables, scope of the quantifier from the following expression $(\forall x)[P(x) \to (\exists y)Q(x, y)]$ and also get free and bound occurrence of the variables involved in the expression.
3. Prove by indirect method the following implication:
   $(\forall x)(P(x) \to Q(x)); (\exists y)P(y) \Rightarrow (\exists z)Q(z)$

Course Outcome (CO4):

1. Verify the validity of the following arguments:
   Everyone chooses between good and evil. Rishi has chosen not to do evil. If anyone chooses to do good or if he is forced to obey the laws then he has an excellent chance for happiness. Therefore, Rishi chances for happiness are excellent.
2. Show that from (i) $(\exists x)(F(x) \wedge S(x)) \to (\forall y)(M(y) \to W(y))$;
   (ii) $(\exists y)(M(y) \wedge 7W(y))$ the conclusion $(\forall x)(F(x) \to 7S(x))$
3. Verify the validity of the following inference:

If one person is more successful than another, then he has worked harder to deserve success. Kumar has not worked harder than Barath. Therefore, Kumar is not more successful than Barath.

Course Outcome (CO5):

1. Let R denote a relation on the set of ordered pairs of integers such that $< x, y > R < u, v >$ iff xv=yu. Show that R is an equivalence relation.
2. Given A = {1,2,3,4} and R ={(1,2),(1,1),(1,3),(2,4)}, S={(1,4),(1,3),(2,3), (31), (4,1)} are relations on A. Find $S \circ R, R \circ S, M_R, M_S, M_{(R \circ S)^{-1}}$ and graph of R,S.
3. Discuss about all types of relations on the set A={1,2,3,4} where R is given by R={(1,1),(2,2),(2,3),(3,2),(3,3)}.

Course Outcome (CO6):

1. Verify which of the following functions are bijective where $f, g : R \to R$, f(x) =-5x , g(x)=x^2-8 , where $f, g : R \to R$, hence find $f \circ g, g \circ f, f \circ f, g \circ g$
2. Let X ={1,2,3,4} and a mapping $f : X \to X$ be given by f ={(1,2),(2,3),(3,4),(4,1)}. Execute f^3 , f^4.
3. 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 $f \circ g \circ h$.

Course Outcome (CO7):

1. Construct a DFA that accepts all the strings on {0,1} except those containing the substring 101.
2. Convert the following NDFA to DFA.

¢	a	b
S_0	{ S_0, S_1}	¤
S_1	¤	{ S_2}
S_2	¤	{ S_2}

(i) Draw transition diagram of NDFA.
(ii) Draw transition diagram of DFA with its state table.

3. Construct an automata with $\in$ moves for the regular expression $0^* + 1$

Course Outcome (CO8):

1. Define context free grammar and ambiguous grammar and hence identify the language generated by the grammar S→aSb/ab
2. Construct context free grammar to the language L={$a^m b^n$ / m,n>0}
3. Are the following languages are regular? Justify your answer.

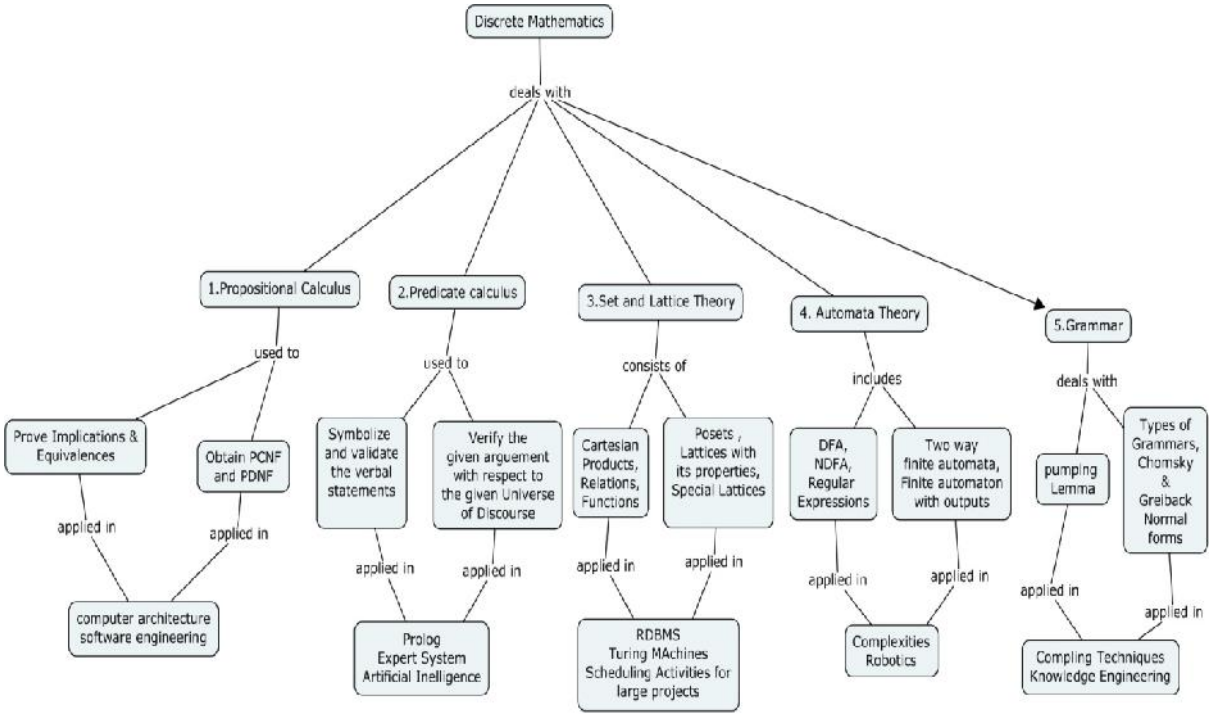
(i) L = {0^P/ P is prime} (ii) L = { 1^{n^2} / n ≥ 1}

(iii) $L = \{w \in \{0,1\}^* / w \text{ contains odd number of } 0\text{'s and odd number of } 1\text{'s}\}$

Course Outcome (CO9):

1. Convert the following grammar into Chomsky normal form:
$S \to ABa,\ A \to aab, B \to Ac$
2. Convert the following grammar into Greiback normal form:
$S \to AA/a\ ;\ A \to SS/b$

Concept Map



Syllabus

Propositional Calculus: Introduction – Statements and Notations ,**Basic Connectives**: Negation – Conjunction – Disjunction , **Higher Connectives:** Conditional – Biconditional – Truth Tables using connectives -Tautological Statements – Equivalence of Formulas, Duality Law – Tautological Implications-Functionally Complete set of Connectives –Other Connectives-Nand,Nor.**Normal Forms:** Disjunctive-Conjunctive-Principle Disjunctive-Principle Conjunctive.**Validation:** Checking the validity using the truth table, Rules of Inference: P,T,CP,AP rules –Consistency of premises- Automatic Theorem proving.

Predicate Calculus: Predicates-Function, Variables and Quantifiers, Predicate formulas – Free and Bound Variables, One place and Two place predicates – Validation using theory of inferences to predicate Calculus on one place and two place predicates.

Set Theory and Lattice Theory: Set Theory: Cartesian Products, Definition of Relation – Binary Relation – Properties-Matrix – Graph,Equivalence relation – Compatibility Relation-Composition of relation- Functions –Composition-Inverse. **Lattices:** Poset, Poset as Lattice, Properties of Lattice, Special Lattices: Modular, Complemented, Distributive, Problems.

Automata Theory: Finite State machines and Basic Definitions , Non-Deterministic Finite Automata, NDFA to DFA , Finite Automata with ε - moves ,Regular Sets, Closure Properties of Regular Sets, Regular Expressions, Two way Finite Automata, **Finite Automata with outputs** : Moore and Mealy Machines.

Grammar: Pumping Lemma (without proof) and its applications, Grammars and Languages, Types of Grammars – Language to Grammar –Grammar to Language, Ambiguity in

grammar, Regular Grammar and Finite Automaton, Chomsky Normal Form, Greiback Normal Form.

Text Book

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, 2006..
3. John E.Hopcraft, Rajeev Motwani, Jeffery D.Ullman,"Introduction to Automata Theory, Languages and Computation ", Pearson Education, Asia, 2006.

Reference Books

1. Dr.M.K.Venkataraman., Dr.N.Sridharan and N.Chandrasekaran, "Discrete Mathematics", National Publishing Company, Chennai.of India, 2004.
2. EitanFarchi, Ben-Chaim, "Mathematical Logic and its Application to Computer Science - Lecture Notes" , March 3, 2010.
3. http://www.research.ibm.com/haifa/dept/svt/papers/Mathematical_Logic.pdf
4. Mathematical Logic and its Application to Computer Science - Lecture Note EitanFarchi, Ben-Chaim, March 3, 2010
5. http://www.cs.waikato.ac.nz/~stever/LCS.pdf

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Propositional Calculus**	
1.1	Introduction – Statements and Notations	1
1.2	Negation – Conjunction – Disjunction – Truth table	1
1.3	Conditional – Biconditional – Tautological Statements – Equivalence of Formulas	2
	Tutorial – I	1
1.4	Duality Law – Tautological Implications-Functionally Complete set of Connectives –Other Connectives-Nand , Nor	1
1.5	Disjunctive – Conjunctive – Principle Disjunctive – Principle Conjunctive	2
	Tutorial – II	1
1.6	Checking the validity using the truth table, Rules of Inference – Consistency of premises and Indirect Method	2
1.7	Automatic Theorem proving	2
2	**Predicate Calculus**	
2.1	Predicates-Function, Variables and Quantifiers	1
2.2	Predicate formulas – Free and Bound Variables	1
2.3	Valid Formulas – Equivalences	1
	Tutorial-I	1
2.4	Theory of Inferences for the predicate Calculus	2
2.5	Two place predicates	1
	Tutorial – II	1
3	**Set and Lattice Theory**	
3.1	Ordered pairs & n-tuples –Cartesian Products	1

3.2	Definition of Relation –Binary Relation – Properties-Matrix – Graph	2
	Tutorial – I	1
3.3	Equivalence relation -Composition of relation- Poset	2
3.4	Functions –Composition-Inverse	1
3.5	Introduction to lattice with its properties	1
3.6	Special Lattices-Modular, Complemented, Distributive	2
	Tutorial – II	1
4	**Automata Theory**	
4.1	Finite State machines and Basic Definitions	2
4.2	Non-Deterministic Finite Automata and its equivalent to DFA	2
4.3	Finite Automata with ε - moves	1
	Tutorial – I	1
4.4	Regular Expressions	1
4.5	Two way Finite Automata	1
4.6	Finite Automata with output	1
	Tutorial – II	1
5	**Grammar**	
5.1	The Pumping Lemma for Regular Sets	1
5.2	Types of Grammars, Context – Free Grammar to language, language to CFG, Regular Grammar to Automaton.	1
	Tutorial – I	1
5.3	Chomsky-Normal Form and Greibach Normal Form	1
	Tutorial – II	1
	Total hours	**48**

Course Designers:

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		Category	L	T	P	Credit
14IT320	**OBJECT ORIENTED PROGRAMMING**	PC	3	0	0	3

Preamble

This course introduces basic concepts of object oriented programming and makes the students to apply these programming concepts towards problem solving. It helps them to effectively build and use ADTs when compared to the traditional structured programming. The course helps in learning object oriented programming Languages. Topics include class definitions, polymorphism by overloading functions and operators, single and multiple inheritance, virtual functions, abstract classes, and exception handling.

Prerequisite

- 14IT220 Problem solving using Computers

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Explain the differences between structural and object oriented programming	Understand
CO2:	Interpret data hiding, member functions, object creation and destruction for a given problem.	Apply
CO3:	Implement object oriented programming constructs like encapsulation, inheritance and polymorphism	Apply
CO4:	Illustrate the use of templates, exceptions and I/O classes for the given scenario.	Apply
CO5:	Identify suitable object oriented programming constructs for real time applications	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											
CO2.	M	L			L							
CO3.	M	L			L							
CO4.	M	L			L							
CO5.	S	M	M		M	L		S	S	S		S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	0	30
Understand	40	50	50	30
Apply	30	30	50	40
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of Course Outcome 5 is evaluated through mini project which involves design and development of simple applications using object oriented programming.

Mini project details: (team size: 3)

1. Problem identification.
2. Problem analysis and design.
3. Develop programs at the module level, test and debug individually.
4. Integrate the modules and present the results in a team.
5. Document the above process.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Mention the need for OOP? Explain its benefits.
2. Explain the different types of data types that are used in C++?
3. Can a C++ and C structure be treated as same? Justify.
4. How does C++ file I/O library compare with its counterpart in C. Discuss how object orientation is achieved in the former?

Course Outcome 2 (CO2):

1. Write a C++ Language code program to Implement Weather report using Constructor & Destructor Concept of Object Oriented Programming language.
2. Write a C++ program which implements a generic Queue ADT. Demonstrate by writing an application to show the operations such as enqueue and dequeue for char data and double data. Can this queue be given to a consumer application without the source code? Justify.
3. Define a class Coord having two members type int as X ad Y. use this class to define another class Rectangle which has two members of type Coord as UpperLeftCoord and BotomRightCoord. Define constructors and member functions to get the length and breadth of rectangle. Write a global function which creates an instance of the class Rectangle and computes the area using the member functions.
4. Write a program to create a database of the students information such as name, roll no, and the program should have the following facilities.
    - Adds a new record to the file.
    - Modifies the details of an record.
    - Display the contents of the file.

Course Outcome 3 (CO3):

1. Clearly differentiate
    i. Runtime polymorphism and Runtime Type identification
    ii. Virtual function and virtual inheritance
2. Differentiate specializing template functions by explicit specification with automatic invocation based on type of argument. Justify its usage.
3. Compare parameter passing mechanism using pointers and reference as arguments. Discuss the pros and cons
4. Write a program having a base class Student with data member rollno and member function getnum() to input rollno and putnum() to display rollno. A class Test is derived from class Student with data member marks and member functions getmarks() to input marks and putmarks() to display marks. Class Sports is also derived from class Student with data member score and member functions getscore() to input score and putscore() to display score. The class Result is inherited from two base classes, class Test and Class Sports with data member total and a member function display() to display rollno, marks, score and the total (marks + score).

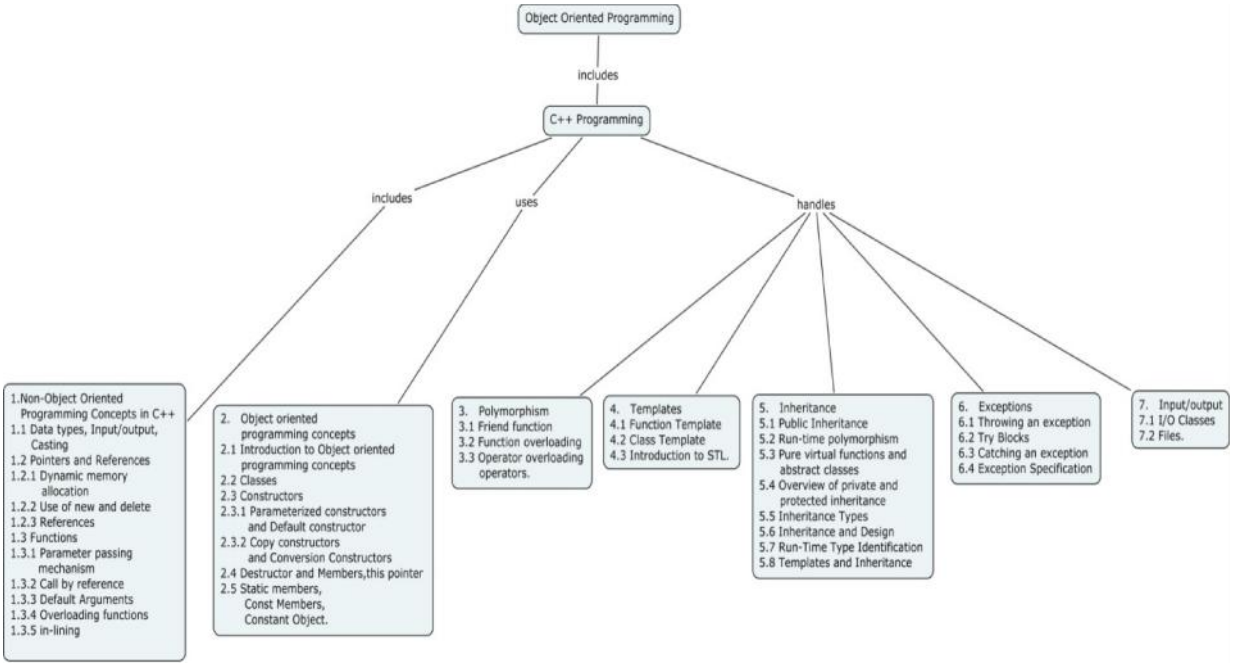
Course Outcome 4 (CO4):

1. Write C++ program to copy the contents of file1.txt to file2.txt
2. Write C++ program to generate random number and store them in a file.
3. Write C++ program to copy the contents of file1.txt to file2.txt. Use appropriate file handling exceptions
4. Using I/O Stream Classes write C++ program to count the vowels in a file.
5. Sort integers using templates

Course Outcome 5 (CO5):

1. Design and Development of applications like (but not limited to):
   a. Library Management System
   b. Banking System
   c. Payroll System
   d. Hospital information system
   e. Shopping applications

Concept Map



Syllabus

Non-Object Oriented Programming Concepts in C++: Data types, Input/output, Casting.Pointers and References –Dynamic memory allocation, Use of new and delete operators**,** References. Functions –Parameter passing mechanism – Call by reference - Default Arguments – Overloading functions - in-lining.

Object Oriented Programming Concepts: Introduction to Object Oriented Programming Concepts-Classes, Constructors: Parameterized constructors, Default constructors, Copy constructors, and Conversion constructors – Destructor – Members – this pointer – Static members – Const Members – Constant Object.

Polymorphism: Friend function – function overloading – Operator overloading: Normal operators, Special operators.

Templates: Function Template, Class Template, Introduction to STL.

Inheritance: Public Inheritance – Run-time polymorphism – Pure virtual functions and abstract classes – Overview of private and protected inheritance – Inheritance Types – Inheritance and Design - Run-Time Type Identification – Templates and Inheritance

Exceptions: Throwing an exception - Try Blocks –catching an exception - Exception Specification.

Input/output: I/O Classes - Files.

Text Books

1. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition, Reprint 2004.
2. BjarneStourstrup, “The C++ programming language”, Addison Wesley Publication, Fourth Edition, 2013.

Reference Books

1. Stanley B.Lippman, “C++ Primer”, Addison-Wesley Professional, Fifth Edition, 2012.
2. Herbert Schildt, “C++ Programmer’s Reference”, McGraw-Hill, Berkely Publication 4th edition, 2003.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Non-Object Oriented Programming Concepts in C++**	
1.1	Data types, Input/output, Casting	1
1.2	Pointers and References	1
1.2.1	Dynamic memory allocation	
1.2.2	Use of new and delete operators	1
1.2.3	References	
1.3	Functions	1
1.3.1	Parameter passing mechanism	
1.3.2	Call by reference	
1.3.3	Default Arguments	
1.3.4	Overloading functions	1
1.3.5	in-lining	
2	**Object Oriented Programming Concepts**	
2.1	Introduction to Object Oriented Programming Concepts	1
2.2	Classes	2
2.3	Constructors	1
2.3.1	Parameterized constructors and Default constructor	1
2.3.2	Copy constructors and Conversion Constructors	1
2.4	Destructor and Members, this pointer	1
2.5	Static members, const Members, Constant Object	1
3	**Polymorphism**	
3.1	Friend function	1
3.2	Function overloading	1
3.3	Operator overloading - Normal operators, Special operators	2
4	**Templates**	

4.1	Function Template,	1
4.2	Class Template	1
4.3	Introduction to STL	1
5	**Inheritance**	
5.1	Public Inheritance	2
5.2	Pure virtual functions and abstract classes	1
5.3	Run time Polymorphism	1
5.4	Overview of private and protected inheritance	1
5.5	Multiple Inheritance	2
5.6	Inheritance and Design	1
5.7	Run-Time Type Identification	1
5.8	Templates and inheritance	1
6	**Exceptions**	
6.1	Throwing an exceptions and Try Blocks	1
6.2	catching an exception and exception specification	2
7	**Input/output**	
7.1	I/O Classes	1
7.2	Files	2
Total Lectures		**36**

Course Designers:

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2. Mr. A.Sheik Abdullah asait@tce.edu
3. Ms. A.Divya divyait@tce.edu

		Category	L	T	P	Credit
14IT330	**COMPUTER ORGANIZATION**	PC	2	1	0	3

Preamble

The main objective of this subject is to understand various data transfer techniques, conceptualize the basics of organizational and architectural issues and to analyze performance issues in processor and memory design of a digital computer.

Prerequisite

- 14IT230: Digital System Design

Course Outcomes

Upon successful completion of this course students will be able to:

Course Outcomes		Bloom's Level
CO1:	Explain the basic structure of computer, instruction types and addressing modes.	Understand
CO2:	Apply arithmetic, logic and control unit operations for a given problem	Apply
CO3:	Describe the concepts of I/O and memory organization such as virtual and cache memory	Understand
CO4:	Identify the type of hazard in a given sequence of instructions and the methods to overcome it.	Apply
CO5:	Describe the working principles of Instruction Level parallelism and its applications to multi-core processors	Understand
CO6:	Interpret the functional units of computer using open source simulators	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											**M**
CO2	**M**											
CO3	**M**											
CO4	**M**											**M**
CO5	**M**											**M**
CO6.	**M**				**S**				**S**	**S**		**M**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	20	20
Understand	40	40	30	30
Apply	30	40	40	40
Analyse	0	0	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe the different addressing modes.
2. Explain the steps involved in the execution of a complete instruction.
3. Distinguish between different Instruction formats.

Course Outcome 2 (CO2):

1. Explain Super Scalar operation.
2. Describe Flynn's classification.
3. Explain Multi core processors.

Course Outcome 3 (CO3):

1. Divide 1000 by 11 using restoring division algorithm
2. Consider the binary numbers in the following addition and subtraction problems to be signed, 6 bit values in the 2's complement representation. Perform the operations indicated, Specify whether or not arithmetic overflow occurs: A = 010110, B = 111111
3. Explain Booth's algorithm with suitable example.

Course Outcome 4 (CO4):

1. A byte addressable computer has a small data cache capable of holding 8 32-bitwords.Eaach cache block consists of one 32-bit word. When a given program is executed the processor reads data from the following sequence of hex addresses:200,204,208,2FO,200,204,218,21C,24C
   a. Show the contents of the cache at the end of each pass through this loop if a directly mapped cache is used. Compute the hit ratio.
   b. Repeat the problem for an associative-mapped cache that uses the LRU replacement algorithm.
   c. Repeat the problem for a four-way-set-associative cache.
2. A block-set-associative cache consists of a total of 64 blocks divided into 4-block sets. The main memory contains 4096 blocks, each consisting of 128 words.
   a. How many bits are there in the main memory address?
   b. How many bits are there in each of the TAG, SET and WORD fields?
3. Explain data transfer using DMA.

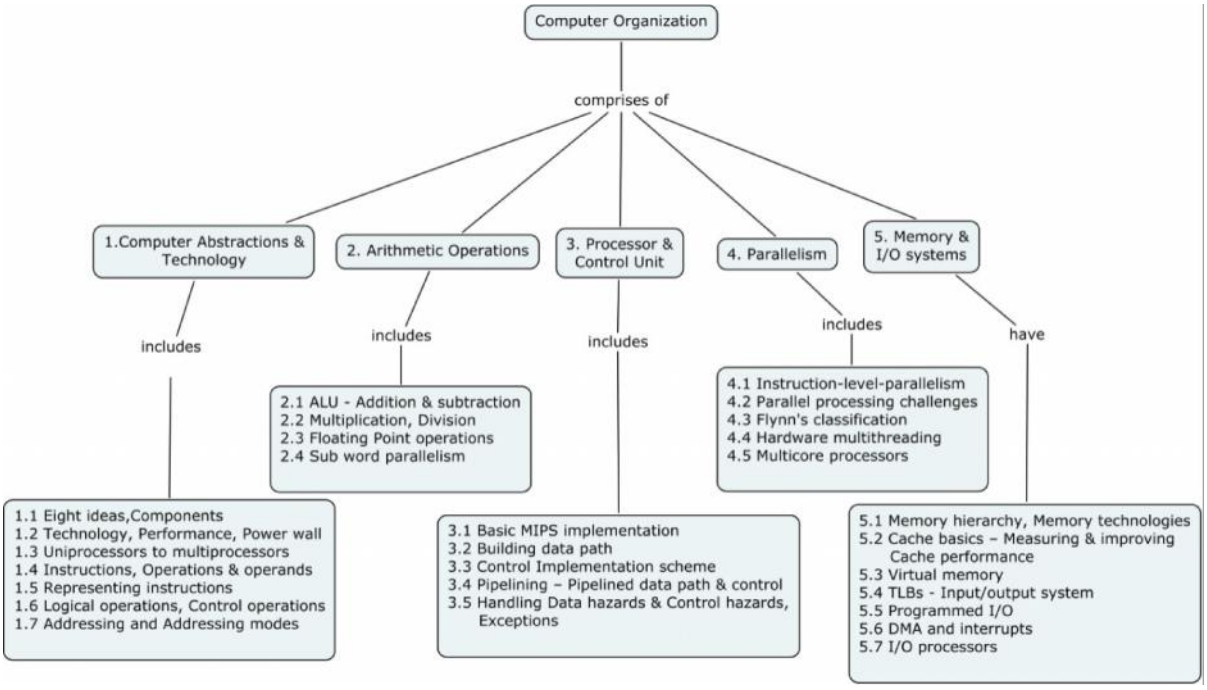
Course Outcome 5 (CO5):

1. Illustrate how the pipelining improves the performance of computers.
2. Identify the type of hazard in executing the following sequence of instructions and determine the ways to overcome that.
   1. DIV R1, R2, R6
   2. ADD R1, R2, R3
   3. SUB R3, R4, R5
3. Demonstrate Instruction Hazard with an example.

Course Outcome 6 (CO6):

1. Implement Full adder with the Open source simulator.
2. Realize Carry Look ahead generator using simulator.
3. Implement 4-bit adder Subtractor circuit.

Concept Map



Syllabus

Computer Abstractions and Technology: Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – Operations and operands – Representing instructions – Logical operations – Control operations – Addressing and Addressing modes.

Arithmetic operations: ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Sub word parallelism.

Processor and control unit: Basic MIPS implementation – Building data path – Control Implementation scheme – Pipelining – Pipelined data path and control – Handling Data hazards & Control hazards – Exceptions.

Parallelism: Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors.

Memory and I/O systems : Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

Text Book

1. David A. Patterson and John L. Hennessey, "Computer Organization and Design", Morgan Auffman, Elsevier, Fifth edition, 2014.

Reference Books

1. V. CarlHamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organization", VI edition, McGraw-Hill Inc, 2012.

2. William Stallings, “Computer Organization and Architecture”, Seventh Edition, Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Second Edition, Pearson Education, 2005.
4. Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications", First edition, Tata McGraw Hill, New Delhi, 2005.
5. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Computer Abstractions and Technology**	
1.1	Eight ideas, Components of a computer system	1
1.2	Technology, Performance, Power wall	1
1.3	Uniprocessors to multiprocessors	1
1.4	Instructions, Operations and operands	1
1.5	Representing instructions	1
1.6	Logical operations, Control operations	2
1.7	Addressing and Addressing modes	2
2	**Arithmetic operations**	
2.1	ALU - Addition and subtraction	1
2.2	Multiplication, Division	1
2.3	Floating Point operations	2
2.4	Sub word parallelism	1
3	**Processor and control unit**	
3.1	Basic MIPS implementation	1
3.2	Building data path	1
3.3	Control Implementation scheme	1
3.4	Pipelining – Pipelined data path and control	2
3.5	Handling Data hazards & Control hazards, Exceptions	1
4	**Parallelism**	
4.1	Instruction-level-parallelism	1
4.2	Parallel processing challenges	1
4.3	Flynn’s classification	2
4.4	Hardware multithreading	1
4.5	Multicore processors	1
5	**Memory and I/O systems**	
5.1	Memory hierarchy, Memory technologies	1
5.2	Cache basics – Measuring and improving cache performance	2
5.3	Virtual memory	1
5.4	TLBs - Input/output system	2
5.5	Programmed I/O	1
5.6	DMA and Interrupts	2
5.7	I/O processors	1
Total Lectures		**36**

Course Designers:

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2. Ms. R.Parkavi rpit@tce.edu

14IT340	DATA STRUCTURES AND ALGORITHMS	Category	L	T	P	Credit
		PC	2	1	0	3

Preamble

The course introduces the basic data structures and their operations. The course discusses the use of data structures and the algorithm design techniques to provide efficient software solutions.

Prerequisite

- 14IT220 Problem solving using Computers

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Implement linear data structures such as arrays, linked lists, stack, queue and hash table with their related operations	Understand
CO2:	Implement non-linear data structures such as trees and heaps with their related operations.	Understand
CO3:	Compute space and time complexity for a given algorithm.	Apply
CO4:	Implement various sorting and searching techniques.	Understand
CO5:	Identify suitable data structure and design technique for developing algorithm to solve a given problem	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**M**				**L**							
CO2.	**M**				**L**							
CO3.	**M**	**L**										
CO4.	**M**				**L**							
CO5.	**S**	**L**			**M**			**S**	**S**	**S**		**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	10	10
Understand	30	40	30	30
Apply	40	40	60	60
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Assignment Problems:

1. Develop applications using linear data structure to solve any problems like expression evaluation using stack, round robin scheduling using circular queue, etc

2. Develop applications using non-linear data structure to solve any problems like building dictionary, constructing expression tree, etc
3. Develop applications using design techniques to solve any problems like travelling salesman problem, n-queens problem, etc

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Insert the elements into the Singly Linked list so that the list is sorted.
2. Select the appropriate data structure to check the palindrome so as to minimize the traversal.
3. Convert infix expression to postfix using suitable data structure
4. Evaluate the given postfix expression using stack
5. Given a postfix expression, determine the infix and prefix expression using the suitable data structure
6. Assignment problems

Course Outcome 2 (CO2):

1. AVL tree is better than Binary Search Tree. Give reason.
2. Identify the suitable data structure so as to delete the minimum element from the list.
3. Insert the A to J into the suitable data structure, so that search always yields O(log n) time.
4. Insert the A to J into the suitable data structure, so that search always yields constant average amount of time
5. Suggest the suitable collision resolution strategies when the given keys are hashed into the hash table
6. Assignment problems

Course Outcome 3 (CO3)

1. List few $O(n^2)$ and O(n log n) sorting algorithms
2. Describe the potential advantages of notations Ω, θ, O
3. Find the space complexity and time complexity of matrix multiplication
4. Compare the time complexity of programs of search when array and linked list are being used
5. State the advantages of Binary Heap compared to ArrayList and LinkedList w.r.t time complexity

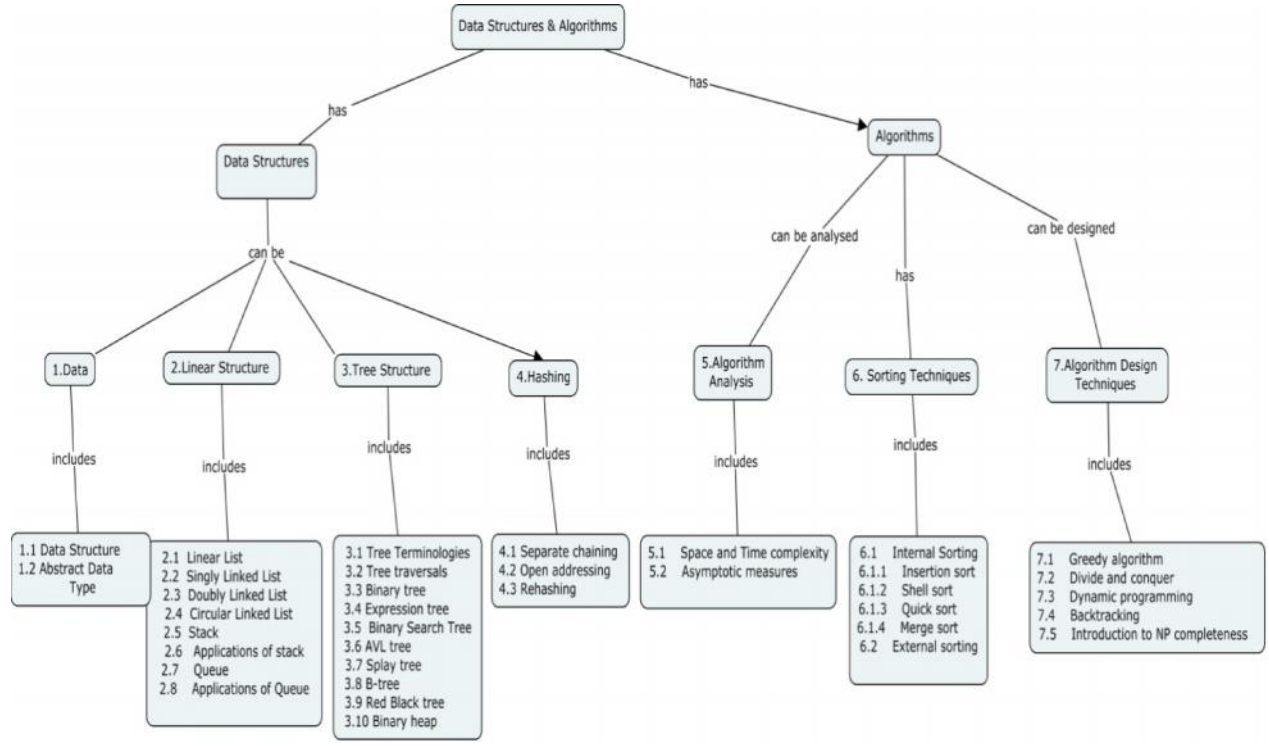
Course Outcome 4 (CO4)

1. Compare linear and binary search techniques
2. Write procedure and sort the elements using insertion sort
3. Modify merge sort procedure to sort number in non-ascending order.
4. Trace the Quick sort algorithm on sorted array of elements 1 to 10.
5. Write procedure and sort the elements using Heap sort.

Course Outcome 5 (CO5)

1. Apply Dynamic Programming concept to find the distance need to be travelled by the salesman
2. Apply suitable data structure to solve 8-queens problem
3. Apply Divide and Conquer strategy for sorting the elements A = {5, 13, 2, 23, 7, 17, 28}
4. Apply Divide and Conquer strategy for searching the element in A = {5, 13, 2, 23, 7, 17, 20, 8}
5. Assignment problems

Concept Map



Syllabus

Data: Data Structure- Abstract Data Type (ADT)

Linear Structures: Linear List- Singly Linked List - Doubly Linked List - Circular Linked List –Stack-Applications of Stack –Queue-Applications of Queue

Tree structures: Terminologies-Tree traversals - Binary tree -Expression tree – Binary Search Tree - AVL Tree- Splay Tree – B-tree- Red Black tree- Binary Heap

Hashing: Separate Chaining - Open Addressing – Rehashing

Algorithm Analysis: Space Complexity- Time Complexity- Asymptotic measures

Sorting Techniques: Internal Sorting- Insertion Sort - Shell Sort - Quick Sort- Merge Sort - External Sorting

Algorithm Design Techniques: Greedy Algorithm – Knapsack problem-Divide and conquer-Merge Sort, Quick sort, Binary Search-Dynamic Programming –Travelling Salesman Problem – Backtracking-n-queens problem-Introduction to NP completeness

Text Books

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2011.
2. AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 2009.

Reference Books

1. Aho, J.E. Hopcroft and J.D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.

2. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, “Data Structures Using C”, Pearson Education Asia, 2004.
3. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”,Galgotia Publications,2010.
4. Richard Gilberg, Behrouz A. Forouzan, “Data Structures: A Pseudo code Approach with C”, Second edition, India Edition 2005.
5. http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm
6. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-851-advanced-data-structures-spring-2012/

Course Contents and Lecture Schedule

Module No	Topic	No.of Lectures
1	**Data**	
1.1	Data Structure	1
1.2	Abstract Data Type (ADT)	
2	**Linear Structures**	
2.1	Linear List (Array Implementation)	1
2.2	Singly Linked List	1
2.3	Doubly Linked List	1
2.4	Circular Linked List	1
2.5	Stack	1
2.6	Applications of stack	1
2.7	Queue	1
2.8	Applications of Queue	1
3	**Tree structures**	
3.1	Tree Terminologies	1
3.2	Tree traversals	1
3.3	Binary tree	1
3.4	Expression tree	
3.5	Binary Search Tree	2
3.6	AVL tree	2
3.7	Splay tree	1
3.8	B-tree	1
3.9	Red Black tree	1
3.10	Binary heap	1
4	**Hashing**	
4.1	Separate chaining	2
4.2	Open addressing	1
4.3	Rehashing	1
5	**Algorithm analysis**	
5.1	Space and Time complexity	1
5.2	Asymptotic measures	1
6	**Sorting Techniques**	
6.1	Internal Sorting	
6.1.1	Insertion sort	1
6.1.2	Shell sort	1
6.1.3	Quick sort	1
6.1.4	Merge sort	1
6.2	External sorting	1

7	**Algorithm Design Techniques**	
7.1	Greedy algorithm (Knapsack problem)	1
7.2	Divide and conquer(Merge sort, Quick sort, Binary search)	1
7.3	Dynamic programming(TSP)	1
7.4	Backtracking(n-queens problem)	1
7.5	Introduction to NP completeness	1
Total Lectures		**36**

Course Designers:

1. Ms. A.M.Abirami abiramiam@tce.edu
2. Ms. Raja Lavanya lavanyachakkaravarthy@gmail.com

		Category	L	T	P	Credit
14IT350	**OPERATING SYSTEMS**	PC	2	1	0	3

Preamble

An operating system is an essential part of any computer system. The major objective of this course are to introduce basic concepts and principles of Windows, Linux, and Unix operating systems which include memory management, device management, process management, and file management.

Prerequisite

- 14IT220 - Problem solving using Computers
- 14IT270 – Free Open Source Software: Practice

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Describe the evolution, types, structure and functions of operating systems	Understand
CO2:	Explain techniques involved in process, memory, device and file management	Understand
CO3:	Describe security and protection measures used in operating systems	Understand
CO4:	Implement processor scheduling, synchronization, deadlocks and disk allocation algorithms for a given scenario	Apply
CO5:	Identify the characteristics of various modern operating systems	Understand

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**											
CO2	**M**											
CO3.	**M**											
CO4.	**M**				**L**			**L**				**L**
CO5.	**M**							**S**	**M**	**M**		**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	20	20
Understand	50	20	20	40
Apply	30	60	60	40
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of Course Outcomes 3, 4 and 5 is partially evaluated through assignments.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List out three main purposes of an operating system?
2. Differentiate operating systems for mainframe computers and personal computers?
3. List the four steps that are necessary to run a program on a completely dedicated machine.
4. State the purpose of system calls.

Course Outcome 2 (CO2):

1. Mention the three major activities of an operating system in regard to memory management.
2. Assume an operating system maps user-level threads to the kernel using the many-to-many model and the mapping is done through LWPs. Furthermore, the system allows developers to create real-time threads. Is it necessary to bind a real-time thread to an LWP? Explain.
3. Consider a system that supports the strategies of contiguous, linked, and indexed allocation. Which strategy is best utilized for a file? Justify you answer
4. Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999.the drive is currently serving a request at cylinder 143, and previous request was at cylinder 125,the queue of pending request in FIFO order is

   86, 1470, 913, 1774, 948, 1509, 1022, 1750, 150
5. Compare and contrast the following algorithms with respect to the total distance (in cylinders) that the disk arm moves to satisfy the entire pending request (Assume that the disk arm starts from the current head position)

Course Outcome 3(CO3):

1. Explain the role of ACL in protection mechanism
2. Compare and contrast the security models of various popular operating systems.
3. Explain the value of fault tolerance for disaster recovery.
4. Explain the implications of virtualization for disaster recovery.

Course Outcome 4 (CO4):

1. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process Burst Time Priority

1. *P*1 10 3
2. *P*2 1 1
3. *P*3 2 3
4. *P*4 1 4
5. *P*5 5 2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

a. Draw four Gantt charts illustrating the execution of these processes using FCFS,SJF,A non preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.

b. What is the turnaround time of each process for each of the scheduling algorithms in part a?

c. What is the waiting time of each process for each of the scheduling algorithms in Part a?

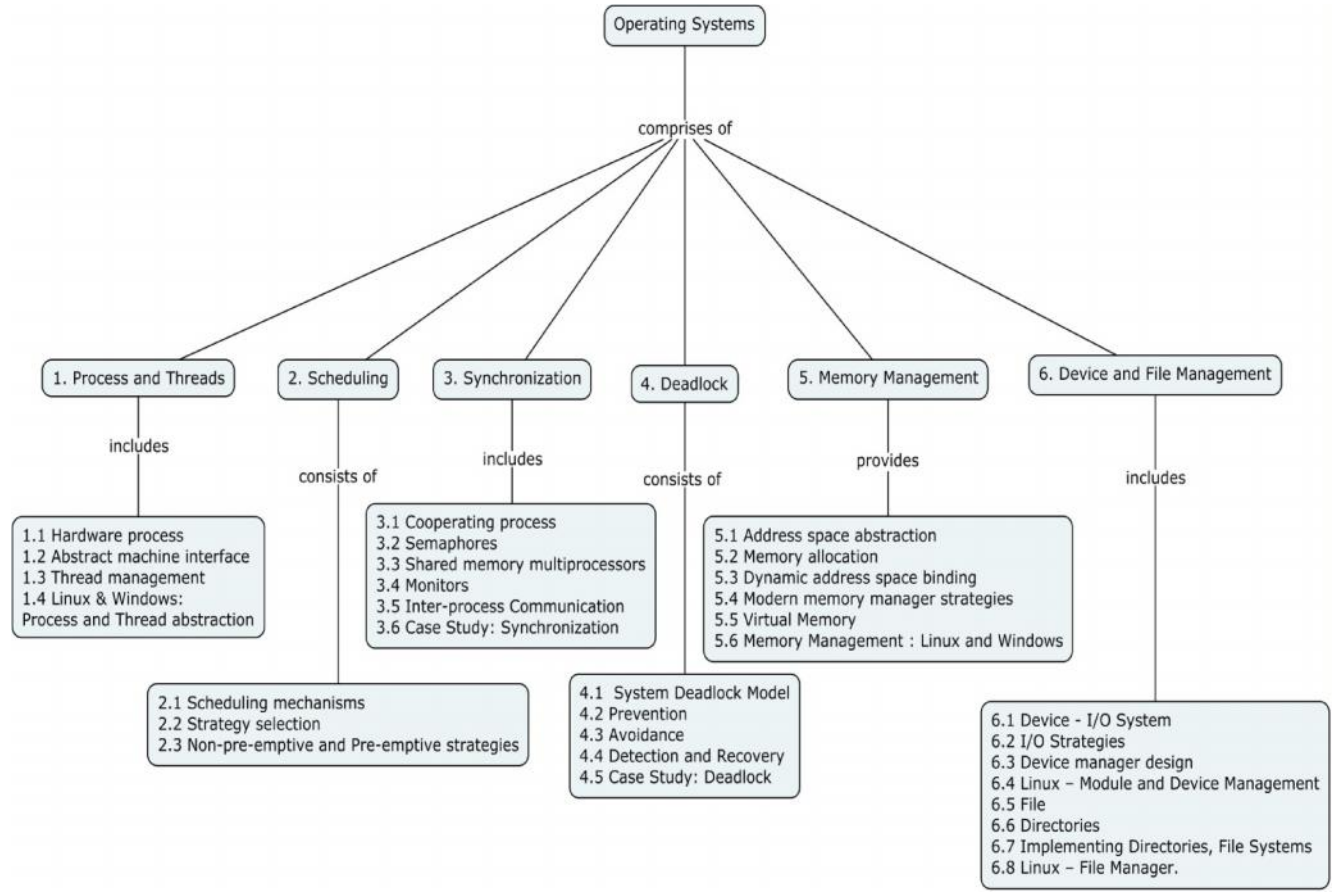
d. Which of the schedules in part a results in the minimal average waiting time (over all processes)?

2. Suppose that a disk drive has 5000 cylinders, numbered 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 following disk scheduling a. FCFS b. SSTF c. SCAN d. LOOK e. C-SCAN
3. Analyze operating system requirements and recommend an appropriate operating system to meet the requirements.
4. Install several current operating systems and validate that the installations were successful.
5. Install a system with atleast two virtual machines.

Course Outcome 5 (CO5):

1. Write a program that create a child process that prints a greeting and then sleeps for 20 seconds then exit. The parent process should print a greeting before creating the child and after terminating child .
2. Write a program that uses a waitable timer to stop itself K seconds after it was started where K is a command line parameter.
3. Consider a computer system in which “computer games” can be played by students only between 10 p.m and 6 a.m., faculty members between 5 p.m and 8 a.m., and by the computer centre staff at all times. Suggest a scheme for implementing this policy efficiently.

Concept Map



Syllabus

Introduction: Computers and Software, Operating system strategies, Operating system architecture.

Process and Threads: Hardware process, Abstract machine interface, Thread management, Linux & Windows: Process and Thread abstraction, Case Study: Kernel timers, manipulating kernel objects, Linux – Process and Resource Management

Scheduling: Overview, Scheduling mechanisms, Strategy selection, Non-pre-emptive and Pre-emptive strategies, Case Study: Implementing the scheduler in Linux, BSD Unix and Windows, Analyzing the Round Robin Scheduling.

Synchronization: Cooperating process, Semaphores, Shared memory multiprocessors, Alternative Synchronization primitives, Monitors, Inter-process Communication, Case Study: Bounded Buffer Problem, Reader's Writer's Problem, Dining Philosopher's Problem, Using pipes, refining the Shell.

Deadlock: System Deadlock Model, Prevention, Avoidance, Detection and Recovery. Case Study: UNIX, Linux, Windows Concurrency Mechanisms.

Memory Management: Address space abstraction, Memory allocation, Dynamic address space binding, Modern memory manager strategies. Virtual Memory – Address translation, Paging, Static and dynamic paging algorithms, Segmentation, Memory Mapped files. UNIX, Linux, and Windows Memory Management.

Device and File Management: Device - I/O System, I/O Strategies, Device manager design, Buffering, Device class characteristics. Case Study: Floppy disk driver, Linux – Module and Device Management. File - Files, Low level and High level file abstraction, Directories, Implementing Directories, File Systems. Case Study: Simple file Manager, Linux – File Manager.

Text Book

1. Garry Nutt, Nabenduchaki, SarmistaNeogy, "Operating Systems", Third Edition, Pearson Education, 2009.
2. Abraham Silberschatz, Greg Gagne, Peter B. Galvin, "Operating System Concepts", Wiley, 2014.
3. William Stallings, "Operating systems Internal and Design Principles", Sixth Edition, Pearson Education, 2009.

References

1. Andrew Tanenbaum, "Modern Operating Systems", 3rd Edition, Addison Wesley, 2008.
2. H M Deital, P J Deital and D R Choffnes, "Operating Systems", Third Edition,Pearson Education, 2004.
3. Randal Bryant, "Computer Systems: A Programmer's Perspective", First Edition, David O'Hallaron, Prentice Hall, 2002.
4. http://nptel.ac.in/courses/Webcourse-contents/IISc BANG/Operating%20Systems/New_index1.html

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
0	**Introduction**	
0.1.	Computers and Software	1
0.2	Operating system strategies, Operating system architecture	
1	**Process and Threads**	
1.1.	Hardware process	1
1.2.	Abstract machine interface	1
1.3.	Thread management,	1
1.4.	Linux & Windows: Process and Thread abstraction	
1.4.1.	Kernel timers, manipulating kernel objects	1
1.4.2.	Linux – Process and Resource Management	1
2.	**Scheduling**	
2.1.	Scheduling mechanisms	1
2.2.	Strategy selection	
2.2.1.	Non-pre-emptive and Pre-emptive strategies	1
2.3.	Implementing the scheduler in Linux, BSD Unix and Windows, Analyzing the Round Robin Scheduling	1
3.	**Synchronization**	
3.1.	Cooperating process	1
3.2.	Semaphores	
3.3.	Shared memory multiprocessors	
3.3.1	Alternative Synchronization primitives	1
3.4.	Monitors	1
3.5.	Inter-process Communication	1
3.6.	Case Study: Synchronization	
3.6.1	Bounded Buffer Problem	1
3.6.2	Reader's Writer's Problem	
3.6.3	Dining Philosopher's Problem,	1
4.	**Deadlock**	
4.1	System Deadlock Model	1
4.2	Prevention	1
4.3	Avoidance	1
4.4	Detection and Recovery	1
4.5	Case Study: Deadlock	
4.6	UNIX, Linux, Windows Concurrency Mechanisms	1
5	**Memory Management**	
5.1	Address space abstraction,	1
5.2	Memory allocation	1
5.3	Dynamic address space binding	1
5.4	Modern memory manager strategies	1
5.5	Virtual Memory	
5.5.1	Address translation, ,	1
5.5.2	Paging, Static and dynamic paging algorithms	1
5.5.3	Segmentation, Memory Mapped files	1
5.6	Memory Management :Linux, and Windows	1
6	**Device and File Management**	
6.1	Device - I/O System	1
6.2	I/O Strategies	1
6.3	Device manager design	1
6.4	Linux – Module and Device Management	1
6.5	File	

6.5.1	Files, Low level and High level file abstraction	1
6.6	Directories	1
6.7	Implementing Directories, File Systems	1
6.8	Linux – File Manager	1
	Total Lectures	**36**

Course Designers:

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4. Ms. A.Divya divyait@tce.edu

		Category	L	T	P	Credit
14IT370	**SOFTWARE ENGINEERING**	PC	2	0	1	3

Preamble

The course presents methods, tools and procedures that enable to control the process of software development and provide the student with a foundation for building quality software in a productive manner. The course highlights the application of systematic, disciplined, quantifiable approach to the development, operation and maintenance of software. The course also enables the students to acquire analytical, critical, technical writing, team building and managerial skills through team project activities by using agile practices.

Prerequisite

- 14IT220 Problem solving using Computers

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes (Theory)		**Bloom's Level**
CO1:	Distinguish traditional and agile software process models	Understand
CO2:	Interpret functional and non-functional requirements for a given problem	Apply
CO3:	Prepare design documents for the given requirements	Apply
CO4:	Write test cases using appropriate testing techniques for an application	Apply
Course Outcomes (Practical)		
CO5:	Develop application with documentation using Software Engineering processes	Apply
CO6:	Apply various project management techniques for a real time application development	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											S
CO2.	S	M										S
CO3.	S	M			S			S				S
CO4.	S	M			S			S				S
CO5.	S	M	S		S	S		S	S	S		S
CO6.	M	L			S						S	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	Practical Test	
Remember	30	20	0	10
Understand	30	40	20	40
Apply	40	40	80	50
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Guidelines for the Mini-project:

- Group formation: Students are split into project groups with around 6 members in each group. A team can execute the project using agile practices like pair-programming, version control, continuous delivery, customer interaction, etc. Project groups are responsible for organizing themselves, keeping records on the progress of the project, including the minutes of meetings held.
- Final project deliverables include Deployable Software, Requirements Model, Design Model, Test suite and User Documentation. Other deliverables include Project Plan, Review Record, Traceability Matrix, Tools/Templates used and Training materials.
- At the end of the semester, the team has to present their project, submit their report and share their lessons learnt/best practices with other teams. The individual's and team's task are assessed through rubrics.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate the various processing models highlighting their advantages and disadvantages.
2. As a Project Manager, you have been contracted to build the software for weather monitoring system. Choose a process model that best fits your project and justify your answer comparing with other process models. Explain your choice of process model in detail.
3. Using the example of safe home security function, justify how does Agile process model can be implemented in this project. Write advantages and disadvantages.
4. Analyze the given case study and create cost estimation and effort estimation for the following software project using Function Point. The project is for Amusement park management: 60 screens optimum, 50 screens most likely and 45 screens pessimistically to accept data from the section manager of each section. 75 reports optimum, 70 reports most likely, 65 reports pessimistically required for billing customer and by the management, 25 screens optimum, 20 screens most likely and 15 screens pessimistically to give status of credit position by making queries by the customer. The system can access the 20 servers located in the same amusement park and 130 servers located in other locations .It is capable of accessing 200 files out of which 40 files stored in the server of one park and 160 files stored in other parks.
5. Plan the timeline chart for software process, and justify how can you track the work progress by using earned value analysis

Course Outcome 2 (CO2):

1. Explain the requirements analysis process.
2. Differentiate the requirements analysis process between various process models
3. Signing off contract is a major task in requirements analysis. Justify your answer for this for agile process model.
4. Identify functional requirements for Online shopping software
5. Identify functional and non-functional requirements for the given case study.

Course Outcome 3 (CO3):

1. Draw DFD for the given case study (online shopping software)
2. Draw System context diagram for the given case study (online shopping software)
3. Draw Class and Sequential diagram for the given case study (online shopping software)
4. Draw Activity diagram for the given case study (Library Management System)

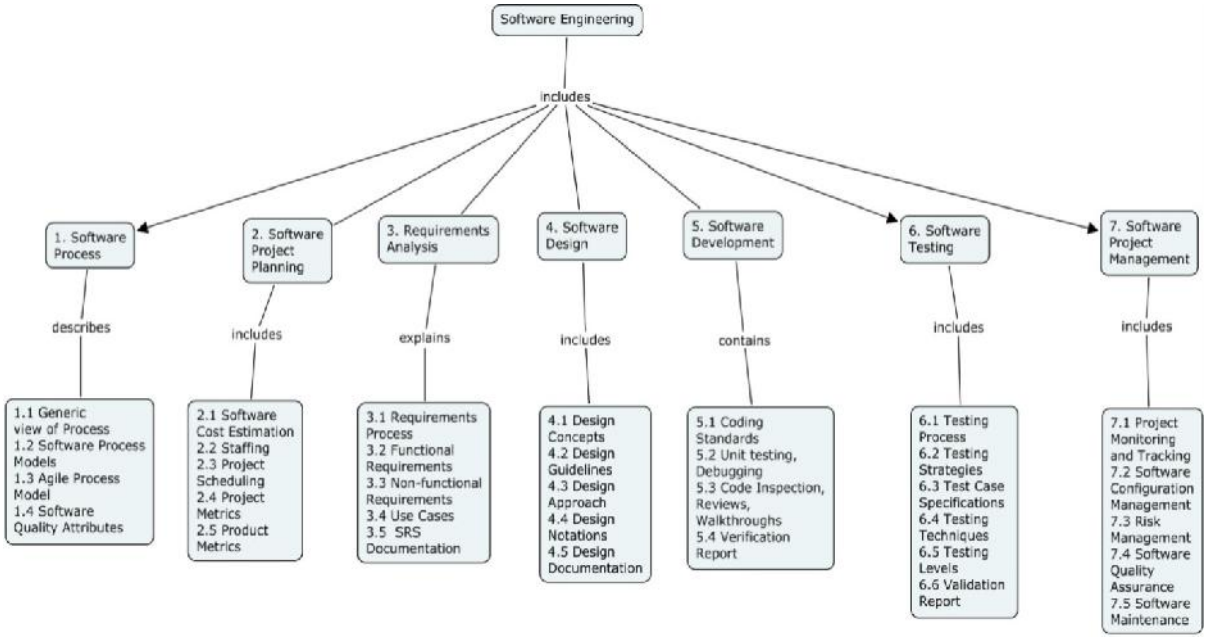
Course Outcome 4 (CO4):

1. Explain different testing techniques
2. Explain cause-effect testing technique with suitable example
3. Design the black-box test suite for software that computes the square root of an input integer which can assume values in the range of 0 to 5000.
4. Identify test cases for PrimeNumber generation program using the cyclomatic complexity
5. Draw program dependence graph and write test cases for the given problem.

Course Outcome 5 and 6 (CO5 & CO6):

1. Development of mini-project by using appropriate Software Engineering practices and Software Project Management techniques

Concept Map



Syllabus

Software Process – Generic view of Process - Software Process Models – Agile Process Model – Software Quality Attributes

Software Project Planning – Software Cost Estimation – LOC – FP - Empirical estimation models – Staffing Level Estimation - Project Scheduling - Project Metrics - Product Metrics

Software Requirements Analysis – Requirement Process - Functional Requirements - Non-functional Requirements – Use Cases – SRS Documentation

Software Design – Design Concepts – Design Guidelines – Design Approach - Structured approach – Object-oriented approach - User Interface Design - Design Notations – Data Flow Diagram – Context Diagram - UML Diagrams – Class Diagram - Sequential Diagram –- Design Documentation

Software Development – Coding Standards – Unit Testing and Debugging - Code Inspection, Reviews and Walkthroughs – Verification Report

Software Testing – Testing Process – Testing Strategies - Test Case Specifications – Testing techniques – Black box testing – Equivalence Partitioning – Boundary Value Analysis – Cause effect graph – White box testing – Control Flow Graph – Program Dependence Graph – Testing levels – Modular testing – Integration testing – Regression testing – System testing – User acceptance testing – Validation Report

Software Project Management – Project Monitoring and Tracking – Software Configuration Management – Risk Management – Software Quality Assurance – Software Maintenance

Text Books

1. Rajib Mall, "Fundamentals of Software Engineering", PHI, 3rd edition, 2009
2. Roger S.Pressman, "Software Engineering A Practitioner's Approach', McGraw Hill, 6thedition, 2006.
3. Adithya P. Mathur, "Foundations of Software Testing", Pearson Education, 2008.

Reference Books

1. PankajJalote, "An Integrated Approach to Software Engineering", Narosa Publishing House,2nd edition, 2011.
2. Richard Fairley, "Software Engineering Concepts", TATA McGraw Hill, 2004.
3. Ian Sommerville, "Software Engineering", Pearson Publishers, 9th edition, 2010.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Software Process**	
1.1	Generic view of process	2
1.2	Software Process Models	
1.3	Agile Process Model	
1.4	Software Quality Attributes	1
2	**Software Project Planning**	
2.1	Software Cost Estimation	
2.1.1	LOC, Function Points	1
2.1.2	Empirical estimation models	
2.2	Staffing level estimation	1
2.3	Project scheduling	
2.4	Project Metrics	1
2.5	Product Metrics	
3	**Software Requirement Analysis**	
3.1	Requirements Process	1
3.2	Functional Requirements	
3.3	Non-functional Requirements	
3.4	Use Cases	1
3.5	SRS Documentation	
4	**Software Design**	
4.1	Design Concepts	1
4.2	Design Guidelines	
4.3	Design Approach	
4.3.1	Structured Approach	1
4.3.2	Object Oriented Approach	
4.3.3	User Interface Design	
4.4	Design Notations	2
4.4.1	Data Flow Diagram (Level 0, Level 1, Level 2)	
4.4.2	Context Diagram	
4.4.3	UML Diagrams (Class Diagram, Sequential Diagram)	1
4.5	Design Documentation	
5	**Software Development**	
5.1	Coding Standards	1
5.2	Unit Testing and Debugging	
5.3	Code Inspection, Reviews and Walkthroughs	

Module No.	Topic	No. of Lectures
5.4	Verification Report	
6	**Software Testing**	
6.1	Testing Process	1
6.2	Testing Strategies	
6.3	Test Case Specifications	1
6.4	Testing Techniques	
6.4.1	Black Box Testing	2
6.4.1.1	Equivalence Partitioning	
6.4.1.2	Boundary Value Analysis	
6.4.1.3	Cause Effect Graph	
6.4.2	White Box Testing	2
6.4.2.1	Control Flow Graph	
6.4.2.2	Program Dependence Graph	
6.4.3	Testing Levels	1
6.4.3.1	Modular Testing	
6.4.3.2	Integration Testing	
6.4.3.3	System Testing	
6.4.3.4	User Acceptance Testing	
6.5	Validation Report	
7	**Software Project Management**	
7.1	Project Monitoring and Tracking	1
7.2	Software Configuration Management	
7.3	Risk Management	1
7.4	Software Quality Assurance	1
7.5	Software Maintenance	
Total Lectures		**24**

List of Lab Experiments include (but not limited to):

S.No	Topic	No. of Lab Sessions
1	Introduction to Agile Process Model and team formation	1
2	Problem identification and Requirements gathering	1
3	Project planning	1
4	Requirements Analysis	1
5	Release plan and Iteration plan	1
6	Tools/Templates identification	1
7	Design and Development	1
8	Verification (Reviews and Inspections)	1
9	Validation methods (White Box - Unit testing, Code Coverage, Black Box testing)	1
10	Metrics analysis report	1
11	Documentation	1
12	Deployment	1
Total Sessions		**12**

Course Designers

1. Dr. R.Suganya rsuganya@tce.edu
2. Ms. A.M.Abirami abiramiam@tce.edu
3. Ms. C.Santhiya c.santhiya@gmail.com

14IT380	OBJECT ORIENTED PROGRAMMING LAB	Category	L	T	P	Credit
		PC	0	0	1	1

Preamble

This lab provides the students to apply the concepts of object oriented programming towards problem solving, with concepts such as Encapsulation, Polymorphism, Inheritance and Exception handling.

Prerequisite

- 14IT220 Problem solving using Computers

Course Outcomes

On the successful completion of the lab, students will be able to

Course Outcomes		Bloom's Level
CO1:	Identify classes including data, methods and the relationship among the classes for a given application	Apply
CO2:	Implement object oriented constructs using C++ programming for the given application.	Apply
CO3:	Develop application for real time problems using object oriented programming	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**M**	**L**			**M**			**S**	**M**	**M**		**S**
CO2.	**M**	**L**			**M**			**S**	**M**	**M**		**S**
CO3.	**S**	**S**	**S**		**S**	**L**	**L**	**S**	**S**	**S**	**M**	**S**

S- Strong; M-Medium; L-Low

Lab Contents and Schedule

S. No.	List of Experiments	No. of Sessions
1	Understanding – data types, I/O, casting	1
2	Implementation of Dynamic Memory Allocation using New and Delete Operators	1
3	Implementations of functions	1
4	Implementation of classes	1
5	Implementation of constructors	1
6	Implementation of polymorphism	1
7	Implementation of templates	1
8	Implementation of inheritance types	1
9	Implementation of Function Overriding	1
10	Exception handling – user defined exceptions	1
11	File handling	1
12	Design of any real time application using object oriented concepts	1
Total Sessions		**12**

Course Designers:

1. Mr. A.Sheik Abdullah asait@tce.edu
2. Ms. A.Divya divyait@tce.edu

		Category	L	T	P	Credit
14IT390	**DATA STRUCTURES LAB**	PC	0	0	1	1

Preamble

With a dynamic learn-by-doing focus, the laboratory course encourages the students to explore data structures by implementing them, a process through which students discover how data structures and algorithms work and how they can be applied. This course challenges the students to exercise their creativity in both programming and analysis.

Prerequisite

- 14IT220: Problem Solving using Computers

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Use linear and non-linear data structures for a given application.	Apply
CO2:	Perform data manipulation in a given application using searching and sorting techniques	Apply
CO3:	Develop application to solve the real world problem by selecting the suitable data structure	Analyze
CO4:	Improve communication and team building skills	Apply

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**S**	**L**			**L**							**S**
CO2	**S**	**L**			**L**							**S**
CO3	**S**	**M**	**M**		**L**	**L**					**M**	**S**
CO4								**S**	**S**	**S**	**S**	

Guidelines for the Mini-project:

- Students can form a project team with around 4 members per team.
- The team can select the problem(s) from societal, health, safety and legal domains. The team needs to use C++ programming language for application development. The team has to identify and use suitable data structure to implement their project.
- At the end of the semester, the team has to present their project, submit their report and share their lessons learnt/best practices with other teams. The individual/team is assessed through rubrics.

Lab Contents and Schedule

Sl. No.	**List of Experiments**	**No of Sessions**
1	Implementation of linear list using array	1
2	Implementation of linear list using Linked List	1
3	Implementation of Circular List and Doubly Linked list	1
4	Implementation of stack using array and Linked List	1
5	Implementation of two way stack	1
6	Implementation of Queue using array and Linked list	1
7	Implementation of Circular Queue	1
8	Implementation of Binary Search Tree	1

9	Implementation of Binary Heap	1
10	Implementation of Hashing techniques	1
11	Performance analysis of sorting algorithms	1
	Mini-project review	1
Total Sessions		**12**

Course Designers:

1. Ms. A.M.Abirami abiramiam@tce.edu
2. Ms. Raja Lavanya lavanyachakravarthy@gmail.com

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

FOURTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2014-15 onwards)

FOURTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
14IT410	Graph Theory and Combinatorics	BS	2	2	-	3
14IT420	Java Programming	PC	3	-	-	3
14IT430	Computer Networks	PC	2	2	-	3
14IT440	Database Management System	PC	3	-	-	3
14IT450	Engineering Design	PC	1	-	2*	3
THEORY CUM PRACTICAL						
14IT470	Professional Communication	HSS	2	-	2	2
PRACTICAL						
14IT480	Java Programming Lab	PC	-	-	2	1
14IT490	Database Management System Lab	PC	-	-	2	1
14IT4C0	Capstone Course-I	PC	-	-	2*	2
		Total	**13**	**4**	**10**	**21**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B.Tech. Information Technology Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2014-15onwards)

FOURTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	14IT410	Graph Theory and Combinatorics	3	50	50	100	25	50
2	14IT420	Java Programming	3	50	50	100	25	50
3	14IT430	Computer Networks	3	50	50	100	25	50
4	14IT440	Database Management System	3	50	50	100	25	50
5	14IT450	Engineering Design	-	100	-	100	-	50
THEORY CUM PRACTICAL								
6	14IT470	Professional Communication	3	50	50	100	25	50
PRACTICAL								
7	14IT480	Java Programming Lab	3	50	50	100	25	50
8	14IT490	Database Lab	3	50	50	100	25	50
9	14IT4C0	Capstone Course-I	-	100	-	100	-	50

* CA evaluation pattern will differ from course to course 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 and subsequently be reduced to 50 marks for the award of terminal examination marks.

		Category	L	T	P	Credit
14IT410	**GRAPH THEORY AND COMBINATORICS**	PC	2	1	0	3

Preamble

Graph theory (the mathematics of network) is one of the most important branches of mathematics and the source of many algorithms of practical importance. Indeed, in many problems dealing with discrete objects and binary relation, a graphical representation of the objects and the binary relations on them is a very convenient form of representation. A **tree** is a data structure that represents hierarchical relationships between individual data items. In computer science, an **integer** is a datum of integral data type. Integers are commonly represented in a computer as a group of binary digits. **Permutations** are arrangements of the objects within a set. **Counting principle** is used to count the number of operations used by an algorithm to study its time complexity. **Queuing theory** provides a rich and useful set of mathematical models for the analysis and design of service process for which there is contraption for shared resources. The above topics are widely used in fault detection and diagnosis in computer, and minimal path problem, to analyse electrical circuits, encrypting and decrypting messages, time complexity, models for the analysis and design of service process.

Based on these, the course aims at giving adequate exposure in graph theory, tree, integer, counting principles and queuing theory.

Prerequisite

- Higher secondary level and degree level set theory concepts, multivariate calculus and elementary probability and statistics.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Apply the concepts of Eulerian and Hamiltonian graphs in computer networks and other network related problems	Apply
CO2:	Apply the concepts of Kruskal's and Prim's algorithms in finding the shortest spanning tree in a given graph.	Apply
CO3:	Apply the concept of planarity to decide whether a graph is Planar or not.	Apply
CO4:	Apply the concepts of pigeon hole principle in handling collisions that occur in has table.	Apply
CO5:	Count the number of operations used by an algorithm to study its time complexity	Apply
CO6:	Apply the concepts of integers for encrypting and decrypting messages, generating pseudo number assigning memory locations to files	Apply
CO7:	Apply the concepts of queuing theory in scheduling of jobs and in the areas that involve service systems whosedemands are random.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	S	M									L
CO2.	S	L	L									L
CO3.	S	M	L									L
CO4.	S	M	M									L
CO5.	S	M	M									L
CO6.	S	M	M									L
CO7.	S	M	M									L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	10
Understand	20	20	20	20
Apply	70	70	70	70
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Demonstrate the necessary and sufficient condition for a graph to be Eulerian and find whether the wheel W_n is an Eulerian graph for any positive number n.
2. Find whether the Peterson graph is Eulerian.
3. Tell about the hamiltonicity of the graph K_n for any positive number n.

Course Outcome 2 (CO2):

1. Using Kruskal's algorithm find the shortest spanning tree of $K_{3,3}$ with weights of the edges as numbers from 1 to 9.
2. How many numbers of non-isomorphic spanning trees can have a complete graph with n vertices?

Course Outcome 3(CO3):

1. Find whether the graph K_4 is planar.
2. Find whether the graph $K_{3,3}$ is planar.

Course Outcome 4(CO4):

1. Demonstrate generalized pigeon hole principle. Also calculate the minimum number of students required in a number theory class to be sure that at least six will receive the same grade, if there are possible grades A, B, C, D and E.
2. How many bishops can one put on an 8x8 chess board such that no two bishops can hit each other?
3. A college has 3000 students. Show that at least two of them were born on the same day of an year.

Course Outcome 5(CO5):

1. In a company, ID cards have 5 digit numbers. (i) How many ID cards can be formed if repetition of the digit is allowed? (ii) How many ID cards can be formed if repetition of the digit is not allowed?
2. Calculate the number of permutations of the letters ABCDEFG contain (i) the string CDE (ii) the string BA or GF (iii) the string ABC and CDE.
3. An ice-cream shop offers 31 flavours. You order a double-scoop cone. In how many ways can the clerk put the ice cream on the cone if you wanted two different flavours?
4. How many lines can you draw using 3 non-collinear points A, B, C on a plane?

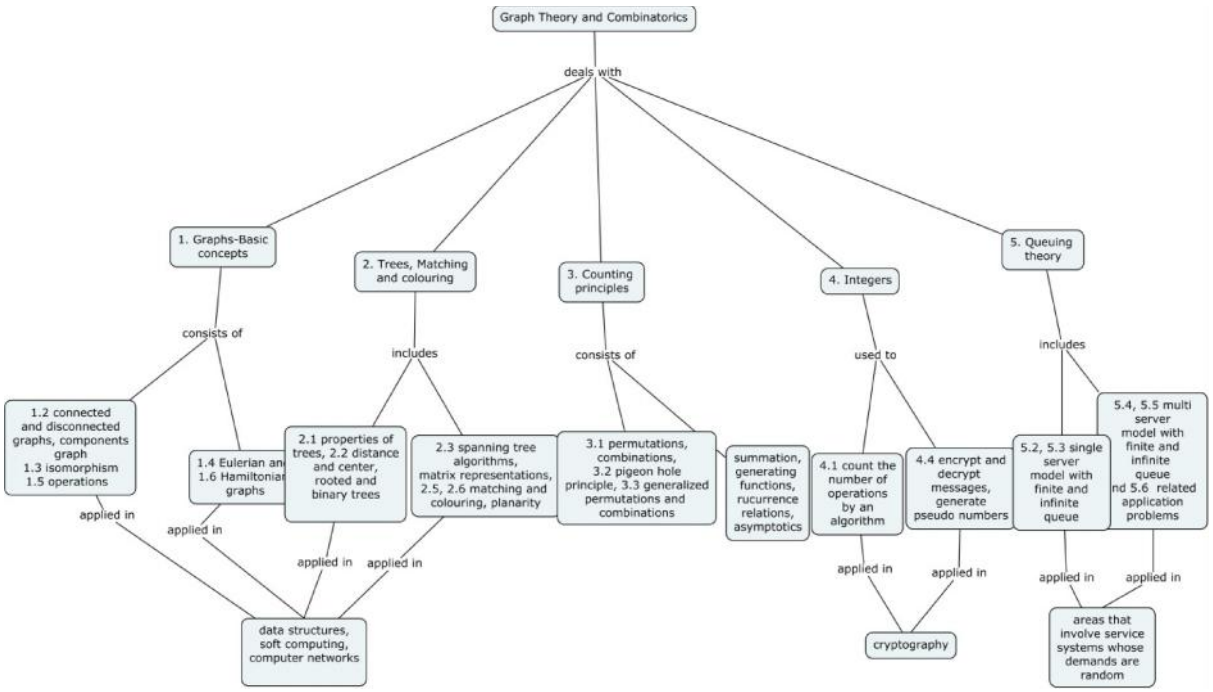
Course Outcome 6(CO6):

1. Apply modular exponentiation to find 2^{644} modulo 645.
2. Demonstrate the role of number theory in RSA encryption and encrypt the message GOOD.
3. Let a, b and c be integers. Then demonstrate the following (i) if a/b and a/c then a/(b+c) (ii) if a/b then a/bc for all integers c (iii) if a/b and b/c then a/c.
4. If p is prime and $p / a_1, a_2, ...a_n$ where each a_i is an integer then show that p / a_i for some i. Also show the uniqueness of prime factorization.

Course Outcome 7(CO7):

1. A dental surgery hospital has two operation rooms. The service times are assumed to be independent, exponentially distributed with mean 15 minutes. Andrew arrives when both operation room are empty. Bob arrives 10 minutes later while Andrew is still under medical treatment. Another 20 minutes later Barath arrives and both Andrew and Bob are still under treatment. No other patients arrives during this 30 minute interval. (i) What is the probability that Barath will be ready before Andrew? (ii) Determine the distribution function of the waiting time in the system for Barath. Find the mean and variance also.
2. If for a period of 2 hours in the day(8 to 10 am) trains arrive at the yard every 20 minutes but the service time continued to remain 36 minutes, then calculate for this period (i) the probability that the yard is empty (ii) Average number of trains in the system on the assumption that the line capacity of the yard is limited to 4 trains only.
3. A super market has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes and if people arrive in a Poisson fashion at the rate of 10 per hour, (i) what is the probability of having to wait for service? (ii) what is the expected percentage of idle time of each girl? (iii) If a customer has to wait what is the expected length of his waiting time?

Concept Map



Syllabus

GRAPH: Basic definitions in graphs-walk, path and circuits- connected graphs, disconnected graphs and components- isomorphism of graphs-Euler graphs- operations on graphs-Hamiltonian graphs.

TREES, MATCHING AND COLOURING: Properties of trees- distance and centres in a tree-rooted and binary trees-spanning trees-Algorithm-spanning tree algorithm- Kruskal's algorithm and Prism's algorithm-adjacency matrix and incidence matrix-Connectivity-cut vertices-cut edges-covering-matching-independent sets-colouring-planarity.

COMBINATORICS-Counting: Permutations-combinations-The basics of counting-the pigeon hole principle-Binomial coefficients-generalized permutations and combinations.

COMBINATORICS-Integers: The fundamentals –algorithms and the integers-the integers and division-peimes and greatest common divisors-integers and algorithms-applications of number theory.

QUEUEING THEORY: Introduction - some queuing terminologies - Single server model with Infinite queue [M/M/1]:[infinity/FCFS] - Single server model with finite queue [M/M/1]:[N/FCFS] - Multi server model with Infinite queue [M/M/C]:[infinity/FCFS] - Multi server model with finite queue [M/M/C]:[N/FCFS] - related application problems.

Text Book

1. NarshinghDeo, Graph Theory, Prentice Hall of India, 2004.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications- Sixth edition, Tata McGraw Hill Publishing Company Limited.

3. Mariappan P., “Operations Research: An Introduction”, Pearson INDIA, First Edition – 2013, ISBN: 978-81-317-9934-5.
4. HamdyM.Taha, "Operations Research — An Introduction"; Seventh edition, Prentice Hall of India Pvt Ltd.,2003.

Reference Books

1. V.K. Balakrishnan, Theory and Problems of Graphs Theory, Schum’s outlines, Tata McGraw Hill Publishing company Limited, New Delhi, 2004.
2. John Clark and Derek Allan Holton, A First Look at Graph Theory, World Scientific Publishing Co., 1995.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**Graphs-Basic definitions**	
1.1	Basic definitions, walk, path and cycles	2
1.2	Connected and disconnected graphs and components	1
1.3	Isomorphism of graphs	1
	Tutorial	1
1.4.	Eulerian graphs	2
1.5	Operations on graphs	1
1.6	Hamiltonian graphs	1
	Tutorial	1
2.	**Trees, Matching and Colouring**	
2.1	Properties of trees,	1
2.2	Distance and center, rooted and binary trees and spanning trees	2
2.3	Spanning tree algorithms, matrix representations	2
	Tutorial	1
2.4	Connectivity, cut vertices and cut edges	2
2.5	Covering and matching	2
2.6	Independent sets and colouring	1
2.7	Planarity	1
	Tutorial	1
3.	**Combinatorics-Counting**	
3.1	Permutations, combinations and basics of counting	2
3.2	Pigeon hole principle, binomial coefficients	2
3.3	Generalized permutaiotns and combinations	2
	Tutorial	1
4.	**Combinatorics-Integers**	
4.1	Fundamentals, algorithms and integers	1
4.2	Integers and division, prime and greatest common divisors	2
	Tutorial	1
4.3	Integers and algorithms	2
4.4	Applications of number theory	2
	Tutorial	1
5.	**Queuing Theory**	
5.1	Introduction, some queuing terminologies	1

Module No.	Topic	No. of Lectures
5.2	Single server model with infinite queue	2
5.3	Single server model with finite queue	1
	Tutorial	1
5.4	Multi server model with infinite queue	2
5.5	Multi server model with finite queue	1
5.6	Related application problems	1
	Tutorial	1
	Total Lectures	**48**

Course Designers:

1. Dr.M. Kameswari mkmat@tce.edu
2. Dr.T. Lakshmi tlakshmimdu@tce.edu

		Category	L	T	P	Credit
14IT420	**JAVA PROGRAMMING**	PC	3	0	0	3

Preamble

This course provides a comprehensive introduction to the Java Programming with an overview of Object Oriented Java Concepts and hands on practices in concepts from J2EE and web by writing sample application programs.

Prerequisite

- 14IT320 Object Oriented Programming

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	**Bloom's Level**
CO1:	Apply the object oriented concepts for the given problem.	Apply
CO2:	Use exceptions, threads, collections, logs of Java for the given problem.	Apply
CO3:	Apply events through swing, RMI, JAR operations for the given application	Apply
CO4:	Select the proper library classes in Java based on the need of a problem	Analyze
CO5:	Develop applications using J2EEconcepts like Servlets, Spring framework, Struts, Enterprise Java Beans	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**M**	**L**			**L**							**M**
CO2.	**M**	**L**			**L**							**M**
CO3.	**M**	**L**			**L**							**M**
CO4.	**S**	**M**	**L**		**S**			**S**	**S**	**S**		**S**
CO5.	**S**	**M**	**L**		**S**			**S**	**S**	**S**		**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	40	40	40	40
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO4, CO5 will be assessed through Assignments.

Assignment 1 Details

1. Identify a suitable problem from various IT domain.
2. Analyze the problem(Requirements and Functionality)
3. Select suitable java concepts
4. Implement and submit the results and findings.

Assignment 2 Details

1. Form a Team (no of members : 5)
2. Select any one of the advanced Java Concepts like javax.json, javax.faces, javax.enterprise etc.
3. Write about Package, Classes, Interfaces and method description.
4. Apply some of the above classes and methods for any simple application.
5. Submit the report with results.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Write a Java Program to implement multilevel inheritance for a university-college database management system.
2. Implement method overloading for calculating the area of different shapes.
3. Write a program to define a class for a student result processing system.

Course Outcome 2 (CO2):

1. Write a Java Program to print the numbers 1 to 50 alternatively by Threads (Use Multithreading).
2. Illustrate with an example how collections are manipulated using arraylist
3. Write an RMI based Application Program for addition of two complex numbers.

Course Outcome 3 (CO3):

1. Write a simple registration form for any event using swing.
2. Illustrate action event using button.
3. Write a code segment to give feedback for a course using swing.
4. Write a sample Java program using adjustment event.
5. List the listeners in java.

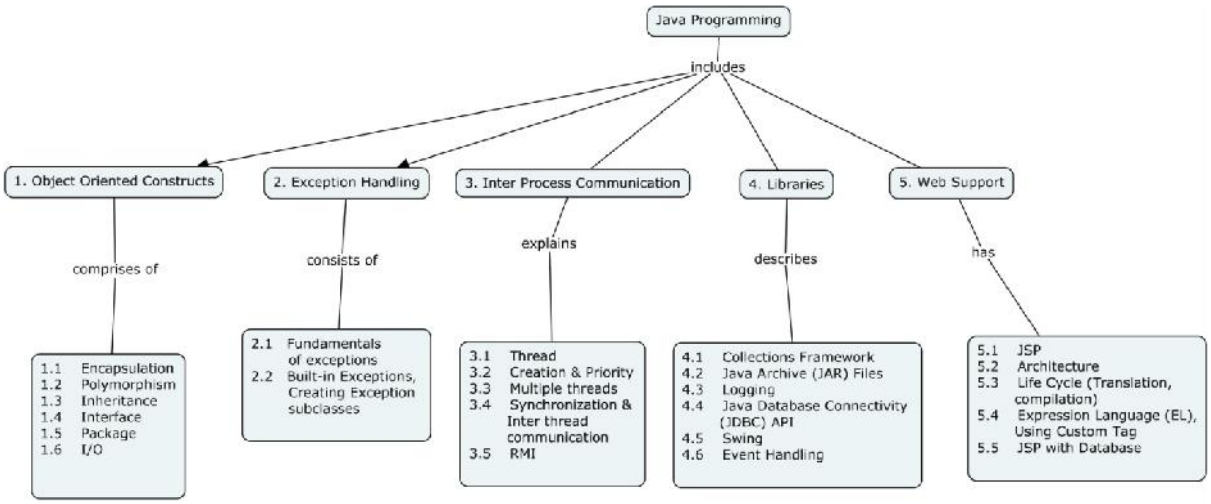
Course Outcome 4 (CO4):

Assignment 1

Course Outcome 5 (CO5):

Assignment 2

Concept Map



Syllabus

Object Oriented Constructs: Encapsulation-Polymorphism-Inheritance-Interface-Package-I/O.

Exception Handling: Fundamentals of exceptions-Built-in Exceptions-Creating Exception subclasses

Inter Process Communication: Thread-Creation & Priority-Multiple threads-Synchronization & Inter thread communication-RMI

Libraries: Collections Framework-Java Archive (JAR) Files-Logging-Java Database Connectivity (JDBC) API-Swing-Event Handling

Web Support: JSP-Architecture-Life Cycle (Translation, compilation)-Expression Language (EL),Using Custom Tag-JSP with Database

Text Book

1. Herbert Schildt, “Java: The Complete Reference”, McGraw-Hill, Ninth Edition, 2014.

References

1. Kathy Sierra, “Head First Java”, Shroff publications, second edition, 2005
2. http://www.journaldev.com/977/java-logging-api-tutorial-examples-logger-levels-handlers-formatters-filters
3. http://docs.oracle.com/javase/tutorial/uiswing/events/intro.html

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Object Oriented Constructs**	
1.1	Encapsulation	1
1.2	Polymorphism	2
1.3	Inheritance	2
1.4	Interface	1
1.5	Package	1
1.6	I/O	2
2	**Exception Handling**	
2.1	Fundamentals of exceptions	1
2.2	Built-in Exceptions, Creating Exception subclasses	2
3	**Inter Process Communication**	
3.1	Thread	1
3.2	Creation & Priority	
3.3	Multiple threads	2
3.4	Synchronization & Inter thread communication	2
3.5	RMI	2
4	**Libraries**	
4.1	Collections Framework	3
4.2	Java Archive (JAR) Files	1
4.3	Logging	1
4.4	Java Database Connectivity (JDBC) API	2
4.5	Swing	3
4.6	Event Handling	2
5	**Web Support**	
5.1	JSP	1

5.2	Architecture	1
5.3	Life Cycle (Translation, compilation)	
5.4	Expression Language (EL),Using Custom Tag	1
5.5	JSP with Database	2
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14IT430	**COMPUTER NETWORKS**	PC	2	1	0	3

Preamble

The course aims to provide an understanding of computer networks architecture, various technologies available to build a network and protocols in use at different levels of network layers stack. An overview of global Internet, Internet applications and introduction to Network simulation is also provided.

Prerequisite

- Nil

Course Outcomes

On successful completion of the course, the students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Describe the building blocks of Computer Networks	Understand
CO2:	Explain the functionalities and protocols of various layers in ISO/OSI Network model	Understand
CO3:	Implement a suitable routing strategies for a given network	Apply
CO4:	Use a suitable transport/application layer protocol based on application requirements	Apply
CO5:	Suggest an appropriateaccess control, congestion control and congestion avoidance technique for a given traffic scenario	Analyze
CO6:	Examine performance analysis for a network using tools like NS2, wireshark	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	M	L										M
CO4	M	L										M
CO5	S	M	L									M
CO6	S	M	M	L	S			L	S	S		S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	10	10	10	10
Analyse	30	30	30	30
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Mention the physical devices operating at various layers of TCP/IP protocol Suite.
2. What is the difference between communication and transmission?
3. Discuss the differences in the functionalities of switches and routers.
4. Discuss the difference between hubs and bridges.

Course Outcome 2 (CO2):

1. Distinguish between LAN and WAN.
2. Describe various types of networks.
3. Explain the schemes prescribed in Ethernet for collision Detection.
4. Discuss the functionalities of all layers in Frame relay network.
5. Describe how ATM combines benefits of both circuit switching and packet switching .

Course Outcome 3 (CO3)

1. Write short notes on VoIP and discuss the suitable transport protocol for the same.
2. Differentiate Interdomain routing protocols and Intradomain routing protocols.
3. Compare various email protocols like SMTP, IMAP and POP and Outline when it is appropriate to use each.
4. Explain how TCP and IP complement each other's functionalities. And bring out the dependencies between the two.

Course Outcome 4(CO4)

1. Compare the functionalities of all layers in OSI architecture
2. Describe multibackbone internet structure
3. Explain how the Network layer and Transport layer complements each other's functionalities. And bring out the dependencies between the two

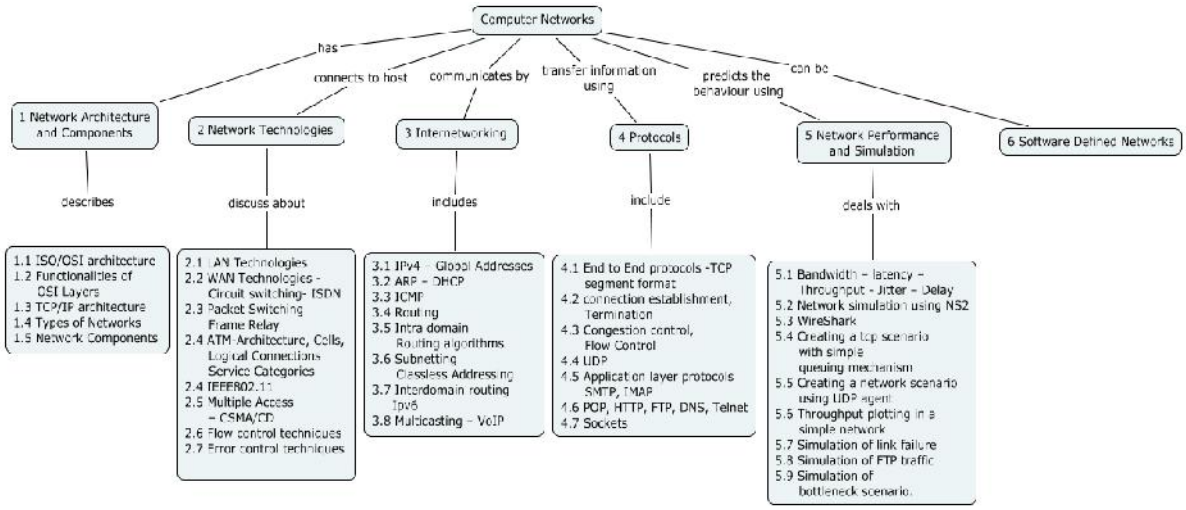
Course Outcome 5(CO5)

1. Suppose a host wants to establish the reliability of a link by sending packets and measuring the percentage that is received ; routers for example do this. Explain the difficulty doing this over TCP connection.
2. How do routers determine that an incoming IP packet is to be multicast?
3. How can a wireless node interfere with the communications of another node when the two nodes are separated by a distance greater than the transmission range of either node?

Course Outcome 6(CO6)

1. Analyse the resources needed to effectively apply microsimulation?
2. How should the project scope and physical limits be established to monitor the network?
3. What security risks are introduced by the use of Network Monitor?

Concept Map



Syllabus

Network Architecture and Components – ISO/OSI architecture – Functionalities of OSI Layers - TCP/IP architecture – Types of Networks (LAN, WAN, VPN, VLAN) – Network Components (NIC, Bridges, Switches, Routers, Hubs, Gateways)

Network Technologies to connect hosts – LAN Technologies (Ethernet, Token Ring) WAN Technologies (Circuit switching- ISDN , Packet Switching – Frame Relay,ATM-Architecture, Cells, Logical Connections, Service Categories) - (IEEE802.11) – Multiple Access – CSMA/CD – Flow control techniques – Error control techniques

Internetworking – IPv4 – Global Addresses – ARP – DHCP – ICMP – Routing – Intra domain Routing algorithms (RIP, OSPF) – Subnetting – Classless Addressing – Interdomain routing – Ipv6 – Multicasting – VoIP

Protocol stack – End to End protocols [TCP (segment format, connection establishment & Termination, Congestion control, Flow Control), UDP] - Application layer protocols (SMTP, IMAP,POP, HTTP, FTP, DNS, Telnet) ,Sockets

Network Performance and Simulation – Bandwidth – latency – Throughput - Jitter – Delay– Network simulation using NS2,WireShark – Creating a simple network with full duplex traffic between nodes, Creating a tcp scenario with simple queuing mechanism, Creating a network scenario using UDP agent, Throughput plotting in a simple network , Simulation of link failure, Simulation of FTP traffic, Simulation of bottleneck scenario.

Fundamentals of Software defined networks

Text Book

1. Larry L.Peterson and Bruce S. Davie, “Computer Networks – A systems Approach” Fourth Edition, Morgan Kaufmann Publishers, Fifth Edition ,2011
2. Thomas D.Nadeau& Ken gray, “Software defined networks”, O’reilly, 2013

Reference Books

1. BehrouzA.Foruzan, “Data Communication and Networking”, Tata McGraw Hill, Fourth Edition, 2009.
2. William Stallings, “Data and Computer Communications:Pearson Education Ninth Edition 2013
3. http://nptel.ac.in/video.php?subjectId=106105081
4. http://nptel.ac.in/courses/IIT-MADRAS/Computer_Networks/
5. Cisco network fundamentals - http://ptgmedia.pearsoncmg.com/images/9781587132087/samplepages/1587132087.pdf

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Computer network architecture**	
1.1 1.2	ISO/OSI architecture Functionalities of OSI layers	1
1.3	TCP/IP architecture	1
1.4	Types of networks(LAN,WAN,VPN,VLAN)	1
1.5	Network components(NIC,Bridges,Switches,Routers,Hubs,Gateways)	1
2	**Network Technologies to connect hosts**	
2.1	LAN Technologies (Ethernet, Token Ring)	1
2.2	WAN Technologies - Circuit switching- ISDN	1
2.3	Packet Switching-Frame relay	1
2.4	ATM-architecture ,cells,logicalconnections,service categories	1
2.5	IEEE802.11	1
2.6	Multiple access – CSMA/CD	1
2.7	Flow control techniques	1
2.8	Error control techniques	1
3	**Internetworking**	
3.1	IPv4-Global Addresses	1
3.2	ARP-DHCP	1
3.3	ICMP	1
3.4	Routing	1
3.5	Intra domain routing algorithms(RIP,OSPF)	1
3.6	Subnetting – Classless addressing	1
3.7	Interdomain routing-Ipv6	1
3.8	Multicasting – VOIP	1
4	**Protocol Stack**	
4.1	End to end protocols (TCP-segment format)	1
4.2	Connection establishment,Termination	1
4.3	Congestion control,Flow control	1
4.4	UDP	1
4.5	Application layer protocols-SMTP,IMAP	1
4.6	POP,HTTP,FTP,DNS,TELNET	1
4.7	Sockets	1
5	**Network Performance and Simulation**	
5.1 5.2	Bandwidth, Latency, Throughput, Jitter, Delay Network simulation using NS2	1
5.3	WireShark – Creating a simple network with full duplex traffic between nodes	1

Module No.	Topic	No. of Lectures
5.4	Creating a tcp scenario with simple queuing mechanism	1
5.5	Creating a network scenario using UDP agent	1
5.6	Throughput plotting in a simple network	1
5.7	Simulation of link failure	1
5.8	Simulation of FTP traffic	1
5.9	Simulation of bottleneck scenario	1
6	Fundamentals of Software Defined Networks	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14IT440	**DATABASE MANAGEMENT SYSTEM**	PC	3	0	0	3

Preamble

This course facilitates the student to understand the various functionalities of DBMS and perform many operations related to creating, using and maintaining databases for real-world applications and introducing emerging technologies in Databases. It emphasizes the need for design of database systems and provides an in depth coverage of various principles of database systems.

Prerequisite

- 14IT240 Information Systems

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom Level**
CO1:	Explain database architecture and representation models.	Understand
CO2:	Use DDL and DML commands using SQL to retrieve data from the given table	Apply
CO3:	Use normalizationtechniques to design a database for a given application	Apply
CO4:	Apply data storage techniques for a given scenario	Apply
CO5:	Describe concurrency control and transaction processing techniques	Understand
CO6:	Explain advanced databases and NoSQL data models	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	L			M							M
CO3	M	L										
CO4	M	L										
CO5	M							M	M	M		M
CO6	M				S			S	S	S		S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	20	20
Understand	40	50	40	40
Apply	30	30	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe database management systems?
2. State the need of a schema?
3. Recall the structure of a DBMS
4. Define a database model? Give any two types of data models with an example for each.
5. Describe the different components of a database systems environment.

Course Outcome 2 (CO2):

1. Write the following queries on the database schema using the relational operators in Relational Algebra. Also show the result of each query as it would apply to the database of relational operations.

a. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the 'ProductX' project.

b. List the names of all employees who have a dependent with the same first name as themselves.

c. Find the names of all employees who are directly supervised by 'Franklin Wong'.

d. For each project, list the project name and the total hours per week (by all employees) spent on that project.

2.Consider the following relations:Employee (emplD , FirstName, LastName, address, DOB,sex,position,deptNo),Department(dtptNo,deptName,mgr,empID),Project(projNo,projName,deptNo), Work on (empID, projNo, hours worked).

Writethe SQL statements for the following:

a. List the name and addresses of all employees who work for the IT department.

b. List the total hours worked by each employee, arranged in order of department number and within department, alphabetically by employee surname.

c. List the total number of employees in each department for those departments with more than 10 employees.

d. List the project number, project name and the number of employees who work on that project.

3 .A table Employee with the following fields: EmpNo, Name, Designation, salary are maintained in a computer. Write SQL queries for the following.

a. Display the details for all employees.

b. Find average salary paid to employees.

c. Display the details of all employees whose salary fall in the range of Rs.10,000 and Rs.50,000.

d. List the names of all employees whose name start with the letter "A".

4. Identify some of the character, number and date functions available in SQL. What are two functions that allow the user to transform column values regardless of the data type?

5. Illustrate the creation of constraints and their enforcement on views?

Course Outcome 3 (CO3):

1.Suppose that we have the following requirements for a university database that is used to keep track of students' transcripts:

a. The university keeps track of each student's name (SNAME); student number (SNUM); social security number (SSN); current address (SCADDR) and phone (SCPHONE); permanent address (SPADDR) and phone (SPPHONE); birth date (BDATE); sex (SEX); class (CLASS) (freshman, sophomore, ..., graduate); major department (MAJORCODE); minor department (MINORCODE) (if any); and degree program (PROG) (B.A., B.S., ..., PH.D.). Both SSSN and student number have unique values for each student.

b. Each department is described by a name (DNAME), department code (DCODE), office number (DOFFICE), office phone (DPHONE), and college (DCOLLEGE). Both name and code have unique values for each department.

c. Each course has a course name (CNAME), description (CDESC), course number (CNUM), number of semester hours (CREDIT), level (LEVEL), and offering department (CDEPT). The course number is unique for each course.

d. Each section has an instructor (INAME), semester (SEMESTER), year (YEAR), course (SECCOURSE), and section number (SECNUM). The section number distinguishes different sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, .up to the total number of sections taught during each semester.

e. A grade record refers to a student (SSN), a particular section, and a grade (GRADE).

Prepare a relational database schema for this database application. First show all the functional dependencies that should hold among the attributes. Then design relation schemas for the database that are each in 3NF or BCNF. Specify the key attributes of each relation. Note any unspecified requirements, and make appropriate assumptions to render the specification complete.

Course Outcome 4 (CO4):

1. Discuss the need of having at most one primary or clustering index on a file, but several Secondary indexes.
2. Explain how disk access can be parallelized using RAID Technology.
3. Discuss the mechanism used to read data from or write data to the disk.
4. Describe the techniques for allowing a hash file to expand and shrink dynamically. What are the advantages and disadvantages of each?
5. PARTS file with Part# as key field includes records with the following P# values: 23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21, 10, 74, 78, 15, 16, 20, 24, 28, 39, 43, 47, 50, 69, 75, 8, 49, 33, 38. Suppose that the search field values are inserted in the given order in a B-tree of order p = 4 and = 3; show how the tree will expand and what the final tree will look like.

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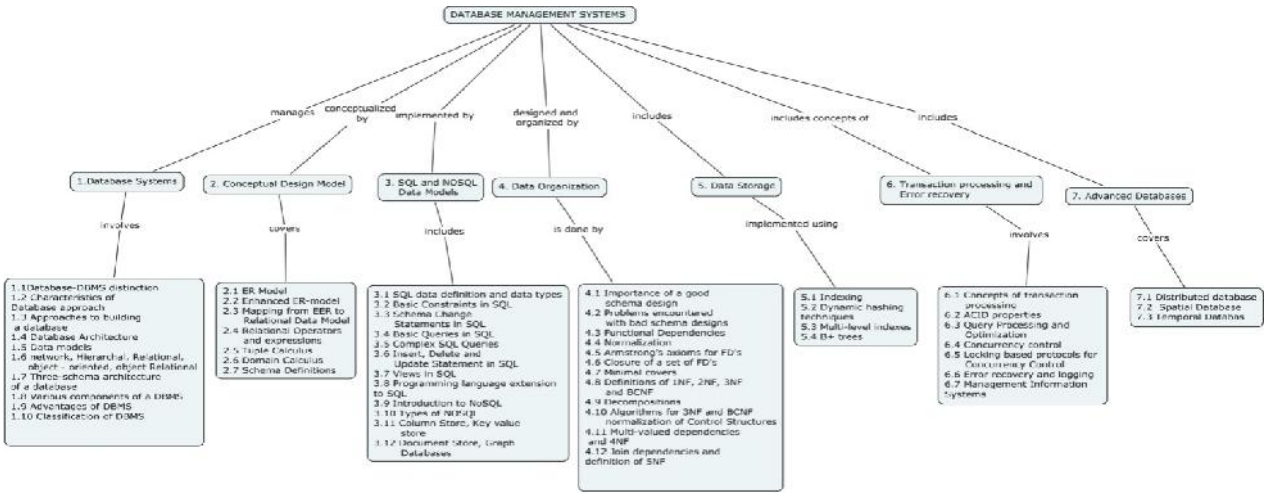
Course Outcome 5 (CO5):

1. Describe ACID properties.
2. Explain Locking based protocols for Concurrency Control.
3. Discuss Management Information Systems with an example.

Course Outcome 6 (CO6):

1. Describe different data models available nowadays.
2. State the various types of advanced databases
3. Outline the requirements that led to the foundation of advanced databases.
4. Discuss the NoSQL data model with respect to a social networking site.

Concept Map



Syllabus

Database systems, Database-DBMS distinction, Characteristics of Database approach- Approaches to building a database, Database Architecture, Data models- network, Hierarchal, Relational, object - oriented, object Relational, Three-schema architecture of a database, Various components of a DBMS, Advantages of DBMS, Classification of DBMS.

Conceptual Design Model - ER Model, Enhanced ER-model- Mapping from EER to Relational Data Model- Relational Operators and expressions, Tuple Calculus, Domain Calculus, Schema Definitions.

SQL and NOSQL Data Models - SQL data definition and data types, Basic constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, Complex SQL Queries, Insert, Delete and Update Statement in SQL, Views in SQL. Programming language extension to SQL.Introduction to NoSQL- Types of NOSQL-Column Store, Key value store, Document Store, Graph databases.

Data Organization – Importance of a good schema design, Problems encountered with bad schema designs, Functional Dependencies, Normalization, Armstrong's axioms for FD's, Closure of a set of FD's, Minimal covers, Definitions of 1NF, 2NF, 3NF and BCNF, Decompositions, Algorithms for 3NF and BCNF normalization of Control Structures, Multi-valued dependencies and 4NF, Join dependencies and definition of 5NF.

Data Storage - Indexing, Dynamic hashing techniques, Multi-level indexes, B+ trees.

Transaction processing and Error recovery-Concepts of transaction processing, ACID properties, Query Processing and Optimization, Concurrency control, Locking based protocols for Concurrency Control, Error recovery and logging, Management Information Systems.

Advanced Database- Distributed database, Spatial Database, Temporal Database.

Text Book

1. RamezElmasri and ShamkantB.Navathe, "Fundamentals of Database Systems", Pearson Education, 6th edition, 2011.

2. Martin Fowler, Pramod J. Sadalage, “Distilled NOSQL: Guide to the emerging world”,Pearson Education,2012.

Reference Books

1. C.J Date, A.Kannan, S.Swamynathan “An Introduction to database systems”, Eighth Edition, Pearson Education, 2006.
2. Abraham Silberschatz, Henry F.Korth and Sudarshan, “Database System Concepts”, Mcgraw-Hill, Fifth edition, 2006.
3. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill ,Third Edition, 2003.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Database systems**	
1.1 1.2	Database-DBMS distinction Characteristics of Database approach	1
1.3	Approaches to building a database	1
1.4	Database Architecture	1
1.5	Data models- network, Hierarchal, Relational, object - oriented, object Relational	1
1.6	Three-schema architecture of a database	1
1.7	Various components of a DBMS	1
1.8 1.9	Advantages of DBMS Classification of DBMS	1
2	**Conceptual Design Model**	
2.1	ER Model	1
2.2	Enhanced ER-model	1
2.3 2.4	Mapping from EER to Relational Data Model Relational Operators and expressions	1
2.5 2.6	Tuple Calculus, Domain Calculus	1
2.7	Schema Definitions	1
3	**SQL and NOSQL Data Models**	
3.1 3.2	SQL data definition and data types Basic Constraints in SQL	1
3.3 3.4	Schema Change Statements in SQL Basic Queries in SQL	1
3.5	Complex SQL Queries	1
3.6	Insert, Delete and Update Statement in SQL	1
3.7 3.8	Views in SQL Programming language extension to SQL	1
3.9	Introduction to NoSQL	1
3.10	Types of NOSQL-Column Store, Key value store, Document Store, Graph Databases	1
4	**Data Organization**	
4.1 4.2	Importance of a good schema design Problems encountered with bad schema designs	1
4.3	Functional Dependencies	1
4.4	Normalization, Armstrong’s axioms for FD’s	1
4.5	Closure of a set of FD’s, Minimal covers	1
4.6	Definitions of 1NF, 2NF, 3NF and BCNF	1
4.7	Decompositions	1
4.8	Algorithms for 3NF and BCNF normalization of Control	1

Module No.	Topic	No. of Lectures
	Structures	
4.9	Multi-valued dependencies and 4NF	1
4.10	Join dependencies and definition of 5NF	1
5	**Data Storage**	
5.1 5.2	Indexes Dynamic hashing techniques	1
5.3	Multi-level indexes	1
5.4	B+ trees	1
6	**Transaction processing and Error recovery**	
6.1 6.2	Concepts of transaction processing ACID properties	1
6.3	Query Processing and Optimization	1
6.4 6.5	Concurrency control Locking based protocols for Concurrency Control	1
6.6 6.7	Error recovery and logging Management Information Systems	1
7	**Advanced Databases**	
7.1	Distributed database	1
7.2 7.3	Spatial Database Temporal Database	1
Total Lectures		**36**

Course Designers:

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14IT480	JAVA PROGRAMMING LAB	Category	L	T	P	Credit
		PC	0	0	1	1

Preamble

This course provides knowledge and skill on java object oriented concepts such as inheritance, polymorphism and also the concepts such as threading, packages, exceptions. It also provides knowledge at analyze level on selecting java libraries like collections, jar, jdbc, logging etc for an application.

Prerequisite

- 14IT320 Object Oriented Programming
- 14IT370 Software Engineering

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Select suitable Java Application Programming Interfaces (APIs) for the application requirements	Analyze
CO2:	Develop applications for any ITproblems using Java	Create
CO3:	Work in a team and communicate effectively based on the given task	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L		S		L	S	S	S	M	M
CO2	S	S	M		S	L	L	S	S	S	S	S
CO3								S	S	S		

S- Strong; M-Medium; L-Low

Mini Project Details:

Phase – I

Team formation (Team size: 5)
Problem identification in various IT, societal/health/safety applications
Requirements gathering and analysis for selecting various java concepts (collections, logging, jdbcetc)
Separate modules individually

Phase – II

Design use case models
Develop programs module level, test and debug individually

Integrate the modules, debug and perform testing

Phase – III

Present the results in a team
Document all the above process as a report

List of Experiments

Sl. No.	Topic	No of Sessions
1	Practice Encapsulation & Polymorphism	1
2	Practice Inheritance	1
3	Practice packages & interfaces	1
4	Practice threading	1
5	Practice collections with string methods	1
6	Practice logging with JAR	1
7	Practice Swing with Events	1
8	Mini project phase-I review	1
9	Practice jdbc	1
10	Mini project phase-II review	1
11	Demonstrate TCP & UDP	1
12	Mini project phase-III review	1
	Total Practical Sessions	**12**

Course Designers:

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		Category	L	T	P	Credit
14IT490	**DATABASE MANAGEMENT SYSTEM LAB**	PC	0	0	1	1

Preamble

This lab course is meant to provide a strong formal foundation in database design concepts and to give adequate exposure to the SQL and PL/SQL programming with the help of the Oracle RDBMS environment. It also deals with connecting the database to a programming language and thereby creating a real world application for a specific set of given requirements.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the lab, students will be able to

Course Outcomes		Bloom Level
CO1	Design database with integrity constraints and appropriate normal forms	Apply
CO2	Implement SQL and NoSQL data model for a given application	Apply
CO3	Use PL/SQL constructs to add programming extension to SQL	Apply
CO4	Use database connectivity mechanism for a real time application	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**M**			**S**			**S**	**S**	**S**		**S**
CO2	**S**	**L**			**S**			**S**	**S**	**S**		**S**
CO3.	**S**				**S**			**S**	**S**	**S**		**M**
CO4	**S**	**M**	**M**		**S**	**S**		**S**	**S**	**S**	**S**	**S**

S- Strong; M-Medium; L-Low

Lab Contents and Schedule

Sl. No.	List of Experiments	No. of Sessions
0	Identification of Mini Project and installation of oracle 10g DBMS client software	1
1	Creation and Modification of relations	1
2	Integrity constraint enforcement and simple SQL queries	1
3	Creation and updation of views	1
4	Complex SQL Queries	1
5	PL/SQL block creation and usage of various composite data types	1
6	Cursor management in PL/SQL	1
7	Procedures, functions and packages in PL/SQL	1
8	Creation of triggers in PL/SQL	1
9	Normalizing the relations: 1NF, 2NF, 3NF and BCNF	1
10	Usage of higher normal forms: 4NF and 5NF	1
11.	Start Oracle NoSQL Database instance and load the user	1

	profile data	
12	Embedding Database Connectivity	1
	Total Sessions	**12**

Course Designers:

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		Category	L	T	P	Credit
14IT470	**PROFESSIONAL COMMUNICATION**	HSS	1	0	2	2

Preamble

This course provides opportunities to students to develop and demonstrate basic communication skills in technical, professional and social contexts effectively.

Prerequisite

14EG140: English

Course Outcomes

On the successful completion of the course, students will be able to

CO 1.	Plan, organise, write, and present project reports, and technical papers in the frame of the scientific method	Apply
CO 2.	Establish themselves through communication skills in corporate environment.	
CO 3.	Solve verbal aptitude questions related to placement and higher studies.	Apply
CO 4.	Apply their interpersonal skills in technical, professional and social contexts.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.									M	M		
CO2.									M	M		
CO3.									M	M		
CO4.									M	M		

S- Strong; M-Medium; L-Low

Assessment Pattern

Internal

- **No Continuous Assessment Test (CAT) will be conducted.**

Project Report Preparation and
Technical Presentation through PPT - 15
Listening Test - 10
Spoken Task – Group Discussion / Mock Job Interview - 10
Writing – Verbal Aptitude for Placement and Higher studies - 15
(The test will be conducted for 50 marks and reduced to 15)

External (Practical)

Listening Test - 20

Group Discussion	-	25
Personal Interview / Situational Conversation	-	25
Technical Presentation	-	20
Resume	-	10

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Hours	
		Theory	Practical
1	Literature Survey / Project Title Selection	1	
2	Characteristics of Technical Paper and Project Report	1	
3	Abstract / Data Presentation	1	
4	Common Errors in Technical Writing	1	
5	Bibliography and References	1	
6	Vocabulary Development	1	
7	Sentence Completion	1	
8	Error Spotting	1	
9	Interpretation of Verbal Analogy	1	
10	Interpretation of Reading (Comprehension - Conception)	1	
11	Interpretation of Reading (Comprehension - Reasoning)	1	
12	Practice for writing E-mails	1	
13	PPT Preparation /Demonstration of Technical Presentation		4
14	Preparation of Resume		2
15	Preparation for Job Interviews		4
16	Demonstration of Group Discussion Skills		4
17	Developing Listening Skill (Comprehension)		3
18	Practice for Short Speeches / Situational Conversation		4
19	Development of Employability Skills		2
20	Non-Verbal Communication		1
	Total	12	24

Reference Books:

1. Courseware on "**Technical Communication for Scientists and Engineers**", IIT Bombay, 2015.
2. Cappel, Annette and Sharp, Wendy, "**Cambridge English: Objective First**", 4th edition., CUP, New Delhi, 2013

3. Sue Prince, Emma, "**The Advantage: The 7 soft skills you need to stay one step ahead**", 1st edition, Pearson; 2013.
4. Cusack, Barry, "**Improve Your IELTS Listening and Speaking Skills (With CD)**" Paperback, Macmillan, 2007.
5. Bates, Susan, "**TOEFL iBT Exam Paperback**", Oxford, 2012.
6. Hart, Guy Brook, "**Cambridge English Business Benchmark**", 2nd edition, CUP 2014.

Course Designers:

1.	Dr. T.Sadasivan	sadasivan@tce.edu
2.	Dr. S.Rajaram	sreng@tce.edu
3.	Dr. A.Tamilselvi	tamilselvi@tce.edu
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5.	Dr.R.K.Jaishree Karthiga	jai@tce.edu

14IT450	ENGINEERING DESIGN

Category	L	T	P	Credit
PC	1	0	2	3

Common for B.E./B.Tech Degree Programmes

(Course Codes: 14CE450, 14ME420, 14EE450, 14EC450, 14CS340,14MT420)

Preamble

Engineering design is normally taught, not as a unified course in India. The courses like Product design, Machine design, Electrical machine design and transformer design, Control system design and Communication system design are tailored to specific topics There were many new approaches developed over a period of time. There is a need to discuss a unified approach of design in a course.

Prerequisite

None

Course Outcomes

On the successful completion of the course, students will be able to

CO1: Explain the steps involved in Engineering Design	Understand
CO2. Explain the Engineering Design process and review designs with societal considerations.	Understand
CO3: Provide specification for customer needs/requirements, considering engineering Characteristics and quality Function Deployment.	Apply
CO4: Prepare conceptual design document.	Apply

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		
	CAT 1	Review 1	Review 2
Remember	20	0	0
Understand	40	0	0
Apply	40	100	50
Analyse	0	0	50

Evaluate	0	0	0
Create	0	0	0

- Milestones:
    1. Problem description (3 weeks)
    2. Framework (4 weeks)
        i. Functional requirements
        ii. User requirements
        iii. Performance requirements
        iv. Specifications
    3. Preliminary design (conceptual) (3 weeks)
        i. Cost estimates
    4. Final design (conceptual document) (2 weeks)

REVIEW 1 FOR MILESTONES1 & 2 AND REVIEW 2 FOR MILESTONES 3 & 4

Course Level Assessment Questions

Course Outcome 1 (CO1):

3. Define Engineering Design
4. State different activities involved in Product Engineering Life Cycle
5. List different design considerations that are required for a good design
6. Explain different types of design
7. List the characteristics of environmentally responsible design

Course Outcome 2 (CO2):

1. List different modes to collect user requirements.
2. Briefly explain the classification of different types of User requirement
3. Define Benchmarking or Reverse Engineering or Product Dissection
4. List two categories of Redesign
5. Explain different activities involved in Design process
6. Explain different steps involved in Conceptual Design process

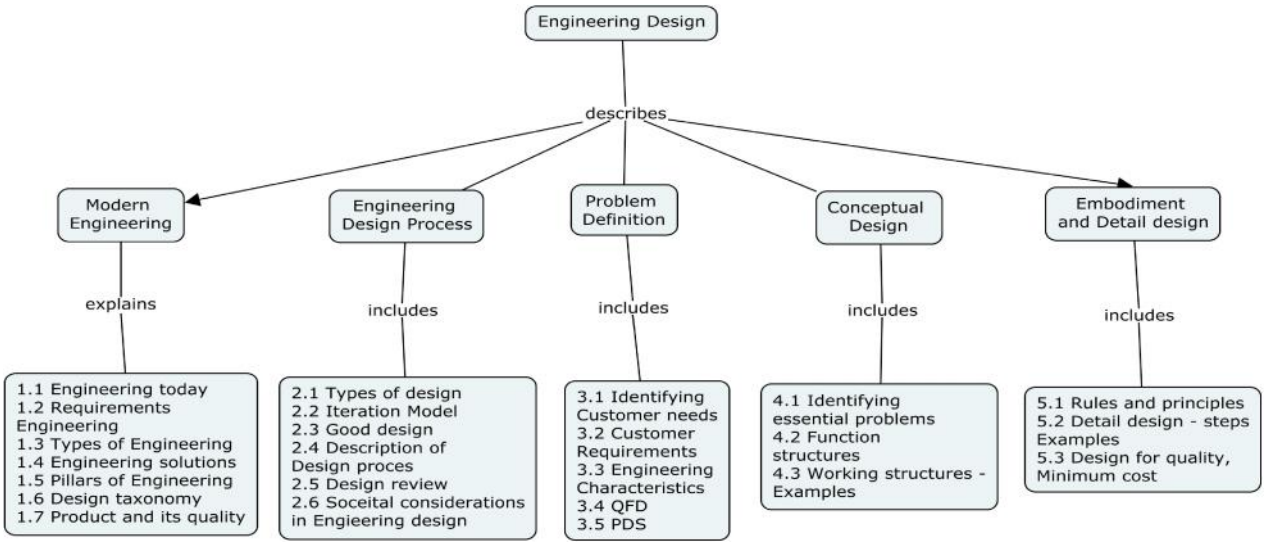
Course Outcome 3 (CO3)

1. Write product design specifications for any of the following product - Desktop Computer or Bicycle or Pencil or Computer Table or mobile.
2. Translate customer requirements into **Engineering characteristics** of any product like mobile or computer or bicycle.

Course Outcome 4 (CO4)

1. Prepare conceptual design document for any complex engineering problem related to societal engineering under specific domain.

Concept Map



Syllabus

Modern Engineering: Introduction, Engineering today, Requirements of engineering, Types of engineering, Engineering Solutions, Pillars of Engineering, Design Taxonomy, Product, Quality of product.

Engineering Design Process: Types of Designs, A Simplified Iteration Model, Considerations of a Good Design, Description of Design Process, Design Review, Societal Considerations in Engineering Design,

Problem Definition and Need Identification: Identifying Customer Needs, Customer Requirements, Establishing the Engineering Characteristics, Quality Function Deployment, product Design Specification

Conceptual Design: Steps, Abstracting to Identify the Essential Problems, Establishing Function Structures, Developing Working Structures and concepts. Examples

Embodiment and Detail Designs: Steps, Basic Rules and Principles of Embodiment Design, Detail Design, Design for Quality and minimum Cost. Examples

Reference Books

1. G.Pahl and W.Beitz (Translated by Ken Wallace et al.,) 'Engineering Design: A Systematic Approach, Second Edition, Springer, 2005.
2. George E. Dieter and Linda C. Schmidt, "Engineering Design", Fourth Edition, McGraw Hill Higher Education, 2009.
3. Power Point Presentation material by Prof.D.K.Subramanian in the Workshop on Engineering Design at TCE, Madurai.
4. Foundation Skills in Integrated Product Development, NASSCOM, Edition 2015

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	Modern Engineering	
1.1	Introduction - Engineering today	1
1.2	Requirements of engineering	
1.3	Types of engineering	1
1.4	Engineering Solutions	
1.5	Pillars of Engineering	
1.6	Design Taxonomy	1
1.7	Product and Quality of product	
2	Engineering Design Process	
2.1	Types of Designs	1
2.2	A Simplified Iteration Model	
2.3	Considerations of a Good Design	
2.4	Description of Design Process	1
2.5	Design Review	
2.6	Societal Considerations in Engineering Design	1
3	Problem Definition and Need Identification	
3.1	Identifying Customer Needs	1
3.2	Customer Requirements	
3.3	Establishing the Engineering Characteristics	
3.4	Quality Function Deployment	1
3.5	Product Design Specification	
4	Conceptual Design	2
4.1	Steps, Abstracting to Identify the Essential Problems	
4.2	Establishing Function Structures	
4.3	Developing Working Structures and concepts - *Examples*	

Module No.	Topic	No. of Lectures
5	Embodiment and Detail Design	2
5.1	Steps, Basic Rules and Principles of Embodiment Design	
5.2	Detail Design – *Examples*	
5.3	Design for Quality and minimum Cost	
	Total Lectures	12

Course Designers:

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2. Dr.S.Baskar sbeee@tce.edu

14IT4C0	**CAPSTONE - I**	Category	L	T	P	Credit
		PC	0	0	2	2

Common for B.E./B.Tech Degree Programmes

(Course Codes: 14CE4C0, 14ME4C0, 14EE4C0, 14EC4C0, 14IT4C0, 14CS4C0,14MT4C0)

Preamble

The purpose of this course is to apply the concept of Mathematics, Science and Engineering Fundamentals and an Engineering Specialization to solve complex engineering Problem

Assessment Pattern

Comprehensive Test and Viva (40 Marks)

- Marks scored in Objective Type Questions in each group (Average to 30 Marks)
  - The courses offered in 1- III semesters are divided into 4 groups
- Marks scored in Review (Explanations for the answers) in each group (Average to 10 Marks)

Complex Engineering Problem Solving (60 Marks)

- Selection of a Complex Engineering Problem by students and approved by Faculty Members (Batch Size:3) (5 marks)
- Literature survey on the chosen problem – 5 Marks
- Critics on Literature-Problem formulation – 10 Marks
- Solution Methodology – (10 Marks)
- Observations/inference/Result and Analysis - (10 Marks)
- Viva-Voce (10 Marks)
- Technical Report (10 Marks)

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

FIFTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2014-15 onwards)

FIFTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
14IT510	Probability and statistics	BS	2	2	-	3
14IT520	Web Technologies	PC	3	-	-	3
14IT530	Network Security	PC	3	-	-	3
14IT540	Data Mining	PC	2	2	-	3
14ITPX0	Programme Elective-1	PE	3	-	-	3
THEORY CUM PRACTICAL						
14IT570	System Administration	PC	2	-	2	3
PRACTICAL						
14IT580	Web Programming Lab	PC	-	-	2	1
14IT590	Network Management and Security Lab	PC	-	-	2	1
Total			**15**	**4**	**6**	**20**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2014-15onwards)

FIFTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	14IT510	Probability and statistics	3	50	50	100	25	50
2	14IT520	Web Technologies	3	50	50	100	25	50
3	14IT530	Network Security	3	50	50	100	25	50
4	14IT540	Data Mining	3	50	50	100	25	50
5	14ITPX0	Programme Elective-1	3	50	50	100	25	50
THEORY CUM PRACTICAL								
6	14IT570	System Administration	3	50	50	100	25	50
PRACTICAL								
7	14IT580	Web Programming Lab	3	50	50	100	25	50
8	14IT590	Network Management and Security Lab	3	50	50	100	25	50

* CA evaluation pattern will differ from course to course 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 and subsequently be reduced to 50 marks for the award of terminal examination marks

14IT510	PROBABILITY AND STATISTICS	Category	L	T	P	Credit
		HSS	2	1	0	3

Preamble

Probability is that branch of mathematics which deals with phenomena whose outcomes involve uncertainty. The fundamental idea in probability is that probability can be measured on a scale which runs from zero (representing impossibility) to one .Statistics is viewed not as a mere device for collecting numerical data but as a means of developing sound techniques for their handling and analysis and drawing valid inferences from them. The sampling distribution of a statistic is the distribution of that statistic, considered as a random variable, when derived from a random sample of size n. It may be considered as the distribution of the statistic for all possible samples from the same population of a given size. Quality control charts are mainly used for the study and control of respective production process. Any respective production process sets certain standards in terms of measurable dimensions such as diameter, length, weight etc. Control chart, in general, help us to rectify the faults and errors during the process or even after the process is over. It depends upon the type of control chart we use. Reliability is an important application of probability as applied to life situations. In our day to day life situation we use the word reliable or reliability in the senses of dependable or dependability. Based on these, the course aims at giving adequate exposure in probability, statistics, sampling theory, quality control and reliability theory.

Prerequisite

Higher secondary level basic probability theory.

Course Outcomes

On the successful completion of the course, students will be able to

Course outcomes	Blooms level
CO1 Construct regression lines	Apply
CO2 Utilize the regression line and regression plane concepts to estimate the specified values.	Apply
CO3 Demonstrate whether two samples came from same population or from different population for set of collected sample data	Apply
CO4 Apply the concepts of discrete and continuous distributions as binomial, Poisson, geometric, normal and Weibull distributions to the biological decision making situations.	Apply
CO5 Detect whether or not a change in the production process results in a significant change in quality.	Apply
CO6 Find failure rate, MTTF and MTBF, number of items fail in a given time etc.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**S**	**S**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**L**
CO2.	**S**	**S**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**L**
CO3.	**S**	**S**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**L**
CO4.	**S**	**S**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**L**
CO5.	**S**	**S**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**L**
CO6.	**S**	**S**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	10
Understand	20	20	20	20
Apply	70	70	70	70
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1.Calculate the coefficient of correlation and obtain the lines of regression for the following data.

X:	9	8	7	6	5	4	3	2	1
Y:	15	16	14	13	11	12	10	8	9

2.The marks obtained by 9 students in Mathematics and Statistics are given below. Compute the correlation coefficient and obtain the lines of regression.

Roll No.	1	2	3	4	5	6	7	8	9
Marks in Mathematics	75	30	60	80	53	35	15	40	38
Marks in Statistics	85	45	54	91	58	63	35	43	45

Course Outcome 2 (CO2):

1.From the following data calculate the value of y at x=68.7 and the value of x at y=70.5

X:	65	66	67	68	69	70	71	67
y:	67	68	64	72	70	67	70	68

2.Determine the plane of regression of Y on X1 and X2 for the following data

Y :	90	72	54	42	30	12
X1:	3	5	6	8	12	14
X2:	16	10	7	4	3	2

Course Outcome 3 (CO3):

1.Apply suitable test to decide whether the following two samples came from the same population

X:	5	6	8	1	12	4	3	9	6	10
Y:	2	3	6	8	1	10	2	8		

2.Two random samples reveal the following data.

Sample No.	Size	Sample mean	Sample variance
1	16	440	40
2	25	460	42

Course Outcome 4 (CO4):

1. The number of accidents in a year to taxi-drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers with (i) no accidents in a year (ii) more than 3 accidents in a year.

2. In a test on 2000 electric bulbs, it was found that bulbs of a particular make, was normally distributed with an average life of 2040 hours and SD of 60 hours. Estimate the number of bulbs likely to burn for (i) more than 2150 hours (ii) less than 1950 hours (iii) more 1920 hours but less than 2100 hours.
   Suppose that the lifetime of a certain kind of an emergency backup battery (in hours) is a random variable X having the Weibull distribution $\sim = 0.1 \& \quad = 0.5$. Compute (i) the mean lifetime of these batteries (ii) the probability that such a battery will last more than 300 hours (iii) the probability that such a battery will not lost 100 hours.

Course Outcome 5 (CO5):

1. Twenty pieces of cloth out of different rolls contained respectively 1,4,3,2,5,4,6,7,2,3,2,5,7,6,4,5,2,1,3 and 8 imperfections. Ascertain whether the process is in a state of statistical control.

2. Construct the control chart for defectives (p-chart) for the data given below. Comment on the result.

Sample no.:	1	2	3	4	5	6	7	8	9	10
Inspected:	175	200	200	175	150	250	200	200	150	200
Defectives:	6	8	5	4	3	8	6	6	6	7

Course Outcome 6 (CO6):

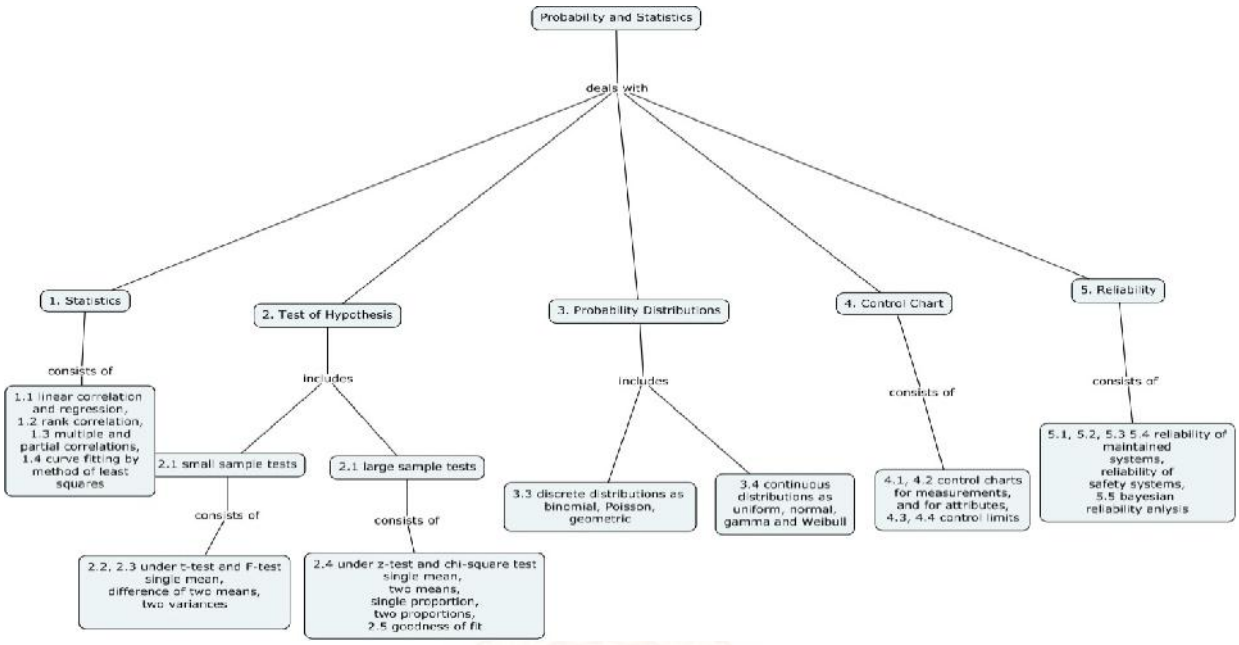
1. The ALPHA company manufactures gizmos for use on widges. The time to failure in years, of these gizmos has the pdf

$$f(t) = \frac{200}{(t+10)^3}, t \geq 0$$

   (i) Find the reliability function and determine the reliability for the first year of operation
   (ii) Find the mean time to failure
   (iii) What is the design life for a reliability 0.90?
   (iv) Will a one year burn in period improve the reliability in (i)? If so, find the new reliability

2. A certain type of engine seal is found to have its life exponentially distributed with a constant failure rate 0.03×10^{-4} failures per hour. (i) What is the probability that a given seal will last beyond 10,000 hours? (ii) What is the MTTF of the seal? (iii) What is the reliability at MTTF? (iv) If the reliability at design life has to be at least 90%, what is the recommended design life?

Concept Map



Syllabus

STATISTICS: Linear correlation and regression-Rank correlation-Multiple and partial correlations-Curve fitting – Method of least squares.

TEST OF HYPOTHESIS: Large and small sample tests, Test for (i)Proportion (ii) Mean (iii) Variance and (iv) Difference between two proportions, Means and variances in large and small samples, Tests of normality, Applications of chi-square, 't', 'F' distributions for test of hypothesis.

PROBABILITY DISTRIBUTIONS: Random variables-probability mass and density functions-conditional probability -Bayes' theorem-mathematical expectation -discrete and continuous distributions-discrete distributions: Binomial, Poisson and Geometric-continuous distributions:Uniform, Gamma, Weibull and Normal.

CONTROL CHART: Introduction to quality control-control charts for measurements-control charts for attributes-statistical basis for control charts-control limits-control charts for variables- $\bar{X}, R, \pm$ charts-charts for defective-p, np charts-charts for defects-c,u charts

RELIABILITY:A Brief History – Different approaches to Reliability Analysis – Basic concepts – application areas - Reliability of Maintained Systems - Reliability of Safety Systems - Bayesian Reliability Analysis - Reliability Data Sources.

Text Book

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Co., 2002.
2. Sheldon M. Ross, A first course in Probability, Pearson Education, 2002.
3. Richard A. Johnson, Miller and Freund's, Probability and Statistics for Engineers, Seventh edition, Prentice Hall of India Private Limited, New Delhi, 2004.
4. 4. Mariappan,P., "Statistics for Scientific Solutions", New Century Book House, Chennai, First Edition-2008; ISBN: 81-234-1404-8

Reference Books

1. John G. Proakis, "Digital Communications", McGraw Hill International Edition, Fourth Edition, 2001.
2. Simon Haykin, "Communication Systems" 3rd Edition, PHI, 1996.
3. Bernard Sklar: "Digital Communications: Fundamentals and Applications", 2nd Edition, Prentice Hall, 2001
4. John R Barry, Edward Lee and David G. Messerschmitt, "Digital Communication", 3rd Edition. Springer, 2003.
5. R.C. Saxena, J.N. Kapoor, "Mathematical Statistics", S.Chand and Co, 1999.
6. J.N.Sharma, J.K.Goel, "Mathematical Statistics", Seventh Edition, Krishna PrakashamMandir, Meerut, 1998.
7. Miller, Fan, " Probability and Statistics for Engineers", Prentice Hall of India, 2001.
8. Veerarajan.T, " Probablility and Statistics" Tata McGraw-Hill Limited, New Delhi

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**Statistics**	
1.1	Linearcorrelation and regression	2
1.2	Rank correlation	2
	Tutorial	1
1.3	Multiple and partial correlation	1
1.4	Curve fitting by the method of least squares	2
	Tutorial	1
2.	**Test of Hypothesis**	
2.1	Large and small sample tests-introduction	1
2.2	Test of single and two means-t test	2
2.3	Test to two variances-F test	1
	Tutorial	1
2.4	Large samples z tests	2
2.5	Chi-square tests	2
	Tutorial	1
3.	**Probability Distributions**	
3.1	Random variable, probability mass and density functions	2
3.2	Conditional probability, Baye's theorem, mathematical	2

Module No.	Topic	No. of Lectures
	expectation	
	Tutorial	1
3.3	Discrete distributions-Binomial, Poisson and Geometric	2
3.4	Continuous distributions-Uniform, Gamma, Weibull and Normal	2
	Tutorial	1
4.	**Control Chart**	
4.1	Introduction to quality control, control chart for measurements	2
4.2	Control charts for attributes, statistical basis for control charts	2
	Tutorial	1
4.3	Control limits, control charts for variables	2
4.4	Charts for defectives, p, np charts, c,u charts	2
	Tutorial	1
5.	**Reliability**	
5.1	Different approaches for reliability theory-a brief history	1
5.2	Basic concepts, application areas	1
5.3	Reliability of maintained systems	1
5.4	Reliability of safety systems	1
	Tutorial	1
5.5	Bayesian reliability analysis	1
5.6	Reliability data sources	2
	Tutorial	1
	Total hours	**48**

Course Designers:

1. Dr.M. Kameswari mkmat@tce.edu
2. Dr.T. Lakshmi tlakshmimdu@tce.edu

		Category	L	T	P	Credit
14IT520	**WEB TECHNOLOGIES**	PC	3	0	0	3

Preamble

This course provides a clear picture of basic web development concepts and process, web design best practices, web page creation using XHTML and XML, web client / server -side scripting using JavaScript and web services. The acquired knowledge will be used in and reinforced by developing a website that aligns to a set of user specified requirements.

Prerequisite

- 14IT420: Java Programming

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's level**
CO1:	Illustrate the architecture and essentials of web and application servers.	Understand
CO2:	Design web sites using HTML5 .	Apply
CO3:	Develop web application using Client side/ server side scripting languages.	Apply
CO4:	Transfer XML documents using schemas and Query languages.	Apply
CO5:	Build web services like SOAP.UDDI and WSDL for web applications.	Apply

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	L											
CO2	S				M							
CO3	S	L	L		M				L	L	L	L
CO4	S	L	L		M			L	L	L	L	L
CO5	S	M	M		S			L	M	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	0	20
Understand	60	20	20	20
Apply	20	40	80	60
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO5: Evaluated through Mini Project

Guidelines for the Mini-project:

Group formation: Students are split into project groups with around 6 members in each group. A team can execute the project using web technologies like HTML 5, Client/ Server technologies, XML and Web services. Project groups are responsible for organising themselves, keeping records on the progress of the project, including the minutes of meetings held.

At the end of the semester, the team has to present their project, submit their report and share their lessons learnt/best practices with other teams.

- ✓ Some of the activities may include: (but not limited to)
- ✓ Application identification and Requirements gathering
- ✓ Project planning
- ✓ Requirements Analysis
- ✓ Tools/Templates identification
- ✓ Design and Development
- ✓ Documentation

Some of the Mini-project titlesmay include: (but not limited to)

- ✓ e-governance
- ✓ Health care
- ✓ Tele shopping
- ✓ Banking
- ✓ Issue Tracking system

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe web browser architecture.
2. List out the types of web pages.
3. Differentiate client/ server technologies.
4. Explain application servers.

Course Outcome 2 (CO2):

1. Define a CSS Rule to change color of all elements containing attribute class = “green move” to green and shift them down to 25 pixels and right 15 pixels?
2. Write a Java Script to get input from the user in XHTML and convert to lowercase and uppercase?
3. Construct an XML Doc that marks up the information in the following table

Name	Job	Department	Cubicle
Joe	Programmer	Engineering	5E
Erin	Designer	Marketing	9M
Melisa	Designer	Human Resource	8H
Craig	Admin	Engineering	4E
Eileen	Proj Coordinator	Marketing	3M
Danielle	Programmer	Engineering	12E
Frank	SalesPerson	Marketing	17M
Corinne	Programmer	TechSupport	19T

4. Implement the Remote Interface by using an Server side program and client side program containing the Remote Objects definition.

Course Outcome 3 (CO3):

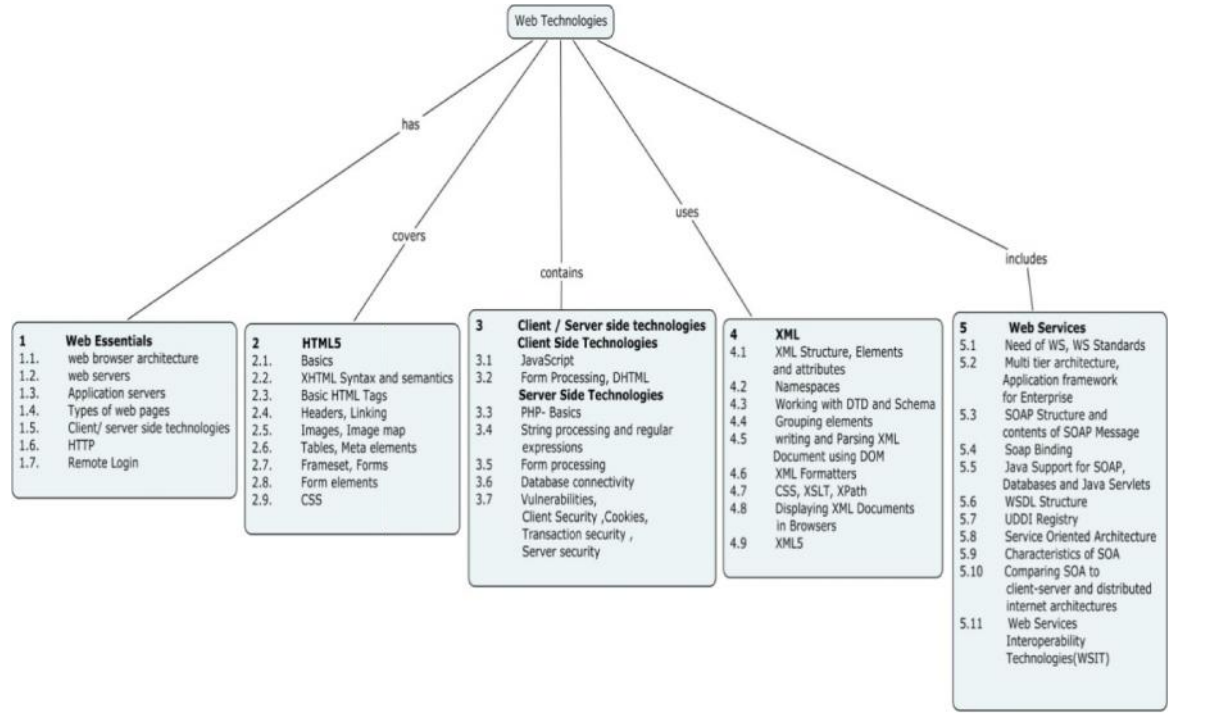
1. Use PHP sessions, Create persistent variables that can be used by multiple requests from a client browser session.
2. Create a Web Page that applies the invert filter to all image if the user moves the mouse over it?
3. Create an XHTML document that marks up your resume?
4. Create an XHTML document titled “How to get Good Grades” Use <meta> tags to include a series of keywords that describe your document.
5. Create a Working environment for PHP Web page development.

Course Outcome 4 (CO4):

1. Design a web application for online data store using web service protocols
2. Integrate any web application and collect the requirements for developing the application
3. Design an XHTML document that marks up your resume?
   - **a.** The first document will establish the **frameset**, which will be split into at least **three** frames. One of these frame windows must contain a document that provides navigation through this set of documents (a table of contents).
   - **b.** The rest of the set will contain, at a minimum, **six** other documents, **four** of which must pass through an active frame. These may include documents that you have created for other assignments, or other pages you have created, but if, you choose to do this, you are responsible for the markup in these pages.
   - **c.** One document in this set must contain a working **form** with at least **three** different types of **input elements**.

   It will also include:
   - **I.** At least **two** external links to documents you do not own;
   - **II.** At least **two** links to other documents you have created;
   - **III.** At least **one** background color or image;
   - **IV.** At least **three** images in the body of your resume pages; and
   - **V.** At least **two** targeted links between frames

Concept Map



Syllabus

Web Essentials:web browser architecture- web servers- Application servers-types of web pages- client/ server side technologies- HTTP- Remote Login.

HTML5: Basics- XHTML- Syntax and semantics- Basic Tags- Headers- Linking- Images - Image map-tables- Meta elements – frameset- forms – CSS.

Client/ Server side technologies: Client side technologies JavaScript--Form Processing-DHTML - Server side technologies**:** PHP- Basics -String processing and regular expressions- Form processing- Database connectivity- Vulnerabilities - Client Security - Cookies - Transaction security -Server security -**Case Study** on AJAX and Flex chart.

XML: XML Structure- Elements and attributes- Namespaces- Working with DTD- Schema-Grouping elements- writing and Parsing XML Document using DOM- XML Formatters- CSS-XSLT- XPath-- Displaying XML Documents in Browsers –XML5.

Web Services: Need of WS- WS Standards- Multi tier architecture - Application framework for Enterprise - SOAP- Structure and contents of SOAP Message- Binding -Java Support for SOAP – Databases and Java Servlets- WSDL- Structure- UDDI-Registry- Service Oriented Architecture -Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures - Web Services Interoperability Technologies (WSIT) – **Case study** on REST.

Text Books

1. Jeffrey C.Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, Fourth Edition,2012.
2. Deitel and Deitel, “Internet and World Wide Web How to Program”, Prentice Hall of India, Fourth Edition, 2009.

Reference Books

1. Achyut S Godbole and AtulKahate, “Web Technologies”, Tata McGraw Hill, Second Edition, 2008.
2. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, andDesign”, Pearson Education, 2005.
3. Gustavo Alonso, Fabio Casati, Harumi Kuno and Vijay Machiraju, “Web Services” Springer International Edition, First Edition, 2009.
4. Paul J.Deitel and Harvey M.Deitel, “AJAX, Rich Internet Applications, and Web Development for Programmers”, Pearson Education, First Edition, 2009.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**Web Essentials**	
1.1.	web browser architecture	1
1.2.	web servers	1
1.3.	Application servers	1
1.4.	Types of web pages	
1.5.	Client/ server side technologies	1
1.6.	HTTP	1
1.7.	Remote Login	
2.	**HTML5**	
2.1.	Basics	2

2.2.	XHTML Syntax and semantics	
2.3.	Basic HTML Tags	
2.4.	Headers, Linking	1
2.5.	Images, Image map	
2.6.	Tables, Meta elements	1
2.7.	Frameset, Forms	1
2.8.	Form elements	1
2.9.	CSS	1
3.	**Client / Server side technologies**	
	Client Side Technologies	
3.1	JavaScript	1
3.2	Form Processing, DHTML	1
	Server Side Technologies	
3.3	PHP- Basics	1
3.4	String processing and regular expressions	1
3.5	Form processing	1
3.6	Database connectivity	1
3.7	Vulnerabilities, Client Security ,Cookies, Transaction security ,Server security	2
3.8	**Case Study**on AJAX & Flex chart	2
4.	**XML**	
1.	XML Structure, Elements and attributes	1
2.	Namespaces	
3.	Working with DTD and Schema	1
4.	Grouping elements	
5.	writing and Parsing XML Document using DOM	1
6.	XML Formatters	1
7.	CSS, XSLT, Xpath	1
8.	Displaying XML Documents in Browsers	1
9.	XML5	1
5.	**Web Services**	
5.1	Need of WS, WS Standards	
5.2	Multi tier architecture, Application framework for Enterprise	1
5.3	SOAP Structure and contents of SOAP Message	1
5.4	Soap Binding	
5.5	Java Support for SOAP, Databases and Java Servlets	1
5.6	WSDL Structure	1
5.7	UDDI Registry	
5.8	Service Oriented Architecture	1
5.9	Characteristics of SOA	
5.10	Comparing SOA to client-server and distributed internet architectures	
5.11	Web Services Interoperability Technologies(WSIT)	1
5.12	**Case study** on REST	1
	Total Lectures	**36**

Course Designers:

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14IT530 **NETWORK SECURITY**

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

Information Security is the discipline which studies the theoretical, practical and managerial aspects of securing Information against threats. It utilises techniques from discrete applied mathematics, including algebra, number theory and probability, as well as from computer science, communications engineering and business. 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.

Prerequisite

14IT430 - Computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Explain the information security terminologies like confidentiality, integrity, authentication and access control.	Understand
CO2:	Perform Encryption/ Decryption of text using symmetric and asymmetric crypto algorithms to provide confidentiality.	Apply
CO3:	Compute hash and digital signature for the given message to provide integrity and non repudiation.	Apply
CO4:	Examine the strength of any cryptographic algorithm by crypt analysis using Open SSL.	Analyze
CO5:	Explain the working principle of security protocols like Secure Socket layer, Secure Electronic Transaction, Kerberos, Email Security etc.	Understand
CO6:	Analyze threats and vulnerabilities of information systems with tools like DVWA, Pflogsum, NMAP etc	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											
CO2.	S	M	L									
CO3.	S	M	L									
CO4.	S	M	L		L							
CO5.	M											
CO6.	S	M	L	L	M	M	L	M	M	M		M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	10
Understand	20	20	30	20
Apply	40	40	40	50
Analyze	20	20	10	20
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of CO4 and Co6 is evaluated partially through practical assignments.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate attacks, services and mechanisms.
2. Define confidentiality, integrity and non repudiation.
3. Develop the model for network security.
4. Explain Brute force attack and frequency analysis attack with reference to Caesar cipher.

Course Outcome 2 (CO2):

1. Encrypt the message "SEPTEMBER" using Hill Cipher with the key {12, 3 5; 7,4,3; 1,2,6}. Calculate the deciphering key and establish $k.k^{-1} \bmod 26 = I$.
2. Given that the round key for the 4th round is 0xE2F467893153F560292F8D7FEC2D3712, determine the key for round 5 in Advanced Encryption Standard.
3. Alice Wishes to send the message (24, 26) to Bob using Elliptic curve encryption. If the Cryptosystem parameters are E67(2,3), G=(2,22) and the private key of Alice is 4 ,find the public key of Alice and the encrypted message if the random value is r=2. Show the steps by which Bob recovers the plaintext from the cipher text.
4. Encrypt the message "CS" using RSA algorithm with n= 18923 and e=79. Break the code by factorizing n and compute the deciphering key.
5. Consider a Diffie Hellman scheme with a common prime q=19 and a primitive root 13. (i) If User A has a public key 10, what is his private key? (ii) If User B has a private key 6, what is his public key? (iii) What is the shared secret key?

Course Outcome 3 (CO3):

1. Apply SHA-1 message digest to message M=THIAGARAJARCOLLEGE…. for one step. Make assumptions of initial buffer values in big endian form. F(t,b,c,d)=bc+b'd. Draw the flow diagram for the scheme and then compute all other relevant parameters required for the calculation.
2. Generate the digital signature for a message with hash value h(m) =25 using Digital Signature Standard Scheme if p=709,q=59,d=14,r=4,e_0=3. Verify the signature at the receiving end.
3. Differentiate strong and weak collision resistance with reference to hash functions.

Course Outcome 4 (CO4):

1. 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.
2. Can the following matrix be used as key in Hill cipher? Justify your answer.

{1,2,3; 4,5,6; 7,8,9}

3. John is reading a mystery book involving cryptography. In one part of the book, the author gives a cipher text “CIW” and two paragraphs later the author tells the reader that this is a Caesar cipher and the plain test is “yes”, In the next chapter the hero found a tablet in a cave with “XVIEWYWI” engraved on it. John immediately found the actual meaning f he cipher text, what type of attack did John launch here? What is the plain text?

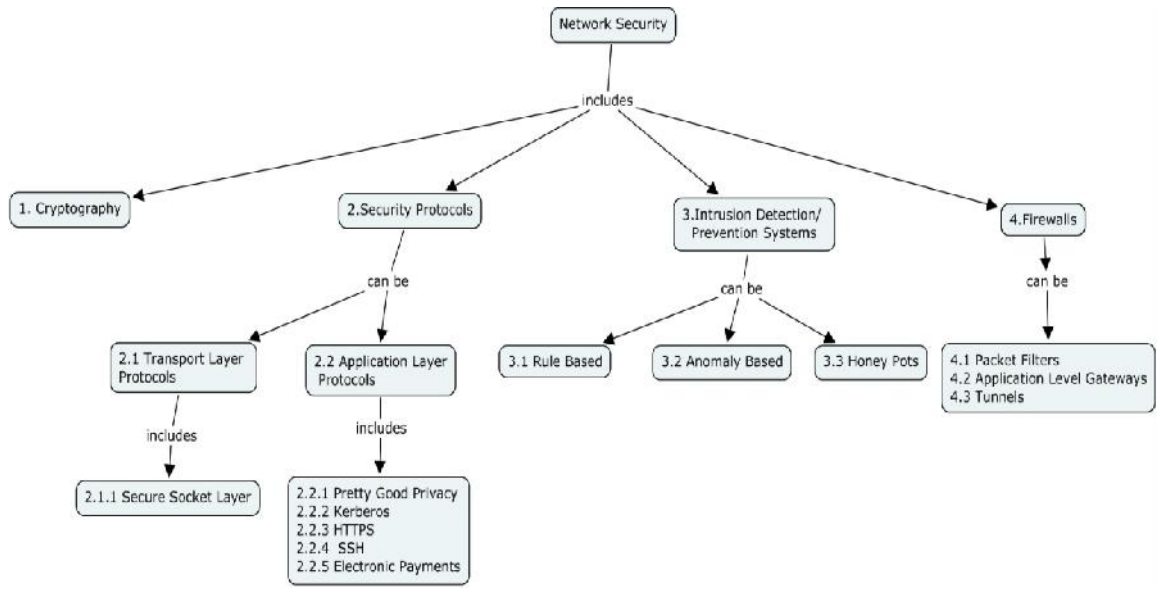
Course Outcome 5 (CO5):

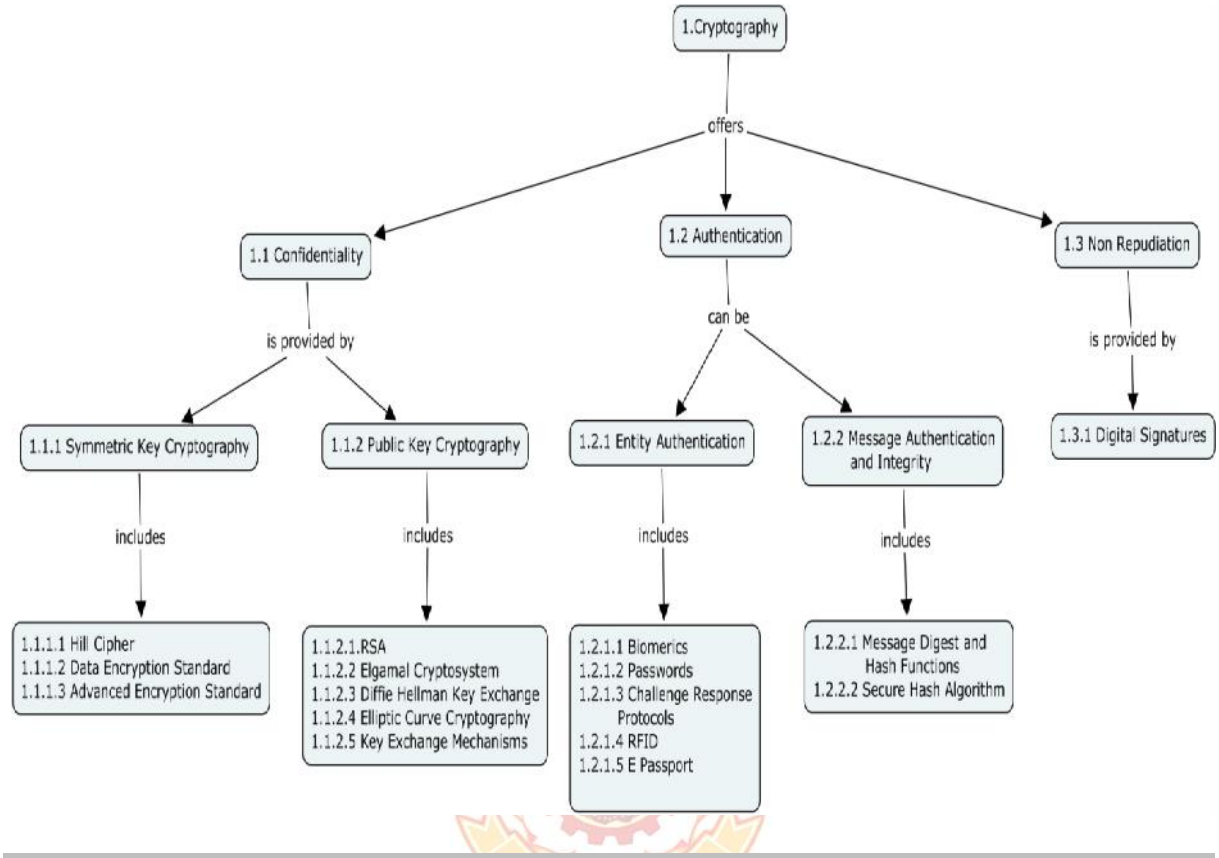
1. An organization allows its employees a remote login facility through an IPsec based VPN. With the help of neat sketches, show different possible placements of VPN terminator with respect to organization firewalls. Discuss the pros and cons of ech placement.
2. Compare the packet marking versus packet logging schemes for IP trace back in respect to the probability of success, cost, ease of deployment and performance overheads.
3. How are the following supported in electronic passport? (i)Detection of fake passports, (ii) Detection of stolen passports, (iii) Prevention of passport skimming attacks, (iv) Prevention of eaves dropping on passport to reader communications.

Course Outcome 6 (CO6):

1. Prepare a security analysis report on the threats and vulnerabilities involved in an online examination system.
2. Examine the feasibility of launching an offline dictionary attack on the electronic passport with the goal of obtaining certain fields in it such as the Date of Birth. Let S represent the concatenation of three fields –DOB, expiry date and passport number.
    - Assuming each character is possible and equally likely, calculate the total number of possible values of S.
    - Recalculate the total number of possible values of S under the following assumptions: (i) The holder of the passport being targeted is less than 80 years old. (ii) The passport validity period is 5 years. (iii) The passport number uses numeric characters only. (iv) About 1million passports have been issued in India and the passport numbers are aligned in sequence.

Concept Map





Syllabus

Introduction: Active and Passive Attacks, Threats and Vulnerabilities, Services and Mechanisms, Legal, Ethical and Professional Aspects of Security, Security Models, Need for Security at Multiple levels, Security Policies.

Symmetric key Cryptography: Modular Arithmetic, Greatest Common Divisor, Multiplicative inverse, Hill Cipher, Data Encryption Standard, Linear and Differential Cryptanalysis, Groups, Rings, Fields, Finite Fields of the form GF(p), Finite fields of the form GF(2^n), Advanced Encryption Standard, Block Cipher Modes of Operation.

Public Key Cryptography: Primes, Cardinality of Primes, Euler's totient function, Fermat's and Euler's Theorem, Primality Testing and Factorization, RSA, Security of RSA, Diffie Hellman Key Exchange, ElGamal Cryptosystem, Elliptic curve cryptography.

Key Exchange: Public Key infrastructures, Certification authorities and key distribution centers.

Authentication: Entity Authentication*:* Biometrics, Passwords, Challenge Response protocols, RFID, E passport. **Message Authentication and Integrity:** Hash Functions and Secure Hash Algorithm. **Non Repudiation:** Digital Signatures Standard

Security Protocols: Transport Layer Protocols: Secure Socket Layer and Transport Layer Security, Application Layer Protocols: Email Security –Pretty Good Privacy, MIME, HTTPS, SSH, Kerberos, Electronic Payments – Secure Electronic Transaction, Electronic Cash.

Intrusion Detection and Prevention: Rule Based and Anomaly Based systems, Honeypots.

Firewalls : Packet filters, Application level gateways, Encrypted tunnels.

Text Book

1. BehrouzA.Foruzan,DebdeepMukhopadhyay“Cryptography and Network Security”, Tata McGraw Hill , Second Edition, 2011.
2. William Stallings, “Cryptography and Network Security: Principles and Practice”, Prentice Hall, Fifth Edition, 2013.
3. Bernard Menezez, “ Network Security and Cryptography”, Cengage Learning India Pvt Limited, 2013.

Reference Books

1. Charlie Kaufman and Radia Perlman, Mike Speciner, “Network Security, Second Editon, Private Communication in Public World”, Prentice Hall India 2002.
2. Bruce Schneier and Neils Ferguson, “Practical Cryptography”, First Editon, Wiley Dreamtech India Pvt Ltd, 2003.
3. Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2006.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
0	**Introduction**	
0.1	Active and Passive Attacks, Threats and Vulnerabilities, Services and Mechanisms	1
0.2	Legal, Ethical and Professional Aspects of Security, Security Models, Need for Security at Multiple levels, Security Policies	1
1 1.1	**Cryptography** **Confidentiality**	1
1.1 1 1.1.1.1	Symmetric Key Cryptography Modular Arithmetic, Greatest Common Divisor, Multiplicative inverse	
1.1.1.1	Hill Cipher	1
1.1.1.2	Data Encryption Standard	2
1.1.1.2	Linear and Differential Cryptanalysis	1
1.1.1.3	Groups, Rings, Fields	1
1.1.1.3	Finite Fields of the form GF(p), Finite fields of the form GF(2^n)	1
1.1.1.3	Advanced Encryption Standard	1
1.1.1.4	Block Cipher Modes of Operation	1
1.1.2	**Public Key Cryptography**	
1.1.2.1	Primes, Cardinality of Primes	1
1.1.2.1	Euler’s totient function, Fermat’s and Euler’s Theorem	
1.1.2.1	Primality Testing and Factorization	1
1.1.2.1	RSA, Security of RSA	1
1.1.2.2	Diffie Hellman Key Exchange	1
1.1.2.3	ElGamal Cryptosystem	1
1.1.2.4	Elliptic curve Arithmetic and Elliptic curve Cryptography	2
1.1.2.5	**Key Exchange**	
1.1.2.5 1.1.2.5	Public Key infrastructures Certification authorities and key distribution centres	1
1.2 1.2.1	**Authentication** Entity Authentication	1
1.2.1.1 1.2.1.2 1.2.1.3	Biometrics Passwords Challenge Response protocols	
1.2.1.4	RFID	1

Module No.	Topic	No. of Lectures
1.2.1.5	E passport.	
1.2.2	Message Authentication and Integrity	1
1.2.2.1	Message Digest and Hash Functions	
1.2.2.2	Secure Hash Algorithm	1
1.3	Non Repudiation	1
1.3.1	Digital Signatures Standard	
2	Security Protocols	
2.1	Transport Layer Protocols: Secure Socket Layer and Transport Layer Security	2
2.2	Application Layer Protocols	
2.2.1	Email Security –Pretty Good Privacy	1
2.2.2	Kerberos	1
2.2.3 2.2.4	HTTPS SSH	1
2.2.5	Electronic Payments – Secure Electronic Transaction, Electronic Cash	1
3	Intrusion Detection and Prevention	
3.1 3.2	Rule Based Systems Statistical Anomaly Based Systems	2
3.3	Honeypots	1
4	Firewalls	
4.1 4.2	Packet filters Application level gateways	1
4.3	Encrypted tunnels	1
	Total Lecture Hours	36

Course Designers:

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		Category	L	T	P	Credit
14IT540	**DATA MINING**	PC	2	1	0	3

Preamble

This course provides a basic understanding of how to plan, evaluate and successfully refine a data mining solution, particularly in terms of model building and model evaluation. It describes the process of data mining and its importance in various fields and it also describes the underlying machine learning and statistical techniques involved.

Prerequisite

- 14IT440: Data Base Management System

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcome	**Bloom's Level**
CO1:	Explain the architecture of data warehousing and data mining process.	Understand
CO2:	Apply suitable Data pre-processing methods for the given dataset.	Apply
CO3:	Generate Association rules using algorithms like Apriori, Frequent Pattern tree for the given problem.	Apply
CO4:	Analyze the performance of different Classification algorithms like decision tree, naïve bayes, neural network etc.	Analyze
CO5:	Use clustering techniques such as partitioning, hierarchical, density based etc for grouping data.	Apply
CO6:	Experiment data mining techniques using R tool, Rapid Miner etc.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M				L							
CO3	M				L							
CO4	M	L			L							
CO5	M				L							
CO6	S	M	L		S	S		S	S	S	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	20	20
Understand	30	30	20	20
Apply	40	40	40	40
Analyse	0	10	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

CO6 will be evaluated by Mini project.

Guidelines for the Mini-project:

Group formation: Students are split into project groups with around 3 members in each group. A team can execute the project using unique data mining algorithms and improve the efficiency of the algorithm by pre-processing methods using any of the data mining software like R tool, Rapid Miner etc.

At the end of the semester, the team has to present their project, submit their report and share their lessons learnt/best practices with other teams.

- ✓ Some of the activities may include: (but not limited to)
- ✓ Application identification and data set collection
- ✓ Project planning
- ✓ Modules Identified.
- ✓ Simulation and performance analysis.
- ✓ Documentation

Some of the Mini-project titles may include: (but not limited to)

- ✓ e-governance
- ✓ Health care
- ✓ Tele shopping
- ✓ Banking

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define knowledge dredging.
2. Data mining as a step in the process of knowledge discovery .Discuss
3. List and describe the five primitives for specifying a data mining task.

Course Outcome 2 (CO2):

1. Suppose that the values for a given set of data are grouped into intervals. The intervals and corresponding frequencies are as follows.

Age	frequency	Age	frequency
1-5	200	20-50	1500
5-15	450	50-80	700
15-20	300	80-110	44

(a) Compute an approximate median value for the data.

(b) In many applications, new data sets are incrementally added to the existing large data sets. Thus an important consideration for computing descriptive data summary is whether a measure can be compute efficiently in incremental manner. Use count, standard deviation, and median to show that a distributive or algebraic measure facilitates efficient incremental computation, whereas a holistic measure does not.

2. Suppose that the data for analysis includes the attribute students_count. The students_count values or the data tuples are (in increasing order) 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45,46, 52, 70. Using the data for students_count given in Question answer the following:
   - **i.** To transform the value 35 for students_count onto the range [0:0; 1:0] by Using min-max normalization and z-score normalization, where the standard deviation of students_count is 12.94. Apply normalization by decimal scaling to transform the value 35 for students_count.
   - **ii.** Examine which method you would prefer to use for the data given in part (a). Justify.
3. Given the following measurements for the variable *age* 18; 22; 25; 42; 28; 43; 33; 35; 56; 28; standardize the variable by the following:
   a. Compute the mean absolute deviation of *age*.
   b. Compute the z-score for the first four measurements.

Course Outcome 3 (CO3):

1. A data base has 5 transactions Let min_sup=60% and min_conf=80%.

Transaction ID	Items purchased
T1	{T,A,K,E}
T2	{M,A,K,E}
T3	{J,A,C,K}
T4	{M,I,C,K,Y}
T5	{C,O,C,K}

   - **a)** Find all the frequent item sets using priori and FP-Growth, respectively. How can we improve the efficiency of Apriori -based mining?
   - **b)** Compare the efficiency of the two mining process.
2. Apply frequent item set mining with and without candidate generation for the following database. Let min_sup=60% and min_conf=80%

TID	Items
100	{m,o,n,k,e,y}
200	{d,o,n,k,e,y}
300	{m,a,k,e}
400	{m,u,c,y}
500	{c,o,o,k,i,e}

3. Prove that association classification is able to achieve higher classification accuracy than classical decision tree method.
4. Let min_sup=2. Interpret SPADE and GSP for the following sequential database. Analyze the performance of SPADE with GSP.

Sequence_ID	***Sequence***
1	<a(abc)(ac)d(cf)>
2	<(ad)c(bc)(ae)>
3	<(ef)(ab)(df)cb>
4	<eg(af)cbc>

Course Outcome 4 (CO4):

1. The following table consists of training data from an Employee database. The data have been generalized .For a given row entry, count represents the number of data tuples having the values for department, status, age, and salary in that row. Let status be the class label attribute.

Department	Status	Age	Salary	Count
Sales	Senior	31-35	45,000-50,000	30
Sales	Junior	26-31	25,000-30,000	20
Sales	Junior	31-35	30,000-35,000	25
Marketing	Senior	31-35	45,000-50,000	30
Marketing	Junior	26-31	25,000-30,000	20
Marketing	Junior	31-35	30,000-35,000	25
Manufacturing	Senior	31-35	55,000-60,000	8
Manufacturing	Junior	26-31	45,000-50,000	2
Manufacturing	Junior	31-35	45,000-50,000	5
Manufacturing	Senior	35-40	60,000-65,000	3

   a. How would you modify the basic decision tree algorithm to take into the consideration the count of each generalized tuple (i.e., for each row entry)?
   b. Given a data tuple having the values “Marketing”,” 26-31” and “25,000-30,000” for the attributes department ,age and salary respectively ,what would be the naïve Bayesian classification of the status for the tuple be?
2. Consider the following example. Apply DT and NB classification algorithms and report the performance of each algorithm.

MOTOR	WHEELS	DOORS	SIZE	TYPE	CLASS
NO	2	0	Small	Cycle	Bicycle
NO	3	0	Small	Cycle	Tricycle
YES	2	0	Small	Cycle	motorcycle
YES	4	2	Small	automobile	Sports car
YES	4	3	Medium	automobile	Mini van
YES	4	4	Medium	automobile	Sedan
YES	4	4	Large	automobile	Sumo

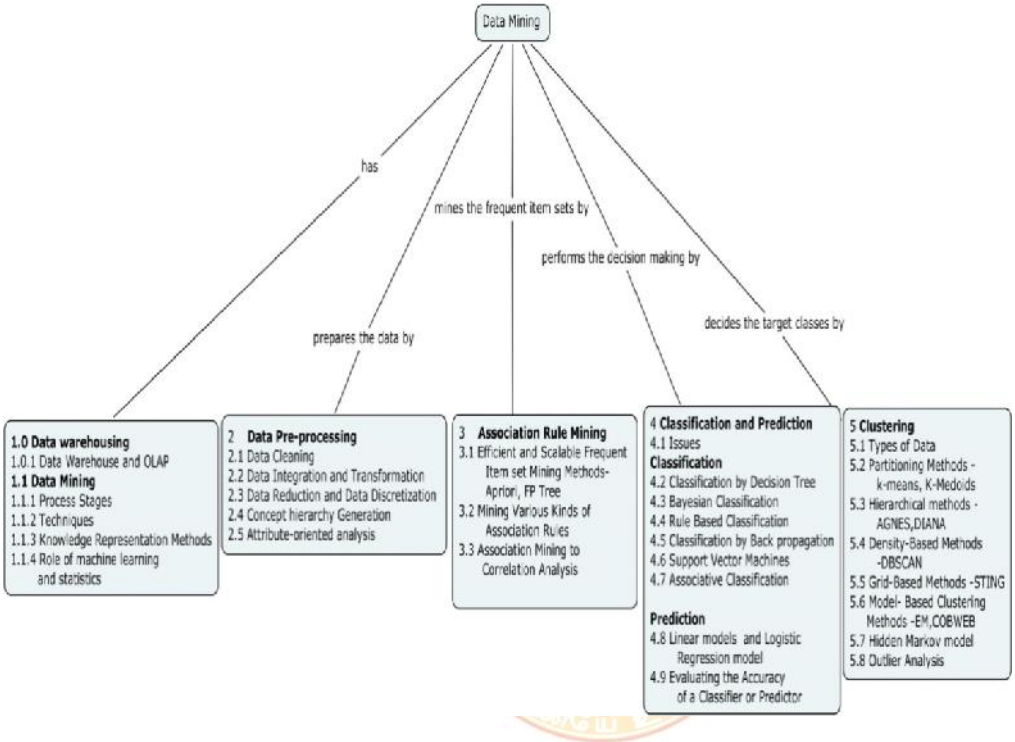
3. Given two objects represented by the tuples (22, 1, 42, 10) and (20, 0, 36, 8)
   a. Compute the Euclidean distance between the two objects.
   b. Compute the Manhattan distance between the two objects.
   c. Compute the Minkowski distance between the two objects, using p = 3.
4. Suppose that the data mining task is to cluster the following eight points (with (x; y) representing location) into three clusters. A1(2; 10);A2(2; 5);A3(8; 4);B1(5; 8);B2(7; 5);B3(6; 4);C1(1; 2);C2(4; 9): The distance function is Euclidean distance. Suppose initially we assign A1, B1, and C1 as the center of each cluster, respectively. Use the k-means algorithm to show only
   a. The three cluster centers after the first round of execution and
   b. The final three clusters

Course Outcome 5 (CO5):

1. Suppose that the data mining task is to cluster the following eight points (with (x; y) representing location) into three clusters. A1(2; 10);A2(2; 5);A3(8; 4);B1(5; 8);B2(7; 5);B3(6; 4);C1(1; 2);C2(4; 9): The distance function is Euclidean distance. Suppose initially we assign A1, B1, and C1 as the center of each cluster, respectively. Investigate the results by using the k-means algorithm and K-Medoids algorithm to show only
   (i)The three cluster centers after the first round of execution, (ii)The final three clusters

2. Characterize the hierarchical clustering algorithms with an example. Also discuss the various distance measures can be used in that algorithms.
3. Differentiate EM, COBWEB and DBSCAN.

Concept Map



Syllabus

Data Warehousing: Data Warehouse and OLAP – **Data Mining-** Process Stages - Techniques-Knowledge Representation Methods- Role of machine learning and statistics

Data Pre-processing: Data Cleaning-Data Integration and Transformation-Data Reduction and Data Discretization -Attribute-oriented analysis

Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods - Apriori, FP Tree – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis –**Case Study** on Constraint-Based Association Mining

Classification and Prediction: Issues- **Classification** – Classification by Decision Tree – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – **Case Study** on Lazylearners and other Classification Methods – **Prediction** -Linear models –Logistic Regression model-Evaluating the Accuracy of a Classifier or Predictor

Clustering: Types of Data – Partitioning Methods- k-means, k-Medoids - Hierarchical Method- AGNES, DIANA – Density Based Method DBSCAN-Grid Based Methods STING – Model- Based Clustering Methods EM, COBWEB – Hidden Markov model –Outlier Analysis-Introduction to Big-data - **Case Study** on Clustering High-Dimensional Data – Constraint-Based Cluster Analysis- **Mini Project on Advanced mining techniques and applications**

Text Books

1. Jiawei Han, MichelineKamber and Jian Pei, “Data Mining Concepts and Techniques”, Elsevier, Third Edition 2012.
2. Ian H.Witten, Eibe Frank, Mark.A. Hall, “Data Mining Practical Machine Learning Tools and Techniques”, Elsevier 3rd Edition, 2011.

Reference Books

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “ Introduction To Data Mining”, Person Education, 2007.
2. K.P. Soman, ShyamDiwakar and V. Ajay “, Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “ Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, “Data Mining Methods and Models”, Wile-Interscience, 2006

Course Contents and Lecture Schedule

Module	Topic	No. of Lectures
1	**Data warehousing**	
1.0.1	Data Warehouse and OLAP	2
1.1	**Data Mining**	
1.1.1	Process Stages	1
1.1.2	Techniques	
1.1.3	Knowledge Representation Methods	1
1.1.4	Role of machine learning and statistics	
2	**Data Pre-processing**	
2.1	Data Cleaning	1
2.2	Data Integration and Transformation	1
2.3	Data Reduction and Data Discretization	1
2.4	Concept hierarchy Generation	1
2.5	Attribute-oriented analysis	2
3	**Association Rule Mining**	
3.1	Efficient and Scalable Frequent Item set Mining Methods- Apriori, FP Tree	3
3.2	Mining Various Kinds of Association rules	1
3.3	Association Mining to Correlation Analysis	1
3.4	**Case Study** onConstraint-Based Association Mining	1
4	**Classification and Prediction**	
	Classification	
4.1	Issues	2
4.2	Classification by Decision Tree	
4.3	Bayesian Classification	1
4.4	Rule Based Classification	1
4.5	Classification by Back propagation	1
4.6	Support Vector Machines	1
4.7	Associative Classification	1
4.8	**Case Study** on Lazy learners and other Classification Methods	1
	Prediction	

4.8	Linear models and Logistic Regression model	2
4.9	Evaluating the Accuracy of a Classifier or Predictor	
5	**Clustering**	
5.1	Types of Data	1
5.2	Partitioning Method –k-Means, k-Medoids	1
5.3	Hierarchical Method- AGNES,DIANA	1
5.4	Density Based Method- DBSCAN	1
5.5	Grid based-STING	1
5.6	Model based-EM,COBWEB	
5.7	Hidden Markov model	1
5.8	Outlier Analysis	
5.9	Introduction to Big-data	1
5.10	**Case Study** on Clustering High-Dimensional Data	1
5.11	**Mini Project on Advanced mining techniques**	2
Total Lectures		**36**

Course Designers:

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14IT570	SYSTEM ADMINISTRATION	Category	L	T	P	Credit
		PC	2	0	1	3

Preamble

System administration involves managing allocation of user names and passwords, monitoring disk space and other resource use, performing backups, monitoring security configuration, and setting up new hardware and software. This course is intended for beginning Unix/Linux and Windows administrators who want to acquire the basic skills and knowledge needed to administer Unix/Linux and Windows machines as standalone workstations or in a network environment.

Prerequisite

14IT270 – Free and Open Source Software

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
Theory		
CO1:	Explain the linux commands with appropriate options for the given scenario.	Understand
CO2:	Describe the administration concepts for managing, debugging and securing the networks.	Understand
CO3:	Outline the various administrative features for Windows.	Understand
Practical		
CO4:	Demonstrate the linux commands with appropriate options for various networking and administration scenarios.	Apply
CO5:	Use the essential Windows administration concepts for given problem.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	L	L										L
CO2.	L	L										L
CO3.	L	L										L
CO4.	S	M		L	L				L			M
CO5.	S	M		L	L				L			M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	Test 1	Test 2	Test 3 (Practical)	
Remember	20	20	0	20
Understand	50	30	20	40
Apply	30	50	80	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define the role of Account provisioning
2. Discuss the administrative monitoring the system
3. Identify which tupe of Linux distribution is suitable for the system
4. Explain notation and typographical conventions.
5. Illustrate the command to read about the terminal driver, tty (*not* the tty command)?

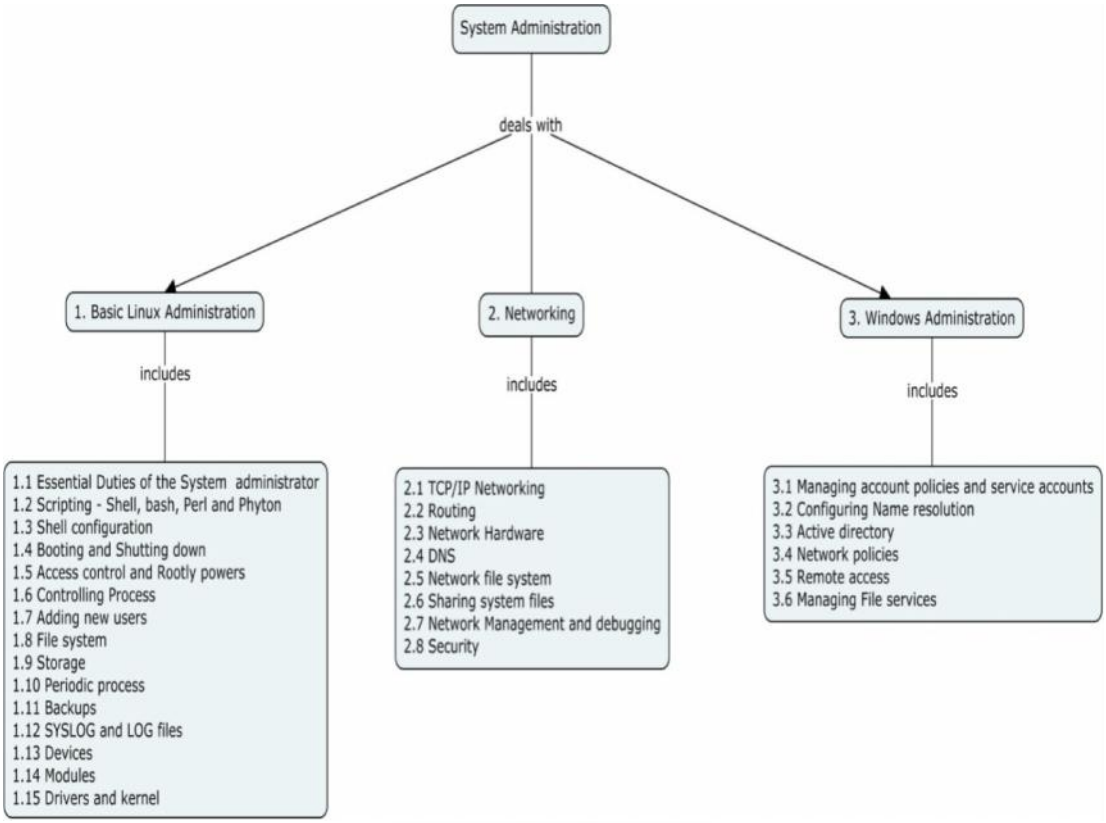
Course Outcome 2 (CO2):

1. Identify the script that enumerates the system's users and groups from /etc/passwd and /etc/group (or their network database equivalents). For each user, print the user's UID and the groups of which the user is a member.
2. Outline the GRUB command line to boot a kernel that isn't in grub.conf.
3. Define the find command with the -perm option to locate five setuid files on your system. For each file, explain why the setuid mechanism is necessary for the command to function properly.
4. List the general-purpose utilities available in Linux and explain any three of them.
5. Describe the tasks of a system administrator? How will you set permissions for Owner, Group and Public?

Course Outcome 3 (CO3):

1. Conclude the effect of the "cd" command executed without any argument?
2. Define the output of "netstat -ta" command?
3. List the important Linux directories and briefly describe them.
4. List any five TCP/IP-related protocols and describe them in brief.
5. Outline the general methods of implementing network security by firewalls?

Concept Map



Syllabus

Basic Linux Administration: Essential Duties of the System administrator, Scripting - Shell, bash, Perl and Phyton, Shell configuration, Booting and Shutting down, Access control and Rootly powers, Controlling Process, Adding new users, File system, Storage, Periodic process, Backups, SYSLOG and LOG files, Devices, Modules, Drivers and kernel.

Networking: TCP/IP Networking, Routing, Network Hardware, DNS, Network file system, sharing system files, Network Management and debugging, Security.

Windows Administration: Managing account policies and service accounts, Configuring Name resolution, Active directory, Network policies, Remote access, and Managing File services.

Text Book

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, “UNIX and Linux System Administration Handbook”, 4th edition, Prentice Hall; 2010.
2. Richard Petersen, ‘The Complete Reference Linux 6th Edition”, Tata Mcgraw Hill, 2008.
3. Orin Thomas, “Administering Windows Server 2012 – Training guide”, O’Reilly Media, 2013.

References

1. Nicholas Wells, “Guide to Linux Installation and Administration”, Vikas Publishing House, 2000
2. Matt Welsh, Matthias KalleDalheimer, Terry Dawson, Lar Kaufman ”Running Linux”, Fourth Edition, December 2002.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecture Hours
1	**Basic Linux Administration**	
1.1	Essential Duties of the System administrator	3
1.2	Scripting - Shell, bash, Perl and Phyton	
1.3	Shell configuration	
1.4	Booting and Shutting down	2
1.5	Access control and Rootly powers	
1.6	Controlling Process	
1.7	Adding new users	
1.8	File system	2
1.9	Storage	
1.10	Periodic process	
1.11	Backups	
1.12	SYSLOG and LOG files	2
1.13	Devices	
1.14	Modules	
1.15	Drivers and kernel	
2	**Networking**	
2.1	TCP/IP Networking	2
2.2	Routing	1
2.3	Network Hardware	1
2.4	DNS	1
2.5	Network file system	1
2.6	Sharing system files	1
2.7	Network Management and debugging	1
2.8	Security	1
3	**Windows Administration**	
3.1	Managing account policies and service accounts	1
3.2	Configuring Name resolution	1
3.3	Active directory	1
3.4	Network policies	1
3.5	Remote access	1
3.6	Managing File services	1
	Total Lectures	24

List of Experiments:

Exp No.	Topic	No. of Lab Hours
	Linux Administration	
1	Server installation and configuration	1
2	Client installation and configuration	1
3	User management	2
4	File system management	2
5	Web server management	2
6	Mail server management	2
7	Backup Management	2
8	Network file system	1
9	Sharing system files	1
10	Network Management and debugging	2
11	Security	1
	Windows Administration	
12	Managing account policies and service accounts	1

13	Configuring Name resolution	1
14	Active directory	2
16	Remote access	1
17	Managing File services	2
	Total Lab Hours	**24**

Course Designers:

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3. Mr.M.Thangavel mtit@tce.edu

		Category	L	T	P	Credit
14IT580	**WEB PROGRAMMING LAB**	PC	0	0	2	1

Preamble

The objective of this laboratory is to motivate the students to learn how to choose their communication approach by considering platform, dynamically updating the web contents based on the client requirements. They will also learn how to transport data using XML, XML related technologies, protocols and how to communicate with databases. This course emphasizes the working principles of web services.

Prerequisite

- 14IT420: Java Programming

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Create web page design using HTML5	Apply
CO2:	Design XML document to update the web contents based on the client requirements.	Apply
CO3:	Implement Client side and Server side form validation	Apply
CO4:	Create the web services	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		L		M				L			L
CO2			L		M				L			L
CO3	M		L		M							L
CO4	M		L		M				L			L

S- Strong; M-Medium; L-Low

List of Experiments:

Exp No.	Topic	No. of Lab Hours
1	Create a home page for your project using HTTP and HTML5.	2
2	Create a web page to handle Events and Objects using Java Script.	2
3	Implement Client side and Server side form validation using Java Script.	2
4	Format and Display the XML file using Java Script.	2
5	Design an XML document to store information about a student in an engineering college affiliated to Anna University. The information must include Register number, Name, Name of the college, Branch, Year of joining and e-mail id. Make up sample data for 5 students. Create a CSS style sheet and use it to display the document.	2
6	Write a PHP program to store current date-time in a COOKIE and display the "Last visited on" date-time on the web page upon reopening of the same page.	2
7	Implement a program for DOM to process XML file.	2
8	Using PHP and MySQL, develop a program to accept book information	2

	viz. Accession number, title, authors. Edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.	
9	Implementation of XML-Schema, XSLT/XSL.	4
10	Implementation of web services and databases.	4
	Total Lab Hours	**24**

Course Designers:

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3.	Ms.S.Karthiga	skait@tce.edu

		Category	L	T	P	Credit
14IT590	**NETWORK MANAGEMENT AND SECURITY LAB**	PC	0	0	2	2

Preamble

The purpose of this course is to explain, configure, verify, and troubleshoot complex computer networks at an introductory level and also to present several hands-on exercises to help reinforce the student's knowledge and understanding of the various security aspects.

Prerequisite

- 14IT430 – Computer Networks
- 14IT530 – Network Security

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Demonstrate the various types of network configurations for the challenging needs of an organization.	Apply
CO2:	Use different crypto algorithms to provide security in design of applications.	Apply
CO3:	Examine the activities such as information gathering, live system detection, enumeration, automated attack and malware using penetration tools.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M		M			M			M		
CO2.	M	M	L	M	M		M		M	M		M
CO3.	S	M	M	M	M	M		M	M	M		M

S- Strong; M-Medium; L-Low

List of Experiments

Exp No.	Topic	No. of Lab Hours
1	Configuration of networking in Linux using ifconfig, route, bind, etc; Configuration of firewall and masquerading in Linux; Network trouble-shooting and performance monitoring using netstat, ping, tcpdump, etc	2
2	Configuration and performance measurement of commonly-used Linux servers such as E-Mail (sendmail, pop3/imap) and Web (Apache)	2
3	Socket programming - TCP and UDP, peer-to-peer applications; Reliable communications using unreliable datagram's; Client-server using RPC; Concurrent servers using threads or processes	2
4	Configuration of Network Topology using packet tracer software	2
5	Configure a Network using Distance vector routing protocol	2
6	Configure a Network using Link state routing protocol	2
7	Perform encryption, decryption and cryptanalysis using the following algorithms, (i) Ceaser cipher, (ii) Hill Cipher, (iii) DES for E-Learning, E-Ticket Reservation Systems.	2

8	Encrypt users passwords using AES algorithm logic before they are stored in a database table, and to retrieve them whenever they are to be brought back for verification.	2
9	Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.	1
10	Calculate the message digest of a text using the SHA-1 algorithm.	1
11	Passive Information Gathering a) IP Address and Domain Identification of log entries – DNS, RIR, etc tools b) Information Gathering of a web site: WHOIS, ARIN, etc tools c) Banner Grabbing: Netcat, etc tools	2
12	Detecting Live Systems a) Port Scanning : Nmap,SuperScan b) Passive Fingerprinting: Xprobe2 c) Active Fingerprinting: Xprobe2	1
13	Enumerating Systems a) SNMP Enumeration: SolarWinds IP Network Browser, b) Enumerating Routing Protocols: Cain & Abel tool	1
14	Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool	1
15	Defeating Malware a) Building Trojans, Rootkit Hunter b) Finding malware	1
	Total Lab Hours	**24**

Course Designers:

1. Ms.R. Parkavi parkaviravi@gmail.com
2. Ms.S. ThiruchadaiPandeeswari eshwarimsp@gmail.com
3. Mr.M.Thangavel mtit@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

SIXTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2014-15 onwards)

SIXTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
14IT610	Accounting and Finance	HSS	3	-	-	3
14IT620	Cloud Computing	PC	3	-	-	3
14IT630	Information Storage and Management	PC	3	-	-	3
14ITPX0	Programme Elective-2	PE	3	-	-	3
14ITGX0	General Elective -1	GE	3	-	-	3
THEORY CUM PRACTICAL						
14IT670	Mobile Application Development	PC	2	-	2	3
PRACTICAL						
14IT680	Multimedia Lab	PC	-	-	2	1
14IT690	Cloud Computing Lab	PC	-	-	2	1
		Total	**17**	**-**	**6**	**20**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B.E. / B.Tech.Information Technology Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2014-15onwards)

SIXTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	14IT610	Accounting and Finance	3	50	50	100	25	50
2	14IT620	Cloud Computing	3	50	50	100	25	50
3	14IT630	Information Storage and Management	3	50	50	100	25	50
4	14ITPX0	Programme Elective-2	3	50	50	100	25	50
5	14ITGX0	General Elective -1	3	50	50	100	25	50
THEORY CUM PRACTICAL								
7	14IT670	Mobile Application Development	3	50	50	100	25	50
PRACTICAL								
8	14IT680	Multimedia Lab	3	50	50	100	25	50
9	14IT690	Cloud Computing Lab	3	50	50	100	25	50

* CA evaluation pattern will differ from course to course 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 and subsequently be reduced to 50 marks for the award of terminal examination marks

		Category	L	T	P	Credit
14IT610	**ACCOUNTING AND FINANCE**	PC	3	0	0	3

Preamble

Engineering profession involves lots of decision making. The decisions may range from operation to non-operation. For taking decisions of these kinds, an engineer needs among other data about the organization routine operations and non-routine operations. Accounting is a science which provides all the data by recording, classifying, summarizing and interpreting the various transactions taking place in an organization and thereby helps an engineer in taking vital decisions in an effective manner. Finance is an allied but a separate field relying on accounting and enables engineers in taking useful financial and cost related decisions by providing well defined concepts, tools and techniques.

Prerequisite

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Explain the basic concepts and process of accounting and finance	Understand
CO2:	Develop trail balance and financial statements like Trading, Profit and Loss accounts, Balance sheet and Cost sheet	Apply
CO3:	Demonstrate the concepts and operations of budgetary control	Understand
CO4:	Apply techniques like breakeven analysis and budgeting for an organization.	Apply
CO5:	Select the right sources of finance and mobilize the right quantum of finance and make use of them in most profitable investment avenues.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											
CO2.	S	M	M		M	M		M			S	L
CO3.	M					M					M	
CO4.	S	M	M		S	M		M		L	S	L
CO5.	S	M	M			M					S	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe the term Accounting.
2. List the concepts of accounting.
3. Recall the methods of depreciation.
4. Name the factors causing depreciation.
5. Write the classification of cost.
6. Describe the term ' Breakeven analysis'
7. Define the term capital budgeting.

Course Outcome 2 (CO2):

1. Prepare trading account from the information given below and calculate the net profit. Gross profit.....Rs.10,000; Office and administrative expenses .....Rs.1000; selling and distribution expenses....Rs.500; Interest on investment received...Rs.500; commission received....Rs.200
2. Compare Trading and profit and loss account.
3. Compute depreciation for an asset worth Rs.10,000 and having a scrap value of Rs.2,000 and a life time of 4 years under straight line method.
4. Outline the cost classification based on the nature of cost.
5. Calculate the breakeven point and margin of safety from the following information .
6. Fixed cost ...Rs.10,000, sales in Rs.25,000,selling price per unit Rs.30; variable cost per unit Rs.10
7. Apply the net present value method of evaluating investment decision and say whether the following project could be selected for investment.

Year	Cash inflows in Rs.
0	10,000
1	3,000
2	4,000
3	4,000
4	2,000
5	2,000

Course Outcome 3

1. Construct journal entries for the following business transactions.
   a) X brings in cash Rs.10,000 as capital
   b) purchases land worth Rs.2000,
   c) He purchases goods worth Rs.5,000,
   d) He sells goods for Rs.10,000,
   e) He incurs travelling expenses of Rs.200.
2. Estimate Gross profit and Net profit and the financial position from the following trial balance extracted from the books of Mr.kumar as on 31.12.2010.

Debit Balances	Amount in Rs.	Credit Balances	Amount in RS.
Buildings	30,000	Capital	40,000
Machinery	31,400	Purchase returns	2,000
Furniture	2,000	Sales	2,80,000
Motor car	16,000	Sundry creditors	9,600
Purchases	1,88,000	Discounts received	1,000
Sales return	1,000	Provision for bad debts	6,00
Sundry debtors	30,000		
General expenses	1,6000		
Cash at bank	9,400		
Rates and taxes	1,200		
Bad debts	4,00		
Insurance premium	8,00		
Discount allowed	1,400		
Opening stock	20,000		
Total	**3,33,200**	**Total**	**3,33,200**

3. Calculate depreciation for a machinery purchased by senthil for Rs.4,00,000 on 1st April 2010.He also adds an additional machinery for Rs.40,000 on 1st April 2011.Depriciation is to be provided at 10% per annum using straight line method. The firm closes its books on 31st March every year.
4. A factory is currently working at 50% capacity and the product cost is Rs.180 per unit as below:

   Material .....Rs.100; Labour.....Rs.30

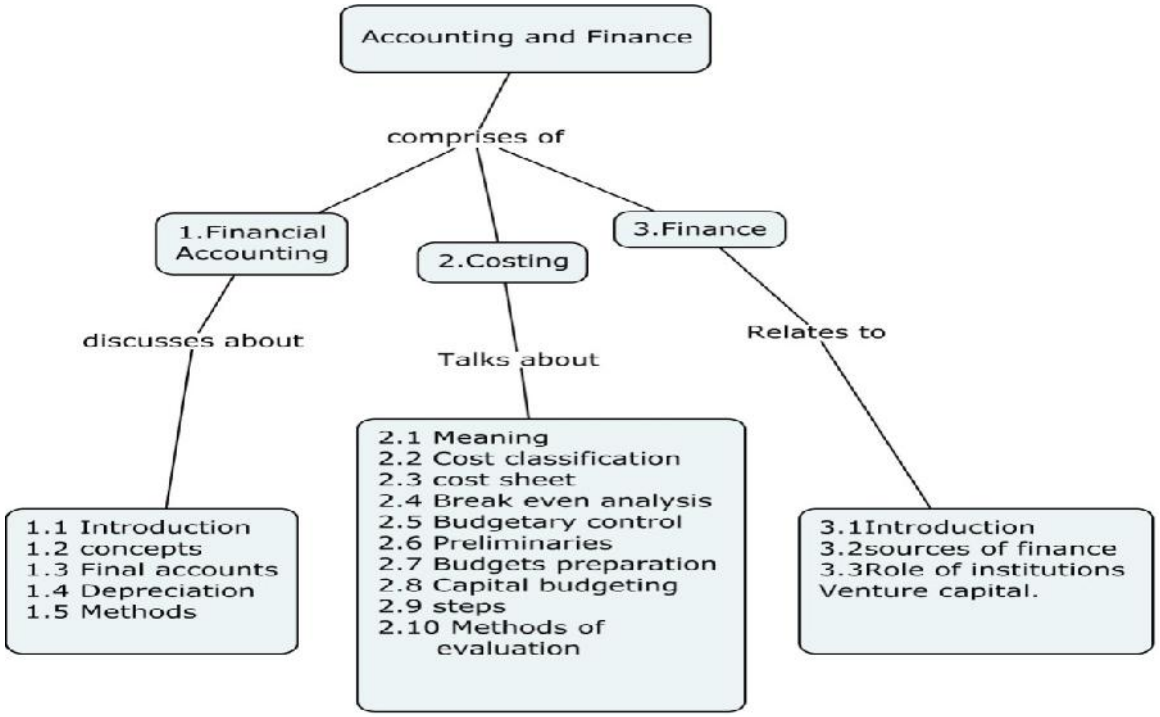
   Factory overheads....Rs.30 (40% fixed)

   Administration overhead ..Rs.20 (50% fixed)

   The product is sold at Rs.200 per unit and the factory produces 10,000 units at 50% capacity. Estimate profit if the factory works to 60% capacity. At 60% working raw material increases by 20% and selling price falls by 20%.

   From the following information calculate the Breakeven point in terms of units and breakeven point in terms of sales. Sales....Rs.10,000; Variable costs Rs.6,000,fixed costs Rs.2000:profit Rs.2,000;No. Of units produced 1,000 units.

Concept Map



Syllabus

Accounting: Introduction and Definition-Accounting concepts and conventions-Final Accounts-Preparation of Trading, Profit and Loss Account and Balance Sheet.Depriciation-Meaning-Need and objectives-Basic factors-Methods of providing depreciation.

Cost Accounting: Meaning and Importance-Cost-Elements of cost-Cost classification-Preparation of cost sheet. Break even analysis-Managerial applications. Budget and budgetary control. Meaning- Objectives of budgetary control-Preliminaries for operation of budgetary control-Budgets-Types of budgets and their preparation. Capital budgeting-Meaning-Importance-steps in capital budgeting-Information needed-Methods of evaluating capital budgeting decisions.

Finance: Introduction-Definition-objectives-functions of finance-sources of finance-Short-term, Medium term, and Long-term-Role of special financial institutions in financing-Venture capital.

Text Book

1. M.C.Shukla, T.S.Grewal,“AdvancedAccounts-Volume-I”, S. Chand & company Ltd.,2010 Reprint.
2. Prasanna Chandra, “Financial Management-Theory and practice”, seventh Reprint,Tata McGraw-Hill publishing company Limited, 2010.

Reference Books

1. A.RamachandraAryasri, V.V Ramana Murthy, “Engineering Economics and Financial Accounting, Tata McGraw hill, 2010.
2. Dr.V.R.Palanivelu,”Accounting for Management“, Third Edition, University science press New Delhi, 2013.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**Financial accounting**	
1.1	Introduction and Definition	1
1.2	Accounting concepts and conventions	2
1.3	Final accounts-Preparation of Trading profit and Loss account and Balance sheet.	4
1.4	Depreciation- Meaning, Need and Objectives	2
1.5	Basic factors-Methods of providing depreciation	3
2.	**Cost Accounting**	
2.1	Meaning and Importance	1
2.2	Cost-Elements of cost-Cost classification	2
2.3	Preparation of cost sheet	2
2.4	Break even analysis-Managerial applications	2
2.5	Budget and budgetary control. Meaning- Objectives of budgetary control	1
2.6	Preliminaries for operation of budgetary control	1
2.7	Types of budgets and their preparation	3
2.8	Capital budgeting-Meaning-Importance	1
2.9	Steps in capital budgeting-Information needed	1
2.10	Methods of evaluating capital budgeting decisions. Payback period-Rate of Return-Net present value-Internal Rate of return method	3
3	**Finance**	
3.1	Introduction-Definition-objectives-functions of finance	2
3.2	sources of finance-Short-term, Medium term, and Long-term	2
3.3	Role of special financial institutions in financing-Venture capital.	3
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14IT620	**CLOUD COMPUTING**	PC	3	0	0	3

Preamble

Cloud computing paradigm covers a range of distributed computing, hosting and access solutions, including service-based computing. The objective of the course is to provide comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations.

Prerequisite

14IT520 – Web Technologies
14IT570 - System Administration
14IT590 – Network Management and Security Lab

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Describe the key technologies, architecture, strengths, limitations and applications of cloud computing	Understand
CO2:	Explain the types and service models of cloud.	Understand
CO3:	Describe the core issues such as security, privacy, and interoperability in cloud platform.	Understand
CO4:	Implement suitable technologies, algorithms, and applications in the cloud computing driven systems	Apply
CO5:	Provide appropriate cloud computing solutions for the given scenario	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											M
CO2.	M				L							M
CO3.	M											M
CO4.	S	M	L		S		S	S	S	S		S
CO5.	S	S	M	L	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20

Understand	50	40	40	40
Apply	30	40	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define Cloud computing, Enlist and explian essential characteristics of cloud computing.
2. What is self service provisioning?
3. Explain in brief, how cloud helps reducing capital expenditure?
4. What is the difference between process virtual machines, host VMMs and native VMMs?
5. What is the fundamental differences between the virtual machine as perceived by a traditional operating system processes and a system VM?

Course Outcome 2 (CO2):

1. Explain the services provided by the Amazon infrastructure cloud from a user perspective.
2. What is cloud computing? Enlist and explain three service models, and four deployment models of cloud computing.
3. Explain a user view of Google App Engine with suitable block schematic.

Course Outcome 3 (CO3)

1. Examine some of the common pitfalls that come with virtualization.
2. Show the reasons of Cloud Computing brings new threats
3. Classify secure execution environment and communication in cloud?
4. Show risks from multi-tenancy, with respect to various cloud environments.
5. Illustrate trusted cloud computing?

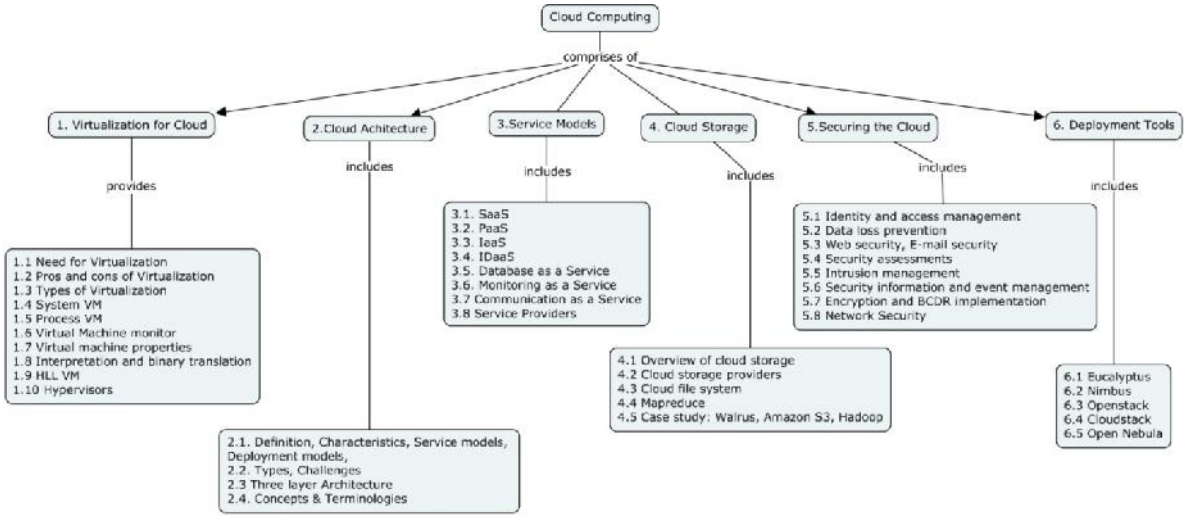
Course Outcome 4 (CO4)

1. Construct the SOAP and REST paradigms in the context of programmatic communication between applications deployed on different cloud providers, or between cloud applications and those deployed in -house.
2. Show conceptual representation of the Eucalyptus Cloud. Explain in brief the components within the Eucalyptus system.
3. Illustrate Nimbus? What is the main way to deploy Nimbus Infrastructure? What is the difference between cloudinit.d and the Context Broker?
4. Show Open Nebula Cloud? Explain main components of Open Nebula.
5. Show Xen Cloud Platform (XCP) with suitable block diagram.

Course Outcome 5 (CO5)

1. Construct the architecture of cloud file systems (GFS, HDFS).
2. Solve with suitable example, how a relational join could be executed in parallel using MapReduce.
3. Show how Big tables are stored on a distributed file system such as GFS or HDFS.
4. Construct MapReduce model with suitable example.

Concept Map



Syllabus

Virtualization for Cloud: Need for Virtualization, Pros and cons of Virtualization, Types of Virtualization, System VM, Process VM, Virtual Machine monitor, Virtual machine properties, Interpretation and binary translation, HLL VM, Hypervisors : Xen, KVM , VMWare, Virtual Box, Hyper-V.

Cloud Architecture: Definition, Characteristics, Service models, Deployment models, Types, Challenges, Three-layer architecture, Concepts & Terminologies - Virtualization, Load balancing, Scalability and elasticity, Deployment, Replication, Monitoring, Software defined networking, Network function virtualization, Service level agreement, Billing.

Service Models: SaaS – Multitenant, OpenSaaS, SOA. PaaS – IT Evolution, Benefits, Disadvantages. IaaS – Improving performance, System and storage redundancy, Cloud based NAS devices, Advantages, Server types. IDaaS – Single Sign-on, OpenID.Database as a Service, Monitoring as a Service, Communication as services.Service providers - Google, Amazon, Microsoft Azure, IBM, Sales force.

Cloud Storage: Overview of cloud storage, cloud storage providers, Cloud file system, Mapreduce. Case study: Walrus, Amazon S3, Hadoop.

Securing the Cloud: Identity and access management, Data loss prevention, Web security, E-mail security, Security assessments, Intrusion management, Security information and event management, Encryption and BCDR implementation, Network Security.

Deployment Tools: Eucalyptus, Nimbus, Openstack, Cloudstack, Open Nebula.

Text Book

1. James E Smith, Ravi Nair, “Virtual Machines”, Morgan Kaufmann Publishers, 2006.
2. John Rittinghouse& James Ransome, “Cloud Computing, Implementation, Management and Strategy”, CRC Press, 2010.
3. T. Velte, A. Velte, R. Elsenpeter, “Cloud Computing, A Practical Approach”, McGraw-Hill, 2009.
4. Cloud Security Alliance, “Providing greater clarity in Security as a Service”, 2013.

References

1. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, “Mastering cloud computing”, Morgan Kaufman, 2013.
2. Dr. Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More”, Jones and Bartlett learning, First edition, 2013.
3. ArshdeepBahga, Vijay Madisetti, “Cloud Computing: A Hands-On Approach”, CreateSpace Independent Publishing Platform, 1st edition, 2013.
4. Massimo Cafaro (Editor), Giovanni Aloisio (Editor), “Grids, Clouds and Virtualization” Springer; edition, 2011.
5. GautamShroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition, 2010.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Virtualization for Cloud**	
1.1	Need for Virtualization	1
1.2	Pros and cons of Virtualization	
1.3	Types of Virtualization	1
1.4	System VM	
1.5	Process VM	2
1.6	Virtual Machine monitor	
1.7	Virtual machine properties,	
1.8	Interpretation and binary translation	2
1.9	HLL VM	2
1.10	Hypervisors :Xen, KVM , VMWare, Virtual Box, Hyper-V.	1
2	**Cloud Architecture**	
2.1	Definition, Characteristics, Service models, Deployment models,	1
2.2	Types, Challenges	1
2.3	Three-layer architecture	
2.4	Concepts & Terminologies - Virtualization, Load balancing, Scalability and elasticity, Deployment, Replication, Monitoring, Software defined networking, Network function virtualization, Service level agreement, Billing.	2
3	**Service Models**	
3.1	SaaS – Multitenant, OpenSaaS, SOA.	1
3.2	PaaS – IT Evolution, Benefits, Disadvantages.	1
3.3	IaaS – Improving performance, System and storage redundancy, Cloud based NAS devices, Advantages, Server types.	2
3.4	IDaaS – Single Sign-on, OpenID.	1
3.5	Database as a Service	1
3.6	Monitoring as a Service	1
3.7	Communication as services	1
3.8	Service providers - Google, Amazon, Microsoft Azure, IBM, Sales force.	1
4	**Cloud Storage**	
4.1	Overview of cloud storage	1
4.2	Cloud storage providers	1
4.3	Cloud file system	1
4.4	Mapreduce.	1
4.5	Case study: Walrus, Amazon S3, Hadoop.	2
5	**Securing the Cloud**	
5.1	Identity and access management,	1
5.2	Data loss prevention,	

5.3	Web security, E-mail security,	1
5.4	Security assessments,	
5.5	Intrusion management,	1
5.6	Security information and event management,	
5.7	Encryption and BCDR implementation,	2
5.8	Network Security.	
6	**Deployment Tools**	
6.1	Eucalyptus	1
6.2	Nimbus	
6.3	Openstack	1
6.4	Cloudstack	
6.5	Open Nebula	1
Total Lectures		36

Course Designers:

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14IT630	INFORMATION STORAGE AND MANAGEMENT	Category	L	T	P	Credit
		PC	3	0	0	3

Preamble

This course on Information Storage and Management covers modern storage technologies and management which includes challenges and solutions for data storage and data management. It includes Direct Attached Storage (DAS), networked storage models and applications in business continuity, replication, disaster recovery, and exposure to real-world storage networking technologies.

Prerequisite

- 14IT350 Operating Systems
- 14IT440 Computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1 :	Identify the various components of a storage infrastructure	**Understand**
CO2:	Explain the information availability and various business continuity methods.	**Understand**
CO3:	Explain different storage virtualization technologies and their benefits	**Understand**
CO4:	Select an appropriate storage networking technologies solution such as FC-SAN, NAS for a given scenario	**Apply**
CO5:	Choose suitable parameters for managing and monitoring storage infrastructure for the classical or virtualized environments	**Apply**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M						S					
CO3.	M											
CO4.	S	M					S	L	M	M		M
CO5.	S	M					S	L	M	M		M

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	10	20
Understand	50	30	30	40

Apply	30	50	60	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO4, CO5 - is attained through Test and Assignment.

Course Level Assessment Questions

Course Outcome1 (CO1):

1. What are the different categories of data?
2. List the demerits of centralized data storage.
3. Describe the key requirements of storage systems with their functionalities.
4. What are the characteristics of Platter?
5. Consider a disk I/O system in which an I/O request arrives at the rate of 80 IOPS. The disk service time is 6ms.Compute the following
    i. Utilization of I/O controller
    ii. Total response time
    iii. Average queue size
    iv. Total time spent by a request in a queue

Course Outcome 2 (CO2):

1. What are the various business/technical considerations for implementing a backup solution and how do these considerations impact the backup solution implementation?
2. Explain how remote replication technology is helpful in disaster recovery.
3. What is the purpose of performing operation backup, disaster recovery and archiving?

Course Outcome 3 (CO3):

1. Describe the benefits of using "virtual tape library" over "physical tapes."
2. Explain the different forms of Virtualization
3. How can a block-level virtualization implementation be used as a data migration tool? Explain how data migration will be accomplished and discuss the advantages of using this method for storage. Compare this method to traditional migration methods

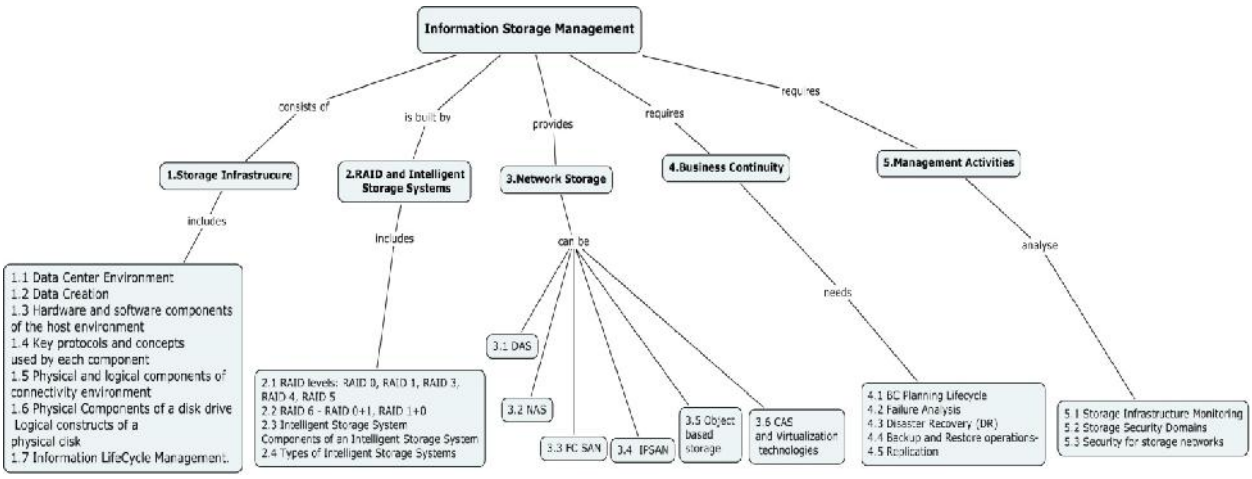
Course Outcome 4 (CO4):

1. ABC Corporation is trying to decide between an integrated or a gateway NAS solution. The existing SAN at ABC will provide capacity and scalability. The IT department is considering a NAS solution for the training department at ABC for training videos. The videos will only be used by the training department for evaluation of instructors. Suggest a NAS solution.
2. A company is considering implementing storage. They do not have a current storage infrastructure to use, but they have a network that gives them good performance. Discuss whether native or bridged iSCSI should be used and explain your recommendation.
3. The IT Department of a departmental store uses tape to archive data. The data once created may be accessed within 30 days and when it crosses that period, the frequency of access is less than 1%. Suggest a CAS solution.

Course Outcome 5 (CO5):

1. A performance problem has been reported on a database. Monitoring confirms that at 12am, a problem surfaced and access to the database is severely affected until 3pm every day. This timeslot is critical for business operations and an investigation has been launched. A reporting process that starts at 12pm contends for database resources and constrains the environment. Illustrate monitoring and management procedures, tools and alerts to ensure accessibility, capacity, performance and security.
2. Prepare a checklist for auditing the security of a storage environment with SAN, NAS, and iSCSI implementations. Explain how you will perform the audit. Assume that you discover at least five security loopholes during the audit process. List them and provide control mechanisms that should be implemented to eliminate them.
3. A storage array dials a support center automatically whenever an error is detected. The vendor's representative at the support center can log on to the service processor of the storage array through the Internet to perform diagnostics and repair. Show the impact of this feature in a secure storage environment and provide security methods that can be implemented to mitigate any malicious attacks through this gateway.

Concept Map



Syllabus

Storage Infrastructure: Data Centre Environment - Data creation -Hardware and software components of the host environment - Key protocols and concepts used by each component - Physical and logical components of connectivity environment - Physical Components of a disk drive - Logical constructs of a physical disk- Information Lifecycle Management.

RAID and Intelligent Storage Systems: RAID levels: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5 - RAID 6 - RAID 0+1, RAID 1+0 - Intelligent Storage System -Components of an Intelligent Storage System - Types of Intelligent Storage Systems

Networked Storage: Direct Attached Storage - Architecture and components - Network Attached Storage – Architecture and components and connectivity - Fiber Channel Storage Area Network – Architecture, components and connectivity - Internet Protocol Storage Area Network – Architecture, components and topologies – Object Based Storage -CAS and Use cases- Virtualization technologies: Block-level and file-level virtualization technologies and processes

Business Continuity: Business Continuity (BC) – Information Availability, BC Planning Lifecycle - Failure Analysis: Single points of failure, Fault Tolerance – Disaster Recovery

(DR), Recovery Time Objective (RTO) and Recovery Point Objective (RPO) Backup: Purpose -Backup Considerations -Backup Granularity - Recovery Considerations -Backup Methods -Backup Architecture- Backup topologies - Backup and Restore Operations- Replication

Storage Management Activities: Storage Infrastructure Monitoring: Parameters, Components, and Alerts - Storage Security Domains: Threats, Vulnerabilities - Security Implementations in Storage Networks

Text Book

1. EMC Education Services," Information Storage and Management", Wiley, 2nd edition, 2009

References

1. Robert Spalding, "Storage Networks :The Complete Reference", Tata McGraw Hill,Osborne,2003.
2. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne.2001.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecturers
1	**Storage Infrastructure**	
1.1	Data centre Environment	1
1.2	Data Creation	1
1.3	Hardware and software components of the host environment	1
1.4	Key protocols and concepts used by each component	1
1.5	Physical and logical components of Connectivity environment	1
1.6	Physical Components of a disk drive - Logical constructs of a physical disk	2
1.7	Information Lifecycle Management	1
2	**RAID and Intelligent Storage Systems**	
2.1	RAID levels- RAID 0, RAID 1, RAID 3, RAID 4, RAID 5	2
2.2	RAID 0+1, RAID 1+0, RAID 6	2
2.3	Intelligent Storage System -Components of an Intelligent Storage System-	1
2.4	Types of Intelligent Storage Systems	2
3	**Networked Storage**	
3.1	Direct Attached Storage – Architecture and components	1
3.2	Network Attached Storage – Architecture and components and connectivity	2
3.3	Fiber Channel Storage Area Network –Architecture, components and connectivity	2
3.4	Internet Protocol Storage Area Network –Architecture, components and topologies	2
3.5	Object based Storage	1
3.6	CAS and Use cases	2
3.7	Virtualization technologies - Block-level and file-level virtualization technologies and processes	1
4	**Business Continuity**	
4.1	Business Continuity (BC) – Information Availability, BC Planning Lifecycle- Failure Analysis: Single points of failure, Fault Tolerance	1

Module No.	Topic	No. of Lecturers
4.2	Disaster Recovery (DR), Recovery Objective (RPO) Time Objective (RTO) and Recovery Point	1
4.3	Backup: Purpose -Backup Considerations -Backup Granularity	2
4.4	Recovery Considerations -Backup Methods -Backup Architecture- Backup topologies	2
4.5	Backup and Restore Operations-Replication	1
5	**Storage Management Activities**	
5.1	Storage Infrastructure Monitoring: Parameters, Components, Alerts	1
5.2	Storage Security Domains: Threats, Vulnerabilities	1
5.3	Security Implementations in Storage Networks	1
	Total Lectures	**36**

Course Designers:

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14IT670	MOBILE APPLICATION DEVELOPMENT	Category	L	T	P	Credit
		PC	2	0	1	3

Preamble

This course provides knowledge and skill on recent technologies in native mobile application development frameworks such as Android, iOS, Windows Mobile and hybrid mobile app development frameworks such as PhoneGap, RhoMobile.

Prerequisites

14IT370 : Software Engineering

14IT520 : Web Technologies

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes for Theory		**Bloom's level**
CO1	Explain the features and challenges of mobile devices, native app development frameworks, hybrid app development frameworks	**Understand**
CO2	Apply the UI components, multimedia usage, location based services, data storage mechanisms for the given problem	**Apply**
CO3	Apply HTML5 in UI design for the given problem	**Apply**

Course Outcomes for Lab		**Bloom's level**
CO4	Select appropriate framework for developing applications based on the problem requirements	**Analyze**
CO5	Design and develop mobile applications for societal and environmental IT problems	**Create**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	L										
CO3	M	L										
CO4	S	M	L					L	L	L		M
CO5	S	S	S	L	S	M		S	S	S	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Practical Test	
Remember	30	30	0	20
Understand	50	40	20	40
Apply	20	30	80	40
Analyse	0	0	0	0

Evaluate	0	0	0	0
Create	0	0	0	0

CO4, CO5 are attained through mini project.

Mini Project Details:

Phase – I

- Team formation (Team size: 5)
- Problem identification in various IT, societal, business and environmental applications
- Requirements gathering and analysis for selecting tool (android, phonegap etc)
- Separate modules individually

Phase – II

- Design UI
- Develop programs module level, test and debug individually

Phase – III

- Integrate the modules and show the demo in a team
- Test the app with the users, improve accordingly and conclude the results
- Document the above process as a report

Mini project Phase-I, Phase-II and Phase-III will be evaluated by the rubrics.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Write the highlights of hybrid application development environment
2. Demonstrate the three golden paths of Mobile app development.
3. Differentiate mobile with web and hybrid environment.
4. Mobile Device Management (MDM) software secures monitors, manages and supports mobile devices deployed across mobile operators, service providers and enterprises. Justify.
5. List the challenges of using mobile devices in the public sector.

Course Outcome 2 (CO2):

1. Write an Android application to display the exam results in a table layout.
2. Define an intent object and invoke the components of Android platform.
3. Tell the procedure to add sound and vibrate in your application using Android platform
4. Show an user interface to demonstrate the various features of a product “car” using android components.
5. Produce a service named “MyService” to provide time service and define its life cycle. Create an Activity to interact with the created Service.
6. 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.
7. Create a Location Based Service in Android.
    - Get the source location and destination Location.
    - Display the Changes in Latitude and Longitude values.
8. Make 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
    - Enter the Name of the book and ISBN number and click on Add Book.

- Data will be added to Sqlite database.
- Add multiple entries into database.
- Click on Show Books to view the contents added so far.
- Click on Delete All Books button to delete the contents of database

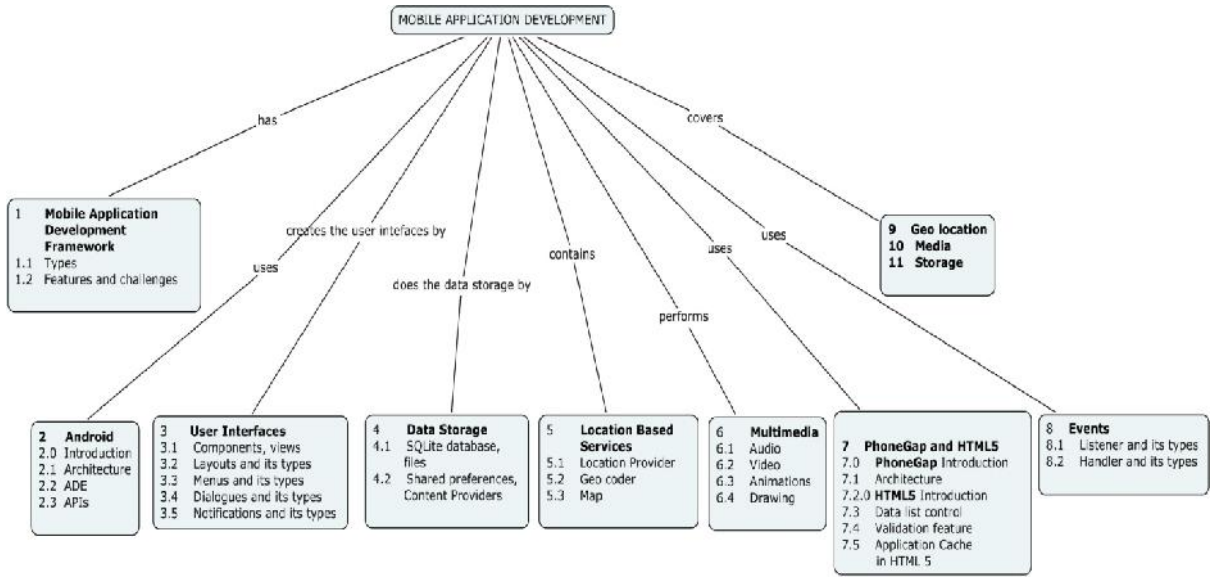
Course Outcome 3

1. Design a registration form using HTML5
2. Design a feedback form of a course using HTML5
3. Design a bookshop purchase activity using HTML5

Course Outcome 4 & 5 (CO4 & CO5):

Mini project on societal, business and environmental applications

Concept Map



Syllabus

Mobile Application Development Framework: Types- Features- challenge.

Android: Introduction – Architecture -Installation and configuration- ADE- APIs

User Interfaces: Components-views-Layouts and its types- Menus and its types – Dialogues and its types - Notifications and its types

Data Storage: SQLite database-Files- shared preferences-Content Providers

Location Based Services: – Location Provider- Geo Coder- Map

Multimedia – Audio- Video- Animations- Drawing.

Phone Gap and HTML5: Phone Gap Introduction – Architecture- Installation and configuration, **HTML5 Introduction** -Data list control- Validation feature -Application Cache in HTML 5.

Events: Listener and its types-handler and its types

Geo location, Media, Storage

Text Books

1. RetoMeier, “Professional Android Application Development”, Wrox, 2010.
2. Thomas Myer, “Beginning PhoneGap”,Wrox, 2012.

Reference Books

1. Mark Murphy, “Beginning Android”,Apress, 2009.
2. Rick Rogers et.al, “Android – Application Development”, O’Reilly, 2009.
3. Matt Gifford, “PhoneGap Mobile Application Development Cookbook”, PACKT, 2012.
4. Kerri Shotts, ”PhoneGap 2.x Mobile Application Development”, PACKT, 2013.
5. Eric Freeman & Elisabeth Robson, “Head First HTML5 Programming”, O’reilly, 2011.

Course Contents and Lecture & Practical Schedule

Module No.	Topic	No. of Lectures
1.	**Mobile Application Development Framework**	
1.1	Types	1
1.2	Features and challenges	
2	**Android**	
2.0	**Introduction**	1
2.1	Architecture	
2.2	ADE	1
2.3	APIs	
3	**User Interfaces**	
3.1	Components, views	1
3.2	Layouts and its types	1
3.3	Menus and its types	1
3.4	Dialogues and its types	1
3.5	Notifications and its types	1
4	**Data Storage**	
4.1	SQLite database, files	1
4.2	Shared preferences, Content Providers	1
5	**Location Based Services**	
5.1	Location Provider	1
5.2	Geo coder	1
5.3	Map	
6	**Multimedia**	
6.1	Audio	1
6.2	Video	1
6.3	Animations	1
6.4	Drawing	1
7	**PhoneGap and HTML5**	
7.0	**PhoneGap Introduction**	1
7.1	Architecture	
7.2	**HTML5 Introduction**	
7.3	Data list control	1
7.4	Validation feature	1
7.5	Application Cache in HTML 5	1
8	**Events**	
8.1	Listener and its types	1

Module No.	Topic	No. of Lectures
8.2	Handler and its types	1
9	**Geo location**	2
10	**Media**	
11	**Storage**	
	Total Lectures	**24**

List of Experiments

Exp. No.	Topic	No. of Practical Sessions
1	Installation and Configuration of Native App development framework, Emulator creation	1
2	Practice layouts and menus	1
3	Practice dialogues and notifications	1
4	Practice SQLite database	1
5	Implement location provider	1
6	Implement audio, video, animations	1
7	Installation and Configuration of Hybrid App development framework	2
8	Mini project phase-I review	1
9	Mini project phase-II review	1
10	Mini project phase-III review	2
	Total Sessions	**12**

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		Category	L	T	P	Credit
14IT680	**MULTIMEDIA LAB**	PC	0	0	2	1

Preamble

The objective of this laboratory is to motivate the students to acquire knowledge and skills in 2D and 3D animation and help the students to implement their own ideas with more creativity for real time applications.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Apply 2D and 3D animation tools for any applications	Apply
CO2:	Create short films using animation tools	Apply
CO3:	Demonstrate skills to use modern animation tools	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L		S			M	M	M		S
CO2	S	M	L		S			M	M	M		S
CO3	S	M	L		S			M	M	M		S

S- Strong; M-Medium; L-Low

Lab Contents and Schedule

S.No	List of Experiments	No. Of Sessions
1	Study about basics of multimedia and its applications	1
2	Implementation of Image manipulations using Photoshop / GIMP	1
3	Study about various 2D animation tools like Ajax Animator, Toon Boom, Adobe Flash Professional	1
4	Use any 2D animation tool to create animations for web applications, mobile applications, gaming applications etc	2
5	Design an advertisement using any 2D animation tool	2
6	Study about various 3D animation tools like Blender, Art of illusion, Maya	1
7	Use any 3D animation tool to create animations for web applications, mobile applications, gaming applications etc	2
8	Create a short film using any 3D tool	2
	Total Sessions	**12**

References:

1. Steve Robets,"Character Animation: 2D Skills for better 3D", Focal Press, Second Edition, 2007.

2. Rick Parent,"Computer Animation: Algorithm and Techniques", Elsevier, Third Edition, 2012.
3. Park, John Edgar, "Understanding 3D Animation using Maya", Springer Publications, Eighth Edition, 2005.
4. IssacKeriow, "The Art of 3D Computer Animation and Effects", Wiley Publications, 4th Edition, 2009.

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		Category	L	T	P	Credit
14IT690	**CLOUD COMPUTING LAB**	PC	0	0	2	2

Preamble

Building a large scale distributed systems that support data-intensive computing involves challenges at multiple levels, from the network (e.g., transport, routing) to the algorithmic (e.g., data distribution, resource management) and even the social (e.g., incentives). This course is a tour through some date intensive computing, covering topics in cloud computing.

Prerequisite

14IT520 – Web Technologies

14IT570 - System Administration

14IT590 – Network Management and Security Lab

Course Outcomes

On the successful completion of the course, students will be able to,

Course Outcomes		Bloom's Level
CO1:	Identify system requirements for the cloud deployment and application development.	Analyze
CO2:	Implement virtualization techniques for the data intensive computing applications.	Apply
CO3:	Develop applications related to data intensive computing in cloud environment.	Create
CO4:	Monitor the cloud servers using extensive knowledge on various software tools	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	S	M	L	S			S	S	S	S	S
CO2.	S	S	M	L	S		M	S	S	S	S	S
CO3.	S	S	S	M	S	S	S	S	S	S	S	S
CO4.								S	S	S	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Category	Projects		Terminal Examination
	1	2	
Problem Statement and Tools used	10	10	10
Proposed Work	20	20	30
Implementation	50	50	30
Testing and Documentation	20	20	30

CO1, CO2, CO3, CO4 will be evaluated by Project reviews of TWO reviews for each project.

Syllabus

The laboratory will be **TWO** major projects (on the topic of choice of the student) that will require possibly the implementation of a real/simulated system, a written report, and an oral presentation.

Projects can fall in a number of different areas, which are somewhat related to data-intensive distributed computing.

Some of the data intensive computing applications like (not limited to),

a) Distributed file systems
b) Data aware scheduling algorithms
c) Distributed operating systems
d) Distributed job management systems
e) Parallel programming languages
f) Distributed workflow systems
g) Distributed monitoring systems

Some of the real time applications like (not limited to),

a) E- Health Care management system
b) OPAC: Library management system
c) Academic Record Management System
d) E – Learning
e) Ticket Booking system
f) Online Survey consolidation system

Software's that need to be considered for the specific projects area are (not limited to),

- Operating systems: Linux, Windows
- Programming models: MapReduce (Hadoop)
- Cloud middleware: Nimbus, Eucalyptus, OpenNebula, CloudStack, Open Stack, etc...
- Virtualization: Sun Virtual Box, XEN, VMWare, KVM

System Requirements are,

Category 1: Intel Xeon, 16-cores @ 2.33GHz, 48GB RAM, 7TB RAID5 disk, 1Gb/s network

- Primary: Linux Suse 11.2 x64
- Virtual Machine: Windows Server 2008 x64

Category 2: AMD Atholon II X4, 4-cores @ 2.6GHz, Nvidia GTX295 with 2GB RAM and 800 cores, 4GB RAM, 75GB disk, 1Gb/s network

- Primary: Windows 7 x64
- Virtual Machine: Linux SuSe 11.2 x64

Course Designers:

1.	Ms.R. Leena Sri	rlsit@tce.edu
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3.	Mr.M.Thangavel	mtit@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

SEVENTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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Passed in Board of Studies Meeting on 29.04.2016 Approved in Academic Council Meeting on 18.06.2016

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2014-15 onwards)

SEVENTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
14IT710	Management Theory and Practice	PC	3	-	-	3
14IT720	Wireless and Mobile Communication	PC	3	-	-	3
14ITPX0	Programme Elective-3	PE	3	-	-	3
14ITPX0	Programme Elective-4	PE	3	-	-	3
14ITGX0	General Elective-2	GE	3	-	-	3
THEORY CUM PRACTICAL						
14IT770	Data Analytics	PC	2	-	2	3
SPECIAL COURSES						
14IT7C0	Capstone Course-II	PC	2	-	-	2
PRACTICAL						
14IT780	User interface design lab	PC	0	0	2	1
		Total	**19**	**0**	**2**	**21**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B.Tech.Information Technology Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2014-15onwards)

SEVENTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	14IT710	Management Theory and Practice	3	50	50	100	25	50
2	14IT720	Wireless and Mobile Communication	3	50	50	100	25	50
3	14ITPX0	Programme Elective-3	3	50	50	100	25	50
4	14ITPX0	Programme Elective-4	3	50	50	100	25	50
5	14ITGX0	General Elective-2	3	50	50	100	25	50
THEORY CUM PRACTICAL								
6	14IT770	Data Analytics	3	50	50	100	25	50
SPECIAL COURSES								
7	14IT7C0	Capstone Course	3	50	50	100	25	50
PRACTICAL								
8	14IT780	User interface design lab	1	50	50	100	25	50

* CA evaluation pattern will differ from course to course 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 and subsequently be reduced to 50 marks for the award of terminal examination marks

14IT710	MANAGEMENT THEORY AND PRACTICE	Category	L	T	P	Credit
		PC	3	0	0	3

Preamble

Management is the science of managing operations for an enterprise or organization. It deals with managing men, material, machinery and money. It has become an essential need to analyze the basic concepts of management theory and to understand the ways and means of implementing them in practice. The course work highlights the systematic approach for the management of various departments in an organization.

Prerequisite

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Levels
CO1:	Explain the fundamental concepts and principles of management.	Understand
CO2:	Apply theories to improve the practice of management.	Apply
CO3:	Identify the key competencies required of effective managers.	Understand
CO4:	Discuss the importance of managerial ethics and social responsibility in management.	Apply
CO5:	Explain the complexity of real life organization and management.	Understand
CO6:	Demonstrate critical thinking when presented with managerial issues and problems.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**L**											
CO2	**S**	**L**										
CO3	**L**											
CO4	**S**	**M**					**S**	**S**				**L**
CO5	**L**						**S**	**M**	**L**			
CO6	**L**	**L**	**L**	**M**			**S**		**L**		**M**	**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Assignment	
Remember	20	20	0	20
Understand	50	0	20	40

Apply	30	80	80	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define Management.
2. What are the various functions of management?
3. Distinguish MBO and MBE.
4. Define Group Cohesiveness
5. What do you mean by semantic barrier of communication?
6. What type of industry requires process type layout?
7. Define Morale.
8. Mention the significance of Market Research?
9. Give an example of centralized layout.
10. Mention the types of maintenance
11. What do you understand by the term Productivity?

Course Outcome 2 (CO2):

1. Briefly explain all the functions of Management
2. Explain various controlling techniques.
3. What are the merits of Modern Type of Organization?
4. List out all the stages of Group formation and explain
5. What are the barriers of communication?
6. What are the factors associated with morale?

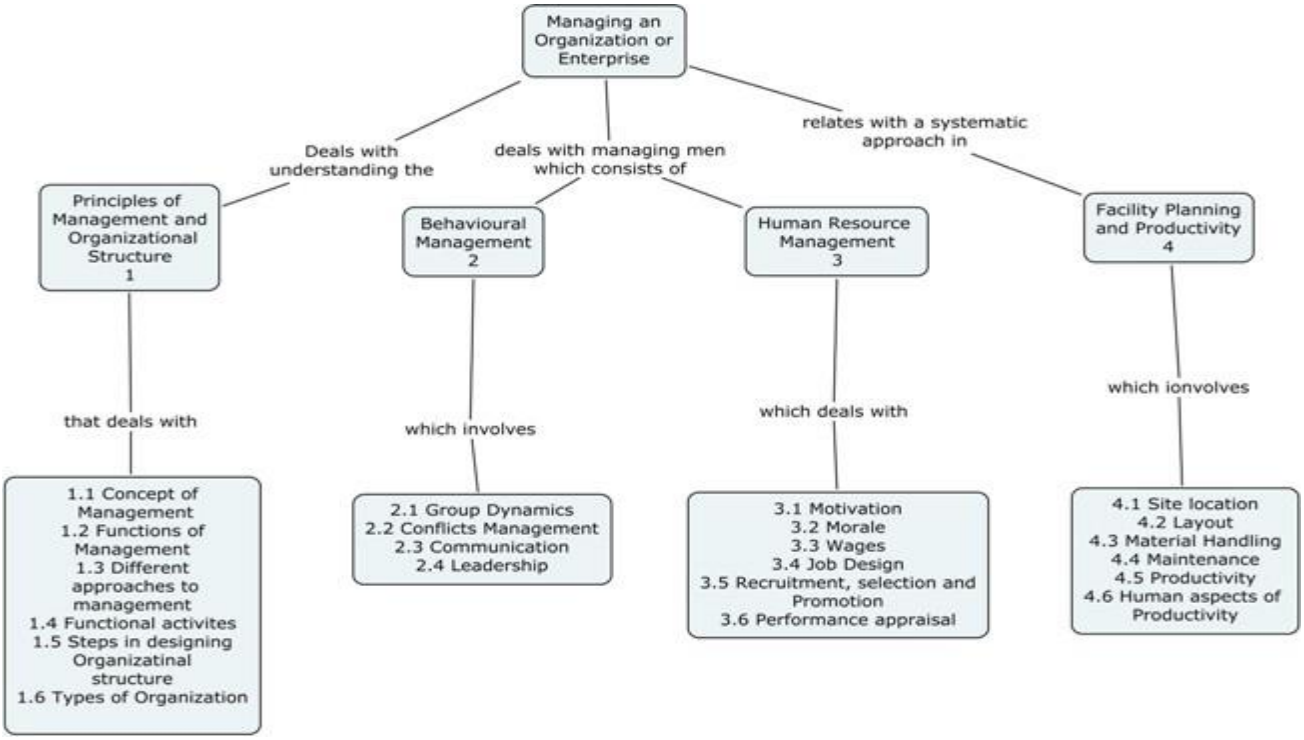
Course Outcome 3 (CO3):

1. Compare job enrichment and job enlargement
2. Compare the merits and demerits of product and process layouts
3. Enumerate all the human factors associated with productivity
4. Differenciate periodical and preventive maintenance
5. Enumerate all the ways of measuring productivity.
6. What are the requirements of an effective material handling system?

Course Outcome 4 (CO4):

1. Bring out all the steps in the formation of a Quality Circle in an educational institution.
2. Suggest the modalities of selection of a trainee engineer to be recruited for a software firm
3. You as a manager prepare a proposal to locate a site to establish a telecommunication industry / Automobile Industry
4. Suggest all the possible ways to increase the overall productivity of a manufacturing sector
5. Prepare a preventive maintenance schedule for an electronic equipment manufacturing company which operates for three shits in 24 hours for 8 hours per shift by 6.00 AM to 2.00 PM, 2.00 PM to 10.00 PM and 10.00 PM to 6.00 AM

Concept Map



Syllabus

Management and Functions of Management: Concept of management, organization, Administration-Management is a Science or an Art- Taylors Scientific Management – Henry Fayol's Principles of management -Functions of management- planning, Organizing, Staffing, Coordinating, Directing and Controlling-different approaches to management-various functional activities of different departments-Strategic planning-Management by Objectives [MBO], Management by Exception [MBE]- Organization Structure- Principles, Steps in designing an Organization, Types of Organization.

Behavioural Management: Group dynamics, types of groups, formation of group, Group cohesiveness, conflicts management- Communication –meaning and types, barriers in communication, communication in Groups- Leadership styles.

Human Resources Management: Objectives-employer-employee relations-Motivation-Morale-Ways of achieving high morale-collective bargaining-Wage and wage payments-incentives-job design ,job analysis-job description, job rotation, job evaluation and merit rating-Recruitment, Selection and training of employees-Promotion-Performance appraisal.

Facility Planning and Productivity: Site location-Factors to be considered-layout-objectives, types, factors influencing layout, layout procedure-Materials handling-principles, factors affecting the choice of materials handling, Materials handling equipment-Plant maintenance-need functions and types-Productivity-definition and concept, measurement-techniques for productivity measurement-Human aspects of productivity

Text Book

1. Harold Koontz, Heinz weihrich "Essentials of Manangement", Tata McGraw Hill ,6th Edition,2004
2. O.P. Khanna, Industrial Engineering and Management , DhanpatRai Publications,2006

Reference Books

1. Chase, Jacobs, aquilano, "Production and Operations Managemet " 8thEditin, Tata McGraw Hil Companies Inc 1999
2. Fred Luthans "Organizational Behaviour", Tata McGraw Hill, 2005
3. Edwin Flippo, "Personnel Management", Tata McGraw Hill,2004
4. R.N. Gupta, "Principles of Management",S.Chand and Co Ltd, 2008

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Priciples of Managmeent and Organizational Structure**	
1.1	Concept of management, Organization, Administration, Management is science or art, Taylor's Scientific Management, Henry Fayol'sPriniciples of management	2
1.2	Functions of management, Planning, organizing, Staffing, Coordinating, Directing and controlling	2
1.3	Different approaches to management	1
1.4	Functional activities, Strategic Planning, MBO, MBE	1
1.5	Principles and Steps Designing Organization structure	1
1.6	Types of Organization	1
2	**Behavioural Management**	
2.1	Group Dynamics, types of group, formation of group, group cohesiveness	2
2.2	Conflicts management	2
2.3	Communication, meaning and types, barriers in communication , communication in groups	2
2.4	Leadership styles	2
3	**Human Resource Management**	
3.1	Employer employee relations, Motivation	2
3.2	Morale, ways of achieving high morale, collective bargaining	1
3.3	Wages, wage and wage payments, incentives	1
3.4	Job Design, job analysis-job description, job rotation, job evaluation and merit rating	2
3.5	Recruitment, Selection and Promotion	2
3.6	Performance appraisal	1
4	**Facility Planning and Productivity**	
4.1	Site Location , factors to be considered	2
4.2	Layout objectives, types , factors influencing layout, layout procedure	2
4.3	Material Handling, principles, factors affecting the choice of materials handling, materials handling equipments	2
4.4	Maintenance, need, functions and types	2
4.5	Productivity, definition and concept, measurement-techniques for productivity measurement	2
4.6	Human aspects of Productivity	1
	Total Lectures	**36**

Course Designers:

1. Mr.S. Karthikeyan skrmech@gmail.com

14IT720	WIRELESS AND MOBILE COMMUNICATION	Category	L	T	P	Credit
		PC	2	2	0	3

Preamble

The course aims at exploring the fundamental concepts of wireless communications in terms of OSI layer in wireless networks aspect. It also explores the latest developments and technologies such as 3G, 4G, and LTE etc. This course also provides research practise through paper presentation in wireless networks.

Prerequisite

14IT440 - Computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome		Bloom's Level
CO1:	Describe the characteristics, challenges and applications of mobile communication	**Understand**
CO2:	Explain the MAC, Network, Transport Layer level schemes of mobile communication	**Understand**
CO3:	Explain the architecture, design considerations of various telecommunication systems	**Understand**
CO4:	Apply the telecommunication MAC schemes for the given problem	**Apply**
CO5:	Analyze the performance of various mobile communication schemes through simulation tools such as NS2, GlomoSim etc	**Analyze**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**M**	**L**										
CO2.	**M**	**L**										
CO3.	**M**	**L**										
CO4.	**S**	**M**	**L**									**M**
CO5.	**S**	**M**	**L**		**S**			**S**	**S**	**S**		**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	30	20	20
Understand	50	50	80	50
Apply	20	20	0	30
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 is attained through paper presentation and is assessed through rubrics.

Paper Presentation Details:

- Team formation (Team size: Maximum 3 & Minimum 2)
- Problem identification and formulation related with the selected issue
- Perform literature survey
- Choose a set of schemes based on the knowledge acquired through literature
- Conduct simulations through proper tool such as NS2, NS3, GlomoSim, etc
- Compare their performances through simulation results
- Write a paper with a above knowledge and present the work in either locally (Dept.) or in a Symposium/ Conference
- 2-Reviews need to be conducted for monitoring their work
- Review -1 will be during the middle of the semester
- Review – 2 will be the end of the semester

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List out the applications of GSM.
2. Recall the characteristics of Wireless LAN.
3. Write the challenges of 3G networks.
4. Enlist the characteristics of WCDMA.

Course Outcome 2 (CO2):

1. What are the design considerations of mobile communications?
2. What is the use of PLMN Interfaces?
3. Specify the working of the spread spectrum technology Is-95.
4. Compare the IEEE802.11 a, b, g and n standards.
5. Explain in detail Wireless PANs

Course Outcome 3 (CO3):

1. Mention the different types of mobile communication system Architectures.
2. Categorize the GSM components based on its function and explain them.
3. Explain briefly about 4G networks.
4. Describe briefly about WiMax.
5. Differentiate 3G and 4G.

Course Outcome 4 (CO4):

1. Consider two senders $\mathbf{X_s}$ and $\mathbf{Y_s}$. Both senders are transmitting signal at the same time, same place with same frequency. Use the following table and demonstrate how the CDMA will work? Show how the two receivers $\mathbf{X_r}$ and $\mathbf{Y_r}$ received the signal and extract the data?

	$\mathbf{X_s}$	$\mathbf{Y_s}$
Digital Data	110	011
Sequence Keys	101101, 110100, 010100	111000, 101010, 000111

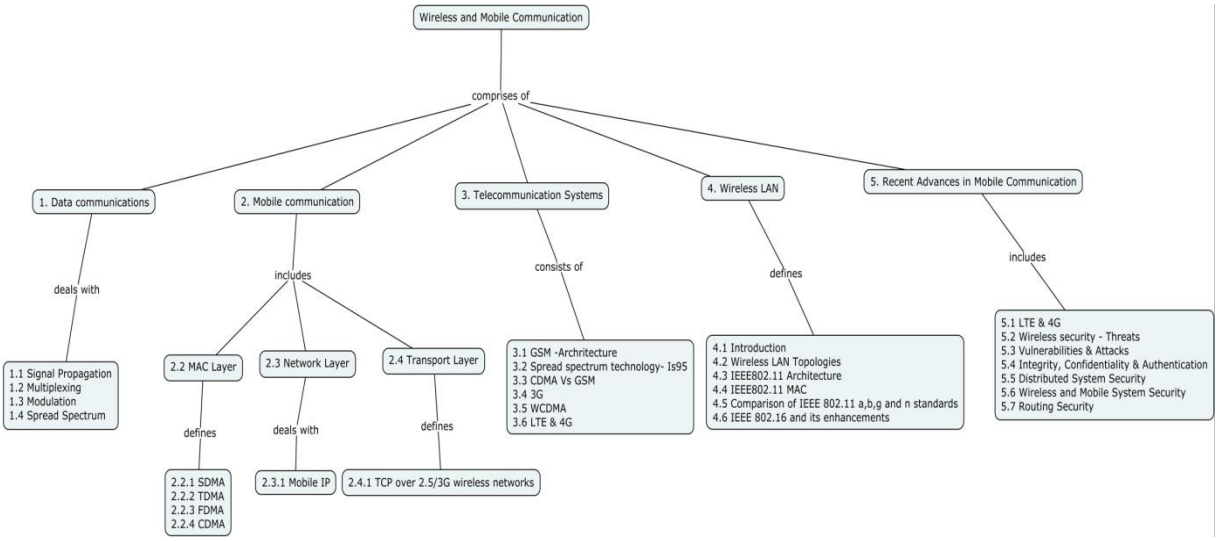
2. Consider the following scenario. Apply aloha and slotted aloha. Explain with proper diagrams. Discuss your findings.
   - Assume there are three stations (X, Y and Z) using the medium for transmission
   - Assume that the transmission time for a single bit is 3 ms
   - Assume your own time slice for slotted aloha

	Station X	**Station Y**	**Station Z**
Digital Data	11011101	01101100	10110111
Starting time for each data transmission (ms)	0,1,4,7,8,9,12,14	1,2,5,8,10,11,13,15	0,3,4,6,10,12,17,18

Course Outcome 5 (CO5):

Paper presentation

Concept Map



Syllabus

Data Communication: Signal propagation – Path loss of radio signals, Additional signal propagation effects, Multi-path propagation, Multiplexing – SDM,FDM,TDM,CDM, Modulation and demodulation – Amplitude Shift Keying, Frequency shift keying, Phase shift keying, Advanced Frequency Shift Keying, Advanced Phase Shift Keying, Multi-carrier Modulation, Spread spectrum-DSSS,FHSS.

Mobile communication: MAC Layer: SDMA, TDMA, FDMA, CDMA, Network Layer: Mobile IP, Transport Layer: TCP over 2.5/3G wireless networks.

Telecommunication Systems –GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces –Spread Spectrum technology –Is-95 – CDMA Versus GSM, 3G, WCDMA.

Wireless LAN – Introduction, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements.

Recent Advances in mobile communication – LTE & 4G, Wireless Security - Threats, Vulnerabilities, Attacks, Integrity, Confidentiality, Policy and relevant definitions Authentication – Different techniques, Distributed Systems Security – Cipher techniques, Protection systems, Wireless and Mobile system security – Strategies, Routing security.

Text Book

1. T.S.Rappaport, “Wireless Communications Principles and Practices”, Pearson Education, Asia, NewDelhi, 2nd Edition, 2010.
2. Jochen.H.Schiller, “Mobile Communications” Addision- Wesley, 2nd Edition 2009.

References

1. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2nd Edition, 2013.

2. W.C.Y.Lee., “Mobile Communication Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Data Communication**	
1.1	Signal Propagation – Path loss of radio signals, Additional signal propagation effects	2
1.2	Multiplexing – SDM, FDM, TDM, CDM	1
1.3	Modulation – ASK, FSK, PSK, MSK, QPSK, MCM	2
1.4	Spread Spectrum – DSSS, FHSS	1
2	**Mobile Communication**	
2.1	MAC Layer – SDMA, FDMA, TDMA, CDMA	1
2.2	Network Layer – Mobile IP	1
2.3	Transport Layer - TCP over 2.5/3G wireless networks.	1
3	**Telecommunication systems**	
3.1	GSM – Architecture	2
3.1.1	Entities	1
3.1.2	Call Routing	2
3.1.3	PLMN Interfaces	1
3.2	Spread Spectrum Technology- Is-95	1
3.3	CDMA Versus GSM	1
3.4	3G	1
3.5	WCDMA	1
4	**Wireless LAN**	
4.1	Introduction	1
4.2	WLAN Topologies	1
4.3	IEEE802.11 Architecture	2
4.4	IEEE802.11 MAC	1
4.5	Comparison of IEEE 802.11 a,b,g and n standards	1
4.6	IEEE 802.16 and its enhancements	1
5	**Recent Advances in Mobile Communication**	
5.1	LTE & 4G,	1
5.2	Wireless Security - Threats,	1
5.3	Vulnerabilities, Attacks,	1
5.4	Integrity, Confidentiality, Policy and relevant definitions, Authentication – Different techniques,	1
5.5	Distributed Systems Security – Cipher techniques, Protection systems,	2
5.6	Wireless and Mobile system security – Strategies,	2
5.7	Routing security	2
Total Lectures		**36**

Course Designers:

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2. Mr.P.Karthikeyan karthikit@tce.edu
3. Ms.T.Manju tmanju@tce.edu

14IT770	DATA ANALYTICS	Category	L	T	P	Credit
		PC	2	0	1	3

Preamble

The course on Data Analytics aims to emphasize the need for Data Engineering and covers various text and streaming data analytics techniques. The course facilitates the student to tackle data analysis problems that exist in real world by using the open source tools.

Prerequisite

- 14IT540 Data Mining

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcome for Theory	**Blooms Level**
CO1:	Identify the big data environment for performing data quality analysis on large data sets.	**Apply**
CO2:	Apply NoSQL data models for unstructured data	**Apply**
CO3:	Perform predictive analytics for text and streaming data	**Apply**
CO4:	Interpret machine learning methods and strategies for data analysis.	**Apply**
	Course Outcome for Practical	
CO5:	Implement text, video and web data analysis using open source software tools.	**Apply**
CO6:	Provide solutions to complex real world issues by using data modelling techniques and analytics algorithms for structured and unstructured data.	**Analyze**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**S**	**M**			**S**		**S**					**M**
CO2.	**S**	**M**			**S**							**M**
CO3.	**S**	**M**			**S**			**S**	**S**	**S**		**M**
CO4.	**S**	**M**			**S**			**S**	**S**	**S**		**M**
CO5.	**S**	**S**	**M**	**L**	**S**			**S**	**S**	**S**	**S**	**S**
CO6.	**S**	**S**	**M**	**L**	**S**	**S**		**S**	**S**	**S**	**S**	**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessments			Terminal Examination
	Test 1	Test 2	Practical Test	
Remember	40	30	0	30
Understand	30	40	30	30
Apply	30	30	70	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of course outcome 5 and 6 is evaluated through mini project which provide solutions to complex real world issues by using data modelling techniques and analytics algorithms.

Mini project details: (team size: 3)

1. Problem identification.
2. Problem analysis and design.
3. Data Modelling using analytical algorithms
4. Implementation of the work
5. Integrate the modules and present the results in a team.
6. Document the above process.

Prerequisites for Mini Project:

Design and Development of Real world applications like

1. Health care system.
2. Social media.
3. Web media application.
4. Streaming data application.
5. Text application (Analytics Perspective)

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define data Analytics.
2. Mention some of the data analytics applications.
3. Describe the Analytics process model.
4. Compute the technique of sampling and pre-processing for the data set of a bank application. Identify the fields and labels over the dataset and perform all the steps over pre-processing technique.

Course Outcome 2 (CO2):

1. Perform data analytics on medical big data using Hadoop and infer the output with respect to processing time and space complexity.
2. Apply multiclass classification techniques for the application that you prefer and provide the necessary specifications that you observe and clearly distinguish over binary classification method for the application that you have chosen.
3. Write different steps involved in text summarization.
4. Explain how social media data is being used for web analysis.

Course Outcome 3 (CO3):

1. Prepare a predictive model for resource utilization by a computer system which has maximum size of RAM 512 MB, and 120 GB hard disk, which runs 6 processes at a given time with the time allotted for each of the process is about 2 milliseconds.
2. Point out the need for using a multiclass classification model in a system. Clearly provide the reasons over binary classification system with necessary illustrations
3. Depict a predictive model using multiclass classification techniques for any real-time application.

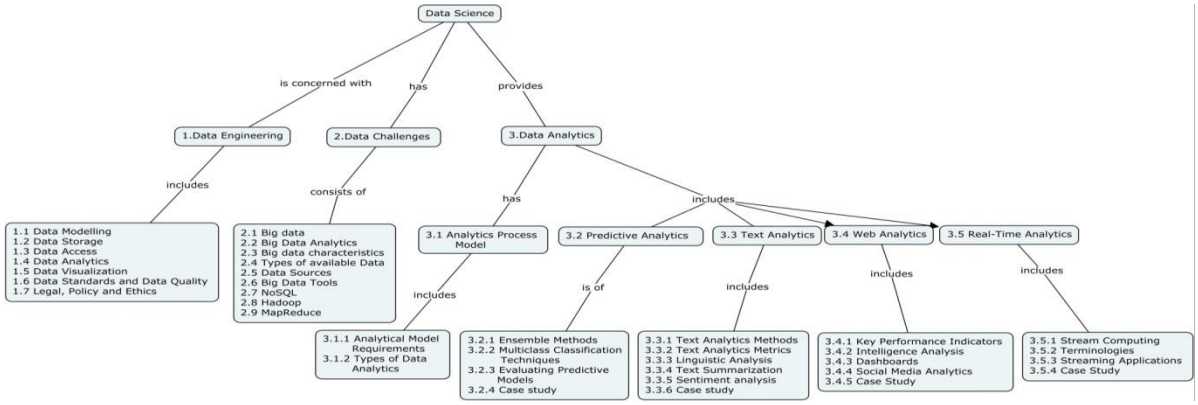
Course Outcome 4 (CO4):

1. Illustrate the need for multiclass classification and how it is different from binary classification technique.
2. Explain text analytics methods with illustrative examples.
3. Explain Naïve Bayesian model to classify text documents.
4. Apply suitable streaming analytics techniques to analyze video data.

Course Outcome 5 & 6 (CO5 & CO6):

Miniproject

Concept Map



Syllabus

Data Engineering: Data Modelling – Data Storage – Data Access - Data Analytics – Data Visualization – Data Standards and Data Quality - Legal, Policy and Ethics.

Data Challenges: Big data – Big Data Analytics vs Business Intelligence - Big data characteristics – Types of available Data – Data Sources – Big Data Tools – NoSQL - Hadoop - Map Reduce - Processing, Reporting, Use cases.

Data Analytics – **Analytics Process Model** – Analytical Model Requirements - Types of Data Analytics.

Predictive Analytics – Ensemble Methods – Multiclass Classification Techniques – Evaluating Predictive Models – Case study for any health care system.

Text Analytics – Text Analytics Methods – Text Analytics Metrics – Linguistic Analysis - Text Summarization - Sentiment analysis – Case study for text data generation system.

Web Analytics – Key Performance Indicators – Intelligence Analysis – Dashboards - Social Media Analytics – Case Study for social media data analytics.

Real Time Analytics – Stream Computing – Terminologies – Streaming Applications – Case Study for video data analytics.

Text Book

1. Bart Baesens, “Analytics in a Big Data World”, The Essential Guide to Data Science and its Applications, Wiley, First edition, 2014.
2. Thomas H. Davenport, Jeanne G. Harris, “Competing on Analytics: The New Science of Winning”, Harvard Business Review Press, First edition, 2007.

Reference Books

1. Paul C. Zikopoulos, Chris Eaton, “Understanding Big Data”, McGraw-Hill, 2012 (eBook from IBM).

Web References

1. http://cloudera.com/content/cloudera/en/training/courses/administrator-training.html
2. http://bigdatauniversity.com/

Course Contents and Lecture Schedule

S.No	Topic	No. of Lectures
1	**Data Engineering**	
1.1 1.2	Data Modelling Data Storage	1
1.3 1.4	Data Access Data Analytics	1
1.5	Data Visualization	1
1.6 1.7	Data Standards and Data Quality Legal, Policy and Ethics	1
2	**Data Challenges**	
2.1 2.2 2.3	Big data Big Data Analytics vs Business Intelligence Big data characteristics	1
2.4 2.5	Types of available Data Data Sources	1
2.6	Big Data Tools	1
2.7	NoSQL	1
2.8	Hadoop	1
2.9	MapReduce, Processing, Reporting, Use cases	1
3	**Data Analytics**	
3.1	**Analytics Process Model**	
3.1.1 3.1.2	Analytical Model Requirements Types of Data Analytics	1
3.2	**Predictive Analytics**	
3.2.1	Ensemble Methods	1
3.2.2	Multiclass Classification Techniques	1
3.2.3	Evaluating Predictive Models	1
3.2.4	Case study	1
3.3	**Text Analytics**	
3.3.1 3.3.2	Text Analytics Methods Text Analytics Metrics	1
3.3.3	Linguistic Analysis	1
3.3.4 3.3.5	Text Summarization Sentiment analysis	1
3.3.6	Case study	1
3.4	**Web Analytics**	
3.4.1 3.4.2	Key Performance Indicators Intelligence Analysis	1
3.4.3 3.4.4	Dashboards Social Media Analytics	1
3.4.5	Case Study	1
3.5	**Real Time Analytics**	
3.5.1 3.5.2	Stream Computing Terminologies	1
3.5.3 3.5.4	Streaming Applications Case Study	1
Total lectures		**24**

List of experiments include (but not limited to):

S. No	Name of Experiments	No. of Sessions
1.	Installation and configuration of Hadoop	2
2.	Execution of simple problems in hadoop	1
3.	Using Big sheets like Spread-sheet analytics	1
4.	Data retrieval using HBase and Hive	1
5.	Data analysis using R	1
6.	Exploring and visualization using R	1
7.	Machine learning techniques for prediction using R/Python	1
8.	Text analytics using NLP tools (SNLP/NLTK)	1
9.	Text analytics using R/Python	1
10.	Real time data analytics using open source tools like R/Python/HBase	2
	Total Sessions	**12**

Course Designers:

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2. Ms.K.V.Uma kvuit@tce.edu
3. Mr.A.Sheik Abdullah asait@tce.edu

		Category	L	T	P	Credit
14IT780	**USER INTERFACE DESIGN LAB**	PC	0	0	2	1

Preamble

The course supports the professional development of students by using user experience and user interface (UX/UI) standards and tools for the software application design. Students will reinforce the practical application of critical thinking, analyze and process of making and conceptualizing, learn how to read design and how to apply them into a broader cultural, technological and social context. Students will gain necessary software skills, and learn how to follow or establish identify guidelines for web or mobile application design.

Prerequisite

- 14IT370 Software Engineering

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Investigate visual design concepts by exploring graphic design basics like color, typography, and layouts	Apply
CO2:	Apply UI and UX design concepts and guidelines for web and mobile devices	Apply
CO3:	Appreciate how cultural and social factors play a vital role in shaping visual design solutions	Apply
CO4:	Demonstrate graphic design skills to effectively visualize and present design solutions and concepts in a clear and concise manner	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**S**	**M**			**S**			**S**				**M**
CO2.	**S**	**M**			**S**			**S**				**M**
CO3.	**S**						**S**	**S**				**M**
CO4.	**S**				**S**			**S**	**S**	**S**		**M**

S- Strong; M-Medium; L-Low

Lab Contents and Schedule

Sl. No.	List of Experiments	No of Sessions
1	Understanding UX/UI Design essentials	1
2	Preparing use case specifications for UI design a. Understanding user stories b. Understanding use cases for UI c. Understanding user persona	3
3	Wireframing or Information hierarchy UI design a. Selection of wireframing tools b. Design Layouts c. Design Menus d. Define Typography (fonts) e. Define Color f. Design for different type of screens g. Design navigation techniques h. Content placement i. Refinement or adjustment to design	3

4	Translate wireframing into Visual Design	2
5	Incorporate accessibility into UI design	1
6	Usability testing for UI design	2
Total Sessions		**12**

List of project titles (but not limited to)

1. GrubHub for Food Trucks
- Research best practices for mobile payment apps
- Design user flows for discovering local food trucks and creating an order
- Create a mobile prototype to test and refine based on user feedback

2. Shopping
- Design an online shopping experience
- Create wireframes and mockups for consumers to browse and purchase products
- Build a responsive site that could be applied to Shopify's platform

3. Kickstarter for Nonprofits
- Research crowdfunding applications to create a competitive analysis
- Develop user personas of both funders and backers
- Design a complex UI that follows well-constructed user flows

4. Product Showcase
- Create a brand identity for a new product
- Design a product landing page to convey a value proposition and competitive differentiators
- Develop a responsive web site to deploy to GitHub Pages

Software Tools:
- Adobe Illustrator
- Balsamiq

References:

1. http://www.ibm.com/design/
2. https://wireframe.cc/
3. https://www.bloc.io/ux-design-bootcamp

Course Designers:

1. A.M.Abirami abiramiam@tce.edu
2. S.Karthiga skait@tce.edu
3. C.V.Nisha Angeline nishaangeline@gmail.com

		Category	L	T	P	Credit
14IT7C0	**CAPSTONE II**	PC	0	0	2	2

Preamble

The purpose of this course is to apply the concept of mathematics, science and engineering fundamentals and an engineering specialization to solve complex engineering problems.

Syllabus

Engineering Group1

Algorithms: Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes – P, NP, NP-hard, NP-complete.

Networks: Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

Engineering Group 2 Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Web technologies: HTML, XML, basic concepts of client-server computing.

Assessment Pattern

(Common to B.E./B.Tech Programmes)

Comprehensive Test (30 Marks)

Test 1: Engineering Group 1 (60 Marks) **Duration: 90 Minutes**

Objective Type Questions : 30

Fill up the blanks : 30

Test 2: Engineering Group 2 (60 Marks) **Duration: 90 Minutes**

Objective Type Questions : 30

Fill up the blanks : 30

Test	Marks Obtained	Converted to
Test1	60 Marks (Max)	15 Marks (Max)
Test 2	60 Marks (Max)	15 Marks (Max)
		30 Marks (Max)

No re-test will be conducted at any circumstances

Complex Engineering Problem Solving (70 Marks):

- Selection of a complex engineering problem (Batch size: 2-4) : 5 Marks
- Literature Survey : 5 Marks
- Problem Formulation : 10 Marks
- Solution Methodology : 15 Marks
- Results and Discussion : 15 Marks

- Technical Report : 10 Marks
- Viva Voce : 10 Marks

Course Designers:

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4. Dr.R.Suganya rsuganya@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

EIGHTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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Approved in Board of Studies Meeting on 15.11.2014 49th Academic Council Meeting on 04.12.2014

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2014-15 onwards)

EIGHTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
14ITPX0	Programme Elective-5	PE	3	-	-	3
14ITPX0	Programme Elective-6	PE	3	-	-	3
14ITPX0	Programme Elective-7	PE	3	-	-	3
PRACTICAL						
14IT880	Project	PC	-	-	24	12
		Total	**9**	**-**	**24**	**21**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B.Tech. . Information Technology Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2014-15 onwards)

EIGHTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	14ITPX0	Programme Elective-5	3	50	50	100	25	50
2	14ITPX0	Programme Elective-6	3	50	50	100	25	50
3	14ITPX0	Programme Elective-7	3	50	50	100	25	50
PRACTICAL								
4	14IT880	Project	-	50	50	100	25	50

* CA evaluation pattern will differ from course to course 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 and subsequently be reduced to 50 marks for the award of terminal examination marks

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

PROGRAMME ELECTIVES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

List of Electives
(For the candidates admitted from 2014-15 onwards)

Sl. No.	Course Code	Course Name
Information Management		
1.	14ITPA0	Data Warehousing
2.	14ITPB0	Big Data Technologies
3.	14ITPC0	Social Network Analysis
4.	14ITPP0	Semantic Web
Information Security		
5.	14ITPD0	Digital Watermarking and Steganography
6.	14ITPE0	Information Theory And Coding
7.	14ITPF0	Computer Forensics
Distributed System		
8.	14ITPG0	Distributed Systems
9.	14ITPH0	Ubiquitous Computing
10.	14ITRM0	Wireless Ad Hoc And Sensor Networks
Software Engineering		
11.	14ITPJ0	Object Oriented Analysis And Design
12.	14ITPK0	Software Quality Assurance
Soft Computing		
13.	14ITPL0	Soft Computing
14.	14ITPM0	Artificial Intelligence
Others		
15.	14ITPN0	Principles Of Compiler Design
16.	14ITRN0	Design And Analysis Of Algorithms
17.	14ITPQ0	Human Computer Interaction
18.	14ITPR0	Computer Vision

PE : Program Elective

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

		Category	L	T	P	Credit
14ITPA0	**DATA WAREHOUSING**	PE	3	0	0	3

Preamble

A data warehouse is a powerful database model that significantly enhances the user's ability to quickly analyze large, multidimensional data sets.This course introduces storage and data retrieval techniques for managing a successful data warehouse.

Prerequisite

- 14IT440 Database Management System

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Identify the life cycle approach for a data warehouse project	Understand
CO2:	Describe the architectural components of a data warehouse	Understand
CO3:	Illustrate logical and physical model of a data warehouse	Apply
CO4:	Perform the data extraction, transformation, and loading (ETL) functions	Apply
CO5:	Prepare backup and recovery plans with monitoring and management	Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											
CO2.	M											
CO3.	M											
CO4.	M				M			M	M	M		M
CO5.	M				M			M	M	M		M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	30	20	30
Understand	50	40	40	40
Apply	20	30	40	30
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain any four development phases in the life cycle of a data warehouse project.
2. Name four key issues to be considered while planning for a data warehouse.
3. Write the three major types of metadata in a data warehouse.

Course Outcome 2 (CO2):

1. Do you think a multitier user support structure is suitable for the data warehouse environment? Analyze the alternates.
2. You are the data design specialist on the data warehouse project team for a manufacturing company. Design a STAR schema to track the production quantities. Production quantities are normally analyzed along the business dimensions of product, time, parts used, production facility, and production run.
3. In a STAR schema to track the shipments for a distributions company, the following dimension tables are found: (1) time, (2) customer ship-to, (3) ship-from, (4) product, (5) type of deal, and (6) model of shipment. Review these dimensions and list the possible attributes for each of the dimension tables.

Course Outcome 3 (CO3)

1. Assume you are in the insurance business. Find two examples of Type 2 slowly changing dimensions in that business. Write the specifications for applying the Type 2 changes to the data warehouse with regard to the two examples.
2. Describe the various activities in Physical design.
3. Explain the steps in physical design.
4. Clearly differentiate physical and logical design of a data warehouse.

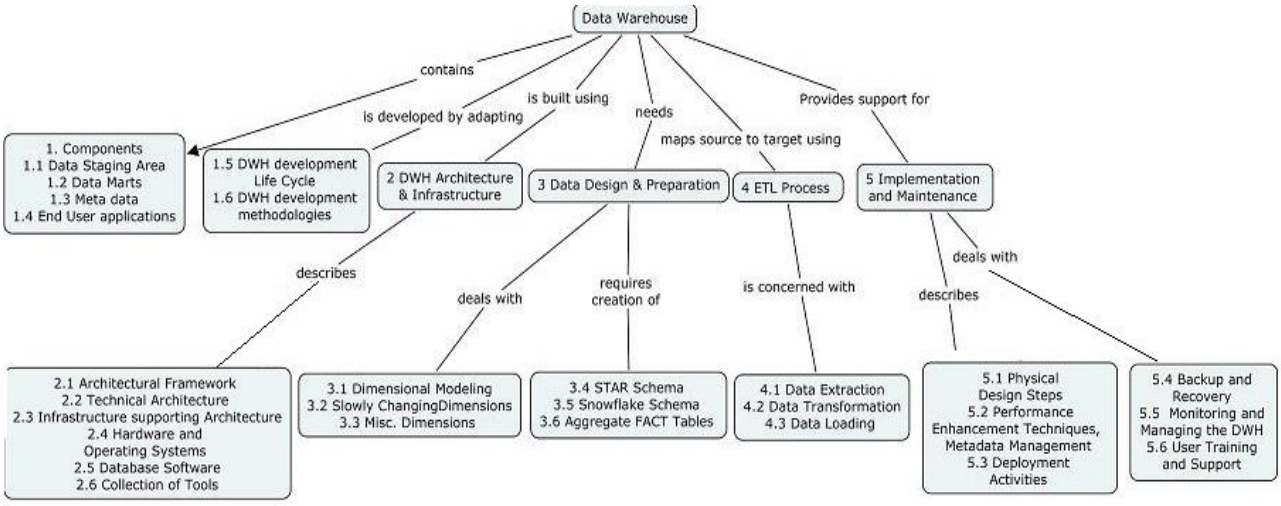
Course Outcome 4 (CO4)

1. Give three reasons why you think ETL functions are most challenging in a data warehouse environment.
2. Describe the types of activities that are part of the ETL Process. Which of these are time consuming?
3. Your project team has decided to use the system logs for capturing the updates from the source operational systems. You have to extract data for the incremental loads from four operational systems all running on relational databases. These are four types of sales applications. You need data to update the sales data in the data warehouse. Make assumptions and describe the data extraction process.

Course Outcome 5 (CO5)

1. As the data warehouse administrator, prepare a backup and recovery plan. Indicate the backup methods and schedules. Explore the recovery options. Describe the scope of the backup function. How will you ensure the readiness to recover from disasters?
2. You are the manager for the data warehouse project of a nationwide car rental company. Your data warehouse is expected to start out in the 500 GB range. Select the suitable server hardware and write a justification for that.
3. As the manager for the data warehouse project, write a project completion report to your CIO and the executive project sponsor. List the major activities completed. Mention the plan for staged deployment of future releases. Indicate the plans for ongoing maintenance. Briefly highlight each topic on growth and maintenance.

Concept Map



Syllabus

Components of data warehouse: Data staging area, Data Marts, Metadata, End user applications, DW development life cycle, DW development Methodologies.

Data Warehouse Architecture and Infrastructure: Understanding DWH Architecture, Architectural Framework, Technical Architecture, Infrastructure Supporting Architecture, Hardware and Operating Systems, Database Software, Collection of Tools.

Data Design and Preparation: Dimensional Modeling, Slowly Changing Dimensions, Miscellaneous Dimensions, STAR Schema, Snowflake Schema, Aggregate Fact Tables.

ETL process: Data Extraction, Data Transformation, Data Loading.

Implementation and Maintenance of DWH: Physical Design Steps, Performance Enhancement Techniques, Meta Data Management, Deployment Activities,.Backup and Recovery, Monitoring and managing the Data warehouse, User Training and Support.

Text Book

1. Ponnaiah, Paulraj,“Data warehousing fundamentals”,. Wiley Publishers, 2010.
2. Kimball, Ralph, “The Data warehouse Life cycle tool kit”, Wiley Publishers,2nd edition, 2008.

Reference Books

1. “Data Warehousing: Design, Development and best practices”, Mohanty, Soumendra. Tata McGraw Hill 2009.
2. “Data warehousing in the real world”, Anahory, Sam / Murray, Dennis. Addison Wesley publishers ,2003.
3. http://www.inmoncif.com
4. http://www.ralphkimball.com
5. http://www.datawarehousing.com

Course Contents and Lecture Schedule

S.No.	Topic	No. of Lectures
1	**Components of data warehouse**	
1.1	Data staging area	1
1.2	Data Marts	1
1.3	Metadata	1
1.4	End User Applications	1
1.5	DWH development life cycle	1
1.6	DWH development Methodologies	1
2	**Data Warehouse Architecture and Infrastructure**	
2.1	Architectural Framework	2
2.2	Technical Architecture	2
2.3	Infrastructure Supporting Architecture	2
2.4	Hardware and Operating Systems	1
2.5	Database Software	1
2.6	Collection of Tools	1
3	**Data Design and Preparation**	
3.1	Dimensional Modeling	1
3.2	Slowly Changing Dimensions	1
3.3	Miscellaneous Dimensions	1
3.4	STAR Schema	1
3.5	Snowflake Schema	1
3..6	Aggregate Fact Tables	1
4	**ETL Process**	
4.1	Data Extraction	2
4.2	Data Transformation	2
4.3	Data Loading	2
5	**Implementation and Maintenance of DWH**	
5.1	Physical Design Steps	2
5.2	Performance Enhancement Techniques, Meta Data Management	2
5.3	Deployment Activities	2
5.4	Backup and Recovery	1
5.5	Monitoring and managing the Data warehouse	1
5.6	User Training and Support	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPB0	**BIG DATA TECHNOLOGIES**	PE	3	0	0	3

Preamble

The course enables the students to understand Big Data processing used in different business intelligence applications and provide an in depth coverage of MapReduce analytics using Hadoop Eco system tools. The student will gain programming knowledge in Pig, Hive, Hbase to handle the Big Data applications and they will get exposure in blooming Big Data technologies.

Prerequisite

- 14IT440 Database Management System
- 14IT540 Data Mining

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Appraise the business areas where big data technologies	Understand
CO2:	Demonstrate the ideas to integrate big data with cloud service	Understand
CO3:	Provide solutions for Big data Applications using different Eco system tools	Apply
CO4:	Implement the map reduce algorithms in Hadoop framework	Apply
CO5:	Use the various NoSQL data models for the appropriate data bases	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**M**				**S**							
CO3	**S**	**M**	**L**	**L**	**S**							L
CO4	**S**	**M**	**L**	**L**	**S**							L
CO5	**S**	**M**	**L**	**L**	**S**							L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	30	0	0
Understand	60	30	40	50
Apply	20	40	60	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe the data format which is used in big data applications
2. Explain how big data analytics is used in marketing and web analytics
3. Explain how input and output data format of the hadoop framework
4. Explain the core methods of reducer
5. Explain the two main parts of hadoop framework
6. Discuss the need of big data in industry

Course Outcome 2 (CO2):

1. Interpret your ideas to bind big data with your clod service
2. Discuss the functionalities of master-slave and peer to peer replication
3. Specify the benefits of using different hadoop tools used in credit risk management
4. Explain the Wordcount implementation via hadoop framework
5. On what concept the hadoop framework works?

Course Outcome 3 (CO3):

1. WritePractice a Pig Latin script to find patents that are often cited together in the internet
2. Illustrate a wordcount example that reads text files and counts how often words occur in the particular text file using hadoop
3. Consider a complete catalog is created for billing system using a NoSQL table file and published on the Web dynamically. Every two days, they receive orders from their customers that they have usually created with Excel and exported, at their request, in a coma-separated file.
   Write the scripts for the following
   a. to run the output
   b. for extracting Useful Data From the Received File
   c. for getting and Printing Billing Name
   d. for Getting Total Amount Due

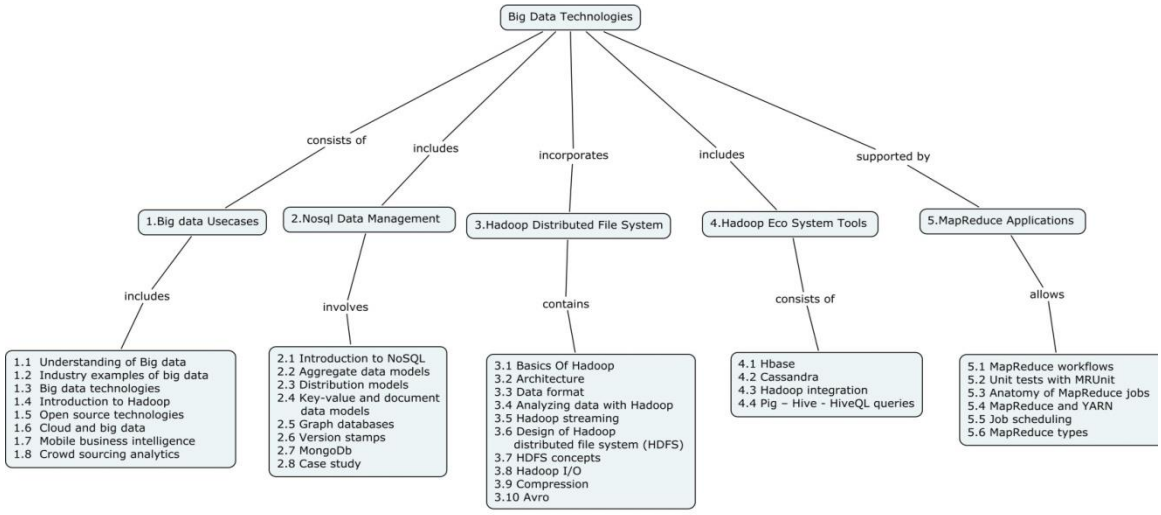
Course Outcome 4 (CO4):

1. DemonstrateTask Tracker in Hadoop and many instances of TaskTracker run on a Hadoop Cluster with an example
2. Illustrate the difference between HDFS and NAS
3. Exhibit the following query: If reducers do not start before all mappers finish then why does the progress on MapReduce job shows something like Map(50%) Reduce(10%)? Why reducers progress percentage is displayed when mapper is not finished yet?
4. Demonstrate how the HDFS Blocks are replicated

Course Outcome 5 (CO5):

1. Demonstrate the graph database that elaborates the key value store
2. Illustrate how the graph database navigates a document store
3. Exhibit that the aggregate oriented data models work best when most data interaction is done with the same aggregate, aggregate – ignorant databases are better when interactions use data organize in many different formations.

Concept Map



Syllabus

Understanding of Big data Industry examples of Big Data - Big Data Technologies - Introduction to Hadoop - Open Source Technologies - Cloud and Big Data - Mobile Business Intelligence - Crowd Sourcing Analytics

NOSQLData Management Introduction to NoSQL - Aggregate Data Models - Distribution Models - Key-value - Document Data Models – Graph Databases - Version Stamps - MongoDB - Case Study

Hadoop Distributed File System Basics of Hadoop - Architecture - Data Format - Analyzing Data with Hadoop - Hadoop Streaming - Design of Hadoop Distributed File system(HDFS) - HDFS Concepts - Hadoop I/O – Compression - Avro

Hadoop Eco System Tools Hbase - Cassandra - Hadoop Integration - Pig – Hive - HiveQL queries

Mapreduce Applications Mapreduce Workflows - Unit tests with MRUnit - Anatomy of MapReduce Jobs- MapReduce and YARN - Job Scheduling - MapReduce Types

Text Book

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

Reference Books

1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
2. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
3. Alan Gates, "Programming Pig", O'Reilley, 2011.
4. http://bigdatauniversity.com/bdu-wp/bdu-course/big-data-fundamentals

Course Contents and Lecture Schedule

S. No	Topic	No.of Lectures
1.	**Big Data Use cases**	
1.1	Understanding of Big data	1
1.2	Industry examples of big data	1
1.3	Big Data Technologies	1
1.4	Introduction to Hadoop	1
1.5	Open Source Technologies	1
1.6	Cloud and Big Data	1
1.7	Mobile Business Intelligence	1
1.8	Crowd Sourcing Analytics	1
2	**NOSQL Data Management**	
2.1	Introduction to NoSQL	1
2.2	Aggregate Data Models	1
2.3	Distribution Models	1
2.4	Key-Value And Document Data Models	1
2.5	Graph Databases	1
2.6	Version Stamps	1
2.7	MongoDb	1
2.8	Case Study	1
3	**Hadoop Distributed File System**	
3.1	Basics of Hadoop	1
3.2	Architecture Data Format	1
3.3	Analyzing Data with Hadoop	1
3.4	Hadoop Streaming	1
3.5	Design of Hadoop Distributed File system(HDFS)	1
3.6	HDFS Concepts	1
3.7	Hadoop I/O	1
3.8	Compression	1
3.9	Avro	1
4	**Hadoop Eco System Tools**	
4.1	Hbase	1
4.2	Cassandra	1
4.3	HadoopIntegration	1
4.4	Pig – Hive - HiveQL queries	1
5	**Mapreduce Applications**	
5.1	Mapreduce Workflows	1
5.2	Unit tests with MRUnit	1
5.3	Anatomy of MapReduce Jobs	1
5.4	MapReduce and YARN	2
5.5	Job Scheduling	1
5.6	Mapreduce Types	1
	Total	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPC0	**SOCIAL NETWORK ANALYSIS**	PE	3	0	0	3

Preamble

Social network analysis focuses on relationships between and among social entities. The objective of the course is to serve as an introduction to the various sources of network data, the different kinds of networks that one can construct from them, the various properties of these networks that people study and motivate this from a sociological point of view.

Prerequisite

- 14IT410: Graph Theory and Combinatorics.

Course Outcomes

Upon successful completion of this course students should:

Course Outcomes		Bloom's Level
CO1:	Recognize the basic concepts of network data and tools for visualizing network data.	Understand
CO2:	Describe the Social Network construction from an online phenomenon.	Understand
CO3:	Predict the Network behavior using network properties.	Apply
CO4:	Perform Link analysis for Web data.	Apply
CO5:	Solve various Social network problems using analytic tools and techniques.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**	**L**				**L**						
CO2	**M**	**L**				**L**				**L**		
CO3	**M**	**L**	**L**									
CO4	**M**	**L**			**L**	**L**		**L**				
CO5	**M**				**M**	**L**		**L**		**L**		

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	50	30	20	20
Apply	30	50	60	60
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO4 can be partially measured by assignment as mini-project.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain about scales of measurement of network data.
2. Discuss about UCINET in detail.
3. Explain the relations among actors in the network.

Course Outcome 2 (CO2):

1. What is the difference between "centrality" and "centralization?"
2. Why is an actor who has higher degree a more "central" actor?
3. How is the size of a network measured? Why population size is so important is sociological analysis?

Course Outcome 3 (CO3):

1. A group of 20 students living on the third and fourth floors of a college dorm like to play on-line games. When a new game appears on campus, each of these students needs to decide whether to join, by registering, creating a player account, and taking a few other steps necessary in order to start playing. When a student evaluates whether to join a new on-line game, she bases her decision on how many of her friends in this group are involved in the game as well. (Not all pairs of people in this 20-person group are friends, and it is more important whether your friends are playing than whether many people in the group overall are playing.)To make the story concrete, let's suppose that each game goes through the following "life cycle" within this group of students:

(a) The game has some initial players in the group, who have discovered it and are already involved in it.
(b) Each other student outside this set of initial players is willing to join the game if at least half of her friends in the group are playing it.
(c) Rule (b) is applied repeatedly over time, as in our model from Chapter 19 for the diffusion of a new behavior through a social network.

Suppose that in this group of 20 students, 10 live on the third floor of the dorm and 10 live on the fourth floor. Suppose that each student in this group has two friends on their own floor, and one friend on the other floor. Now, a new game appears, and five students all living on the fourth floor each begin playing it. The question is: if the other students use the rule above to evaluate whether to join the game, will this new game eventually be adopted by all 20 students in the group? There are three possible answers to this question: yes, no, or there is not information in the set-up of the question to be able to tell. Say which answer you think is correct, and explain.

2. Some friends of yours have gone to work at a large on-line game company, and they're hoping to draw on your understanding of networks to help them better understand the user population in one of their games.Each character in the game chooses a series of quests to go on, generally as part of a group of characters who work together on them; there are many options for quests to choose from, but once a character goes on a quest with a group, it can generally last for a couple of weeks. Your friends working at the game company have also mapped the social network of the game, and they've invented what they find is a useful way of classifying each player's friends: a reinforced friend is one with whom the player has at least one other friend in common, and an unreinforced friend is one with whom the player has no other friends in common. For example, the figure below shows the friends of a player A: players B,C, and D would count as reinforced friends, while player E would be an unreinforced friend. Now, your friends are particularly interested in what causes players to choose particular quests instead of others; and they are also interested in how players learn about particular methods of cheating along the way — general tricks outside the rules of the game that make it easier toaccumulate points, usually regardless of which particular quest they're on. To do some

market research on this, they've anonymously surveyed players of the game, asking them two questions: (a) How did you first learn about the current quest that you're taking part in? (b) How have you learned about ways of cheating in the game?

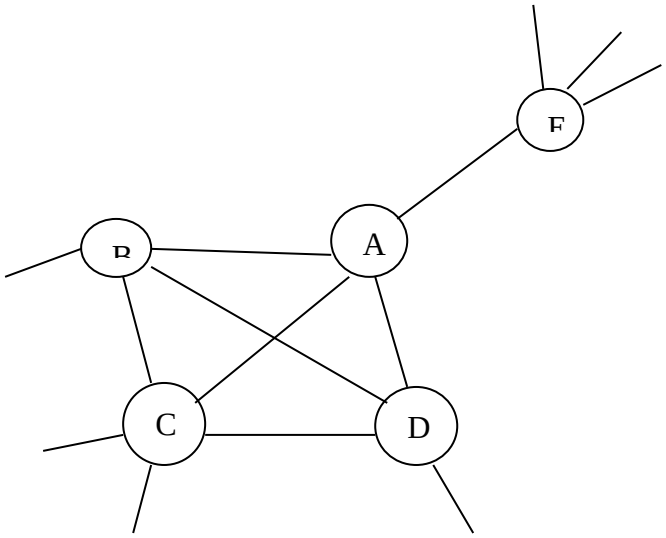


Fig. A small portion of the social network in an online game

To their surprise, the answers to these questions were quite different. For (a), 80% of respondents said that they first found out about the current quest they're on from a reinforced friend, while for (b), 60% of respondents said that they found out about ways of cheating from an unreinforced friend. Your friends thought you might be able to shed some light on these findings. Why did the answers to these two questions turn out differently? Is the difference specific to this particular game, or could it be predicted from general principles of social networks? In 1-2 paragraphs, describe how particular ideas from the book can shed light on why the answers to these questions turned out the way they did.

Course Outcome 4 (CO4):

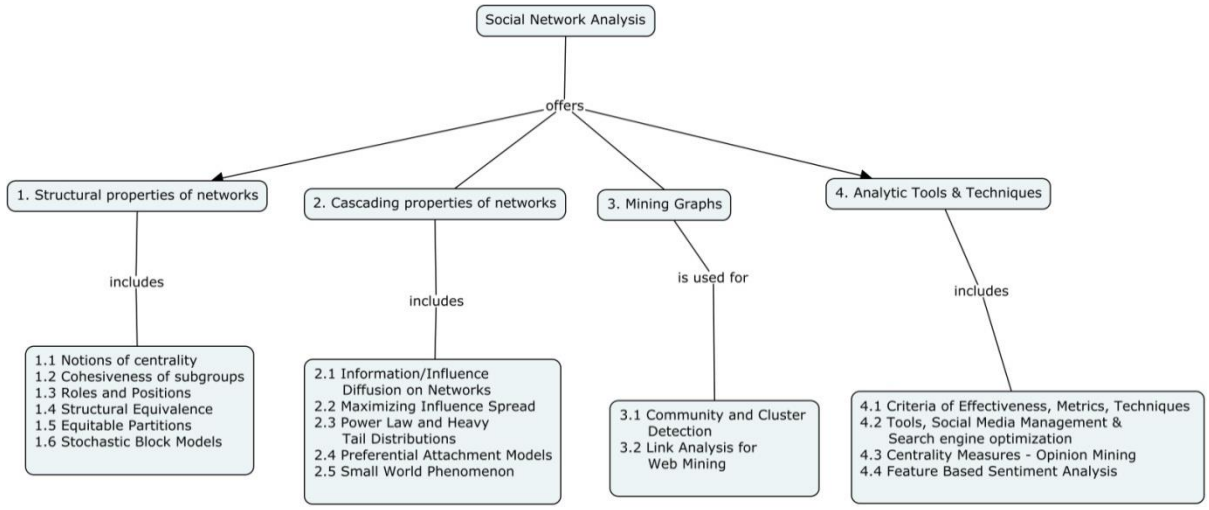
1. Compare Page Rank, Weighted Page Rank and Weighted Page Content Rank Algorithms.
2. Apply the various Methods for Mining Frequent Sub graphs
3. Analyze the Mining Newsgroups Using Networks

Course Outcome 5 (CO5):

Tools: Gephi, NodeXL, R, SICORE

1. Mining and modelling the open-source software community.
2. Visualizing Twitter Social Network Data using above tools.
   Airline Twitter Network Analysis with NodeXL.

Concept Map



Syllabus

Introduction: Motivation, different sources of network data, types of networks, tools for visualizing network data, review of graph theory basics.

Structural properties of networks: Notions of centrality, cohesiveness of subgroups, roles and positions, structural equivalence, equitable partitions, stochastic block models.

Cascading properties of networks: Information/influence diffusion on networks, maximizing influence spread, power law and heavy tail distributions, preferential attachment models, small world phenomenon.

Mining Graphs: Community and Cluster detection: random walks, spectral methods; link analysis for web mining.

Analytic Tools & Techniques: Criteria of Effectiveness, Metrics, Techniques (e.g., Social Network Analysis, Semantic Analysis, and Online Sentiment Analysis), Tools, Social Media Management, Centrality Measures – Opinion Mining, Feature Based Sentiment Analysis.

Text Book

1. Stanley Wasserman, Katherine Faust, “Social network analysis: methods and applications”, Cambridge University Press, 1994(Reprinted 1999).
2. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010.

Reference Books

1. Peter R. Monge, Noshir S. Contractor, “Theories of communication networks “,Oxford University Press,2003.
2. Hansen, Derek, Ben Sheiderman, Marc Smith, “Analyzing Social Media Networks with NodeXL: Insights from a Connected World”, Morgan Kaufmann, 2011.
3. AvinashKaushik, “Web Analytics 2.0: The Art of Online Accountability”, Sybex, 2009.
4. Marshall Sponder, “Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics”, MGH,1st Edition, 2011.
5. Peter Mika, “Social Networks and the Semantic Web”, Springer, First Edition, 2007.

Course Contents and Lecture Schedule

S.No.	Topic	No. of Lectures
0	**Introduction**	
0.1	Motivation, Different sources of network data	1
0.2	Types of networks	1
0.3	Tools for visualizing network data	2
0.4	Review of graph theory basics	2
1	**Structural properties of networks**	
1.1	Notions of centrality	1
1.2	Cohesiveness of subgroups	1
1.3	Roles and Positions	2
1.4	Structural Equivalence	1
1.5	Equitable Partitions	1
1.6	Stochastic Block Models	2
2	**Cascading properties of networks**	
2.1	Information/Influence Diffusion on Networks	2
2.2	Maximizing Influence Spread	1
2.3	Power Law and Heavy Tail Distributions	2
2.4	Preferential Attachment Models	1
2.5	Small World Phenomenon	1
3	**Mining Graphs**	
3.1	Community and Cluster Detection: Random Walks, Spectral Methods.	3
3.2	Link Analysis for Web Mining	2
4	**Analytic Tools & Techniques**	
4.1	Criteria of Effectiveness, Metrics, Techniques (e.g., Social Network Analysis, Semantic Analysis, and Online Sentiment Analysis)	3
4.2	Tools, Social Media Management, and Search engine optimization	2
4.3	Centrality Measures – Opinion Mining	2
4.4	Feature Based Sentiment Analysis	3
	Total Lectures	**36**

Course Designers:

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2. Ms.S.Sujitha sujithait@tce.edu

		Category	L	T	P	Credit
14ITPD0	**DIGITAL WATERMARKING AND STEGANOGRAPHY**	PE	3	0	0	3

Preamble

Watermarking and Steganography are a valuable mechanism for protecting audio, video, and data and they are also becoming an important tool in facilitating e-commerce. The purpose of this course is to recognize and apply the digital watermarking and Steganography concepts as an protection tool for distribution of content over the Internet.

Prerequisite

- 14IT530 Network Security
- 14IT590 Network Management and Security Lab

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Express the concepts of digital watermarking and Steganography by distinguishing from other related fields.	Understand
CO2:	Explain different types of watermarking and Steganography applications.	Understand
CO3:	Describe digital watermarking systems in terms of Message coding, Analyzing errors, Security and authentication.	Understand
CO4:	Recognize the Steganography concepts through various models and steganalysis.	Understand
CO5:	Demonstrate the digital watermarking and Steganography systems according to application domains.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**M**											
CO3.	**M**											
CO4.	**M**											
CO5.	**S**	**M**							**M**	**M**		**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	50	20	20	40
Apply	30	60	60	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 will be partially evaluated through Assignments.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. What is a digital watermark?
2. What key policies or issues could be supported by digital watermarking?
3. What is steganography and how it is different from encryption?

Course Outcome 2 (CO2):

1. How does digital watermarking work with mobile devices?
2. Can pirates eliminate forensic watermarks once they have been inserted in the content?
3. What are the different types of steganographic protocols?

Course Outcome 3 (CO3):

1. What are the top three ways watermarking contributes to security?
2. How do digital watermarks stop driver licenses, IDs and value documents from being counterfeited?
3. Describe about the various types of watermarking attacks.

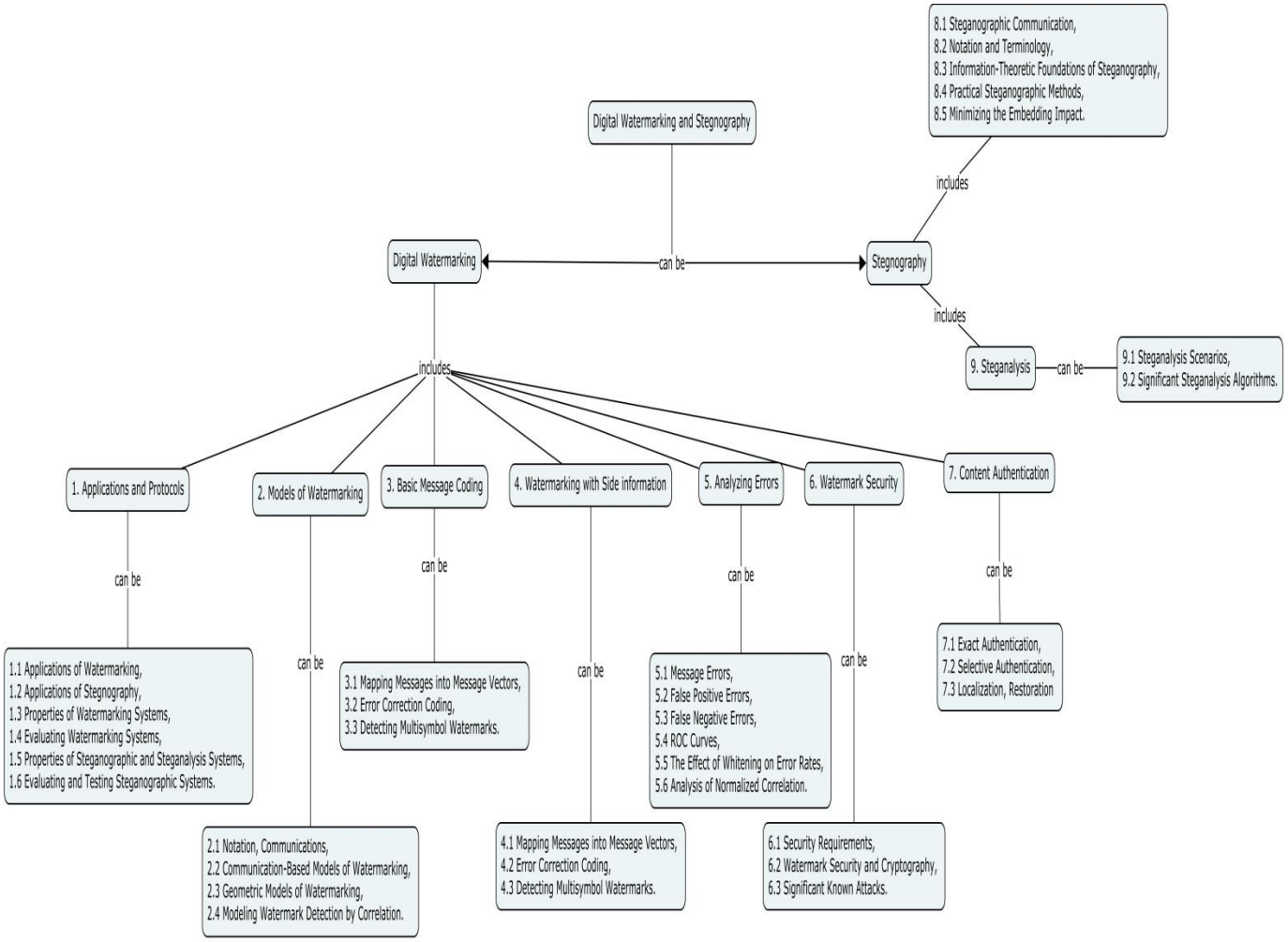
Course Outcome 4 (CO4):

1. What would some advantages be of using a statistical method of steganalysis?
2. Is there any visible difference between the cover-image and the stego-image? And why is there or isn't there a difference?
3. Explain about Universal Steganalysis technique.

Course Outcome 5 (CO5):

1. Demonstrate any one of the following digital watermarking application content identification & management, broadcast monitoring, content filtering, document & image security, locating content online.
2. Demonstrate any one of the following steganography tool with an example Anubis, Steghide, MP3Stego, OpenStego, S-Tools, Steg, StegaMail.
3. Compare the level of security in Watermarking and Steganography

Concept Map



Syllabus

Introduction: Information Hiding, Steganography, and Watermarking, History of Watermarking and Steganography, Importance of Digital Watermarking, Importance of Steganography.

Applications and Properties: Applications of Watermarking, Applications of Steganography, Properties of Watermarking Systems, Evaluating Watermarking Systems, Properties of Steganographic and Steganalysis Systems, Evaluating and Testing Steganographic Systems.

Models of Watermarking: Notation, Communications, Communication-Based Models of Watermarking, Geometric Models of Watermarking, Modeling Watermark Detection by Correlation.

Basic Message Coding: Mapping Messages into Message Vectors, Error Correction Coding, Detecting Multisymbol Watermarks.

Watermarking with Side Information: Informed Embedding, Embedding as an Optimization Problem, Watermarking Using Side Information Dirty-Paper Codes.

Analyzing Errors: Message Errors, False Positive Errors, False Negative Errors, ROC Curves, the Effect of Whitening on Error Rates, Analysis of Normalized Correlation.

Watermark Security: Security Requirements, Watermark Security and Cryptography, Significant Known Attacks.

Content Authentication: Exact Authentication, Selective Authentication, Localization, Restoration

Steganography: Steganographic Communication, Notation and Terminology, Information-Theoretic Foundations of Steganography, Practical Steganographic Methods, Minimizing the Embedding Impact.

Steganalysis: Steganalysis Scenarios, Significant Steganalysis Algorithms.

Text Book

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich and TonKalker, “Digital Watermarking and Steganography”, The Morgan Kaufmann Series in Multimedia Information and Systems, 2nd Ed., 2008.

References

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, “Digital Watermarking”, Margan Kaufmann Publishers, New York, 2003.
2. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, “Techniques and Applications of Digital Watermarking and Contest Protection”, Artech House, London, 2003.
3. JuergenSeits, “Digital Watermarking for Digital Media”, IDEA Group Publisher, New York, 2005.
4. Peter Wayner, “Disappearing Cryptography – Information Hiding: Steganography & Watermarking”, Morgan Kaufmann Publishers, New York, 2002.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
0	**Introduction**	
0.1 0.2	Information Hiding, Steganography, and Watermarking History of Watermarking and Steganography, Importance of Digital Watermarking, Importance of Steganography	1
1	**Applications and Properties**	
1.1	Applications of Watermarking, Applications of Steganography	1
1.2	Properties of Watermarking Systems, Evaluating Watermarking Systems	2
1.3	Properties of Steganographic and Steganalysis Systems, Evaluating and Testing Steganographic Systems	2
2	**Models of Watermarking**	
2.1 2.2	Notation, Communications Communication-Based Models of Watermarking	2
2.3 2.4	Geometric Models of Watermarking Modeling Watermark Detection by Correlation	3
3	**Basic Message Coding**	
3.1	Mapping Messages into Message Vectors	1
3.2 3.3	Error Correction Coding Detecting Multisymbol Watermarks	3
4	**Watermarking with Side Information**	

4.1 4.2	Informed Embedding Embedding as an Optimization Problem	2
4.3	Watermarking Using Side Information	1
4.4	Dirty-Paper Codes	1
5	**Analyzing Errors**	
5.1 5.2	Message Errors False Positive Errors	1
5.3	False Negative Errors	1
5.4	ROC Curves	1
5.5	the Effect of Whitening on Error Rates	1
5.6	Analysis of Normalized Correlation	1
6	**Watermark Security**	
6.1 6.2	Security Requirements Watermark Security and Cryptography	1
6.3	Significant Known Attacks	1
7	**Content Authentication**	
7.1	Exact Authentication	1
7.2	Selective Authentication	1
7.3 7.4	Localization Restoration	1
8	**Steganography**	
8.1	Steganographic Communication	1
8.2	Notation and Terminology	1
8.3	Information-Theoretic Foundations of Steganography	1
8.4	Practical Steganographic Methods	1
8.5	Minimizing the Embedding Impact	1
9	**Steganalysis**	
9.1	Steganalysis Scenarios	1
9.2	Significant Steganalysis Algorithms	1
	Total Lectures	**36**

Course Designers:

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3. Mr. M.Thangavel mtit@tce.edu

14ITPE0	INFORMATION THEORY AND CODING	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course provides an understanding of fundamental information theoretic techniques including applications to compression and error control coding. Understand the quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Levels
CO1:	Observe the Similarities and differences among various Error Control Mechanisms available for Block and Convolutional coding.	Understand
CO2:	Experiment the fundamental concepts of Information Theory, Source Coding and Error Control.	Apply
CO3:	Demonstrate the acquired knowledge of Error control coding, encoding and decoding of Digital Data.	Apply
CO4:	Illustrate the acquired knowledge of encoding and decoding to the output and design state diagrams, tree and trellis diagrams.	Apply
CO5:	Outline the feasibility of Huffman coding, Shannon- Fano techniques in the design of codebook for a given message.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**M**	**M**	**M**								
CO2	**S**	**M**										
CO3	**S**	**M**										
CO4	**S**	**M**										
CO5	**M**	**S**						**M**	**M**	**M**		

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	Test 1	Test 2	Test 3	
Remember	20	10	0	10
Understand	20	20	30	30
Apply	60	40	50	40
Analyze	0	30	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Write about the channel coding theorem for a discrete memory less channel.
2. Illustrate how the maximum likelihood decoding and Viterbi decoding algorithms of a convolution encoder.
3. Write about mutual information.
4. Illustrate the capacity of the channel having infinite bandwidth?
5. Write on entropy

Course Outcome 2 (CO2)

1. Determine how to encode and decode a P-frame and B-frame?
2. Illustrate the entropy encoding block of JPEG standard.
3. Write about H.261 video compression standard.
4. Illustrate JPEG image compression techniques.
5. Demonstrate Motion estimation and Motion compensation technique.

Course Outcome 3 (CO3)

1. Determine the decoded data bits by applying Viterbi decoding algorithm , if r=1100000111 rest all 0.
2. Consider a (7,4) cyclic code whose generator polynomial is $g(x) = 1 + x^2 + x^3$.

a. Encode the message (1001) using encoder and algorithm

b.Decode the received word if error has occurred at middle bit using both syndrome calculator circuit and algorithm

3. Consider the rate r=1/2, Constraint length K=4 convolutional encoder. The Encoder outputs are represented as $v_1 = XOR(S_1, S_3)$ and $v_2 = XOR(S_1, S_2, S_3)$. Determine the encoder output produced by the message sequence 10100 using state diagram, tree diagram and trellis diagram.

Course Outcome 4 (CO4)

1. In a Message, each letter occurs the following percentage of times.

Letter	A	B	C	D	E	F
% of occurrence	23	20	11	9	15	22

   a. Calculate the entropies of this alphabet of symbols.
   b. Devise a codebook using Huffman Technique and find the average code word length.
   c. Devise a codebook using Shannon- Fano Technique and find the average code word length.
   d. Compare and comment on the performance of both Techniques.

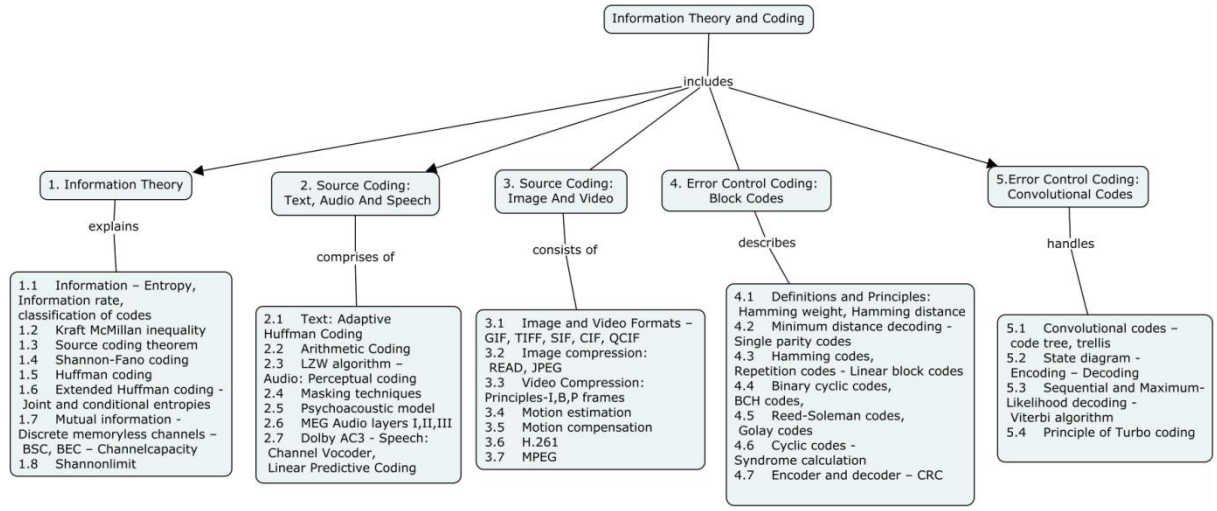
2. Model a symmetric (7,4) cyclic code using the generator polynomial $g(x)= x^3+x+1$.
What are the error correcting capabilities of this code? For the received word 1110000, determine the transmitted codeword.

3.Analyse and show that the minimum hamming distance d_{min} between two code words of a binary linear block code is equal to the hamming weight of the codeword with the smallest number of 1s.excluding all 0-codeword for the codebook C={0000,1010,0101,1111}

Course Outcome 5 (CO5)

1. State the difference between Block Codes and Convolutional Codes.
2. Why differential encoding is carried out only for DC coefficient in JPEG ?
3. How arithmetic coding is advantages over Huffman coding for text compression ?
4. Use differential entropy to compare the randomness of random variables
5. State the main difference between MPEG video compression algorithms and H.261

Concept Map



Syllabus

Information theory Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memory less channels – BSC, BEC – Channel capacity, Shannon limit.

Source Coding: Text, Audio and Speech Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, LinearPredictive Coding

Source Coding: Image and Video Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

Error Control Coding: Block Codes Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, binary cyclic codes, BCH codes, Reed-Soleman codes, Golay codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC

Error Control Coding: Convolutional Codes Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential and Maximum-Likelihood decoding - Viterbi algorithm – Principle of Turbo coding

Text Books

1. R Bose, “Information Theory, Coding and Cryptography”, Tata McGraw Hill, 2008
2. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and Standards”, Pearson Education Asia, 2007

References

1. K.Sayood, “Introduction to Data Compression”, Elsevier, Third edition, 2012
2. S Gravano, “Introduction to Error Control Codes”, Oxford University Press, 2007
3. Amitabha Bhattacharya, “Digital Communication”, Tata McGraw Hill, 2006

Course Contents and Lecture Schedule

Module No	Topic	No of Lectures
1	**Information Theory**	
1.1 1.2	Information – Entropy, Information rate, classification of codes Kraft McMillan inequality	1
1.3	Source coding theorem	1
1.4	Shannon-Fano coding	1
1.5	Huffman coding	1
1.6	Extended Huffman coding - Joint and conditional entropies	1
1.7	Mutual information - Discrete memoryless channels – BSC, BEC – Channelcapacity	2
1.8	Shannonlimit	1
2	**Source Coding: Text, Audio And Speech**	
2.1 2.2	Text: Adaptive Huffman Coding Arithmetic Coding	1
2.3	LZW algorithm – Audio: Perceptual coding	1
2.4	Masking techniques	1
2.5	Psychoacoustic model	1
2.6	MEG Audio layers I,II,III	1
2.7	Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding	2
3	**Source Coding: Image And Video**	
3.1	Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF	2
3.2	Image compression: READ, JPEG	1
3.3	Video Compression: Principles-I,B,P frames	2
3.4	Motion estimation	1
3.5	Motion compensation	2
3.6	H.261	1
3.7	MPEG	1
4	**Error Control Coding: Block Codes**	
4.1	Definitions and Principles: Hamming weight, Hamming distance	1
4.2	Minimum distance decoding - Single parity codes	1
4.3	Hamming codes, Repetition codes - Linear block codes	1
4.4	Binary cyclic codes, BCH codes,	1
4.5	Reed-Soleman codes, Golay codes	2
4.6	Cyclic codes - Syndrome calculation	1
4.7	Encoder and decoder – CRC	1
5	**Error Control Coding: Convolutional Codes**	
5.1 5.2	Convolutional codes – code tree, trellis State diagram - Encoding – Decoding	1
5.3	Sequential and Maximum-Likelihood decoding - Viterbi algorithm	1
5.4	Principle of Turbo coding	1
	Total Lectures	**36**

Course Designers

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		Category	L	T	P	Credit
14ITPF0	**COMPUTER FORENSICS**	PE	3	0	0	3

Preamble

Securing relevant evidence from computer systems and other electronic devices requires a range of skills and a deep understanding of how data is stored and organized electronically. This course serves as an introduction to the technologies relevant to computer forensics and provides the student with hands-on experience collecting and analyzing electronic data.

Prerequisite

- 14IT530 – Network Security

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Demonstrate a working knowledge of computers, storage devices, and digital data	Understand
CO2:	Explain the responsibilities and liabilities of a computer forensic investigator	Understand
CO3:	Plan and prepare for an incident requiring computer forensic skills	Apply
CO4:	Demonstrate basic skills with various tools for recovering digital evidence from computer storage devices	Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**M**											
CO3.	**S**	**M**					**L**					
CO4.	**S**	**M**		**L**	**S**		**M**		**S**			**M**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	50	30	30	40
Apply	30	50	50	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of Course Outcome 3 and 4 is partially evaluated by Assignments

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. What is computer forensics and how does the process work?
2. Companies who recycle their computers by selling them on to someone else will aim to erase all data on their hard drive. However, this may not always be successful.
   (a) Outline how formatting the disk may not in fact achieve this aim.
   (b) Outline the possible effects on privacy if all of the data is not erased.
3. Explain why securing the hard drive of the suspect's computer is more important than other file evidence on the hard drive.

Course Outcome 2 (CO2):

1. What are the roles & responsibilities of computer forensic investigator?
2. How can a computer forensics help us reduce loss and liability?
3. What are the different elements faced during investigation?

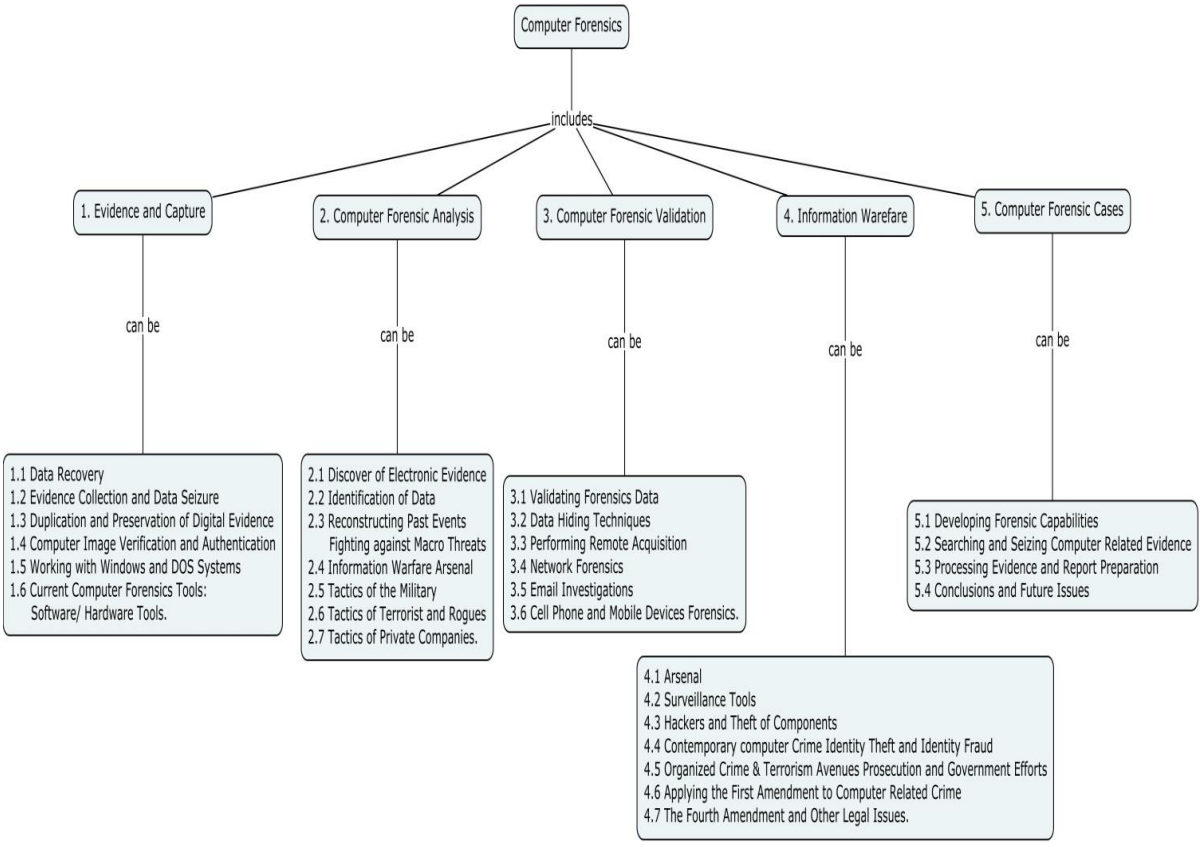
Course Outcome 3 (CO3):

1. Discuss the methods used by criminals to hide or disguise certain files. For each method identify the countermeasures that can be taken by a computer forensic scientist.
2. What are the qualities a trained computer forensic examiner can have?
3. Consider the case "Doctor accused of withholding treatment and erasing records", how can you prepare for this incident.

Course Outcome 4 (CO4)

1. Explain the procedure for gathering evidence in the case of bank robbery.
2. Why traditional forensics techniques are less effective with Digital evidence?
3. Justify any scenario, why computer forensics is needed?

Concept Map



Syllabus

Introduction: Fundamentals, Types of Computer Forensics Technology, Types of Vendor and Computer Forensics Services.

Evidence and Capture: Data Recovery, Evidence Collection and Data Seizure, Duplication and Preservation of Digital Evidence, Computer Image Verification and Authentication, Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

Computer Forensic Analysis: Discover of Electronic Evidence, Identification of Data, Reconstructing Past Events Fighting against Macro Threats, Information Warfare Arsenal, Tactics of the Military– Tactics of Terrorist and Rogues – Tactics of Private Companies.

Computer Forensic Validation: Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

Information Warfare : Arsenal – Surveillance Tools- Hackers and Theft of Components- Contemporary computer Crime Identity Theft and Identity Fraud-Organized Crime & Terrorism Avenues Prosecution and Government Efforts- Applying the First Amendment to Computer Related Crime-The Fourth Amendment and Other Legal Issues.

Computer Forensic Cases: Developing Forensic Capabilities- Searching and Seizing Computer Related Evidence-Processing Evidence and Report Preparation-Conclusions and Future Issues

Text Book

1. John R. Vacca, “Computer Forensics: Computer Crime Scene Investigation”, CharlesRiver Media,2nd Edition, 2008.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.

References

1. Bernadette H Schell, Clemens Martin, “Cybercrime”, ABC – CLIO Inc, California, 2004.
2. Chad Steel, “Windows Forensics”, Wiley India, 2006.
3. MajidYar, “Cybercrime and Society”, Sage Publications, 2006.
4. Robert M Slade, “Software Forensics”, Tata McGrawHill, 2004.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecture Hours
0	**Introduction**	
0.1	Fundamentals,	1
0.2	Types of Computer Forensics Technology,	1
0.3	Types of Vendor and Computer Forensics Services.	1
1	**Evidence and Capture**	
1.1	Data Recovery	1
1.2	Evidence Collection and Data Seizure	1
1.3	Duplication and Preservation of Digital Evidence	1
1.4	Computer Image Verification and Authentication	1

Module No.	Topic	No. of Lecture Hours
1.5	Working with Windows and DOS Systems	1
1.6	Current Computer Forensics Tools: Software/ Hardware Tools.	1
2	**Computer Forensic Analysis**	
2.1	Discover of Electronic Evidence	1
2.2	Identification of Data	1
2.3	Reconstructing Past Events Fighting against Macro Threats	1
2.4	Information Warfare Arsenal	1
2.5	Tactics of the Military	1
2.6	Tactics of Terrorist and Rogues	1
2.7	Tactics of Private Companies.	1
3	**Computer Forensic Validation**	
3.1	Validating Forensics Data	1
3.2	Data Hiding Techniques	2
3.3	Performing Remote Acquisition	1
3.4	Network Forensics	1
3.5	Email Investigations	1
3.6	Cell Phone and Mobile Devices Forensics	1
4	**Information Warfare**	
4.1	Arsenal	1
4.2	Surveillance Tools	2
4.3	Hackers and Theft of Components	1
4.4	Contemporary computer Crime Identity Theft and Identity Fraud	1
4.5	Organized Crime & Terrorism Avenues Prosecution and Government Efforts	2
4.6	Applying the First Amendment to Computer Related Crime	1
4.7	The Fourth Amendment and Other Legal Issues.	1
5	**Computer Forensic Cases**	
5.1	Developing Forensic Capabilities	1
5.2	Searching and Seizing Computer Related Evidence	1
5.3	Processing Evidence and Report Preparation	1
5.4	Conclusions and Future Issues	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPG0	**DISTRIBUTED SYSTEMS**	PE	3	0	0	3

Preamble

This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.The course examines issues related to data dissemination and discovery, safety and correctness, scaling, security and trust, distributed transactions, resiliency to failures, file systems and data intensive computing. The course explores how to design synchronous and asynchronous distributed systems that do not have race conditions, and can sustain failures and certain classes of denial of service attacks.

Prerequisite

- 14IT350-Operating Systems
- 14IT430-Computer Networks
- 14IT520-Web Technologies

Course Outcomes

By the end of the course, students should be able to:

Course Outcomes		Bloom's Level
CO1:	Explain principles architectures, algorithms and programming models used in distributed systems	Understand
CO2:	Identify the different models of distributed systems, including failure and timing models	Understand
CO3:	Implement basic distributed algorithms like failure detection, leader elections	Apply
CO4:	Apply middleware communication techniques for a given scenario.	Apply
CO5:	Examine distributed system issues to handle and process large data volumes through appropriate modern tools	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**M**											
CO3	**S**	**M**	**L**									
CO4	**S**	**M**	**M**	**L**	**M**			**S**	**S**	**S**	**L**	**S**
CO5	**S**	**S**	**M**	**L**	**S**	**L**	**L**	**S**	**S**	**S**	**L**	**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	Test 1	Test 2	Test 3	
Remember	30	20	-	10
Understand	40	50	20	20
Apply	30	30	60	50
Analyse	-	-	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

Extensive experimentation through programming assignments/Mini Project in Java is a principal activity of this course. These assignments will focus on developing skills that are immediately transferrable to building real-world systems.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. State transparency and give examples of different types of transparency.
2. Why is it sometimes so hard to hide the occurrence and recovery from failures in a distributed system?
3. Differentiate vertical distribution and horizontal distribution?
4. Why are transport-level communication services often inappropriate for building distributed applications?
5. Describe how connectionless communication between a client and a server proceeds when using sockets.

Course Outcome 2(CO2):

1. Explain difference between the primitives MPI-bsend and MPI-isend in MPI.
2. Consider a personal mailbox for a mobile user, implement as part of a wide-area distributed database. What kind of client-centric consistency would be most appropriate?
3. Describe a simple implementation of read-your-writes consistency for displaying Web pages that have just been updated.
4. Can the model of triple modular redundancy described in the text handle Byzantine failures? Consider a process P that requires access to file F which is locally available on the machine where P is currently running. When P moves to another machine, it still requires access to F. If the file to machine binding is fixed, how could the system wide reference to F be implemented?
5. Considering that a two-tired home-based approach is a specialization of a hierarchical location service, where is the root?

Course Outcome 3 (CO3):

1. Consider the behavior of two machines in a distributed system. Both have clocks that are supposed to tick 1000 times per millisecond. One of them actually does, but the other ticks only 990 times per millisecond. If UTC updates come in once a minute, what is the maximum clock skew that will occur?
2. Consider a procedure incr with two integer parameters. The procedure adds one to each parameter. Now suppose that it is called with the same variable twice, for example, as incr(i,i). If I is initially 0, what value will it have afterward if call by reference is used? How about if copy/restore is used?
3. A file is replicated on 10 servers. List all the combinations of read quorum and write quorum that are permitted by the voting algorithm.
4. In the following 3 concurrently-executing processes table,

Process P1	Process P2	Process P3
x←1; print(y,z);	y← 1; print(x,z);	z← 1; print(x,y);

is 001110 a legal output for a sequentially consistent memory? Explain your answer.

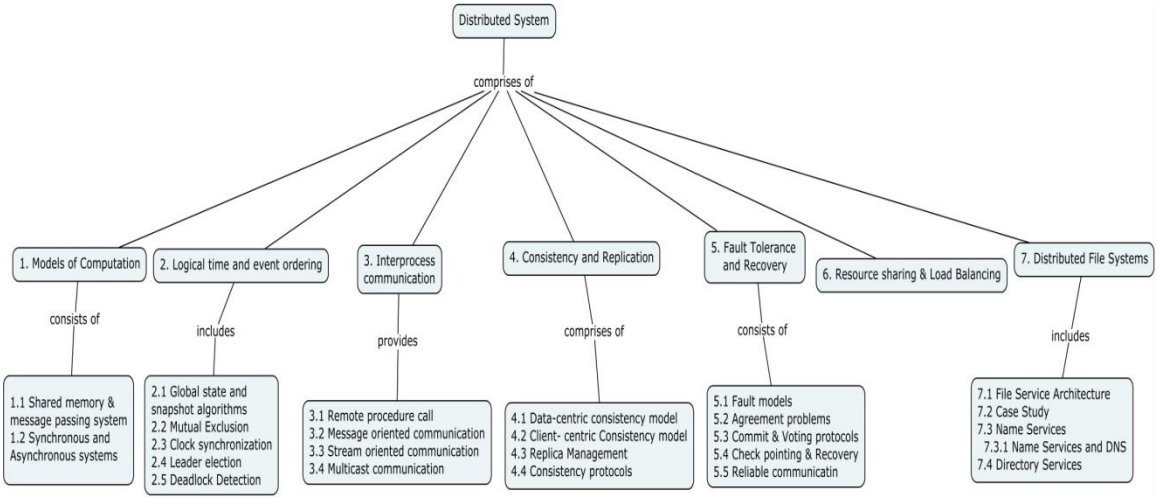
Course Outcome 4(CO4):

1. A Distributed system may have multiple, independent resource. Imagine that process 0 wants to assess resource A and Process1 wants to assess resource B. Apply using Ricart and Agarwal's algorithm to find deadlock.
2. Develop a multithreaded Java program that responds to remote clients' requests for meaning of words stored in a Dictionary. If a client program sends a message "King" to the server, the server program responds back with the meaning of word "King" by retrieving it from the dictionary (as a string). Use Java Sockets for communication between clients and the server.
3. Imagine a Web server that maintains a table in which client IP addresses are mapped to the most recently accessed Web pages. When a client connects to the serve, the server looks up the client in its table, and if found, returns the registered page. Is this server stateful or stateless?

Course Outcome 5(CO5):

1. Consider a chain of process P1, P2, ….Pn, implementing a multi tiered client server architecture. Process Pi is client of process P_{i+1}, and P_i will return a reply to P_{i-1} only after receiving a reply from P_{i+1}. What are the main problems with this organization when taking a look at the request-reply performance at process P1?
2. Assume a client calls an asynchronous RPC to a server, and subsequently waits until the server returns a result using another asynchronous RPC. Is this approach the same as letting the client execute a normal RPC? What if we replace the asynchronous RPCs with asynchronous RPCs?
3. UNIX systems provide many facilities to keep computers in synch, notably the combination of the crontab tool and various synchronization commands are powerful. Configure a UNIX system that keeps the local time accurate with in the range of a single second. Likewise. Configure an automatic backup facility by which a number of crucial files are automatically transferred to a remote machine once every 5 minutes. Your solution should be efficient when it comes to bandwidth usage.

Concept Map



Syllabus

Models of computation: shared memory and message passing systems, synchronous and asynchronous systems.

Logical time and event ordering. Global state and snapshot algorithms, mutual exclusion, clock synchronization, leader election, deadlock detection, **Inter-process communication** Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, Multicast Communication.

Consistency and Replication –Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, Consistency Protocols.

Fault tolerance and recovery: basic concepts, fault models, agreement problems and its applications, commit protocols, voting protocols, Check pointing and recovery, reliable communication.

Resource sharing and load balancing.

Distributed File Systems-Introduction-File service architecture-Case Study: Sun Network File System, Name Services-Introduction-Name Services and the Domain Name System-Directory Services-Case Study: Global Name Service.

Text Book

1. George Coulouris, Jean Dollimore, Tim Kindberg, , "Distributed Systems: Concepts and Design", Pearson Education, Fourth Edition, 2011.
2. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed Systems”, Pearson Education,Second Edition, 2013.

Reference Books

1. H. Attiya and J. Welch, “Distributed Computing: Fundamentals, Simulations, and Advanced Topics”, McGraw-Hill, 2nd Edition, 2006.
2. MukeshSinghal, “Advanced Concepts In Operating Systems”, Tata McGraw-Hill, 2001, Reprint 2008.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
0	**Basic Concepts**	1
1	**Models of computation**	
1.1	Shared memory and message passing systems	2
1.2	Synchronous and asynchronous systems.	1
2	**Logical time and event ordering.**	
2.1	Global state and snapshot algorithms	2
2.2	Mutual exclusion,	1
2.3	Clock synchronization,	2
2.4	Leader election,	1
2.5	Deadlock detection	1
3	**Inter-process communication**	
3.1	Remote Procedure Call,	2
3.2	Message-Oriented Communication,	1
3.3	Stream-Oriented Communication,	1
3.4	Multicast Communication	1
4	**Consistency and Replication**	

4.1	Data-Centric Consistency Models,	2
4.2	Client- Centric Consistency Models,	2
4.3	Replica Management,	1
4.4	Consistency Protocols.	1
5	**Fault tolerance and recovery: basic concepts,**	
5.1	Fault models,	2
5.2	Agreement problems and its applications,	1
5.3	Commit protocols, Voting protocols,	1
5.4	Check pointing and recovery,.	1
5.5	Reliable communication	1
6	**Resource sharing and load balancing**.	1
7	**Distributed File Systems**	
7.1	File service architecture	2
7.2	Case Study: Sun Network File System	1
7.3	Name Services-Introduction-	
7.3.1	Name Services and the Domain Name System-	2
7.4	Directory Services-Case Study: Global Name Service.	2
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPH0	**UBIQUITOUS COMPUTING**	PE	3	0	0	3

Preamble

The course aims at providing conceptual foundation in the area of ubiquitous Computing. Also, the course attempts to provide knowledge on various ubiquitous computing technologies and protocols, so that the students will be able to conceptualize, analyze and design ubiquitous computing systems

Prerequisite

- 14IT430 Computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Describe ubiquitous computing principles, characteristics and fundamental attributes	Understand
CO2:	Employ various embedded controls and Sensor technologies,	Apply
CO3:	Use appropriate data processing approaches and device technologies for given requirements	Apply
CO4:	Identify the requirements to design and build applications in ubiquitous computing context	Analyze
CO5:	Construct novel systems using Context-aware and location-aware computing concepts	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	M										
CO3.	S	M	L									
CO4.	S	S	M	L								
CO5.	S	S	S	S	S							

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2		
Remember	10	10	**MiniProject**	20
Understand	40	40		40
Apply	50	50		40
Analyse	0	0		0
Evaluate	0	0		0
Create	0	0		0

- CO3,CO4 and CO5 may be verified by MiniProject while CO2 may be verified by Assignments

Mini Project examples:

1. Build a simple demo with an input (e.g. RFID reader) and one output (e.g. LCD). Use the built-in controller tool to explore the sensors and actuators.
2. Adopting ubiquitous computing for routine use in healthcare and education
3. Build a content alert service informing all students enrolled into a programme of a suitably connected organization that could have the ability to inform all registered users of any content update on their chosen portable device (Say for example, mobile

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Recall the three areas of ubiquitous computing technologies?
2. Name some applications of ubiquitous computing
3. List the devices used in pervasive computing.
4. Why are the Pervasive Computing Systems called so? Are these systems indeed ubiquitous in terms of their computing elements' presence? Please explain in brief.

Course Outcome 2 (CO2)

1. List the key challenges of choosing a suitable sensor in the context of ubiquitous computing
2. Name some types of sensors
3. Describe the requirements due to mobility and context awareness on ubiquitous data management
4. JINI employs The Java Remote Method Invocation mechanism for a specific functionality. Identify the functionality and explain how does use of the Java Remote Method Invocation help JINI?
5. Why is it required to have the SyncML support at the Client as well as the Server side for allowing ubiquitous data access across a range of connectable devices though synchronization?
6. Explain the significance of the Web-services, if any, in the context of a ubiquitous computing architectures

Course Outcome 3 (CO3)

1. Why and when do the following device technologies receive preference by the designers of portable computing devices which may become part of larger ubiquitous computing solutions:
    a) Organic-LED-based display technology,
    b) Code-morphing software-based architecture,
    c) Ice-based display technologies
    d) Digital Graffiti
2. Explain the factors affecting the choice of power-provisioning technology for pervasive computing environments
3. Explain the significance of the OSGi in the context of a pervasive car information system
4. In the context of Pervasive Computing environments, when shall the following be possible and how: A pervasive healthcare service that would have the ability to monitor patient's conditions and alert the patient as well as the medical /paramedical support team for appropriate action in time.

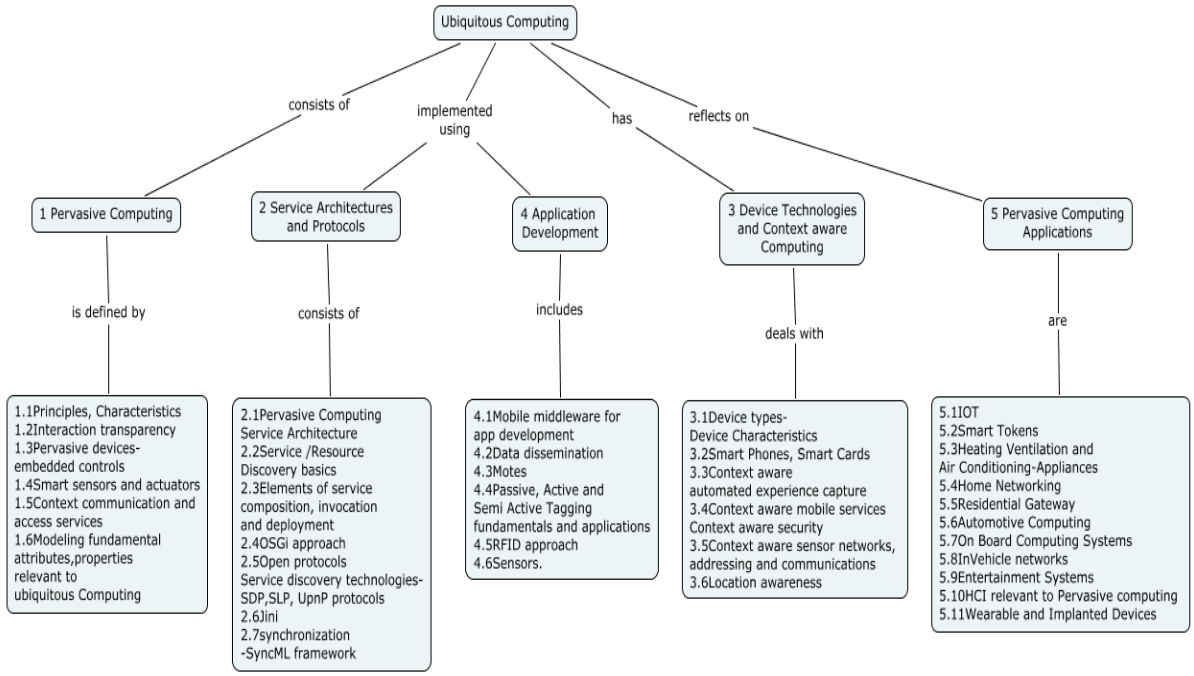
Course Outcome 4(CO4):

1. What would it take to convert an existing student mess and adjoining kitchen area building a pervasive computing environment for its staff and consumers (students)

and why? Please make suitable assumptions where needed and support your answer with the help of a suitable duly labeled diagram, if necessary

2. Which ingredients would go into making an existing convention centre (a modern multi-conference facility) building a pervasive computing environment for its staff and visitors and why? Please make suitable assumptions where needed and illustrate your answer with the help of a suitable duly labeled diagram, if necessary.
3. When and why should a designer of a pervasive computing system for a passenger train require integration of an interconnection Gateway into the embedded information system designed for the train? Please explain in detail with the help of suitable diagrams, where necessary. Please make suitable assumptions where needed.

Concept Map



Syllabus

Pervasive Computing-Principles, Characteristics-Interaction transparency - Pervasive devices-embedded controls.-smart sensors and actuators-Context communication and access services-, Modeling fundamental attributes /properties relevant to ubiquitous Computing

Service architecture and protocols: Pervasive Computing Service Architecture - Service /Resource Discovery basics, Elements of service composition, invocation and deployment - OSGi approach - Open protocols-Service discovery technologies-SDP, Jini, SLP, UpnP protocols–synchronization-SyncML framework

Device technologies and context aware computing: Device types- Device Characteristics- Smart Phones, Smart Cards - Context aware, automated experience capture –Context aware mobile services-Context aware sensor networks, addressing and communications-Context aware security – Location awareness

Application development: Mobile middleware for app development – Data dissemination – Motes - : Passive, Active and Semi Active Tagging fundamentals and applications: the RFID approach, Sensors.

Ubiquitous computing applications: IOT - Smart Tokens - Heating Ventilation and Air Conditioning-Appliances and Home Networking, Residential Gateway, Automotive Computing, On Board Computing Systems, In Vehicle networks, Entertainment Systems-HCI relevant to Pervasive computing - Wearable and Implanted Devices

Text Book

1. Stefan Posland, Ubiquitous Computing- Smart Devices, Environments and Interactions, Wiley, First Edition,2010.
2. SengLoke, "Context Aware Pervasive systems-architectures for a new breed of Pervasive sytems" ,AuerbachPublications,First Edition,2007

Reference Books

1. Frank Adelstein, Sandeepk.s.Gupta, Golden G.Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive computing ,McGraw Hill, First Edition,2005
2. http://ubicomp.in/ubicomptutorials
3. http://link.springer.com/journal/779
4. http://www.peterindia.net/UbiquitousComputingLinks.html

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Pervasive Computing**	
1.1	Principles, Characteristics	1
1.2	Interaction transparency	1
1.3	Pervasive devices-embedded controls	1
1.4	smart sensors and actuators	1
1.5	Context communication and access services	1
1.6	Modeling fundamental attributes /properties relevant to ubiquitous Computing	1
2	**Service architecture and protocols**	
2.1	Pervasive Computing Service Architecture	1
2.2	Service /Resource Discovery basics	1
2.3	Elements of service composition, invocation and deployment	1
2.4	OSGi approach	2
2.5	Open protocols-Service discovery technologies-SDP, SLP, UPnP	2
2.6	JINI	2
2.7	synchronization-SyncML framework	1
3	**Device technologies and context aware computing**	
3.1	Device types- Device Characteristics	1
3.2	Smart Phones, Smart Cards	1
3.3	Context aware, automated experience capture	1
3.4	Context aware mobile services, Context aware security	2
3.5	Context aware sensor networks, addressing and Communication	2
3.6	Location Awareness	1
4	**Application development**	
4.1	Mobile middleware for app development	1
4.2	Data dissemination	1

Module No.	Topic	No. of Lectures
4.3	Motes	1
4.4	Passive, Active and Semi Active Tagging fundamentals and applications	1
4.5	the RFID approach	1
4.6	Sensors	1
5	**Ubiquitous computing applications**	
5.1	IOT	1
5.2	Smart Tokens	1
5.3	Heating Ventilation and Air Conditioning-Appliances	
5.4	Home Networking	1
5.5	Residential Gateway	
5.6	Automotive Computing	
5.7	On Board Computing Systems	1
5.8	InVehicle networks	
5.9	Entertainment Systems	2
5.10	HCI relevant to Pervasive computing	
5.11	Wearable and Implanted Devices	
	Total Lectures	**36**

Course Designers:

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2. Ms.S.ThiruchadaiPandeeswari eshwarimsp@tce.edu

14ITRM0	WIRELESS AD HOC AND SENSOR NETWORKS	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course aims at exploring the fundamental concepts of wireless ad hoc and sensor networks. They also explain the issues of MAC and network layer level. The routing taxonomy of both ad hoc and sensor networks are also discussed. Particularly in sensor networks, architecture, data dissemination, localization, topology control, tasking, control, and databases have been covered. This course also provides research practise through paper presentation in various issues of ad hoc and sensor networks.

Prerequisite

- 14IT440 – Computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	Blooms Level
CO1	Describe the issues, challenges and applications of wireless Ad Hoc and sensor networks	**Understand**
CO2	Explain the architecture, data dissemination, localization, topology control, tasking and control, databases of sensor networks	**Understand**
CO3	Apply the MAC schemes for the given problem in ad hoc networks	**Apply**
CO4	Apply the routing concepts of Ad Hoc and sensor networks for the given networks	**Apply**
CO5	Analyze the performance of various schemes of wireless ad hoc or sensor networks	**Analyze**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											**L**
CO2	**M**	**L**										**L**
CO3.	**S**	**M**	**L**									**L**
CO4.	**S**	**M**	**L**									**L**
CO5.	**S**	**S**	**S**	**S**	**S**	**L**	**M**	**S**	**S**	**S**	**L**	**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Test 3	
Remember	30	30	20	20
Understand	50	50	60	50
Apply	20	20	20	30
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 is attained through paper presentation and is assessed through rubrics.

Paper Presentation Details:

- Team formation (Team size: Maximum 3 & Minimum 2)
- Problem identification and formulation related with the selected issue
- Perform Literature survey
- Choose a set of schemes based on the knowledge acquired through literature
- Conduct simulations through proper tool such as NS2, NS3, GlomoSim, etc.
- Compare the findings through simulation results
- Write a paper with a above knowledge and present the work in either locally (Dept.) or in a Symposium/ Conference
- 2-Reviews need to be conducted for monitoring their work
- Review -1 will be during the middle of the semester
- Review – 2 will be the end of the semester

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List out the applications of ad hoc networks.
2. Recall the challenges of sensor networks
3. Reproduce few issues in designing a sensor network.

Course Outcome 2 (CO2):

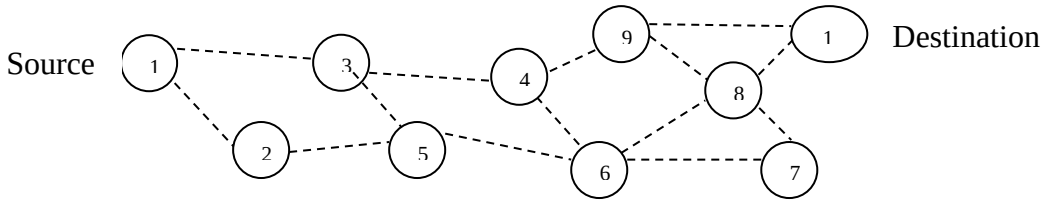
1. Explain the tasks of a network sensor.
2. Describe in details about the data gathering scheme using PEGASIS.
3. Explain the sensor models.
4. Write about querying in sensor networks.

Course Outcome 3 (CO3):

1. Demonstrate hidden and exposed terminal problem with an example.
2. Apply the polling concept for the given network.

Course Outcome 4 (CO4):

1. Find the route between the given source and destination of the following network by applying DSDV.

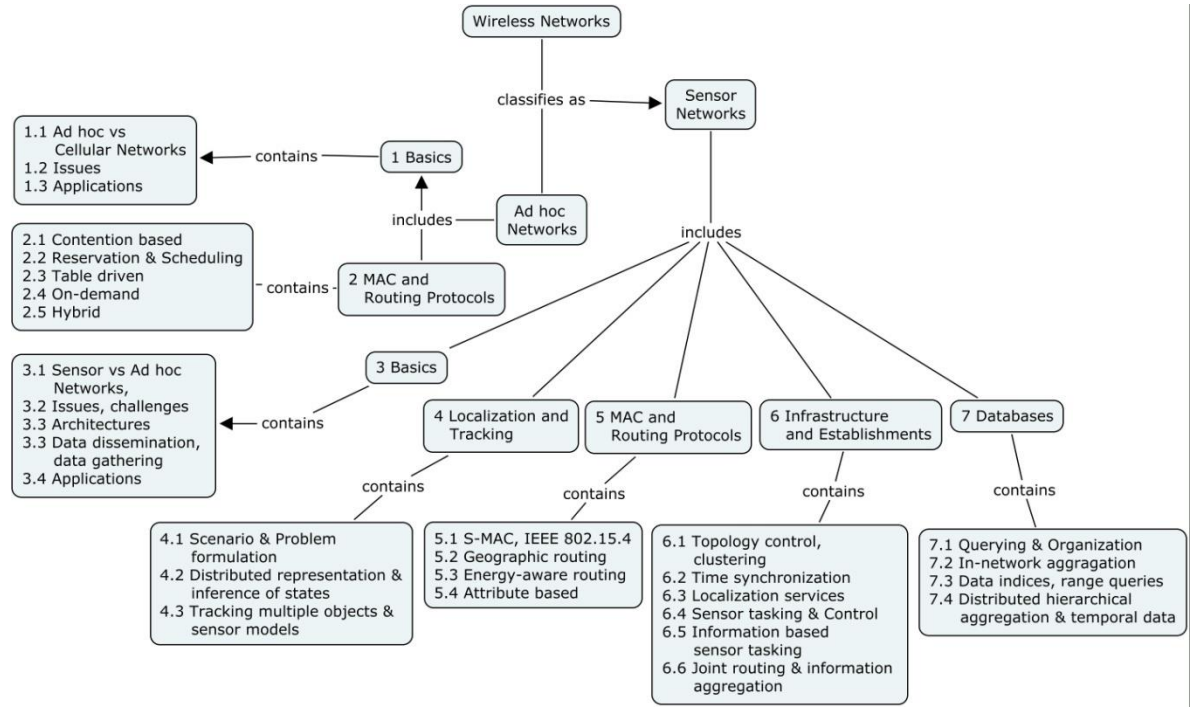


2. Apply DSR for the above network and perform the route discovery process.
3. Construct the routing table for node 4 for the above network using DSDV.

Course Outcome 5 (CO5):

- Paper presentation done through based on their research work in ad hoc and sensor networks issues

Concept Map



Syllabus

Ad Hoc Networks:

Basics: Ad hoc vs Cellular networks, Issues – medium access, routing, multicasting, pricing, transport layer, QoS, energy management, scalability, deployment and security, applications – military, emergency operations, distributed and collaborative computing

MAC and Routing Protocols: MAC Classification - Contention based schemes - MACAW, reservation – DPRMAP, CATAP, scheduling - DPS; Routing Classification - Table Driven – DSDV, WRP, On-Demand – DSR, AODV, Hybrid - ZRP; Multicast Routing: Classification - Tree-Based - MAODV, Mesh-Based - ODMRP

Sensor Networks:

Basics: Ad hoc vs Sensor networks, issues, challenges, architecture, Data Dissemination, Data Gathering, applications – habitat monitoring, tracking chemical plumes, smart transportation, collaborative processing

Localization and Tracking: Scenario, problem formulation – sensing model, collaborative localization, Bayesian state estimation, distributed representation, inference of states, tracking multiple objects, sensor models

MAC and Routing Protocols: S-MAC, IEEE 802.15.4, ZigBee, geographic routing, energy-aware routing, attribute based routing

Infrastructure establishment: Topology control, clustering, time-synchronization, localization services, sensor tasking and control – tasks, roles, information based sensor tasking, joint routing and information aggregation

Databases: Querying, organization, In-Network aggregation, data-centric storage, data indices, range queries, distributed hierarchical aggregation and temporal data

Text Book

1. C.Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks- Architectures and Protocols", Prentice Hall, Second Edition, 2008.
2. F. Zhao and L. J. Guibas, "Wireless Sensor Networks: An Information Processing Approach", Elsevier/Morgan-Kaufmann, First Edition, 2004.

References

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005.
2. Cauligi S. Raghavendra, Krishna Sivalingam and Taieb M. Znati "Wireless Sensor Networks", Springer, 2005.
3. NirupamaBulusu and Sanjay Jha, "Wireless Sensor Networks : A systems perspective", Artech House, 2005.

Course Contents and Lecture Schedule

S.No.	Topic	No. of Lectures
	Ad Hoc Networks	
1	**Basics**	
1.1	Ad hoc vs Cellular networks,	1
1.2	Issues – medium access, routing, multicasting, pricing, transport layer, QoS, energy management, scalability, deployment and security	1
1.3	Applications - military, emergency operations, distributed and collaborative computing	1
2	**MAC and Routing Protocols**	
2.1	MAC Classification - Contention based schemes - MACAW	1
2.2	Reservation – DPRMAP, CATAP, Scheduling - DPS	1
2.3	Routing Classification - Table Driven – DSDV, WRP	2
2.4	On-Demand – DSR, AODV	1
2.5	Hybrid – ZRP	1
	Sensor Networks	
3	**Basics**	
3.1	Ad hoc vs Sensor networks, issues, challenges, architecture	1
3.2	Data Dissemination, Data Gathering	2
3.3	Applications – habitat monitoring, tracking chemical plumes, smart transportation, collaborative processing	1
4	**Localization and Tracking**	
4.1	Scenario, problem formulation – sensing model, collaborative localization, Bayesian state estimation	1
4.2	Distributed representation, inference of states	1
4.3	Tracking multiple objects, sensor models	1
5	**MAC and Routing Protocols**	
5.1	S-MAC, IEEE 802.15.4, ZigBee	2
5.2	Geographic routing	2
5.3	Energy-aware routing	2
5.4	Attribute based routing	2
6	**Infrastructure and Establishment**	
6.1	Topology control, clustering	1

6.2	Time-synchronization	1
6.3	Localization services	1
6.4	Sensor tasking and control – tasks, roles	1
6.5	Information based sensor tasking	2
6.6	Joint routing and information aggregation	2
7	**Databases**	
7.1	Querying, organization	1
7.2	In-Network aggregation, data-centric storage	1
7.3	Data indices, range queries	1
7.4	Distributed hierarchical aggregation and temporal data	1
	Total Lectures	36

Course Designers:

1. Mr.P.Karthikeyan karthikit@tce.edu
2. Ms.T.Manju tmanju@tce.edu

		Category	L	T	P	Credit
14ITPJ0	**OBJECT ORIENTED ANALYSIS AND DESIGN**	PE	3	0	0	3

Preamble

Object Oriented Systems Design and Development is an approach for developing software systems using object oriented analysis and design methods, techniques and tools. The course will enable the students to understand, analyse, design and develop real time software applications using the object oriented methodologies.

Prerequisite

14IT320: Object Oriented Programming

14IT370: Software Engineering

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome	Bloom's Level
CO1:Explain the system, component or process as per needs and specifications	Understand
CO2: Illustrate the object oriented methodologies for the given requirements	Apply
CO3: Use UML diagrams to design real life problems	Apply
CO4: Characterize the classes ,access and physical layers for an application	Analyze
CO5: Experiment the solutions using forward /reverse engineering by tools	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**M**	**L**							**M**	**M**	**L**	**L**
CO3	**M**	**L**			**S**				**M**	**M**	**L**	**L**
CO4	**S**	**S**	**M**	**M**	**S**				**M**	**M**	**L**	**L**
CO5	**S**	**S**	**M**	**M**	**S**				**M**	**M**	**L**	**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	0	20
Understand	40	20	20	30
Apply	40	60	40	50
Analyze	0	0	40	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 will be evaluated by case study.

Guidelines for case study and Realization by open source tools:

Group formation: Students are split into project groups with around 3 members in each group. A team can execute the project using OO approach, design tools and techniques. Project groups are responsible for organising themselves, keeping records on the progress of the project.

Case Study deliverables: It includes requirements Model, Design Model, Deployment and Documentation. At the end of the semester, Object Oriented Design, Implementation - Realization by tools will be done by the teams. They have to present their project along with tools study, submit their report and share their lessons learnt/best practices with other teams.

Some of the activities may include: (but not limited to)

- Introduction to OO life cycle model ,approaches and team formation
- Problem or application identification and Requirements gathering
- Object oriented analysis
- Design UML diagrams using tools and code generation(Froward Engineering)
- Code conversion to design diagrams(Reverse Engineering)
- Documentation

Some of the titles may include: (but not limited to)

- Traffic control system
- E learning system
- Online trading
- Digital library
- Reservation system.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain in Detail about object oriented systems development life cycle.
2. Discuss the different approaches for identifying objects.
3. Enlist the advantages of object orientated development.
4. Differentiate the structured approach and Object Oriented Systems Development approach.

Course Outcome 2 (CO2):

1. Identify the actors, scenarios and use cases for library management systems
   Apply Booch methodology to identify the relationships and cardinalities between the classes. Identify all the objects, methods and attributes in a payroll system. Write a short description of services that each method will provide. Prove that the object oriented data base is the combination of object oriented programming and data base technology.
2. You have been hired as a system analyst for the software company. Your first assignment is to propose a new communication system among employees. Assume that you would like to apply the Rambaugh approach, what would you do at the "what" phase? How would you accomplish it? Should you develop several alternatives or just one? Discuss with several alternatives.
3. Compare and contrast the various object oriented methodologies emphasizing the following issues – phases, diagrams, strengths and weaknesses.

Course Outcome 3(CO3):

1. Draw an activity diagram for lending and returning books to the university library.
2. Illustrate the relationship between a car (that has an engine and a color) and its owners (having a name) in a UML class diagram. A car can have several owners over time, but only one or none owner at a time. Use the cardinalities, role names, attributes and their types. Also, draw the package diagram for the given system
3. Design an application for a customer drawing money from the ATM machine using class, sequence and collaboration diagram.

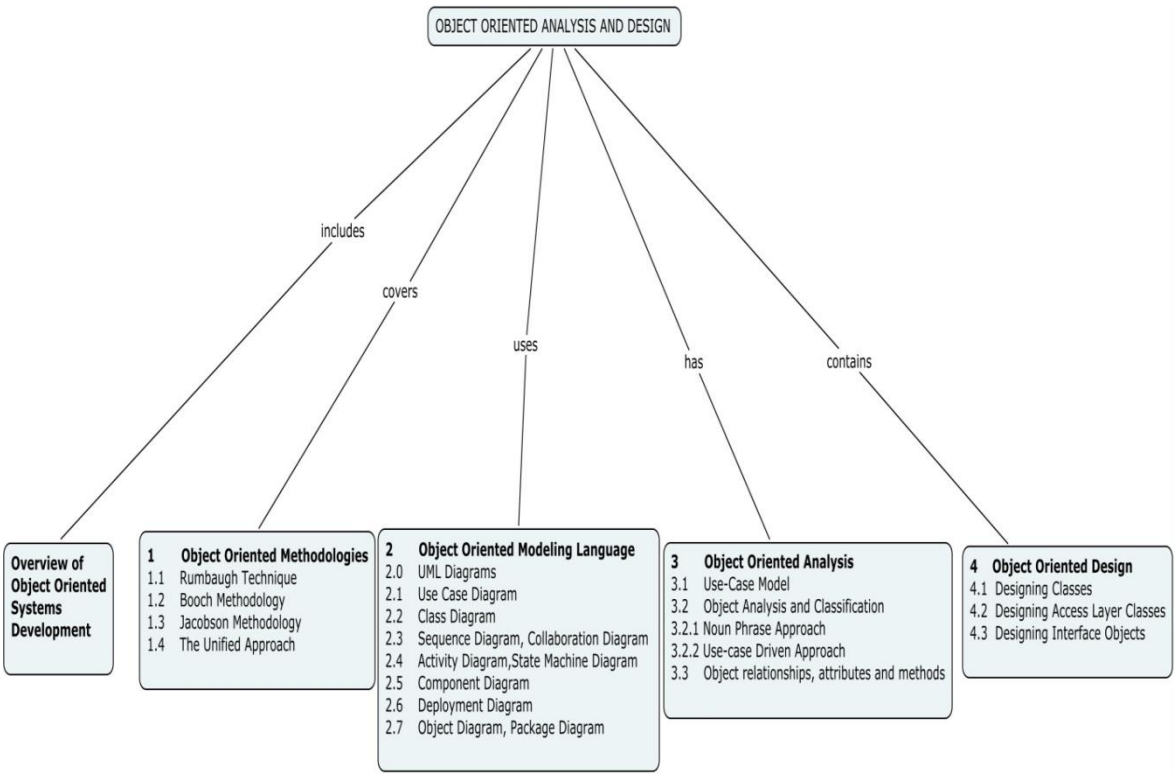
Course Outcome 4(CO4):

1. Construct the model which includes all the classes, access layer and interface objects for the payroll system.
2. Draw a model for all the possible classes, associations and behavior for the "Issue Tracking System" Application. Outline the domain specification to your level of understanding of this domain using the following approaches: -Noun-phrase approach, Common Class Pattern approach, Use case driven approach and CRC approach.
3. Prove that the object oriented data base is the combination of object oriented programming and data base technology.

Course Outcome 5(CO5):

Case Study

Concept Map



Syllabus

Overview of Object Oriented Systems Development: Introduction to Object Oriented Systems- Object Basics- Object Oriented Systems Development Life Cycle

Object Oriented Methodologies: Rumbaugh Technique- Booch Methodology- Jacobson Methodology-The Unified Approach

Object Oriented Modeling Language: UML Diagrams- Use Case Diagram-Class Diagram-Sequence Diagram –Collaboration Diagram- Activity Diagram-State Machine Diagram-Component Diagram-Deployment Diagram-Object Diagram-Package Diagram

Object Oriented Analysis – Use-Case Model- Object Analysis and Classification – Noun phrase approach-Use Case Driven approach - Object relationships, attributes and methods-**Case Study** on code generation using open source tools.

Object Oriented Design – Designing classes -Designing Access Layer Classes- Designing Interface objects- **Case Study** on code to design conversion using tools -**Implementation - Realization by tools**

Textbooks:

1. Ali Bahrami, “Object Oriented Systems Development”, Irwin McGraw Hill,2nd edition, 2004.
2. Grady Booch, “Object Oriented Analysis and Design with Applications”, Pearson Education, 3rd Edition, 2009.

Reference Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education, 2nd edition,2005.
2. Simon Bennet, Steve McRobb, Ray Farmer, “Object oriented Systems Analysis and Design using UML”, McGraw Gill, 2nd edition, 2008.
3. Mike O’Docherty, “Object-Oriented Analysis & Design: Understanding System Development with UML 2.0”, John Wiley & Sons, 2nd edition, 2007.

Course Contents and Lectures schedule

S.No	Topic	No of Lectures
0	**Overview of Object Oriented Systems Development**	
0.1	Introduction to Object Oriented Systems	1
0.2	Object Basics	1
0.3	Object Oriented Systems Development Life Cycle	1
1	**Object Oriented Methodologies**	
1.1	Rumbaugh Technique	1
1.2	Booch Methodology	1
1.3	Jacobson Methodology	1
1.4	The Unified Approach	1
2	**Object Oriented Modeling Language**	
2.0	UML Diagrams	
2.1	Use Case Diagram	1
2.2	Class Diagram	1
2.3	Sequence Diagram, Collaboration Diagram	1
2.4	Activity Diagram, State Machine Diagram	1
2.5	Component Diagram	1
2.6	Deployment Diagram	1
2.7	Object Diagram, Package Diagram	1
3	**Object Oriented Analysis**	
3.1	Use-Case Model	2
3.2	Object Analysis and Classification	1
3.2.1	Noun Phrase Approach	1
3.2.2	Use-case Driven Approach	2
3.3	Object relationships, attributes and methods	3
3.4	**Case Study** on code generation using open source tools	2
4	**Object Oriented Design**	
4.1	Designing Classes	2
4.2	Designing Access Layer Classes	2
4.3	Designing Interface Objects	2
4.4	**Case Study** on code to design conversion using tools	2
4.5	**Implementation - Realization by tools**	3
	Total Lectures	**36**

Course Designers:

1. Ms.M.Nirmala Devi mnit@tce.edu
2. Ms.C.Santhiya csit@tce.edu

		Category	L	T	P	Credit
14ITPK0	**SOFTWARE QUALITY ASSURANCE**	PE	3	0	0	3

Preamble

The course presents methods, tools and procedures that enable to control the quality of software product and provide the student with a foundation for building quality software in a productive manner. The course highlights almost all the elements of the Certified Software Quality Engineer (CSQE) body of knowledge and the need of Software Quality Assurance in the software industries.

Prerequisite

- 14IT370 Software Engineering

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Explain different software quality standards and models	Understand
CO2:	Apply different project management techniques such as configuration management and quality assurance practices during the project life cycle	Apply
CO3:	Apply verification and validation methods such as inspection and testing during the project life cycle	Apply
CO4:	Analyze different software metrics to assess the project quality	Analyze
CO5:	Manage and track software projects based on quality standards	Analyze

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**	**L**									**M**	**M**
CO2	**S**	**M**			**M**						**S**	**M**
CO3	**S**	**M**			**M**						**S**	**M**
CO4.	**S**	**S**	**M**		**M**						**S**	**M**
CO5.					**M**						**S**	**M**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Test 3	
Remember	30	20	20	20
Understand	40	40	40	40
Apply	30	30	30	30
Analyse	0	10	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss the use of Software Quality Standards for the software developer.
2. Describe how the change management needs to be handled for the project.
3. Explain the process of analyzing the software metrics collection.
4. Differentiate Software Inspection and Software Testing.
5. List the software metrics for development and maintenance projects.

Course Outcome 2 (CO2):

1. If the priorities of requirements are changed, as a project leader, how do you plan and implement them without any impact on quality.
2. Apply risk identification and mitigation techniques for the new project.
3. As a quality support engineer, how do you ensure that the software product satisfies all Quality attributes before its delivery?
4. A programmer claims that because only a small proportion of software errors turn into software failures, it is unnecessary to make substantial investments in the prevention and elimination of software errors. Do you agree with this view? Discuss the outcome of accepting these views.

Course Outcome 3 (CO3)

1. Justify how does QC varies from QA.
2. Analyze the need for verification, validation and qualification for the software product.
3. Assume a software development firm is planning for a new development project. As a SQA engineer, suggest and justify suitable SQA methodology for the project.
4. Author of an artefact, say Design Document, need to be present during the review. Compare and contrast this view and justify your answer.
5. “Software testing is to prove that the software package is ready”. Suggest suitable arguments so that this is not the only goal. Justify your answer with other goals.

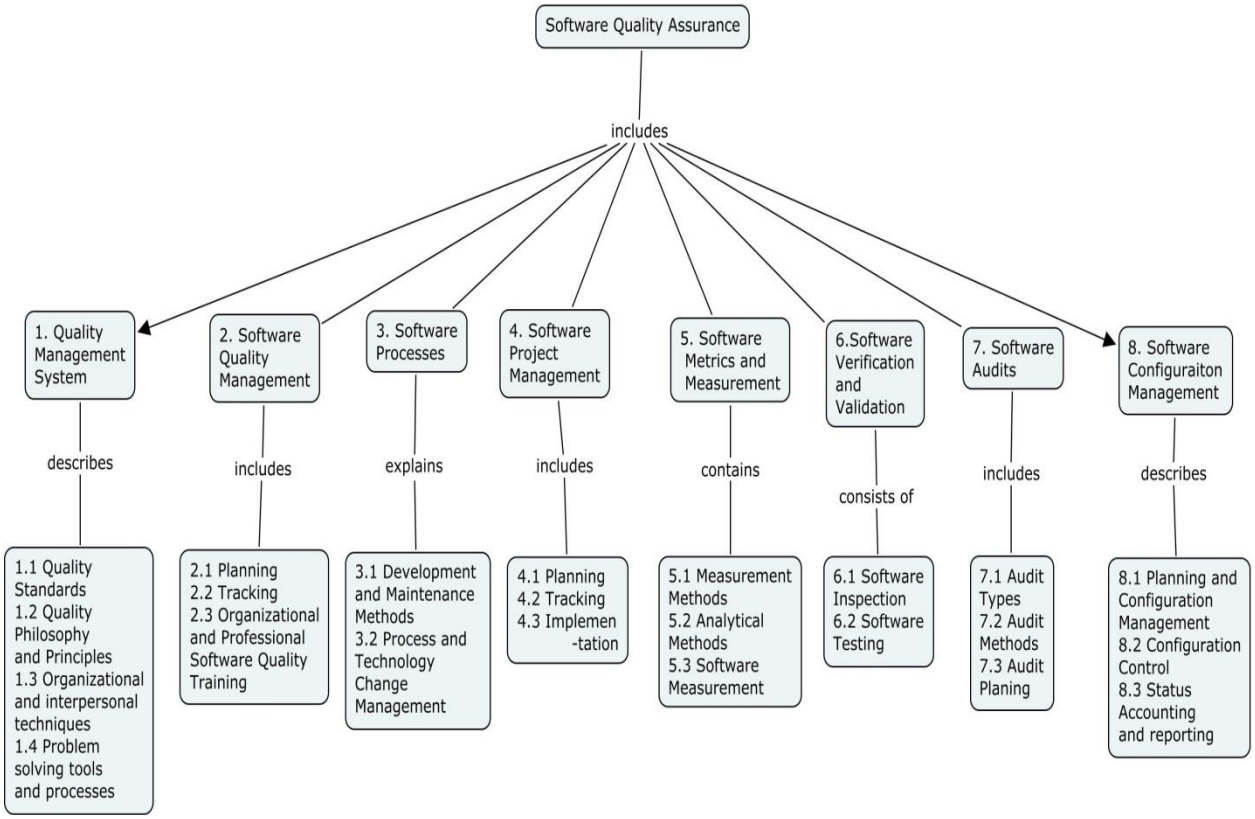
Course Outcome 4 (CO4)

1. Compare and contrast process and project metrics
2. State the steps for setting up and revising the targets for different project metrics.
3. Given the set of project metrics, analyze the status of the project.

Course Outcome 5 (CO5)

1. You’re the project manager for a major software company. You’ve been asked to lead a team that’s developing “next generation” word-processing software. Create a risk table for the project.
2. Identify configurable items for the given application (Online Shopping software)
3. Develop a checklist for use during configuration audits.

Concept Map



Syllabus

Quality Management System – Quality Standards, Quality Philosophy and Principles, Organizational and interpersonal techniques, Problem solving tools and processes - Software Quality Management – Planning, Tracking, Organizational and Professional Software Quality Training

Software Processes – Development and Maintenance Methods, Process and Technology Change Management - Software Project Management – Planning, Tracking, Implementation Software Metrics and Measurement - Measurement Methods, Analytical Methods, Software Measurement

Software Verification and Validation Software Inspection, Software Testing - Software Audits - Audit Types, Audit Methodology, Audit Planning

Software Configuration Management – Planning and Configuration Identification Configuration control, status accounting and reporting.

Text Book

1. Daniel Galin, “Software Quality Assurance”, Pearson Education, 2004.

Reference Books

1.KshirasagarNaik, PriyadharshiTripathy, “Software Testing and Quality Assurance, Theory and Practice”, Wiley, 2008

2. Roger S.Pressman, “Software Engineering A Practitioner’s Approach”, McGraw Hill International Edition.,Sixth Edition, 2007.

Course Content and Lecture Schedule

Module .No	Topic	No of Lectures
1	**Quality Management System**	
1.1	Quality Standards	3
1.2	Quality Philosophy and principles	1
1.3	Organizational and interpersonal techniques	2
1.4	Problem solving tools and processes	1
2	**Software Quality Management**	
2.1	Planning	1
2.2	Tracking	1
2.3	Organizational and Professional SoftwareQuality Training	2
3	**Software Processes**	
3.1	Development and Maintenance methods	2
3.2	Process and Technology Change Management	2
4	**Software Project Management**	
4.1	Planning	1
4.2	Tracking	1
4.3	Implementation	1
5	**Software Metrics and Measurement**	
5.1	Measurement methods	2
5.2	Analytical methods	2
5.3	Software measurement	2
6	**Software Verification and Validation**	
6.1	Software Inspection	1
6.2	Software Testing	2
7	**Software Audits**	
7.1	Audit Types	2
7.2	Audit Methodology	2
7.3	Audit Planning	1
8	**Software Configuration Management**	
8.1	Planning and Configuration identification	2
8.2	Configuration control	1
8.3	Status Accounting and Reporting	1
	Total Lectures	**36**

Course Designers

1. Ms.A.M.Abirami abiramiam@tce.edu
2. Ms.C.Santhiya csit@tce.edu

		Category	L	T	P	Credit
14ITPL0	**SOFT COMPUTING**	PE	3	0	0	3

Preamble

To familiarize the students with soft computing techniques such as Neural networks, fuzzy logic and genetic algorithm and apply the above techniques to real world applications to get the desired optimal solution.

Prerequisite

- Nil

Course Outcomes

On successful completion on the course, the students will be able to

Course Outcomes		Blooms Level
CO1:	Explain the concepts of fuzzy logic and neural networks	Understand
CO2:	Analyse the problem nature and select the method to find solution	Analyse
CO3:	Apply soft computing techniques to real world problems and find the optimal solutions	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**S**	**M**										
CO3.	**S**	**M**	**M**		**M**							**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	10	10
Understand	40	40	30	30
Apply	40	40	40	40
Analyse	0	0	0	0
Evaluate	0	0	20	20
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define fuzzy set and membership function.
2. Distinguish between biological and artificial neuron.
3. Define supervised and unsupervised learning in ANN

Course Outcome 2 (CO2):

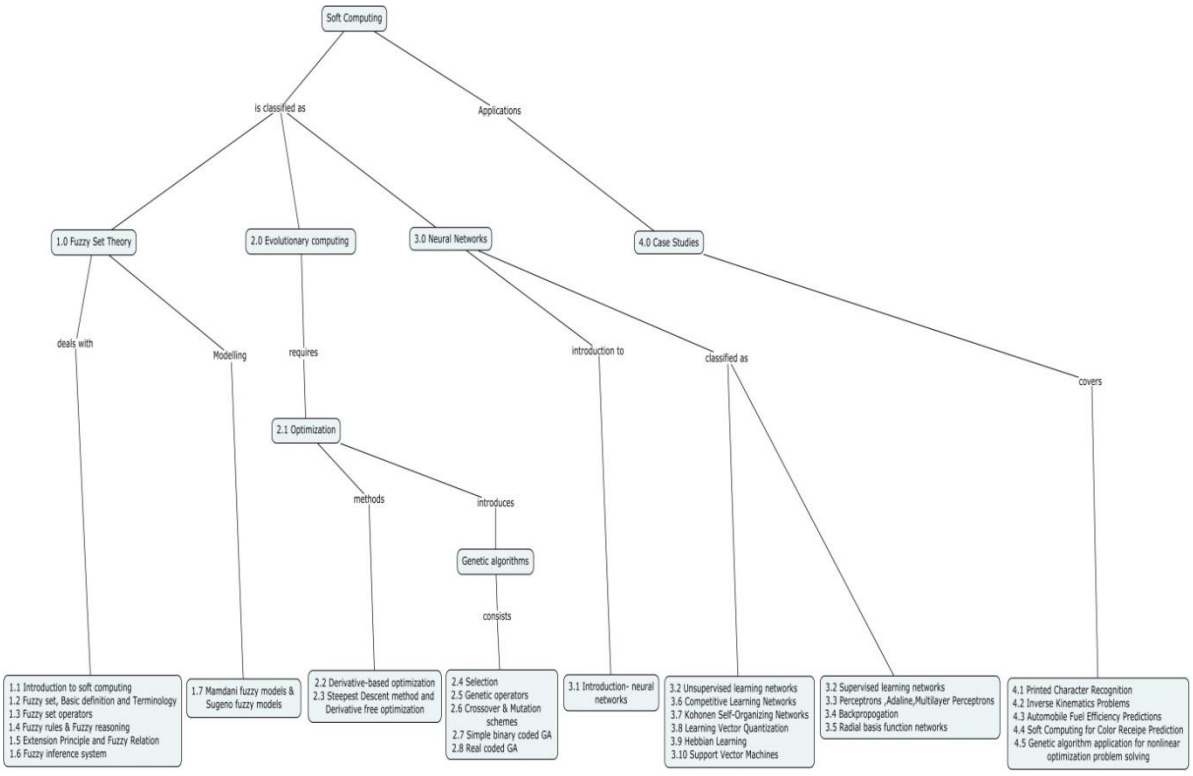
1. Design a McCulloh-Pitts neuron network model for 2-input bipolar and bipolar output
   XOR function with Hebbian learning rule.

2. Explain how radial basis function networks can be used for function approximation.
3. Justify with reasons Sugeno FIS models used for many real world applications

Course Outcome 3(CO3)

1. Evaluate the optimal solution of the given objective function $f(x) = x^2 + 2x - 3$, for one generation in the range $0 < x < 55$. Assume the population size as four, single point crossover, bitwise mutation, Roulette wheel selection and random initialization.
2. Cluster the given four input vectors (1 1 0 0), (0 0 0 1), (1 0 0 0) and (0 0 1 1) into two clusters using Kohonenself organizing map. Take the learning rate as 0.6, Neighborhood radius = 0, and initial weight as [0.2 0.6 0.5 0.9; 0.8 0.4 0.7 0.3].
3. Apply fuzzy logic to printed character recognition. Give and explain the number of inputs, outputs, membership functions and fuzzy if-then rules used for the problem

Concept Map



Syllabus

Fuzzy set theory

Introduction to soft computing - Fuzzy set, Basic definition and Terminology -Fuzzy set operators - Fuzzy Rules and Fuzzy Reasoning - Extension Principle and Fuzzy Relation Fuzzy Inference System -Mamdani Fuzzy Models and Sugeno Fuzzy Models.

Genetic algorithms

Introduction to optimization techniques - Derivative-based optimization - Steepest Descent method and Derivative-free optimization - Genetic Algorithms-Selection - Genetic operators Crossover and Mutation Schemes - Simple binary coded GA -Real coded GA

Neural networks

Introduction -Supervised and Unsupervised Learning Neural Networks - Perceptrons ,Adaline,MultilayerPerceptrons – Backpropogation -Radial Basis Function Networks - Competitive Learning Networks - Kohonen Self-Organizing Networks -Learning Vector Quantization -Hebbian Learning -Support Vector Machines

Case studies

Printed Character Recognition -Inverse Kinematics Problems -Automobile Fuel Efficiency Predictions - Soft Computing for ColorReceipe Prediction - Genetic algorithm application for nonlinear optimization problem solving

Text Book

1. S.N.Sivanandam, S.N.Deepa, “Principles of Soft Computing”, John Wiley & Sons, 2007.
2. J.S.R.Jang,C.T.Sun,E.Mizutani “Neuro Fuzzy & Soft Computing”,PHI 2004,Pearson Education, 2004.

Reference Books

1. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”,McGraw-Hill,1997.
2. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.
3. Simon Haykin, “Neural Networks A Comprehensive Foundation”, PHI, Second Edition,1999.

Course Contents and Lecture Schedule

S.No	Topic	No of Lectures
1.0	**Fuzzy set theory**	
1.1	Introduction to soft computing	1
1.2	Fuzzy set, Basic definition and Terminology	1
1.3	Fuzzy set operators	1
1.4	Fuzzy Rules and Fuzzy Reasoning	1
1.5	Extension Principle and Fuzzy Relation	1
1.6	Fuzzy Inference System	1
1.7	Mamdani Fuzzy Models and Sugeno Fuzzy Models	2
2.0	**Genetic algorithms**	
2.1	Introduction to optimization techniques	1
2.2	Derivative-based optimization	2
2.3	Steepest Descent method and Derivative-free optimization	1
2.4	Genetic Algorithms-Selection	1
2.5	Genetic operators	1
2.6	Crossover and Mutation Schemes	1
2.7	Simple binary coded GA	2
2.8	Real coded GA	1
3.0	**Neural networks**	
3.1	Introduction	1
3.2	Supervised and Unsupervised Learning Neural Networks	1
3.3	Perceptrons ,Adaline,MultilayerPerceptrons	2
3.4	Backpropogation	2
3.5	Radial Basis Function Networks	1
3.6	Competitive Learning Networks	1

3.7	Kohonen Self-Organizing Networks	2
3.8	Learning Vector Quantization	1
3.9	Hebbian Learning	1
3.10	Support Vector Machines	1
4.0	**Case studies**	
4.1	Printed Character Recognition	1
4.2	Inverse Kinematics Problems	1
4.3	Automobile Fuel Efficiency Predictions	1
4.4	Soft Computing for ColorReceipe Prediction	1
4.5	Genetic algorithm application for nonlinear optimization problem solving	1
	Total Lectures	**36**

Course Designers:

1. D.Tamilselvi dtamilselvi@tce.edu
2. Raja Lavanya lavanyachakkaravarthy@gmail.com

		Category	L	T	P	Credit
14ITPM0	**ARTIFICIAL INTELLEGENCE**	PE	3	0	0	3

Preamble

The objective of this subject is to make the students to apply AI techniques using the planning, searching and learning techniques applied to real world problems.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Levels**
CO1:	Explain the agents and environment specification for real world problem	Understand
CO2:	Explore the searching techniques and planning methods for finding the solution	Understand
CO3:	Apply adversarial search and various learning techniques for real world and toy world problems	Apply
CO4:	Apply the learning techniques to support for real world automated taxi driving application.	Apply
CO5	Use various symbolic knowledge representation to Implement basic AI algorithms	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**M**											
CO3	**S**	**M**				**M**						
CO4	**S**	**M**				**M**					**L**	**L**
CO5	**S**	**M**				**M**					**L**	**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	30	20	20	20
Understand	40	40	40	40
Apply	30	40	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the concept of learning using decision trees and neural network approach
2. Describe the concept of Bayesian network in representing knowledge in an uncertain domain.
3. Discuss Forward and Backward Chaining
4. Briefly explain the concepts: Statistical Learning and Explanation Based Learning
5. Explain in detail the different structures of Intelligent agents

Course Outcome 2 (CO2):

1. Explain the concept of Planning with State space search using suitable example
2. What are planning graphs ? Explain the methods of planning and acting in the real world.
3. What is the Structure of an Intelligent Agent, Explain in detail about the 4 types of AGENT PROGRAMS, with neat diagram
4. Explain in detail the steps involved in Problem Formulation with an example, and give the Algorithm for Problem solving Agents

Course Outcome (CO3)

1. Represent the problem of sorting a four-element list as a state space search problem:
    a. Use state transitions that swap two neighboring elements
    b. Use state transitions that swap two neighboring elements, only if they are not in the correct order (like in bubble sort).
2. Use decision tree learning with the weather data and:
    a. Illustrate all possible decision trees (by varying the threshold) and compute the total error (the proportion of misclassified training examples) for each.
    b. Explain on playing tennis on a day described as [outlook=sunny, temp=mild, humidity=normal, wind=weak] using each of the trees. Compare the decisions.
3. Use Naive Bayes and Nearest Neighbor with k=1,3,5 and knnw with k=14) and:
    a. Compute the error of each algorithm on the training data.
    b. Compute the holdout error of each algorithm (and each parameter for knn) by splitting the weather data into 8-example training set and 6-example test set.
    c. Classify [outlook=sunny, temp=mild, humidity=normal, wind=weak] with each algorithm (and each parameter for knn).
    d. Compare (use a table to summarize) results and find out which algorithm performs better.
4. Explain the steps involved in knowledge engineering projects with an example.

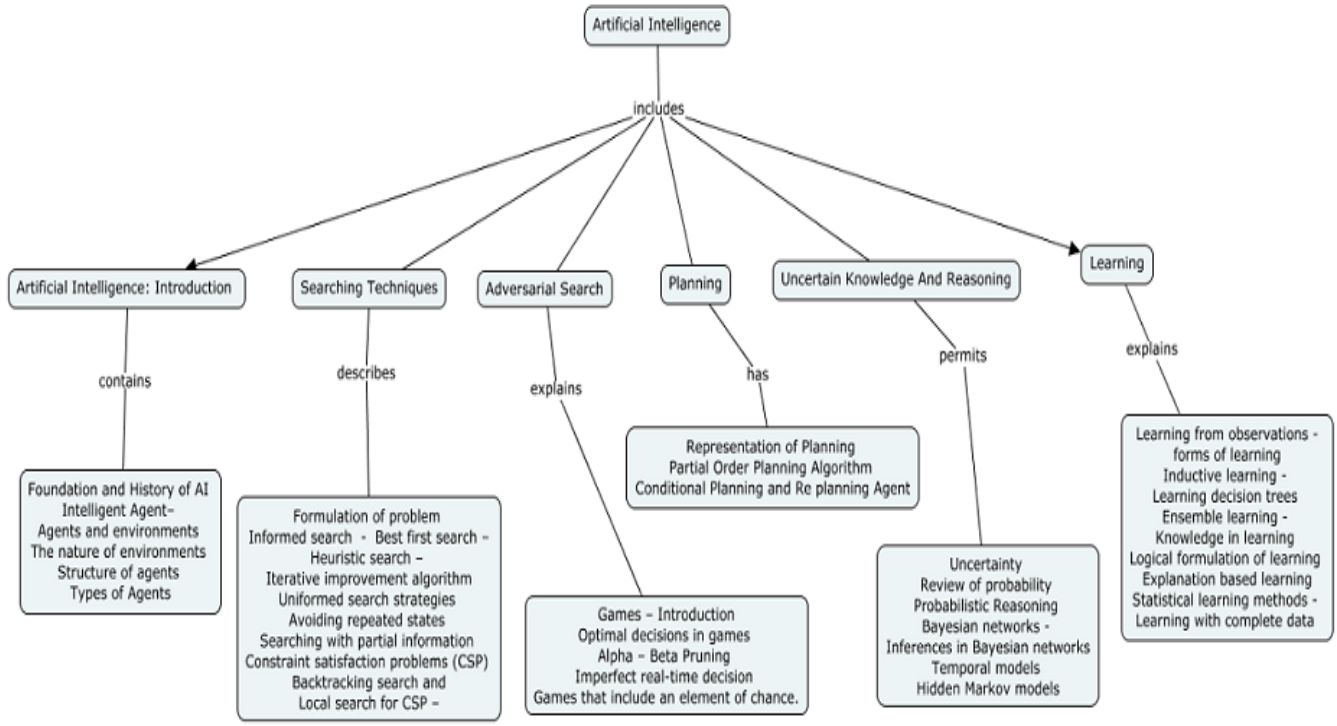
Course Outcome (CO4)

1. Explain in detail about the wumpus world problem with necessary steps and diagrams
2. Describe in detail the steps involved in knowledge engineering with an example of electronics circuit domain
3. Give the algorithm for Forward and Backward chaining and explain with a real world example
4. Describe in detail about Inference by Markov chain Simulation with a real world example

Course Outcome (CO5)

1. Compare the Biological evolution approach with computing algorithms
2. How genetic algorithm differs from other evolutionary approaches
3. Using the example of map coloring , describe the concept of constraint satisfaction
4. Which of the following search algorithms are complete and which are optimal? Justify the same
   •C= complete but not optimal
   •O= optimal but not complete
   •B= both complete and optimal
   •N= neither complete nor optimal
   (a)breadth-first search
   (b)depth-first search
   (c)depth-limited search
   (d)iterative deepening search

Concept Map



Syllabus

Artificial Intelligence: Introduction - Foundation and History of AI – Intelligent Agent– Agents and environments - The nature of environments – structure of agents – Types of agents

Searching Techniques Formulation of problem - informed search –Best first search – heuristic search – Iterative improvement algorithm – uniformed search strategies - avoiding repeated states – searching with partial information - Constraint satisfaction problems (CSP) – Backtracking search and Local search for CSP – Structure of problems- Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision – games that include an element of chance.

Planning: Representation of Planning – Partial Order Planning Algorithm – Conditional Planning and Re planning Agent

Uncertain Knowledge and Reasoning: Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks – inferences in Bayesian networks – Temporal models – HiddenMarkovmodels

Learning - Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanation based learning – Statistical learning methods - Learning with complete data - Learning with hidden variable - EM algorithm – Reinforcement Learning – Cognitive Learning – Case studies - real time applications using learning techniques

Text Book

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education / Prentice Hall of India, 3rd Edition,2009.

Reference Books

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill,2nd Edition, 2008.
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education, 2008.

S. No.	Topic	No. of Lectures
1	**Artificial Intelligence: Introduction**	
1.1	Foundation and History of AI	2
1.2	Intelligent Agent– Agents and environments	1
1.3	The nature of environments	1
1.4	Structure of agents	1
1.5	Types of Agents	2
2	**Searching Techniques**	
2.1	Formulation of problem	1
2.2	Informed search - Best first search –	2
2.3	Heuristic search – Iterative improvement algorithm	1
2.4	Uniformed search strategies	1
2.5	Avoiding repeated states	1
2.6	Searching with partial information	1
2.7	Constraint satisfaction problems (CSP)	1
2.8	Backtracking search and Local search for CSP	1
3	**Adversarial Search**	
3.1	Games – Introduction	1
3.2	Optimal decisions in games	1
3.3	Alpha – Beta Pruning	2
3.4	Imperfect real-time decision	1
3.5	Games that include an element of chance.	1
4	**Planning**	
4.1	Representation of Planning	1
4.2	Partial Order Planning Algorithm	1
4.3	Conditional Planning and Re planning Agent	1

S. No.	Topic	No. of Lectures
5	**Uncertain Knowledge And Reasoning**	
5.1	Uncertainty	1
5.2	Review of probability	1
5.3	Probabilistic Reasoning	1
5.4	Bayesian networks - Inferences in Bayesian networks	2
5.5	Temporal models	1
5.6	Hidden Markov models	2
6	**Learning**	
6.1	Learning from observations - forms of learning	1
6.2	Inductive learning - Learning decision trees	2
6.3	Ensemble learning - Knowledge in learning	1
6.4	Logical formulation of learning	1
6.5	Explanation based learning	1
6.6	Statistical learning methods - Learning with complete data	2
6.7	Learning with hidden variable	1
6.8	EM algorithm – Reinforcement Learning – Cognitive Learning	1
6.9	Case studies- real time applications using learning techniques	2
	Total Lectures	**36**

Course Designers:

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2. Ms.M.Ayswharya Devi ayswharyadevi@gmail.com

14ITPN0	PRINCIPLES OF COMPILER DESIGN	Category	L	T	P	C
		PE	3	0	0	3

Preamble

This course introduces the fundamental concepts in compiler design. The topic includes scanner, parser designs and its implementation, program shape analysis, intermediate code generation, and back-end optimizations such as instruction selection and scheduling. The goal is to familiarize students with basic structure of a typical compiler, compiler phases and implementation consequences of the choices made in programming language design.

Prerequisite

- 14IT310 Discrete Mathematics.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Describe the compiler architecture with the register allocation and Identify the phases of compiler	Understand
CO2:	Distinguish formal and practical properties of different approaches to parsing	Understand
CO3:	Practise various techniques to parse the source code	Apply
CO4:	Construct a Parser, generate IR code and Perform peephole optimization on the IR	Apply
CO5:	Implement a basic complier for any language	Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											
CO2	**M**											
CO3.	**M**	**L**										**M**
CO4.	**S**	**S**	**M**			**M**			**M**	**L**		**S**
CO5.	**S**	**S**	**S**	**S**	**M**	**M**			**S**	**M**		**S**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	50	20	0	20
Understand	30	40	30	30
Apply	20	40	70	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of CO5 will be partially evaluated by Assignments

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define Compiler. State the phases of the Compiler with a neat diagram.
2. State the Compiler Construction Tools andexplain its specifications in detail.
3. Quote the error recovery actions in a lexical analyser
4. List the algebraic properties of regular expressions?

Course Outcome 2 (CO2):

1. Define the role of input buffer in lexical analysis.
2. Predict the function of syntax directed translation.
3. Express the three address code to the statement A=-B*(C+D).
4. Explain code motion.

Course Outcome 3(CO3)

1. Describe the basic block and explain the role of flow graph in basis blocks
2. Estimate the cost of an instruction?
3. Establish a technique to map the names to values?
4. Predict what does the operator-precedence parser do to the input id + id * id.

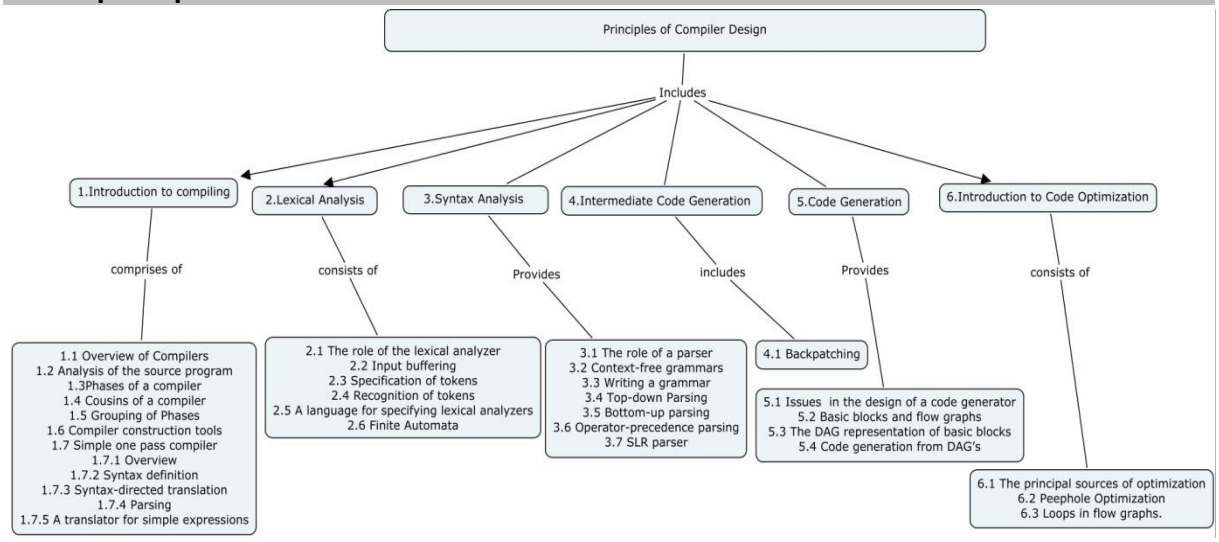
Course Outcome 4 (CO4)

1. Calculate the regular expression to generate identifiers by giving examples.
2. Construct NFA, DFA for the expression aa* ¦ bb*
3. Discuss SLR parsing and construct SLR parsing table for the grammar.
   E->E+T/T
   T->T*F/F
   F->(E)/id
4. Construct the predictive parser for the following grammar.
   S->a|↑|(T)
   T->T,S|S
   Apply the necessary algorithms and define FIRST and FOLLOW. Show the behaviour of the parser in the sentences:
   (i)(a,(a,a))
   (ii)(((a,a),↑,(a),a).
5. Construct the generation of intermediate code with control-flow analysis, dataflow analysis with simple code optimizations and peephole optimisation.

Course Outcome 5 (CO5)

1. Design and implement a significant portion of a compiler for any programming language.
2. Apply all the techniques in practice to construct a fully working compiler for a object-oriented language.
3. Implement a parser such as a bottom-up SLR parser without using Yacc/Bison or any other compiler-generation tools.

Concept Map



Syllabus

Introduction to compiling: Compilers-Analysis of the source program-Phases of compiler-Cousins of a compiler-Grouping of Phases- Compiler construction tools- A Simple one pass compiler-Overview-syntax definition-syntax-directed translation- Parsing- A translator for simple expressions.

Lexical Analysis-Role of the lexical analyser-Input buffering-Specification of tokens-Recognition of tokens-A language for specifying lexical analysers- Finite Automata.

Syntax Analysis -The role of a parser- Context-free grammars-Writing a grammar-Top-down Parsing-Bottom-up parsing-Operator-precedence parsing-SLR parser.

Intermediate Code Generation- Back patching.

Code Generation-Issues in the design of a code generator- basic blocks and flow graphs-The DAG representation of basic blocks-Code generation from DAG's.

Introduction to Code Optimization- The principal sources of optimization-Peephole Optimization- Loops in flow graphs.

Text Book

1. Alfred V. Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman ,"Compilers: Principles, Techniques, and Tools",Pearson New International , 2013.

Reference Books

1. Steven S. Muchnick: Advanced Compiler Design & Implementation – Harcourt Asia, Morgan Kaufmann,Second Edition, 2001.
2. J. P. Bennet: Introduction to Compiling Techniques, Tata McGraw-Hill Publishing-Second Edition, 2002**.**

Course Contents and Lecture Schedule

S.No	Topics	No.of lectures
1.	**Introduction to Compiling**	
1.1 1.2	Overview of Compilers Analysis of the source program	1
1.3 1.4	Phases of a compiler Cousins of a compiler	1
1.5 1.6	Grouping of Phases Compiler – construction tools	1
1.7	A Simple one pass compiler	
1.7.1 1.7.2 1.7.3	Overview syntax definition syntax	1
1.7.4 1.7.5	Parsing A translator for simple expressions	1
2.	**Lexical Analysis**	
2.1	The role of the lexical analyzer	1
2.2 2.3 2.4 2.5	Input buffering Specification of tokens Recognition of tokens A language for specifying lexical analyzers	2
2.6	Finite Automata	4
3.	**Syntax Analysis**	
3.1 3.2	The role of a parser Context-free grammars	3
3.3	Writing a grammar	1
3.4	Top-down Parsing	1
3.5	Bottom-up parsing	1
3.6 3.7	Operator-precedence parsing SLR parser	4
4.	**Intermediate Code Generation**	
4.1	Backpatching	4
5.	**Code Generation**	
5.1	Issues in the design of a code generator	1
5.2	Basic blocks and flow graphs	2
5.3	The DAG representation of Basic Block	2
5.4	Code generation from DAG's	1
6	**Introduction to Code Optimisation**	
6.1	The principal sources of optimization	1
6.2	Peephole Optimisation	2
6.3	Loops in flow graphs	1
	Total Lectures	**36**

Course Designers:

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2. Ms.A.Divya divyait@tce.edu

14ITRN0	DESIGN AND ANALYSIS OF ALGORITHMS	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course enables the student to understand various algorithm design techniques, and know how to apply those techniques to various problems. The analysis of various algorithms can be performed and select the best algorithm for solving a problem.

Prerequisite

- 14IT340 – Data Structures and Algorithms

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Explain the different Asymptotic notations.	Understand
CO2:	Construct algorithms for various computing problems.	Apply
CO3:	Demonstrate the algorithms of various types such as Brute force, Divide and Conquer, Dynamic programming, Greedy, Backtracking and, Branch and bound.	Apply
CO4:	Analyse the time and space complexity of an algorithm.	Analyse
CO5:	Examine the type of problem(NP hard, NP complete) for the given scenario.	Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**											**L**
CO2	**S**	**M**										**S**
CO3	**S**	**M**										**L**
CO4	**S**	**S**										
CO5	**S**	**S**										**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	20	30	30
Apply	40	50	60	60
Analyse	10	10	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Check whether the $1000n^2 + 50n = O(n^2)$ is correct .
2. Explain the different asymptotic notations.
3. Infer that $2n^2 = O(n^2)$.

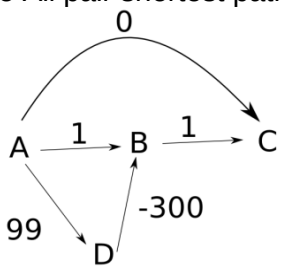
Course Outcome 2(CO2)

1. Write both recursive and iterative algorithm, to compute the binomial co-efficient $\binom{n}{m}$,

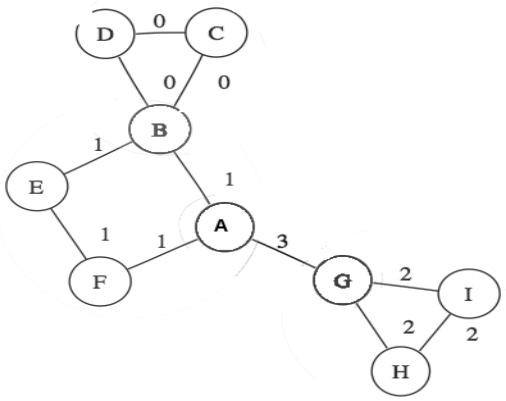
   where $\binom{n}{0} = \binom{n}{n} = 1$. Hint:- $\binom{n}{m} = \frac{n!}{m!(n-m)!}$
2. Write an algorithm for finding the summation on n series.
3. Explain the different ways of representing an algorithm.

Course Outcome3 (CO3)

1. Find the All pair shortest path in the given graph using dynamic programming.



2. Consider the following instance of "Job Sequencing problem with deadlines". Let n=4, (p1,p2,p3,p4)=(200,20,30,55) and (d1,d2,d3,d4)=(2,1,2,1). Exhibit all the feasible solutions for this problem. Identify if greedy approach succeeds in finding optimal solution.
3. Illustrate the algorithm for finding the articulation points of an undirected graph by starting the search
   a. at node A
   b. at node D



Course Outcome 4 (CO4)

1. Explain the methods for finding the complexity of a recursive algorithm can be calculated.
2. Solve the recurrence

$$t_n = \begin{cases} nif n = 0,1, or\ 2 \\ 5t_{n-1} - 8t_{n-2} + 4t_{n-3} otherwise \end{cases}$$

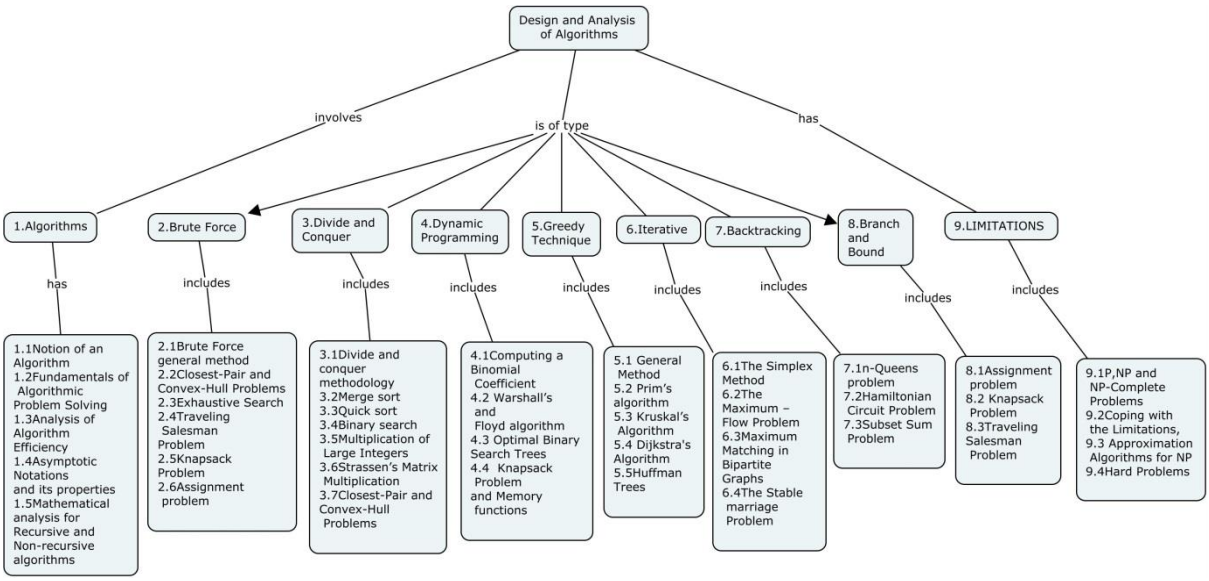
3.Solve the recurrence relation using change of variable technique. Verify your answer using master theorem. Express in θ.

1. $T(n) = \begin{cases} 2 & if\ n = 1 \\ 5T\left(\frac{n}{2}\right) + 3n & n > 1 \end{cases}$

Course Outcome 5(CO5)

1. Prove that the TSP problem is a hard problem.
2. Explain Cooks theorem.
3. Show that m-coloring problem is an decision problem.

Concept Map



Syllabus

Algorithms: Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Analysis of Algorithm Efficiency – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.

Brute force: Brute Force - Closest-Pair and Convex-Hull Problems-Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem.

Divide-and-conquer: Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex-Hull Problems.

Dynamic programming: Computing a Binomial Coefficient – Warshall's and Floyd algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions.

Greedy technique: General method-Prim's algorithm- Kruskal's Algorithm-Dijkstra's Algorithm-Huffman Trees.

Iterative improvement: The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.

Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem.

Branch and bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem.

Limitations of algorithm power :P, NP and NP-Complete Problems--Coping with the Limitations - Approximation Algorithms for NP – Hard Problems .

Text Book

1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.

Reference Books

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI Learning Private Limited, Third Edition, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

Course Contents and Lectures schedule

S. No.	Topic	No. of Lectures
1	**Algorithms**	
1.1	Notion of an Algorithm	1
1.2	Fundamentals of Algorithmic Problem Solving	1
1.3	Analysis of Algorithm Efficiency	1
1.4	Asymptotic Notations and its properties	1
1.5	Mathematical analysis for Recursive and Non-recursive algorithms	1
2	**Brute force**	
2.1	Brute Force general method	1
2.2	Closest-Pair and Convex-Hull Problems	1
2.3	Exhaustive Search	1
2.4	Traveling Salesman Problem	1
2.5	Knapsack Problem	1
2.6	Assignment problem	1
3	**Divide-and-conquer**	
3.1	Divide and conquer methodology	1
3.2	Merge sort	1
3.3	Quick sort	1
3.4	Binary search	1
3.5	Multiplication of Large Integers	1
3.6	Strassen's Matrix Multiplication	1
3.7	Closest-Pair and Convex-Hull Problems	1
4	**Dynamic programming**	
4.1	Computing a Binomial Coefficient	1
4.2	Warshall's and Floyd algorithm	1
4.3	Optimal Binary Search Trees	1
4.4	Knapsack Problem and Memory functions	1

S. No.	Topic	No. of Lectures
5	**Greedy technique**	
5.1 5.2	General Method Prim's algorithm	1
5.3 5.4	Kruskal's Algorithm Dijkstra's Algorithm-Huffman Trees	1
6	**Iterative improvement**	
6.1	The Simplex Method	1
6.2	The Maximum – Flow Problem	1
6.3	Maximum Matching in Bipartite Graphs	1
6.4	The Stable marriage Problem	1
7	**Backtracking**	
7.1	n-Queens problem	1
7.2	Hamiltonian Circuit Problem	1
7.3	Subset Sum Problem	1
8	**Branch and bound**	
8.1	Assignment problem	1
8.2	Knapsack Problem	1
8.3	Traveling Salesman Problem	1
9	**Limitations of algorithms**	
9.1	P,NP and NP-Complete Problems Coping with the Limitations	1
9.2	Approximation Algorithms for NP Hard Problems	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPP0	**SEMANTIC WEB**	PE	3	0	0	3

Preamble

The main objective of the course is to introduce semantic web and technologies for knowledge based real world applications using ontologies and semantic web tools. The course focuses on the development of ontologies using tools and mark-up languages.

Prerequisite

- 14IT440 Data Base Management Systems

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Recognize the role of ontology in representing the data model and the use of ontologies in the particular application	Understand
CO2:	Appraise the use of semantic web tools in knowledge based applications	Understand
CO3:	Appreciate the development methodology and the application of ontologies for different domains	Apply
CO4:	Differentiate the use of ontology mark-up languages for representing the data and rule languages for inferring the knowledge	Apply
CO5:	Use ontology editor tool and query languages for manipulating the data and inferring the knowledge	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3.	**M**											
CO4.	**M**				**M**							**L**
CO3.	**M**				**M**							
CO4.	**M**				**M**							**L**
CO5.	**M**				**S**							**M**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	50	50	40	40
Understand	50	50	40	40
Apply	0	0	20	20
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss about the medical ontologies.
2. Write about the classification of ontologies
3. Describe the role of WordNet in extracting the information from Web sources.
4. Describe the role of ontologies in web search.

Course Outcome 2 (CO2):

1. Discuss the semantic web layer architecture.
2. Ontologies are suitable for representing meta data. Justify.
3. RDF and RDF-S are more powerful than XML in representing knowledge. Justify.
4. Discuss about ontology middleware and reasoning tools.

Course Outcome 3 (CO3)

1. Describe ontology learning algorithm used in the semantics based web search
2. Discuss how ontologies can be used for eLearning application
3. Create domain ontology for a particular application.

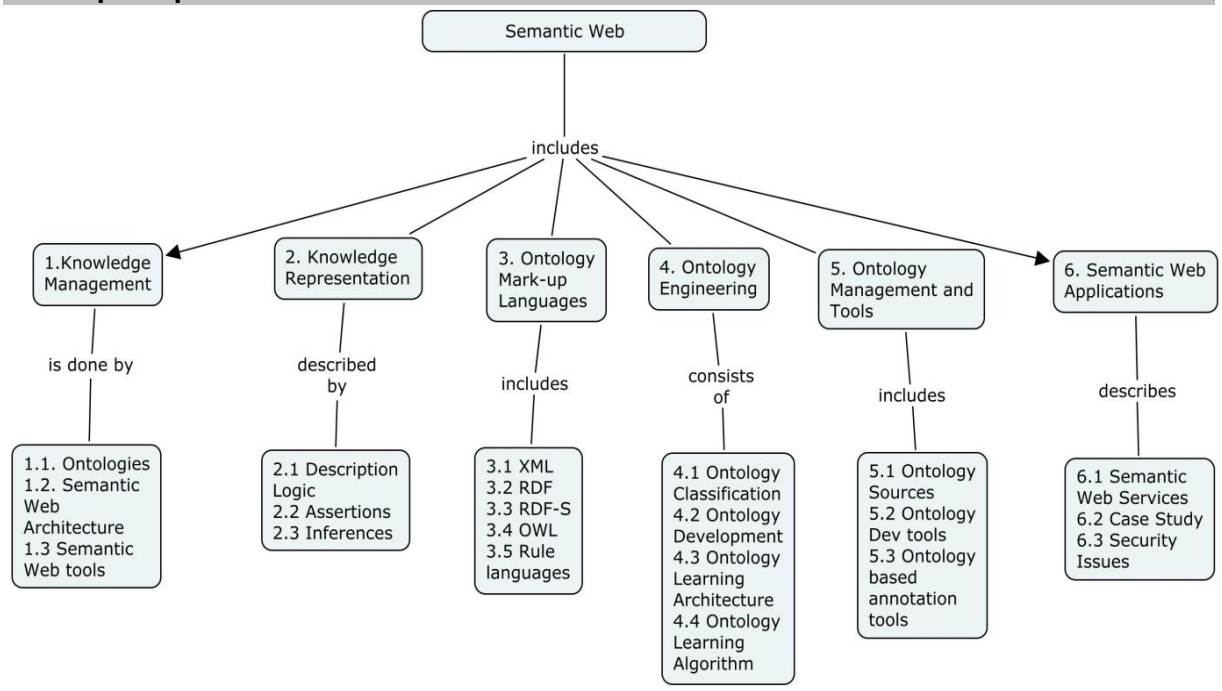
Course Outcome 4 (CO4)

1. Model part of a library in RDF Schema: books, authors, publishers, years, copies and dates. Write some statements in RDF, and query them using RQL
2. Write an ontology about geography: cities, countries, capitals, borders and states
3. Using RDF / RDF-S, express the fact that all mathematics courses are taught by David Billington only (no other lecturer may be involved). Also express the fact that the mathematics courses are exactly the courses taught by David Billington.

Course Outcome 5 (CO5)

1. Explain OWL syntax to demonstrate Symmetric property and Functional Property with a suitable example.
2. Propose a combination of nonmonotonic rules with ontologies.
3. Write ontologies for a particular application using OWL

Concept Map



Syllabus

Knowledge Management Role of ontologies – Semantic Web Architecture – Semantic Web tools

Knowledge Representation Description Logic – Assertions – Inferences

Ontology Mark-up Languages XML – RDF – RDF Schema – OWL – Rule languages

Ontology Engineering Ontology Classification – Ontology Development – Ontology Learning Architecture – Ontology Learning Algorithm

Ontology Management and Tools Ontology Sources – Ontology Development tools – Ontology based annotation tools

Semantic Web Applications Semantic Web Services – Case study – Security Issues

Text Book

1. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer", The MIT Press, 2004.
2. Alexander Maedche and Steffen Staab, "Ontology Learning for the Semantic Web", Springer, 2002.

References

1. Dr John Davies, Professor Dieter Fensel, Professor Frank van Harmelen, "Towards the Semantic Web Ontology-driven Knowledge Management", John Wiley, 2003.
2. KrainK.Breitman, Marco Antonio Casanova, Walter Truszkowski, "Semantic Web Concepts, Technologies and Applications", Springer, 2010.
3. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez – Lopez, "Ontological Engineering: with examples from the areas of knowledge Management", Springer, 2004.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecture Hours
1.	**Knowledge Management**	
1.1	Role of Ontologies	1
1.2	Semantic Web Architecture	1
1.3	Semantic Web tools	2
2.	**Knowledge Representation**	
2.1	Description Logic	2
2.2	Assertions	2
2.3	Inferences	2
3	**Ontology Mark-up Languages**	
3.1	XML	1
3.2	RDF	2
3.3	RDF Schema	1
3.4	OWL	2
3.5	Rule Languages	2
4	**Ontology Engineering**	
4.1	Ontology Classification	2
4.2	Ontology Development	2
4.3	Ontology Learning Architecture	2

Module No.	Topic	No. of Lecture Hours
4.4	Ontology Learning Algorithm	2
5	**Ontology Management and Tools**	
5.1	Ontology Sources	1
5.2	Ontology Development Tools	2
5.3	Ontology based annotations tools	1
6	**Semantic Web Applications**	
6.1	Semantic Web Services	1
6.2	Case study for specific domain	4
6.3	Security Issues	1
	Total Lectures	**36**

Course Designers:

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3. A.Sheik Abdullah asait@tce.edu

		Category	L	T	P	Credit
14ITPQ0	**HUMAN COMPUTER INTERACTION**	PE	3	0	0	3

Preamble

Human-computer interaction is an interdisciplinary field that integrates theories and methodologies from computer science, cognitive psychology, design, and many other areas. The course is intended to introduce the students to the basic concepts of human-computer interaction. It will cover the basic theory and methods that exist in the field. The course will unfold by examining design and evaluation. Case studies are used throughout the readings to exemplify the methods presented and to lend a context to the issues discussed. The students will gain principles and skills for designing and evaluating interactive systems

Prerequisite

- None

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Describe user Interface and Design patterns.	Understand
CO2:	Explain the basics of human and computational abilities and their limitations.	Understand
CO3:	Choose appropriate HCI techniques to design applications	Apply
CO4:	Select GUI tools to develop user interfaces	Apply
CO5:	Compare the different user interfaces for the given scenario	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**						**M**					
CO2	**M**						**M**					
CO3.	**S**	**M**	**L**		**S**	**M**		**M**	**M**	**M**	**M**	**M**
CO4.	**S**	**M**	**L**		**S**			**M**	**M**	**M**		**M**
CO5.	**S**	**M**	**L**		**S**			**M**	**M**	**M**		**M**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	50	20	20	40
Apply	30	60	60	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO3 is partially evaluated by Assignment.
CO4 and CO5 are completely evaluated by Assignment.

Assignment details:

1) Students are divided into batches of two.
2) They are asked to choose their own domain of interest
3) For that domain, they should apply the HCI techniques to design good user interfaces keeping in the mind the psychological and computational abilities.
4) Compare the various interfaces using various evaluation techniques for betterment.

Assignment topics:

1) Choose Hierarchical model to implement a user interface for an application,
2) Use Linguistic model to develop a screen for the customer
3) Evaluate the various interfaces using empirical methods for further improvement.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List down the advantages of interactive systems?
2. What is proactive inhabitation?
3. List out the various factors that can limit the speed of interactive system?
4. What are the most common interface styles?
5. What is the distinction between a process oriented and a structure oriented design rationale technique?

Course Outcome 2 (CO2):

1. What are the qualities of good interface design?
2. What are mental models, and why are they important in interface design?
3. How do you think fast memory devices and processors have influenced in HCI?
4. Is there any successful natural language interfaces?
5. Differentiate local and global structure?

Course Outcome 3 (CO3)

1. A typical computer system is comprised of a QWERTY keyboard, a mouse, and a color screen. There is usually some form of loudspeaker as well. What sort of input does the keyboard support? What sort of input does the mouse support? Arethese adequate for all possible applications? If not, to which areas are they most suited? Do these areas map well onto the typical requirements for users of computer systems?
2. How can design rationale benefit interface design and why might it be rejected by design teams?
3. A user has a word-processor and a drawing package open. The word-processor's window is uppermost. The user then clicks on the drawing window. The drawing window then pops to the front. Describe in detail the things that the window manager and applications perform during the processing of the mouse click in the above scenario. Explain any assumptions you make about the kind of window manager or application toolkits that are being used.

Course Outcome 4 (CO4)

1. Define the roles of windowing systems?
2. Discuss the need for separating the semantics of the application and its interface?

3. Examine the things are required to perform cognitive walkthrough?
4. What are the factors governing the choice of an appropriate evaluation methods for different interactive systems
5. Recognize any experiments to test the properties of (i) short-term memory (ii) long term memory. Try out your experiments on your friends. Are your results consistent with the properties?

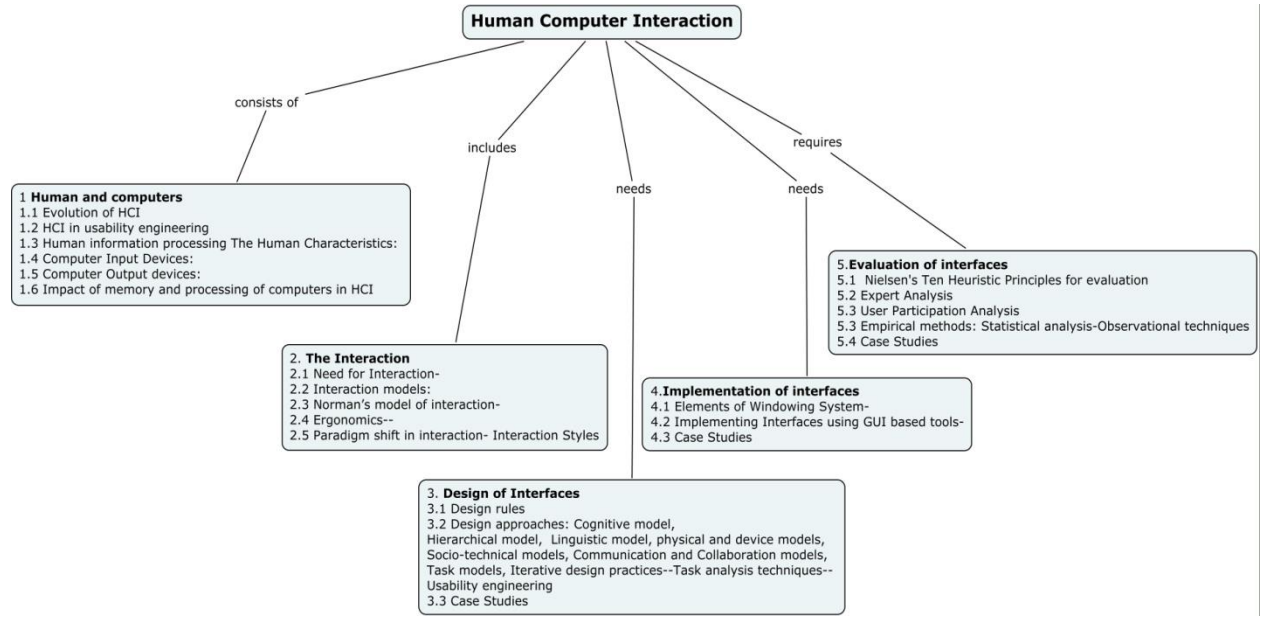
Course Outcome 5 (CO5)

1. Scrolling is an effective means of browsing through a document in a window that is too small to show the whole document. Compare the different interactive behavior of the following two interaction objects to implement scrolling:
   a. A scrollbar is attached to the side of the window with arrows at the top and bottom. When the mouse is positioned over the arrow at the top of the screen (which points up), the window frame is moved upwards to reveal a part of the document above/before what is currently viewed. When the bottom arrow is selected, the frame moves down to reveal the document below/after the current view.
   b. The document is contained in a textual interaction object. Pressing the mouse button in the text object allows you to drag the document within the window boundaries. You drag up to browse down in the document and you drag down to browse up.

2 Imagine you have been asked to produce a prototype for the diary system. What would be an appropriate prototyping approach to enable you to test the design using the usability metrics specified, and why?

3 Imagine you are designing a new interface to a document-processing package, which is to use icons for presentation. You are considering two styles of icon design and you wish to know which design will be easier for users to remember. One set of icons uses naturalistic images, the other uses abstract images. How might you design an experiment to help you decide which style to use?

Concept Map



Syllabus

Human and computers- Evolution of HCI- HCI in usability engineering- Human information processing: input and output channels, human memory, and processing of information- The Human Characteristics: Emotion, individual differences, psychology- Computer Input Devices: Text entry devices, pointing devices, and 3D interaction devices- Computer Output devices: Screen displays, digital papers, virtual Reality, and 3D visualization - Impact of memory and processing of computers in HCI.

The Interaction -- Need for Interaction- Interaction models: Norman's model of interaction-Ergonomics--Paradigm shift in interaction- Interaction Styles

Design of Interfaces-Interaction design basics-Design rationale- Design rules: Shneiderman's eight golden rules--Design approaches: Cognitive model, Hierarchical model, Linguistic model, physical and device models, Socio-technical models, Communication and Collaboration models, Task models, Iterative design practices--Task analysis techniques--Usability engineering--Case Studies using GUI based Tools: Designing an interface for Nuclear Reactor/ an online banking system/ a chat application in mobile

Implementation of interfaces- Elements of Windowing Systems-Implementing Interfaces using GUI based tools- Case Studies using GUI based Tools: Implementing the Interface for Nuclear Reactor/ an online banking system/ a chat application in mobile

Evaluation of interfaces- Nielsen's Ten Heuristic Principles for evaluation- Expert Analysis-User Participation Analysis-Empirical methods: Statistical analysis-Observational techniques- Case Studies using GUI based Tools: Evaluating Interfaces of Nuclear Reactor/ an online banking system/ a chat application in mobile

Text Book

1. Alan Dix, Janet Finley, Gregory D. Abowd, Russell Beale: Human- Computer Interaction, Pearson Education,Third Edition, 2004
2. Nielsen, Jakob. Usability Engineering. Morgan Kaufmann, 1993. ISBN: 9780125184069.
3. Mullet, Kevin, and Darrell Sano. Designing Visual Interfaces: Communication Oriented Techniques. Prentice Hall, 1994.

Reference Books

1. John M. Carroll: Human- Computer Interaction In the New Millennium, Pearson Education, ACM Press, 2002
2. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
3. http://nptel.ac.in/courses/106103115/1

Course Contents and Lecture Schedule

S. No.	Topic	No. of Lectures
1	**Human and computers**	
1.1	Evolution of HCI	1
1.2	HCI in usability engineering	1
1.3	Human information processing: input and output channels, human memory, and processing of information	1
1.4	The Human Characteristics: Emotion, individual differences, psychology.	1

1.5 1.6	Computer Input Devices: Text entry devices, pointing devices, and 3D interaction devices Computer Output devices: Screen displays, digital papers, virtual Reality, and 3D visualization	1
1.7	Impact of memory and processing of computers in HCI	1
2.	**The Interaction**	
2.1	Need for Interaction	1
2.2	Interaction models: Norman's model of interaction	2
2.3	Ergonomics	1
2.4	Paradigm shift in interaction	1
2.5	Interaction Styles	1
3.	**Design of Interfaces**	
3.1 3.2	Interaction design basics Design rationale	1
3.3	Design rules: Shneiderman'seight golden rules	1
3.4	Design approaches: Cognitive model, Hierarchical model, Linguistic model, physical and device models, Socio-technical models, Communication and Collaboration models, Task models, Iterative design practices	3
3.5	Task analysis techniques	1
3.6	Usability engineering	1
3.7	Case Studies: Designing an interface for Nuclear Reactor/ an online banking system/ a chat application in mobile	2
4	**Implementation of interfaces**	
4.1	Elements of Windowing System	1
4.2	Implementing Interfaces using GUI based tools	2
4.3	Dialogue Toolkits (UIMS)	1
4.4	Case Studies: Implementing the Interface for Nuclear Reactor/ an online banking system/ a chat application in mobile	2
5	**Evaluation of interfaces**	
5.1	Nielsen's Ten Heuristic Principles for evaluation	1
5.2	Expert Analysis	2
5.3	User Participation Analysis	1
5.4	Empirical methods: Statistical analysis	1
5.5	Observational techniques	1
5.6	Case Studies: Evaluating Interfaces of Nuclear Reactor/ an online banking system/ a chat application in mobile	2
	Total Lectures	**36**

Course Designers:

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14ITPR0	COMPUTER VISION	Category	L	T	P	Credit
		PE	2	1	0	3

Preamble

The objective of the course is make the students to understand the image processing techniques applied for computer vision real time applications

Prerequisite

- NA

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes:		Bloom's Level
CO1:	Explain low level processing of image and transformation techniques applied to images	Understand
CO2:	Explain the feature extraction, segmentation and object recognition methods.	Understand
CO3:	Apply vision techniques to real time applications.	Apply
CO4:	Apply cognitive vision application to track the driver eye movement	Apply
CO5	Apply ANN Model for diagnosing tumour	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO5.	**L**											
CO6.	**L**	**L**										
CO3	**L**	**L**	**M**									
CO4	**L**	**L**	**M**								**L**	**L**
CO5	**L**	**L**	**L**								**L**	**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	20	20
Understand	40	40	40	40
Apply	30	40	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List the steps involved in Fourier transform for the conversion of spatial image
2. What are the roles of LOG detector as the local feature detector in an image

3. How histogram equalisation supports for getting the uniform histogram of the image

Course Outcome 2 (CO2):

1. Compare region based and edge based segmentation
2. Define the Histogram benefits
3. Why we choose Fourier Transform for image processing

Course Outcome 3(CO3)

1. Apply CBIR technique for real time medical image to diagnose the brain disease
2. Apply PCA for Face Recognition application

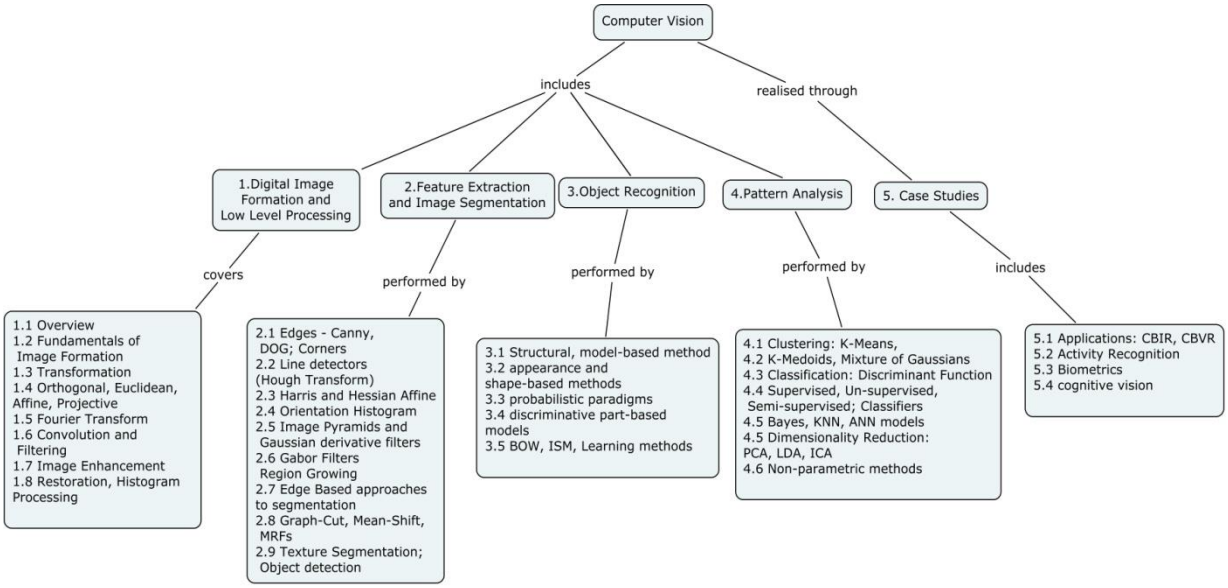
Course Outcome 4(CO4)

1. Define Bayes Theorem
2. Discuss the techniques involved in biometric real time classification
3. Role of cognitive vision in industry applications

Course Outcome 5(CO5)

1. Analyse supervised and semi supervised technique
2. How CBIR used for face finding application

Concept Map



Syllabus

Digital Image Formation and low-level processing: Overview, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

Feature Extraction and Image Segmentation : Edges - Canny, LOG, DOG; Corners, Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, Image Pyramids and Gaussian derivative filters, Gabor Filters - Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

Object Recognition: Structural, model-based, appearance and shape-based methods; probabilistic paradigms; discriminative part-based models; BOW, ISM, Learning methods.

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

Case Studies: Applications: CBIR, CBVR, Activity Recognition, Biometrics, cognitive vision.

Text Book

1. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited,2011

Reference Books

1. R.C. Gonzalez and R.E. Woods," Digital Image Processing", Addison- Wesley, 1992

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**Digital Image Formation and low-level processing**	
1.1	Overview	1
1.2	Fundamentals of Image Formation	2
1.3	Introduction Transformation	1
1.4	Orthogonal, Euclidean, Affine, Projective	2
1.5	Fourier Transform	1
1.6	Convolution and Filtering	1
1.7	Image Enhancement	1
1.8	Restoration, Histogram Processing	2
2	**Feature Extraction and Image Segmentation**	
2.1	Edges - Canny, LOG, DOG; Corners	1
2.2	Line detectors (Hough Transform)	1
2.3	Harris and Hessian Affine	1
2.4	Orientation Histogram	1
2.5	Image Pyramids and Gaussian derivative filters	1
2.6	Gabor Filters - Region Growing	1
2.7	Edge Based approaches to segmentation	1
2.8	Graph-Cut, Mean-Shift, MRFs	1
2.9	Texture Segmentation; Object detection.	1
3	**Object Recognition:**	
3.1	Structural, model-based method	1
3.2	appearance and shape-based methods	1
3.3	probabilistic paradigms	1
3.4	discriminative part-based models	1
3.5	BOW, ISM, Learning methods.	1
4	**Pattern Analysis:**	
4.1	Clustering: K-Means,	1
4.2	K-Medoids, Mixture of Gaussians	1
4.3	Classification: Discriminant Function	1

Module No.	Topic	No. of Lectures
4.4	Supervised, Un-supervised, Semi-supervised; Classifiers	1
4.5	Bayes, KNN, ANN models	1
4.6	Dimensionality Reduction: PCA, LDA, ICA	1
4.7	Non-parametric methods	1
5	**Case Studies:**	
5.1	Applications: CBIR, CBVR,	1
5.3	Activity Recognition	1
5.4	Biometrics	1
5.5	cognitive vision	1
	Total Lectures	**36**

Course Designers:

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OUTCOME BASED EDUCATION

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

PROGRAMME ELECTIVES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech Information Technology Degree Programme

List of Electives
(For the candidates admitted from 2014-15 onwards)

Sl. No.	Sub Code	Subject Name
	Data Engineering	
1.	14ITPS0	Information Retrieval
2.	14ITPT0	Decision Support Systems
3.	14ITPU0	Database Administration
	Information Security and Management	
4.	14ITPV0	Cloud Security
5.	14ITPW0	Advanced Cryptography
6.	14ITRQ0	Ethical Hacking
7.	14ITPY0	Information Security Auditing and Management
	Distributed System	
8.	14ITPZ0	Internet of Things
9.	14ITRA0	Service Oriented Architecture
10.	14ITRB0	Parallel Computing
11.	14ITRC0	Software defined Networks
12.	14ITRD0	Network Administration
	Software Design and Development	
13.	14ITRE0	Software Testing
14.	14ITRF0	C# and .NET Framework
	Hardware/ Support Courses	
15.	14ITRG0	Multi-core Architecture
16.	14ITRH0	Embedded Systems
17.	14ITRI0	Robotics
18.	14ITRJ0	Theory of Computation
19.	14ITRK0	Numerical Methods
20.	14ITRL0	Operations Research

PE : Program Elective

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

		Category	L	T	P	Credit
14ITPS0	**INFORMATION RETRIEVAL**	PE	3	0	0	3

Preamble

The course focuses on the representation, storage, organization of, and access to information items using various IR algorithms and techniques. The course emphasizes the building of information retrieval systems for documents so as to retrieve relevant or useful information from them.

Prerequisite

- Any Programming Language
- 14IT340 - Data Structures and Algorithms
- 14IT510 – Probability and Statistics

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	**Bloom's Level**
CO1:	Use information retrieval modelling techniques for Corpus documents	Apply
CO2:	Apply query processing techniques to locate relevant information from the large collection of data	Apply
CO3:	Apply information retrieval techniques for textual data	Apply
CO4:	Evaluate different information retrieval systems for web search tasks	Analyze
CO5:	Develop simple information retrieval system for applications like personalization and recommender systems, search engines, etc	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	L										
CO2.	S	L										
CO3.	S	L										
CO4.	S	M	M		S			M	S	S		S
CO5.	S	M	M		S			M	S	S		S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	10	10	10
Understand	40	30	30	30
Apply	40	40	40	50
Analyze	0	20	20	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Find the inverted index that would be built for the given set of documents.
2. Draw the term-document incidence matrix for the given document collection.
3. Consider the table of term frequencies for the set of documents. Compute tf-idf weights for the given terms.
4. Compute Euclidean normalized document vectors for each of the documents.
5. An IR system returns 8 relevant documents and 10 non relevant documents from the set of 20 documents. Compute precision, recall and F-measure values.

Course Outcome 2 (CO2)

1. Explain how the Boolean query x and not y be handled.
2. Explain the principled approaches for assigning weights to query terms.
3. Suppose the query tem is not in the document collection, how would one adapt hte vector space representation to handle this situation?
4. State three reasons why relevance feedback has been little used in web search.
5. Positive feeback is likely to be more useful than negative feedback. Justify.

Course Outcome3 (CO3)

1. Describe the differences between vector space and probabilistic model for the information retrieval of text documents.
2. Describe the differences between vector space relevance feedback and probabilistic relevance feedback for the information retrieval of text documents.
3. Classify the given set of documents using Naive Bayes theorem.
4. Describe document clustering for text data.

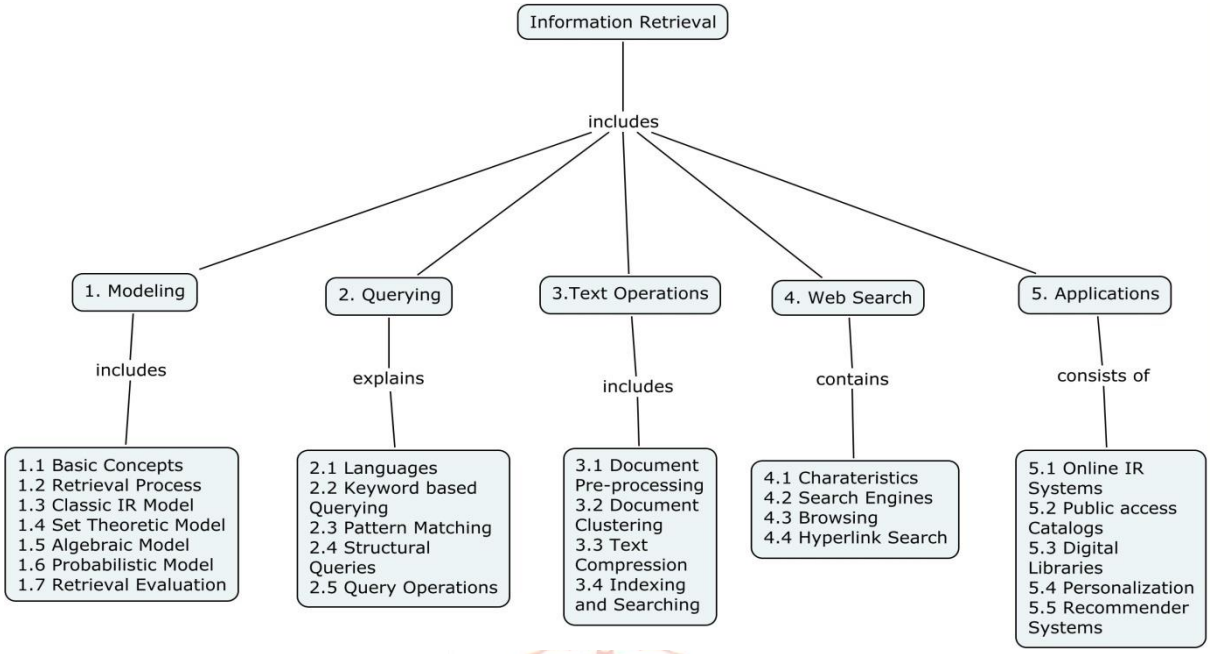
Course Outcome 4 (CO4)

1. Analyze the reasons why relevance feedback has been little used in web search.
2. Write down the transition probability matrix of given figure.
3. A user uses links to traverse forward and back button to move backward. Justify whether Markov chain can be used as a model in this case.
4. Show that the page rank of every page is at least α/N.
5. Write a routine to compute the PageRank for the given data.

Course Outcome 5 (CO5)

1. Development of simple IR system for a given domain.

Concept Map



Syllabus

Modeling Basic Concepts – Retrieval Process – Classic Information Retrieval Models – Boolean Model – Vector Model – Probabilistic Model – Set Theoretic Model – Fuzzy Set Model – Extended Boolean Model - Algebraic Model – Vector Space Model – Latent semantic indexing model – Alternative Probabilistic Model – Bayesian Networks – Retrieval Evaluation

Querying Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis

Text Operations Document Preprocessing – Clustering – Text Compression - Indexing and Searching – Inverted files – Boolean Queries – Structural queries

Web Search Characteristics – Search Engines – Browsing – Hyper link search

Applications Online IR systems – Online Public Access Catalogs – Digital Libraries – Personalization – Recommender systems

Text Book

1. Ricardo Baeza-Yates, BerthierRibeiro-Neto, “Modern Information Retrieval”, Pearson Education, 2nd edition, 2011.

References

1. Christopher D. Manning, PrabhakarRaghavan, and HinrichSchütze, “An Introduction to Information Retrieval”, Cambridge University Press, Cambridge, England, 2007.
2. http://www.cs.utexas.edu/users/mooney/ir-course
3. http://www.ischool.washington.edu/efthimis/courses/lis544
4. http://www.informationretrieval.or
5. http://www.sims.berkeley.edu/~hearst/irbook/

Course Contents and Lecture Schedule

Module No	Topic	No.of Lectures
1	**Modeling**	
1.1	Basic Concepts	1
1.2	Retrieval Process	1
1.3	Classic Information Retrieval Models	
1.3.1	Boolean Model	2
1.3.2	Vector Model	2
1.3.3	Probabilistic Model	2
1.4	Set Theoretic Models	
1.4.1	Fuzzy Set Model	1
1.4.2	Extended Boolean Model	1
1.5	Algebraic Models	
1.5.1	Vector Space Model	2
1.5.2	Latent Semantic Indexing Model	2
1.6	Alternative Probabilistic Models	
1.6.1	Bayesian Networks	1
1.7	Retrieval Evaluation	2
2	**Querying**	
2.1	Languages	1
2.2	Keyword based querying	1
2.3	Pattern Matching	1
2.4	Structural Queries	1
2.5	Query Operations	
2.5.1	User Relevance Feedback	2
2.5.2	Local and Global Analysis	3
3	**Text Operations**	
3.1	Document Pre-processing	2
3.2	Document Clustering	1
3.3	Text Compression	1
3.4	Indexing and Searching	
3.4.1	Inverted files	1
3.4.2	Boolean queries	1
3.4.3	Structural queries	1
4	**Web Search**	
4.1	Characteristics	1
4.2	Search Engines	2
4.3	Browsing	2
4.4	Hyperlink search	2
5	**Applications**	
5.1	Online IR Systems	2
5.2	Online public access catalogs	2
5.3	Digital Libraries	2
5.4	Personalization	2
5.5	Recommender Systems	2
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPT0	**DECISION SUPPORT SYSTEM**	PE	3	0	0	3

Preamble

The course aims at introducing decision support systems by demonstrating their relationship with other computer-based information systems and characterizing its features for business intelligence.

Prerequisite

- 14IT540- Data Mining

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcome	**Blooms Level**
CO1:	Describe foundations, definitions, characteristics, and capabilities of DSS and Business Intelligence	Understand
CO2:	Evaluate decisions suggested for the given business scenario	Analyze
CO3:	Illustrate the processes involved in designing and building a DSS	Apply
CO4:	Develop user interfaces for Decision Support Systems	Apply
CO5:	Develop simple DSS for the given application using suitable models	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M						L					
CO2	S	S	L									
CO3.	S	M	L									
CO4.	S	M	L		S			S	S	S	M	L
CO5.	S	S	L		S			S	S	S	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Mini Project	
Remember	20	10	10	20
Understand	20	20	10	30
Apply	40	50	40	40
Analyse	20	0	40	10
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of course outcomes 2 - 5 is evaluated through mini project which provide solutions to complex real world issues by using techniques and methodologies in Decision Support System.

Mini project details: (team size: 3)

1. Problem identification.
2. Problem analysis and design.
3. Process involved in developing DSS.

4. Implementation of the work
5. Integrate the modules and present the results in a team.
6. Document the above process.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain how decisions are supported
2. List the guidelines can be learned from this vignette about developing DSS?
3. State the various aspects of decision making?
4. Differentiate optimization with sub optimization.
5. Explain the difference between a principle of choice and the actual choice phase of decision making.
6. List the phases involved in the data warehouse delivery process.

Course Outcome 2 (CO2):

1. Analyze why the decision making is so complex in today's business environment discuss with any real time problem.
2. Compare decision making versus problem solving. Determine whether or not it makes sense to distinguish the two from one another and provide decision making system for any expert system.

Course Outcome 3 (CO3):

1. Apply the mental models that to be utilized in decision making in involving many qualitative factors
2. Demonstrate how can modern IT tools help synthesize qualitative and quantitative factors in decision making
3. Describe at least 3 advantages that expert systems offer organizations thatwould otherwise have to employ human experts

Course Outcome 4 (CO4):

1. Compare the normative and descriptive approaches to decision making.
2. Illustrate why do we exhibit bounded rationality when problem solving?
3. Demonstrate Why a production system model was used to implement the rule based expert systems.

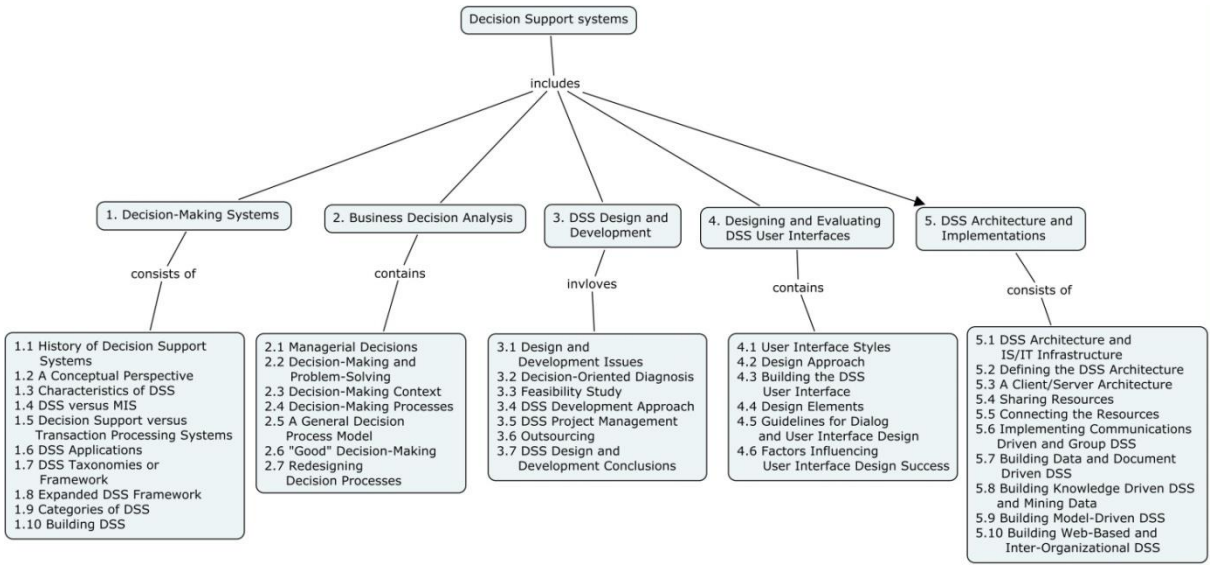
Course Outcome 5 (CO5):

1. Describe the phases of designing an expert system? What term is used to call the Whole process.
2. Demonstrate a process of DKNF – Domain Key Normal Form.
3. Illustrate the main three ways to use competency models in Business Intelligence.

Course Outcome 6 (CO6):

1. Experiment the Medical Agent-based IDSS with the process flow diagram.
2. Demonstrate the implications on NICU agent-based IDSS Research.
3. Criticize the taxonomies of Decision Support System with an example illustration.

Concept Map



Syllabus

Decision-Making Systems -History of Decision Support Systems - A Conceptual Perspective -Characteristics of DSS - DSS versus MIS - Decision Support versus Transaction Processing Systems - DSS Applications - DSS Taxonomies or Framework - Expanded DSS Framework - Categories of DSS -Building DSS

Business Decision Analysis -Managerial Decisions-Decision-Making and Problem-Solving - Decision-Making Context- Decision-Making Processes - A General Decision Process Model - "Good" Decision-Making - Redesigning Decision Processes

DSS Design and Development - Design and Development Issues- Decision-Oriented Diagnosis - Feasibility Study - DSS Development Approach - DSS Project Management - Outsourcing - DSS Design and Development Conclusions

Designing and Evaluating DSS User Interfaces - User Interface Styles- Design Approach- Building the DSS User Interface - Comments on Design Elements - Guidelines for Dialog and User Interface Design- Factors Influencing User Interface Design Success

DSS Architecture and Implementations-DSS Architecture and IS/IT Infrastructure - Defining the DSS Architecture - A Client/Server Architecture - Sharing Resources- Connecting the Resources - Implementing Communications-Driven and Group DSS - Building Data and Document-Driven DSS - Building Knowledge-Driven DSS and Mining Data - Building Model-Driven DSS - Building Web-Based and Inter-Organizational DSS

Text Book

1. Power, D. J. Decision Support Systems: Concepts and Resources for Managers, Green wood Publishing Corporation, 2002.
2. Efraim Turban, Ramesh Sharda, and DursunDelen. 2011. Decision Support and Business Intelligence Systems (9th edition). Prentice-Hall. (9780136107293).

Reference Books

1. Decision Support Systems: Myth or Reality, C. Carlson; Elsevier Sciences; March 2004.
2. Java Decision Support Systems and Intelligent Systems/ 6th Ed., Efraim Turban and Jay E. Aronson; Prentice-Hall, 2001
3. Making Hard Decisions with Decision Tools Suite, Robert T. Clemen and Terry Reilly; Duxbury Press, 2000.
4. Decision Support Systems in the 21st Century/ 1st, George M. Marakas, Prentice-Hall, 1999.

Course Contents and Lecture Schedule

S. No	Topic	No. of Lectures
1	**Decision-Making Systems**	
1.1	History of Decision Support Systems	1
1.2	A Conceptual Perspective	
1.3	Characteristics of DSS	1
1.4	DSS versus MIS	1
1.5	Decision Support versus Transaction Processing Systems	1
1.6	DSS Applications	1
1.7	DSS Taxonomies or Framework	
1.8	Expanded DSS Framework	1
1.9	Categories of DSS	1
1.10	Building DSS	
2	**Business Decision Analysis**	
2.1	Managerial Decisions	1
2.2	Decision-Making and Problem-Solving	1
2.3	Decision-Making	1
2.4	Context- Decision-Making Processes	1
2.5	A General Decision Process Model	1
2.6	"Good" Decision-Making	1
2.7	Redesigning Decision Processe	1
3	**DSS Design and Development**	
3.1	Design and Development Issues	2
3.2	Decision-Oriented Diagnosis	
3.3	Feasibility Study	1
3.4	DSS Development Approach	1
3.5	DSS Project Management	
3.6	Outsourcing	1
3.7	DSS Design and Development Conclusions	1
4	**Designing and Evaluating DSS User Interfaces**	
4.1	User Interface Styles	1
4.2	Design Approach	1
4.3	Building the DSS User Interface	1
4.4	Comments on Design Elements	1
4.5	Guidelines for Dialog and User Interface Design	1
4.6	Factors Influencing User Interface Design Success	1
5	**DSS Architecture and Implementations**	
5.1	DSS Architecture and IS/IT Infrastructure	2
5.2	Defining the DSS Architecture	

S. No	Topic	No. of Lectures
5.3	A Client/Server Architecture	2
5.4	Sharing Resources	
5.5	Connecting the Resources	2
5.6	Implementing Communications-Driven and Group DSS	
5.7	Building Data and Document-Driven DSS	2
5.8	Building Knowledge-Driven DSS and Mining Data	
5.9	Building Model-Driven DSS	
5.10	Building Web-Based and Inter-Organizational DSS	1
	Total Lectures	**36**

Course Designers:

1. Ms.S.Karthiga skait@tce.edu
2. Mr.A.Sheik Abdullah asait@tce.edu

		Category	L	T	P	Credit
14ITPU0	**DATABASE ADMINISTRATION**	PE	3	0	0	3

Preamble

Database administration provides the conceptual understanding of the database architecture and how its components work and interact with one another. This course includes how to create an operational database and properly manage the various structures in an effective and efficient manner including performance monitoring, database security, user management, and backup/recovery techniques.

Prerequisite

- 14IT440: Data Base Management System

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome		Blooms Level
CO1.	Summarize the database architecture, including memory, process and data structures, and the management of those structures	**Understand**
CO2	Experiment the performance of the database by Performance monitoring, problem troubleshooting, and resolving lock and conflict issues.	**Analyze**
CO3	Develop the security policies and procedures, including administration of user accounts, roles, privileges and profiles for Oracle.	**Apply**
CO4	Explain the compliance and regulatory mechanisms for database administration.	**Understand**
CO5	Use the control mechanisms over database support services, including the Database Control, backup , recovery structures and strategies	**Apply**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	M	L		M		S		M	L		L
CO3	S	M	L		L		S		L			L
CO4	M	L										
CO5	S	M	L		L		S		L			L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	30	30	20
Understand	30	30	30	40
Apply	30	40	40	40
Analyze	20	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Show the problems faced by organizations using relational databases.
2. Prepare the primary high-level job responsibilities of DBA.
3. Demonstrate the number of DBAs needed to support an organization's database environment properly.
4. Use the technologies that mandate the need for procedural DBAs in an enterprise.

Course Outcome 2 (CO2):

1. Inspect the locking mechanism to assure data integrity.
2. Compare and contrast any two application design techniques to minimize the impact of locking on application performance.
3. Distinguish lock timeout and a deadlock.
4. Infer the technique used to minimize deadlocks using any programming language with an example.

Course Outcome 3(CO3):

1. Implement referential integrity in a relational database.
2. Solve data integrity by utilizing user-defined data type property.
3. Interpret the key properties of check constraint, rule, entity integrity, database structural integrity and semantic data integrity.
4. Demonstrate the purpose of creating an audit trail of database operations.
5. Compare Governance and privacy in terms of regulations impacting security.

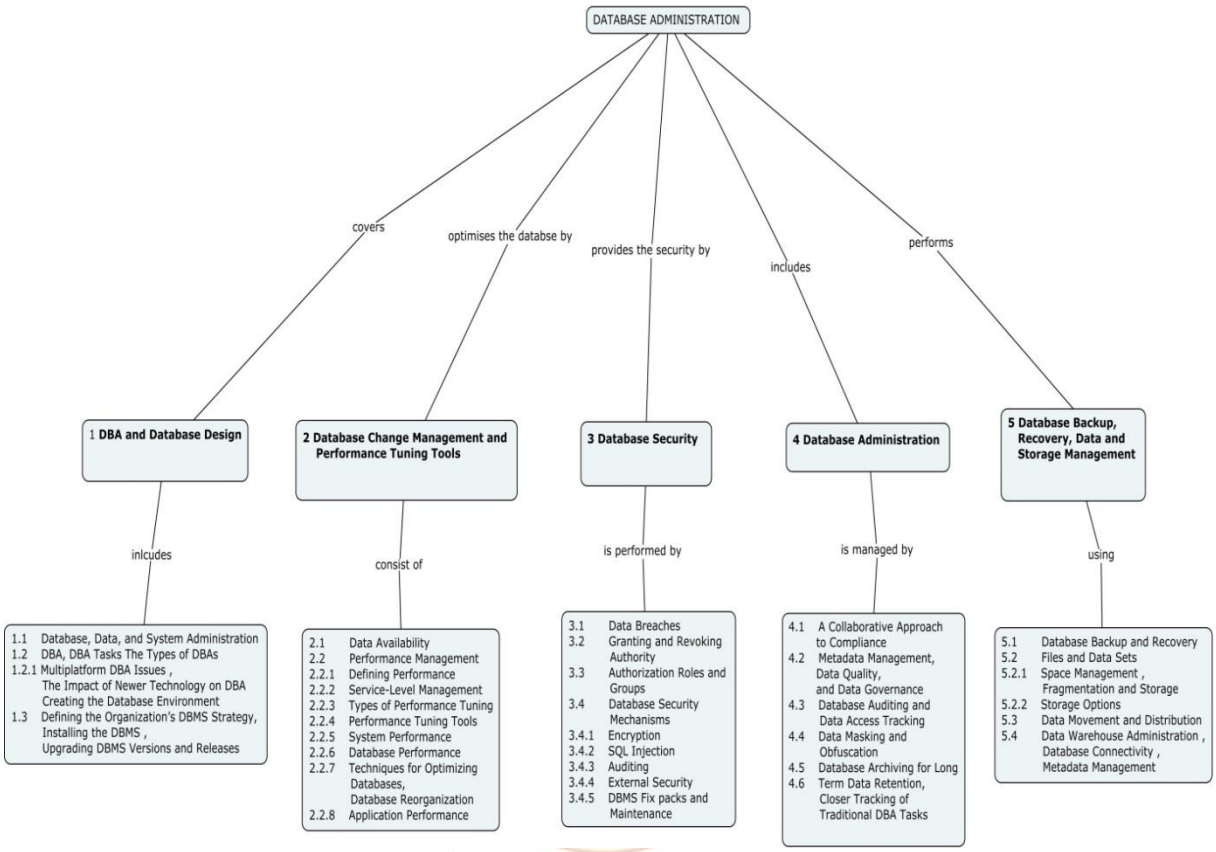
Course Outcome 4(CO4):

1. Classify the primary high-level job responsibilities of a DBA.
2. Illustrate the steps for all enterprises to take security measures to protect private data.
3. Outline the regulatory compliance used in SQL DBA.
4. Explain Telecommunications Act of 1996 based on oracle.
5. Select any two view methods to implement data security.

Course Outcome 5(CO5):

1. Model a logical backup and an image copy backup for an enterprise application.
2. Select the factors to determine whether a full or incremental image copy backup should be taken for a database object?
3. Your organization has decided to purchase RAID arrays to support your DBMS. Which levels of RAID would you advise them to use and why?

Concept Map



Syllabus

DBA and Database Design- Database, Data, and System Administration- DBA- DBA Tasks The Types of DBAs- Multiplatform DBA Issues - The Impact of Newer Technology on DBA Creating the Database Environment - Defining the Organization's DBMS Strategy - Installing the DBMS - Upgrading DBMS Versions and Releases

Database Change Management and Performance Tuning Tools- Data Availability - Performance Management - Defining Performance -Service-Level Management - Types of Performance Tuning- Performance Tuning Tools- System Performance - Database Performance- Techniques for Optimizing Databases - Database Reorganization - Application Performance.

Database Security - Data Breaches - Granting and Revoking Authority - Authorization Roles and Groups - Database Security Mechanisms- Encryption - SQL Injection - Auditing- External Security- DBMS Fix packs and Maintenance.

Regulatory Compliance and Database Administration - A Collaborative Approach to Compliance - Metadata Management, Data Quality, and Data Governance - Database Auditing and Data Access Tracking - Data Masking and Obfuscation - Database Archiving for Long-Term Data Retention - Closer Tracking of Traditional DBA Tasks.

Database Backup, Recovery, Data and Storage Management - Database Backup and Recovery- Files and Data Sets - Space Management - Fragmentation and Storage - Storage Options- Data Movement and Distribution- Data Warehouse Administration - Database Connectivity - Metadata Management - CASE STUDY :Open source DBA Tools.

Text Book

1.Craig S. Mullins. “Database Administration: The Complete Guide to Practices and Procedures”, Addison Wesley, 2nd edition, 2012

Reference Books

1. Craig Mullins, “Db2 Developer's Guide: A Solutions-oriented Approach to Learning the Foundation and Capabilities of Db2 for Z/OS, IBM Press, 2012
2. Edward Whalen, “Microsoft SQL Server 2000 Performance Tuning: Technical Reference” ,Microsoft Press, 2001
3. Joyit Mukherjee, “MCDBA Administering SQL Server 2000 Study Guide”, Osborne/McGraw-Hill, 2001

Course Content and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**DBA and Database Design**	
1.1	Database, Data, and System Administration	3
1.2	DBA, DBA Tasks The Types of DBAs	
1.2.1	Multiplatform DBA Issues ,The Impact of Newer Technology on DBA Creating the Database Environment	1
1.3	Defining the Organization’s DBMS Strategy, Installing the DBMS ,Upgrading DBMS Versions and Releases	2
2	**Database Change Management and Performance Tuning Tools**	
2.1	Data Availability	1
2.2	Performance Management	2
2.2.1	Defining Performance	
2.2.2	Service-Level Management	
2.2.3	Types of Performance Tuning	
2.2.4	Performance Tuning Tools	1
2.2.5	System Performance	
2.2.6	Database Performance	1
2.2.7	Techniques for Optimizing Databases, Database Reorganization	
2.2.8	Application Performance	1
3	**Database Security**	
3.1	Data Breaches	1
3.2	Granting and Revoking Authority	1
3.3	Authorization Roles and Groups	
3.4	Database Security Mechanisms	5
3.4.1	Encryption	
3.4.2	SQL Injection	
3.4.3	Auditing	
3.4.4	External Security	
3.4.5	DBMS Fix packs and Maintenance	
4	**Database Administration**	
4.1	A Collaborative Approach to Compliance	1
4.2	Metadata Management, Data Quality, and Data Governance	1
4.3	Database Auditing and Data Access Tracking	2
4.4	Data Masking and Obfuscation	2
4.5	Database Archiving for Long	1

Module No.	Topic	No. of Lectures
4.6	Term Data Retention, Closer Tracking of Traditional DBA Tasks	2
5	**Database Backup, Recovery, Data and Storage Management**	
5.1	Database Backup and Recovery	1
5.2	Files and Data Sets	1
5.2.1	Space Management ,Fragmentation and Storage	1
5.2.2	Storage Options	1
5.3	Data Movement and Distribution	
5.4	Data Warehouse Administration ,Database Connectivity , Metadata Management	2
	CASE STUDY :Open source DBA Tools	2
	Total Lectures	**36**

Course Designers:

1. Ms.M.Nirmala Devi <mnit@tce.edul>
2. Mr.E.Ramanujam <erit@tce.edu>

		Category	L	T	P	Credit
14ITPV0	**CLOUD SECURITY**	PE	3	0	0	3

Preamble

In today's world, as organizations changeover to cloud computing technology, security issues became a critical concern. In order to protect resources and sensitive data, maintain regulatory compliance, this course addresses the unique cyber security challenges faced when moving to a cloud environment. This course also provides an experience of identifying and resolving the security issues specific to public and private clouds.

Prerequisite

- 14IT620 - Cloud Computing

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Explain the various characteristics and models of cloud computing.	Understand
CO2:	Illustrate the requirements and implementation features of Data loss prevention, Encryption, Identity and Access Management	Apply
CO3:	Demonstrate the essentials and features of securing public and private clouds for the given application scenario.	Apply
CO4:	Compare modern security concepts as a service for the cloud computing environment.	Analyze
CO5:	Develop applications in cloud by considering the security as a service.	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M	L										L
CO2.	M	M	L	L	M					M		M
CO3.	M	M	L	L	M	M	M	L	M	M	L	M
CO4.	S	M	L	L	M							M
CO5.	S	S	M	M	S	M	M	M	M	M	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination	Assignments
	1	2	3		
Remember	20	0	0	20	0
Understand	30	20	20	30	0
Apply	50	50	50	40	20
Analyse	0	30	20	10	80
Evaluate	0	0	0	0	0
Create	0	0	10	0	0

CO3 and CO4 are partially evaluated by Assignments.
CO5 is evaluated by Mini-projects.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss briefly about various characteristics, service and deployment models of cloud computing.
2. Use the Cloud Reference Model and Jericho Cloud Cube Model, to differentiate the types of services provided in the Public cloud, and Private cloud.
3. Relate the importance of service level agreements in-case of Multi-tenancy and Cloud service brokers.

Course Outcome 2 (CO2):

1. Prioritize the requirements of Identity and access management for Public cloud and Private cloud.
2. Explain the implementation considerations and concerns for data loss prevention, Identity and access management in Public cloud.
3. Compare and contrast the Guidance and Implementation steps of data loss prevention, Identity and access management in Private cloud.

Course Outcome 3 (CO3)

1. Use the encryption services for demonstrating the importance of securing public cloud.
2. Illustrate the essentials of key management and data integrity for securing private cloud.
3. Relate cloud broker and cloud audit for assessing the security of public cloud.

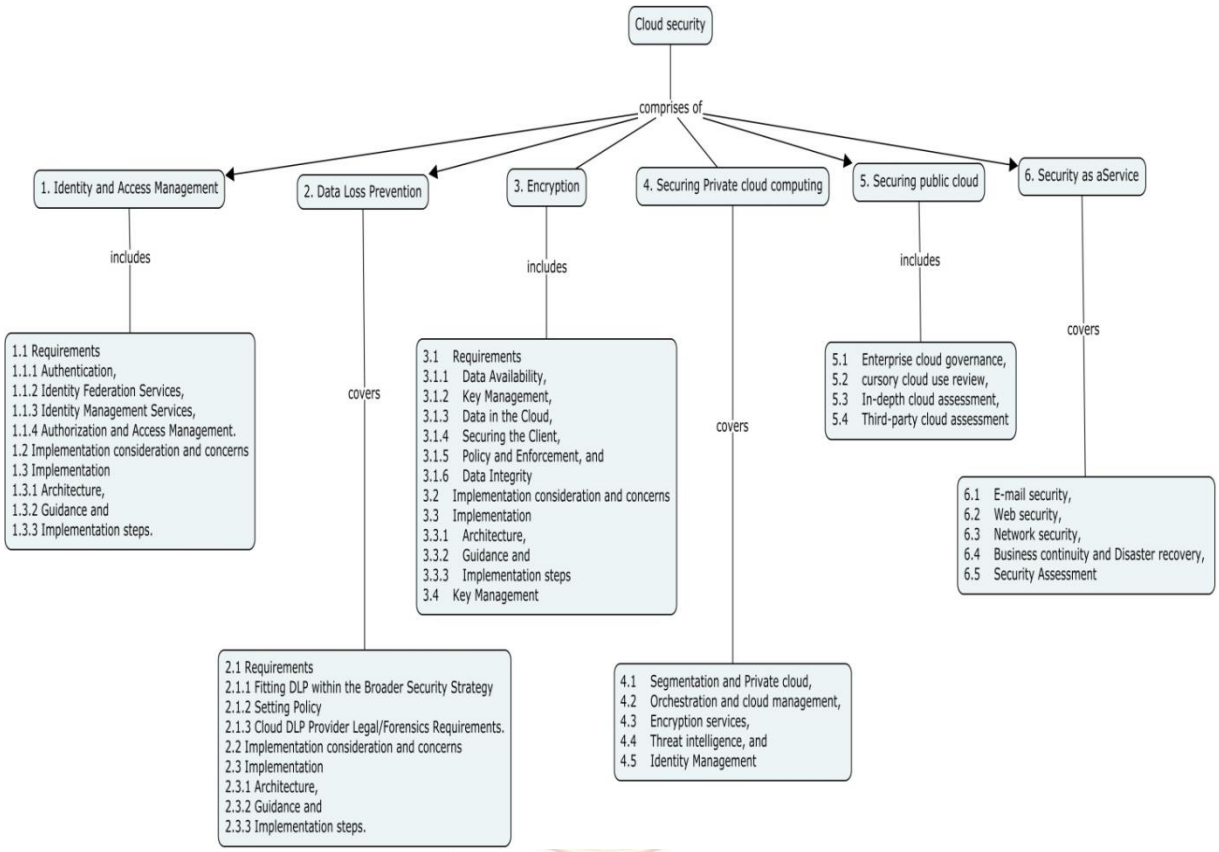
Course Outcome 4 (CO4)

1. Relate the importance of Network security in public and private cloud.
2. Apply the E-mail security concepts to demonstrate an private e-mail domain in an organization.
3. Use the security assessment methods and list the features to assess the College Private cloud.

Course Outcome 5 (CO5)

1. Create and deploy Internal Mark and Attendance management system with SecaaS in TCE private cloud.
2. Develop online test application with SecaaS in Microsoft Azure cloud.
3. Design the Time table generation application with SecaaS in Amazon public cloud.

Concept Map



Syllabus

Introduction: Cloud Computing: NIST Definitions, Essential Characteristics, Service Models, Deployment Models, Multi-Tenancy, Cloud Reference Model, Jericho Cloud Cube Model, Cloud Security Reference Model, Cloud Service Brokers, Service Level Agreements. Security: Introduction to cybercrime and security, Basics of Assessing and securing a system, Internet fraud and cyber crime, Computer security Hardware and software.

Identity and Access Management: Requirements - Authentication, Identity Federation Services, Identity Management Services, Authorization and Access Management. Implementation consideration and concerns, Implementation - Architecture, Guidance and Implementation steps.

Data Loss Prevention: Requirements - Fitting DLP within the Broader Security Strategy, Setting Policy, Cloud DLP Provider Legal/Forensics Requirements. Considerations and Concerns, Implementation - Architecture, Guidance and Implementation steps.

Encryption: Requirements - Data Availability, Key Management, Data in the Cloud, Securing the Client, Policy and Enforcement, and Data Integrity. Implementation consideration and concerns, Implementation - Architecture, Guidance and Implementation steps, Key Management.

Securing Private cloud computing: Segmentation and Private cloud, Orchestration and cloud management, Encryption services, Threat intelligence, and Identity Management.

Securing Public clouds: Enterprise cloud governance, cursory cloud use review, In-depth cloud assessment, Third-party cloud assessment.

Security as a Service: E-mail security, Web security, Network security, Business continuity and Disaster recovery, Security Assessment.

Text Book

1. Ian Lim, E. Coleen Coolidge, Paul Hourani, "Securing Cloud and Mobility: A Practitioner's Guide", CRC Press, 2013.
2. William (Chuck) Easttom, “Computer Security Fundamentals”, Pearson Education, First edition, 2011.
3. Cloud Security Alliance, “Security as a Service Implementation Guidance" - https://cloudsecurityalliance.org/research/secaas/#_downloads
4. Cloud Security Alliance, “Security Guidance for Critical Areas of Focus in Cloud Computing V2.1" - https://cloudsecurityalliance.org/guidance/csaguide.v2.1.pdf.
5. Peter Mell, Timothy Grance, NIST “The NIST Definition of Cloud Computing” - http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf.

References

1. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, “Mastering cloud computing”, Morgan Kaufman, 2013.
2. Cloud Security Alliance, “Top Threats to Cloud Computing” - https://cloudsecurityalliance.org/topthreats/csathreats.v1.0.pdf.
3. ENISA, “Cloud computing security risk assessment” - https://www.enisa.europa.eu/activities/risk-management/files/deliverables/cloud-computing-risk-assessment.
4. The National IT and Telecom Agency, “Cloud audit and assurance initiatives” - http://www.digst.dk/~/media/Files/English/Cloud-Audit-and-Assurance-EN_cagr.pdf
5. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach” McGraw-Hill Osborne Media, 1 edition, 2009.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
0	**Introduction**	
0.1.	NIST Definitions, Essential Characteristics,	1
0.2	Service Models, Deployment Models, Multi-Tenancy	
0.3	Cloud Reference Model, Jericho Cloud Cube Model, Cloud Security Reference Model,	1
0.4	Cloud Service Brokers, Service Level Agreements.	
1	**Identity and Access Management**	
1.1	Requirements	
1.1.1	Authentication,	1
1.1.2	Identity Federation Services,	
1.1.3	Identity Management Services,	1
1.1.4	Authorization and Access Management.	
1.2	Implementation consideration and concerns	1
1.3	Implementation	
1.3.1	Architecture,	1
1.3.2	Guidance and	1
1.3.3	Implementation steps.	1
2.	**Data Loss Prevention**	
2.1	Requirements	
2.1.1	Fitting DLP within the Broader Security Strategy	1
2.1.2	Setting Policy	

Module No.	Topic	No. of Lectures
2.1.3	Cloud DLP Provider Legal/Forensics Requirements.	1
2.2	Implementation consideration and concerns	1
2.3	Implementation	
2.3.1	Architecture,	1
2.3.2	Guidance and	1
2.3.3	Implementation steps.	1
3.	**Encryption**	
3.1	Requirements	1
3.1.1	Data Availability,	
3.1.2	Key Management,	1
3.1.3	Data in the Cloud,	
3.1.4	Securing the Client,	1
3.1.5	Policy and Enforcement, and	
3.1.6	Data Integrity	
3.2	Implementation consideration and concerns	1
3.3	Implementation	
3.3.1	Architecture,	1
3.3.2	Guidance and	1
3.3.3	Implementation steps	1
3.4	Key Management	1
4.	**Securing Private cloud computing**	
4.1	Segmentation and Private cloud,	1
4.2	Orchestration and cloud management,	1
4.3	Encryption services,	1
4.4	Threat intelligence, and	1
4.5	Identity Management	1
5.	**Securing Public clouds**	
5.1	Enterprise cloud governance,	1
5.2	cursory cloud use review,	1
5.3	In-depth cloud assessment,	1
5.4	Third-party cloud assessment	1
6.	**Security as a Service**	
6.1	E-mail security,	1
6.2	Web security,	1
6.3	Network security,	1
6.4	Business continuity and Disaster recovery,	1
6.5	Security Assessment	1
	Total Lectures	**36**

Course Designers:

1. Ms.C.Jeyamala jeyamala@tce.edu
2. Mr.M.Thangavel mtit@tce.edu

		Category	L	T	P	Credit
14ITPW0	**ADVANCED CRYPTOGRAPHY**	PE	3	0	0	3

Preamble

The main objective of the course is to provide an in depth coverage of recent trends in cryptography and its associated applications in the field of cyber security. The course will provide the necessary mathematical foundations for doing research in cryptography.

Prerequisite

- 14IT530: Network Security

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Appreciate the usage of mathematical principles such as One way functions, Trap door functions and Pseudo Random functions in Cryptography.	Apply
CO2:	Utilize Zero Knowledge and Oblivious transfer protocols for proposing security solutions.	Apply
CO3:	Explain the theory behind secure multi-party computation and identify the challenges and limitations of such schemes.	Understand
CO4:	Recommend suitable cryptographic techniques and protocols to address the security threats and vulnerabilities in real world applications like E-Voting and Digital cash.	Analyze
CO5:	Explain the working principle of Threshold Cryptography, Visual Cryptography and Quantum Cryptography.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M										
CO2.	S	M										
CO3.	M	L										
CO4.	S	M	L	L	L	M	M	M		L		M
CO5.	M	L										

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Test 3	
Remember	20	20	20	10
Understand	40	20	20	20
Apply	40	50	50	50
Analyse	0	10	10	20
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate strong and weak one way functions..
2. Develop the pseudocode for Blum-Blum-Shub pseudo random bit generator.
3. Consider the (non-random) sequence s of length n = 160 obtained by replicating the following sequence four times: 11100 01100 01000 10100 11101 11100 10010 01001. Compute the result of runs test, poker test, frequency test and serial test.

Course Outcome 2 (CO2):

1. Discuss the implementation of oblivious transfer.
2. Prove that, “if there exist (non-unifrom) polynomial-time indistinguishable encryption scheme then every NP language has a computational zero-knowledge interactive proof-system”.
3. Illustrate the steps involved in one round of Guillou – Quisquater protocol if p=17, q=23, e=11, s=4, r=3 by computing the values of witness and response if the challenge is 5.

Course Outcome 3 (CO3):

1. Explain Shamir Secret sharing scheme for secure multiparty computation.
2. What are anonymous transactions?
3. Modify the multiparty ping pong protocol if most of the parties are honest.

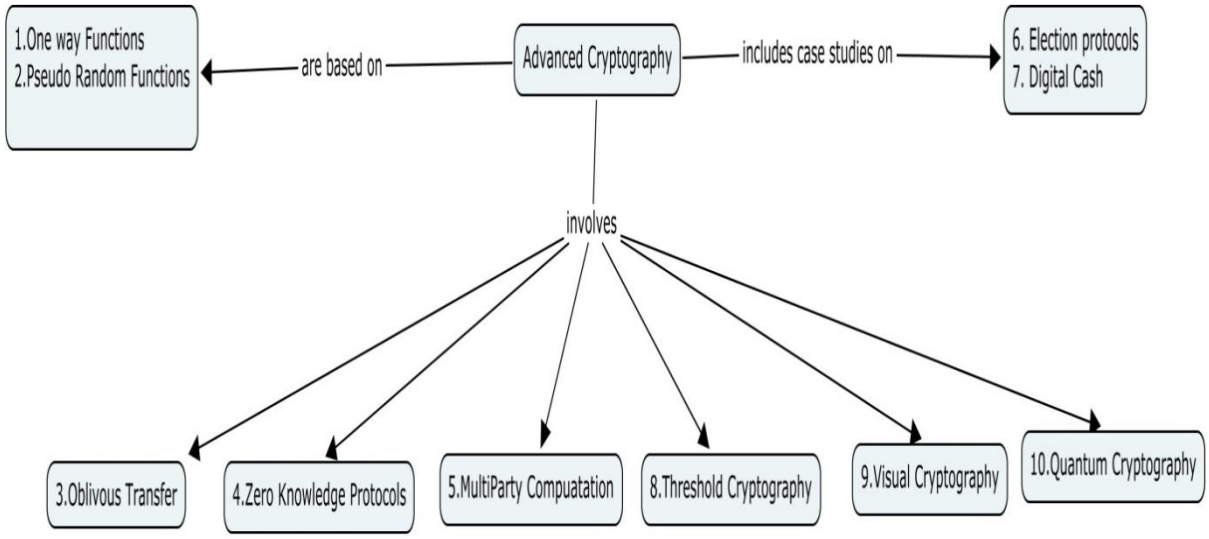
Course Outcome 4 (CO4):

1. Prepare a security analysis report with focus on threats, vulnerabilities and possible counter measures for an online voting system.
2. Enlist the properties required for digital cash.
3. Propose a security solution involving RSA blind signatures in Bit coins.

Course Outcome 5 (CO5):

1. Explain the challenges involved in Quantum key distribution.
2. Discuss the applications of Threshold cryptography.
3. Differentiate secret sharing vs verifiable secret sharing

Concept Map



Syllabus

One way Functions - (Strong) One Way Functions, Weak One-Way Functions, Non-Uniform One-Way Functions, Trapdoor Functions and Collections, Hard core predicates of one way Functions.

Pseudorandom bit sequences : Random bit generation, Pseudorandom bit generation Statistical tests, Cryptographically secure pseudorandom bit generation, Examples of Pseudo-Random Generators - Blum/Blum/Shub Pseudo-Random Generator, Pseudo random Functions and its applications -Cryptographically Strong Hashing, Prediction, Learning, Private-Key Encryption.

Oblivious transfer, Simultaneous contract signing, Bit Commitment, Coin flipping in a well Oblivious circuit evaluation, Simultaneous Secret Exchange Protocol .

Zero-Knowledge Protocols: Interactive Proof-Systems (IP), Examples, Zero-Knowledge, Applications to User Identification

Multi Party Computation: Secret sharing, Verifiable Secret Sharing, Anonymous Transactions, Multiparty Ping-Pong Protocols.

Electronic Elections: The Merritt Election Protocol and The fault-tolerant Election Protocol, **Digital Cash** Required properties for Digital Cash ,Blind signatures RSA blind signatures , On-line digital cash and Off-line digital cash .

Threshold Cryptography: Secret sharing, Verifiable secret sharing, Threshold cryptosystems.

Visual Cryptography: Extended, Dynamic, Visual, Progrssivevisual Cryptography schemes

Quantum cryptography: Quantum computing, Shor's quantum factoring algorithm, quantum key distribution and bit commitment.

Reference Books

1.Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press ,2001. ISBN: 0-8493-8523-7
2. ShafiGoldwasser, MihirBellare, "Lecture Notes on Cryptography", July 2008.
3. Berry Schoenmakers. "Lecture Notes Cryptographic Protocols Version 1.1", Technical University of Eindhoven.
4.Jonathan Weir and WeiQiYan, "Visual Cryptography and its applications", Ventus Publishing, 2012, ISBN: 978-87-403-0126-7.

Course Contents and Lecture Schedule

Module. No	Topic	No. Of Lectures
1	One Way Functions	2
1.1	Strong One Way Functions, Weak One-Way Functions, Non-Uniform One-Way Functions	
1.2	Trapdoor Functions and Collections.	1
1.3	Hard core predicates of one way Functions.	2
2	Pseudorandom bit sequences	
2.1	Random bit generation, Pseudorandom bit generation, Cryptographically secure pseudorandom bit generation	2
2.2	Statistical tests	1
2.3	Examples of Pseudo-Random Generators - Blum/Blum/Shub Pseudo-Random Generator	1
2.4	Pseudo random Functions and its applications -Cryptographically Strong Hashing, Prediction, Learning, Private-Key Encryption.	2
3	Oblivious transfer	1
3.1	Simultaneous contract signing, Bit Commitment, Coin flipping in a well Oblivious circuit evaluation	2
3.2	Simultaneous Secret Exchange Protocol	1
4	Zero-Knowledge Protocol	
4.1	Interactive Proof-Systems	1
4.2	Zero-Knowledge and Examples	1
4.3	Applications to User Identification	2
5 5.1 5.2	Multi Party Computation Secret sharing, Verifiable Secret Sharing	2
5.3	Anonymous Transactions	
5.4	Multiparty Ping-Pong Protocols	1
6	Electronic Elections: The Merritt Election Protocol and The fault-tolerant Election Protocol	2
7 7.1	Digital Cash Requirements for Digital Cash	1
7.2 7.3	Blind signatures and RSA blind signatures On-line digital cash and Off-line digital cash.	2
8 8.1 8.2	Threshold Cryptography: Secret sharing Verifiable secret sharing	2
8.3	Threshold cryptosystems.	1
9 9.1 9.2	Visual Cryptography: Extended visual cryptography Dynamic visual cryptography	3

9.3	Progressive visual Cryptography	
10 10.1	Quantum cryptography: Quantum computing	1
10.2 10.3	Shor's quantum factoring algorithm, quantum key distribution and bit commitment	2
	Total Lectures	**36**

Course Designers:

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2. Mr.M.Thangavel mtit@tce.edu

		Category	L	T	P	Credit
14ITRQ0	**ETHICAL HACKING**	PE	3	0	0	3

Preamble

Ethical Hacking course will immerse the students into an interactive environment where they will be shown how to scan, test, hack and secure their own systems. The lab intensive environment gives each student in-depth knowledge and practical experience with the current essential security systems. Students will begin by understanding how perimeter defenses work and then be lead into scanning and attacking their own networks, no real network is harmed. Students then learn how intruders escalate privileges and what steps can be taken to secure a system. Students will also learn about Session Hijacking, Social Engineering, DDoS Attacks, Buffer Overflows and Cryptography

.

Prerequisite

- 14IT530 - Network Security

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Extract as much as information as possible with expert knowledge, concerning the target organization	**Analyze**
CO2:	Conduct network scanning by analyzing the network vulnerabilities and maintaining a secure network	**Evaluate**
CO3:	Monitor a system remotely and to extract hidden files	**Analyze**
CO4:	Provide countermeasures and perform penetration testing for Social engineering, Denial of service, Session Hijacking, Buffer overflow and Cryptography attacks	**Evaluate**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M	M	M	S	L	L	L	L	L	L	L
CO2.	S	S	M	M	S	L	L	L	L	L	L	M
CO3.	S	M	M	M	S	L	L	L	L	L	L	M
CO4.	S	S	M	M	S	M	M	M	M	M	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	10	10	20
Understand	30	20	20	40
Apply	30	40	30	40
Analyse	20	20	20	0
Evaluate	0	10	20	0
Create	0	0	0	0

Course Outcomes CO4 Are Partially Evaluated By Assignments And Mini Projects.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Sequence and prepare the report for tools as an ethical hacker to determine organization's publicly available information on the Internet such as network architecture, operating systems, applications, and users.
2. Discuss briefly about the methodologies to collect information from websites, Regional Internet Registries databases and Networks.
3. "For attackers to build a hacking strategy, they need to gather information about the target organization's network, so that they can find the easiest way to break into the organization's security perimeter." – Why it is needed for the hacker?

Course Outcome 2 (CO2):

1. Outline the different types of techniques used to identify the open ports on a targeted server or host.
2. From the given information, can you identify hosts, ports, and services in a network? Apply in the TCE IT Department Lab network environment and justify your answer.
    - Establishing the connection between protocols.
    - Use fragmented probe packets that reassemble once that reach the targeted host
3. Sequence and prepare the report for tools as an ethical hacker to identify system attack points and perform password attacks to gain unauthorized access to information system resources

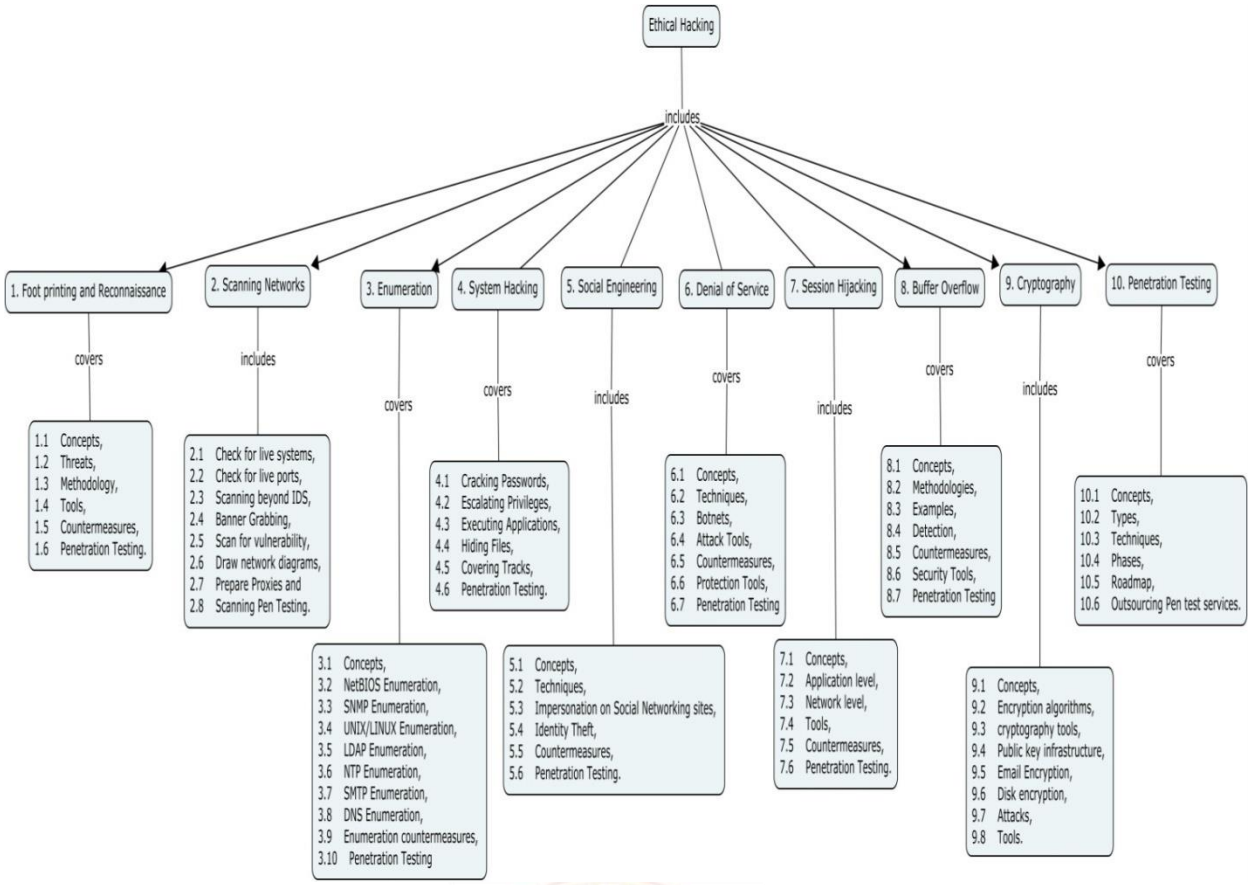
Course Outcome 3 (CO3)

1. Compare the various types of attacks in the process of monitoring and capturing all data packets passing through a given network using software (an application) or hardware device.
2. Use the appropriate techniques to achieve the goals of an attacker:
    - To collect enough information to gain access
    - To create a privileged user account if the user level is obtained
3. Identify the various phases and stages of the Computer virus attacks

Course Outcome 4 (CO4)

1. Perform Penetration testing and defend against buffer overflow attacks for a college website.
2. Use the process and types of Session Hijacking to perform penetration testing against the services of Banking website.
3. Discuss briefly about the various types of Penetration Testing.

Concept Map



Syllabus

Introduction: Elements of Information security, Information security threats, Hacking Vs Ethical Hacking, Hacking Phases, Types of Attacks, Need and skills of Ethical Hacker, Incident Management Process, Security Policies.

Foot printing and Reconnaissance: Concepts, Threats, Methodology, Tools, Countermeasures, Penetration Testing.

Scanning Networks: Check for live systems, Check for live ports, Scanning beyond IDS, Banner Grabbing, Scan for vulnerability, Draw network diagrams, Prepare Proxies and Scanning Pen Testing.

Enumeration: Concepts, NetBIOS Enumeration, SNMP Enumeration, UNIX/LINUX Enumeration, LDAP Enumeration, NTP Enumeration, SMTP Enumeration, DNS Enumeration, Enumeration countermeasures, Penetration Testing.

System Hacking: Cracking Passwords, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Penetration Testing.

Social Engineering: Concepts, techniques, Impersonation on Social Networking sites, Identity Theft, Countermeasures, Penetration Testing.

Denial of Service: Concepts, Techniques, Botnets, Attack Tools, Countermeasures, Protection Tools, Penetration Testing.

Session Hijacking: Concepts, Application level, Network level, Tools, Countermeasures, Penetration Testing.

Buffer Overflow: Concepts, Methodologies, Examples, Detection, Countermeasures, Security Tools, Penetration Testing.

Cryptography: Concepts, Encryption algorithms, cryptography tools, Public key infrastructure, Email Encryption, Disk encryption, Attacks, Tools.

Penetration Testing: Concepts, types, Techniques, Phases, Roadmap, Outsourcing Pen test services.

Text Book

1. E-Council, "Certfied Ethical Hacking Review Guide", Wiley India Edition, 2012.

Reference

1. AnkitFadia " Ethical Hacking" second edition Macmillan India Ltd, 2006

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
0	**Introduction**	
0.1	Elements of Information security,	1
0.2	Information security threats,	
0.3	Hacking Vs Ethical Hacking,	
0.4	Hacking Phases,	1
0.5	Types of Attacks,	
0.6	Need and skills of Ethical Hacker,	1
0.7	Incident Management Process,	
0.8	Security Policies.	
1	**Foot printing and Reconnaissance**	
1.1	Concepts,	1
1.2	Threats,	
1.3	Methodology,	2
1.4	Tools,	
1.5	Countermeasures,	1
1.6	Penetration Testing.	
2	**Scanning Networks**	
2.1	Check for live systems,	1
2.2	Check for live ports,	
2.3	Scanning beyond IDS,	
2.4	Banner Grabbing,	2
2.5	Scan for vulnerability,	
2.6	Draw network diagrams,	1
2.7	Prepare Proxies and	
2.8	Scanning Pen Testing.	1
3	**Enumeration**	
3.1	Concepts,	1
3.2	NetBIOS Enumeration,	
3.3	SNMP Enumeration,	1

Module No.	Topic	No. of Lectures
3.4	UNIX/LINUX Enumeration,	
3.5	LDAP Enumeration,	
3.6	NTP Enumeration,	
3.7	SMTP Enumeration,	
3.8	DNS Enumeration,	
3.9	Enumeration countermeasures,	1
3.10	Penetration Testing	
4	**System Hacking**	
4.1	Cracking Passwords,	2
4.2	Escalating Privileges,	
4.3	Executing Applications,	2
4.4	Hiding Files,	
4.5	Covering Tracks,	1
4.6	Penetration Testing.	
5	**Social Engineering**	
5.1	Concepts,	1
5.2	Techniques,	
5.3	Impersonation on Social Networking sites,	
5.4	Identity Theft,	1
5.5	Countermeasures,	
5.6	Penetration Testing.	
6	**Denial of Service**	
6.1	Concepts,	1
6.2	Techniques,	
6.3	Botnets,	
6.4	Attack Tools,	1
6.5	Countermeasures,	
6.6	Protection Tools,	
6.7	Penetration Testing	
7	**Session Hijacking**	
7.1	Concepts,	1
7.2	Application level,	
7.3	Network level,	
7.4	Tools,	1
7.5	Countermeasures,	
7.6	Penetration Testing.	
8	**Buffer Overflow**	
8.1	Concepts,	1
8.2	Methodologies,	
8.3	Examples,	1
8.4	Detection,	
8.5	Countermeasures,	1
8.6	Security Tools,	1
8.7	Penetration Testing	
9	**Cryptography**	
9.1	Concepts,	1
9.2	Encryption algorithms,	
9.3	cryptography tools,	1
9.4	Public key infrastructure,	
9.5	Email Encryption,	
9.6	Disk encryption,	

Module No.	Topic	No. of Lectures
9.7	Attacks,	1
9.8	Tools.	
10	**Penetration Testing**	
10.1	Concepts,	1
10.2	Types,	
10.3	Techniques,	1
10.4	Phases,	
10.5	Roadmap,	1
10.6	Outsourcing Pen test services.	
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPY0	**INFORMATION SECURITY AUDITING AND MANAGEMENT**	PE	3	0	0	3

Preamble

This course aims to provide knowledge on enterprise structure, governance, policies, accountability mechanisms and monitoring practices in place to achieve information security

Prerequisite

- Nil

Course Outcomes

On successful completion of the course, the students will be able to

Course Outcomesi		**Bloom's Level**
CO1:	Explain the need for information security policies, standards, procedures and alignment with generally accepted practices	Understand
CO2:	Plan information security auditing of various domains of information systems.	Apply
CO3:	Examine the effectiveness of the IT governance structure	Apply
CO4:	Assess information security risks of given IT system	Analyze
CO5:	Implement information security strategy	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**M**							**S**				
CO2.	**S**								**L**			
CO3.	**S**	**L**						**L**				
CO4.	**S**	**S**						**L**				
CO5.	**S**	**S**	**L**					**L**	**L**			

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	40	20	20	20
Understand	40	40	40	40
Apply	20	20	20	20
Analyze	0	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. State the authority of the Office of Internal Audit and the Purpose of Internal Audit report
2. Identify the information security policies, standards and procedures for completeness
3. List the responsible persons for internal controls and importance of IT Governance

4. State the Procedure for selecting audits and examine the technique that management uses to addresses the IT issues.
5. Describe the Structure of the information technology function.

Course Outcome 2 (CO2):

1. Discuss the Disaster Recovery Plan Tests and Drill.
2 Report the Attacks on Data Integrity through Web site defacements, Logic bombs and Unauthorized modifications of operating systems etc, by the Following life cycle steps which includes
    a) Entering, creating and/or acquiring data
    b) Processing and/or deriving data
    c) Storing, replicating and distributing data
    d) Archiving and recalling data
    e) Backing up and restoring data
    f) Deleting, removing and destroying data
3 Relate the Standards and Best Practices for Risk Management and Compliance with the Security requirements for data management, information security with COBIT Deliver and Support and manipulate the improvement of the Data Integrity associated with it.

Course Outcome 3 (CO3):

1. Experiment the Triggers of Data Integrity Loss through the following parameters
    a. Vulnerable code-in applications
    b. Unauthorized devices connected to the corporate network
    c. Inadequate or not applied segregation of duties (SoD)
    d. Inability to track the use of privileged passwords, particularly when passwords are shared
2. Predict the finest way of conducting periodic reviews of information systems.
3. Describe how to Provide assurance that the processes for information systems operations, maintenance and support meet the organization's strategies and objectives

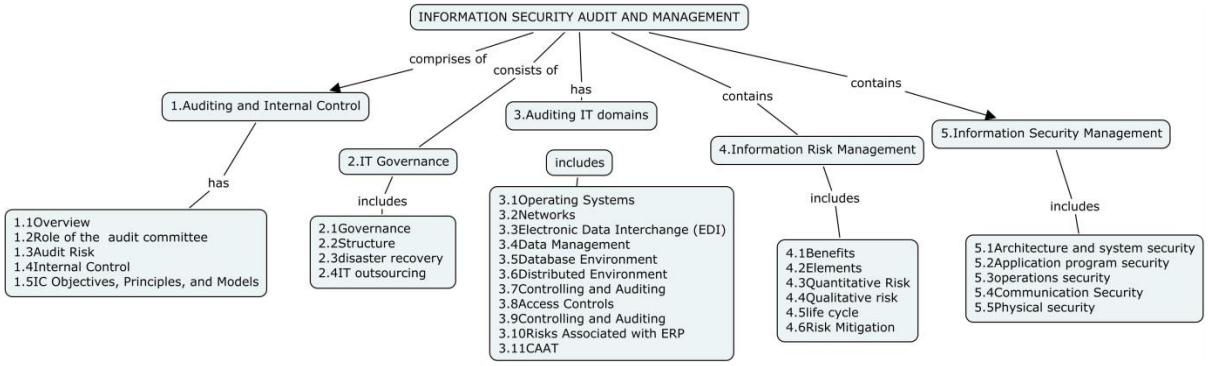
Course Outcome 4 (CO4):

1. Categorize the assurance for the necessary leadership and organization structure and point out the processes that are in place to achieve objectives and to support the organization's strategy.
2. Analyze the IT management and monitoring of controls (e.g., continuous monitoring, QA) for compliance with the organization's policies, standards and procedure.
3. Identify the actual problem and the incident management practices to determine whether incidents, problems or errors are recorded, analyzed and resolved in a timely manner.

Course Outcome 5 (CO5):

1. Write down the steps to develop information security program
2. Outline the best practices to develop information security strategic plan
3. List the items in the checklist to verify the standard of given information security strategy

Concept Map



Syllabus

Auditing and Internal Control: Overview of Auditing, Role of the audit committee ,Audit Risk ,The IT Audit, Internal Control, Internal Control Objectives, Principles, and Models.

IT Governance: Information Technology Governance, Structure of the information technology function, disaster recovery planning, audit implications of IT outsourcing.

Auditing IT domains: Auditing Operating Systems, Auditing Networks, Auditing Electronic Data Interchange (EDI),Data Management Approaches, Key Elements of the Database Environment, Databases in a Distributed Environment, Controlling and Auditing Data Management Systems, Access Controls.Controlling and Auditing the SDLC.Risks Associated with ERP Implementation, Implications for Internal Control and Auditing, CAAT

Information Risk Management: Benefits of Risk management,Elements of Risks, Quantitative Risk analysis, Qualitative risk analysis, Risk management life cycle, Risk Mitigation

Information Security Management: Computer Architecture and system security, Application program security. Computer operations security, Communication Security, Physical security

Text Book

1. Chris Davis and Mike Schiller, “IT Auditing: Using Controls to protect Information Assets”, Mc-Graw Hill, Second Edition, 2011

References

1. http://www.isaca.org/knowledge-center/itaf-is-assurance-audit-/IT-Audit-Basics/Pages/IT-Audit-Basics-Articles.aspx
2. http://intosaiitaudit.org/India_GeneralPrinciples.pdf
3. http://opentuition.com/wp-content/blogs.dir/1/files/group-documents/15/1289480671-COMPUTERASSISTEDAUDITTECHNIQUES.pdf

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Auditing and Internal Control**	
1.1	Overview of Auditing	2
1.2	Role of the audit committee	1
1.3	Audit Risk	1
1.4	The IT Audit	1
1.5	Internal Control	2
1.6	Internal Control Objectives, Principles, and Models.	
2	**IT Governance**	
2.1	Information Technology Governance	1

2.2	Structure of the information technology function	1
2.3	Disaster recovery planning	1
2.4	Audit implications of IT outsourcing	1
2.5	Information security Policies, Standards and Procedures	2
3	**Auditing IT domains**	
3.1	Auditing Operating Systems	1
3.2	Auditing Networks	1
3.3	Auditing Electronic Data Interchange (EDI)	1
3.4	Data Management Approaches	1
3.5	Key Elements of the Database Environment	1
3.6	Databases in a Distributed Environment	1
3.7	Controlling and Auditing Data Management Systems	1
3.8	Access Controls	1
3.9	Controlling and Auditing the SDLC	1
3.10	Risks Associated with ERP Implementation	1
3.11	Implications for Internal Control and Auditing	1
3.12	CAAT	1
4	**Information Risk Management**	
4.1	Benefits of Risk management	1
4.2	Elements of Risks	1
4.3	Quantitative Risk analysis	1
4.4	Qualitative risk analysis	1
4.5	Risk management life cycle	1
4.6	Risk Mitigation	1
5	**Information Security Management**	
5.1	Computer Architecture and system security	1
5.2	Application program security	1
5.3	Computer operations security	1
5.4	Communication Security	1
5.5	Physical security	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITPZ0	**INTERNET OF THINGS**	PE	3	0	0	3

Preamble

This course aims at providing a basic understanding of Internet of Things. It aims at providing hands on training for building simple applications using appropriate sensors, microcontroller board and other components.

Prerequisite

- 14IT430 Computer Networks
- Any Programming Language

Course Outcomes

Upon successful completion of this course students will be able to:

Course Outcomes		**Bloom's Level**
CO1:	Identify the components and Protocols of IOT	Understand
CO2:	Practise programming appropriate boards and reading input from various sensors for IoT specific application	Apply
CO3:	Interpret the issues in connecting microcontroller with Mobile Devices, Bluetooth, USB and Internet.	Apply
CO4:	Examine the working of various sensors and microcontrollers for building IoT based application	Analyze
CO5:	Devise solutions for various IoT applications using sensors and various microcontroller boards	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	L										M
CO3	S	L										M
CO4	S	S	L									M
CO5	S	S	S	M	S	M	S	L	S	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	40	30	20	20
Understand	40	40	30	30
Apply	20	30	40	40
Analyse	0	0	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 is assessed through Mini -Project.

Mini Project Details

- Team formation (Team size: 5)
- Problem identification on various IT, societal, business and environmental needs
- Identify the appropriate components needed to build the microcontroller board.
- Assemble the components and program the board.
- Test the board with sample input.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss the Evolution of IoT.
2. List the some of the protocols involved in IoT.
3. Distinguish among Raspberry Pi,Arduino and Zigbee.
4. Describe the architecture of Cloud of Things.
5. Discuss the two pillars of WoT

Course Outcome 2 (CO2):

1. Write a program to read the input from a switch port and copy it to a LED.
2. Illustrate the Arduino board with a diagram and name its components.
3. Write a program to glow an LED using Arduino

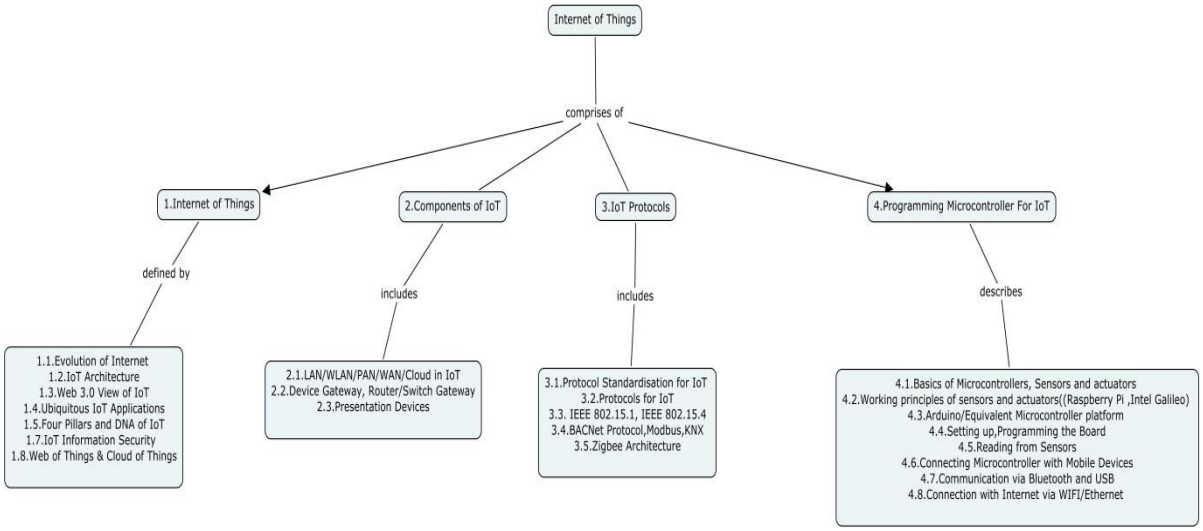
Course Outcome 3 (CO3):

1. Illustrate how a microcontroller can be connected to mobile device.
2. Show the connectivity of microcontroller with Bluetooth and USB.
3. Demonstrate the connectivity issues involved in IoT

Course Outcome 4 (CO4):

1. Illustrate the role of IoT in various applications
2. Infer the right components to build an application in IoT
3. Compare the working of different microcontroller boards.

Concept Map



Syllabus

Internet of Things: Evolution of Internet,IoTArchitecture,Web 3.0 View of IoT, Ubiquitous IoT Applications, Four Pillars and DNA of IoT, IoT Information Security, Web of Things, Cloud of Things.

Components of IoT: LAN/WLAN/PAN/WAN/Cloud in IoT,Device Gateway, Router/Switch Gateway,Presentation Devices

IoTProtocols: Protocol Standardisation for IoT ,Protocols for IoT, IEEE 802.15.1, IEEE 802.15.4,BACNet Protocol,Modbus,KNX,Zigbee Architecture

Programming Microcontroller For IoT: Basics of microcontroller, sensors and actuators ,Working principles of sensors and actuators,Arduino/Equivalent Microcontroller platform(Raspberry Pi ,Intel Galileo) ,Setting up,Programming the Board,Reading from Sensors,Connecting Microcontroller with Mobile Devices,Communication via Bluetooth and USB,Connection with Internet via WIFI/Ethernet

Case Studies: IoT in Agriculture, Healthcare,Smart Cities/Buildings, Augumented Reality.

Text Book

1.CharalamposDoukas ,“Building Internet of Things with the Arduino”, Create space, April 2012.
2.DieterUckelmann,MarkHarrison,FlorianMichahelles, “Architecting the Internet of Things”,Springer,2011

Reference Books

1. Donald Norris, “The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black”,Mc.Graw Hill,2015.
2. CunoPfister, “Getting Started with the Internet of Things”, O'Reilly Media, Inc.,2011
3. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”,CRC Press,2012
4. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things,Key applications and Protocols”,Wiley, 2012
5. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011.
6. https://www.raspberrypi.org/
7. http://estimote.com
8. http://www.ti.com/tool/cc2541dk-sensor
9. https://developer.ibm.com/iot/
10. http://www.microsoft.com/en-in/server-cloud/internet-of-things.aspx

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Internet of Things**	
1.1	Evolution of Internet	1
1.2	IoT Architecture	
1.3	Web 3.0 View of IoT	1
1.4	Ubiquitous IoT Applications	
1.5	Four Pillars and DNA of IoT	2
1.6	IoT Information Security	
1.7	Web of Things & Cloud of Things	1
2	**Components of IoT**	
2.1	LAN/WLAN/PAN/WAN/Cloud in IoT	1

Module No.	Topic	No. of Lectures
2.2	Device Gateway, Router/Switch Gateway	1
2.3	Presentation Devices	
3	**IoT Protocols**	
3.1	Protocol Standardisation for IoT	1
3.2	Protocols for IoT	2
3.3	IEEE 802.15.1, IEEE 802.15.4	2
3.4	BACNetProtocol,Modbus,KNX	1
3.5	Zigbee Architecture	2
4	**Programming Microcontroller For IoT**	
4.1	Basics of microcontroller, sensors and actuators	3
4.2	Working principles of Sensors and actuators	2
4.3	Arduino/Equivalent Microcontroller platform(Raspberry Pi ,Intel Galileo)	3
4.4	Setting up,Programming the Board	3
4.5	Reading from Sensors	2
4.6	Connecting Microcontroller with Mobile Devices	2
4.7	Communication via Bluetooth and USB	1
4.8	Connection with Internet via WIFI/Ethernet	2
5	**Case Studies**	
5.1	IoT Devices:Estimote,Ti Sensor Tag	1
5.2	IoT Platforms: IBM Bluemix, Microsoft Azure	1
5.3	Iot Applications: Agriculture,Healthcare, Smart Cities/Buildings, Augumented Reality	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITRA0	**SERVICE ORIENTED ARCHITECTURE**	PE	3	0	0	3

Preamble

This course defines "service" and "architecture" and establishes a strong understanding of the concepts needed to have an effective working knowledge of SOA methodologies, modelling, design, SOA technologies, orchestration and architectural frameworks. Service Oriented Architecture (SOA) is a specification to make a distributed application over the Internet.

Prerequisite

- 14IT540 - Computer Networks
- 14IT520 - Web Technologies

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom Level**
CO1:	Outline the various SOA delivery strategies	Understand
CO2:	Demonstrate the steps involved in service oriented analysis and design	Apply
CO3:	Implement SOA in development life cycle of Web Services	Apply
CO4:	Experiment with the advanced concepts in SOA such as WS-Security Framework	Apply
CO5:	Model the various business processes involved in a given application with the help of BPEL	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											L
CO2	M								L	L	L	M
CO3	S	M	L						L			M
CO4	S	M	L		S					L	L	L
CO5	S	M	M	L	S					L	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	20	20
Understand	40	50	40	40
Apply	30	30	40	40
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List various Characteristics of SOA.
2. Tell the common principles of service-orientation
3. Show SOAP elements along with its structure
4. Define the loosely coupled nature of the web services.

Course Outcome 2 (CO2):

1. Outline the stages that need to be organized into a delivery cycle that can accommodate the goals and constraints of a project.
2. Compare the different SOA delivery strategies
3. Explain the need of choosing the right delivery strategy that will determine the extent to which business analysts can help shape a service portfolio conceptually.

Course Outcome 3 (CO3):

1. Demonstrate the working of entity centric business service design process.
2. Outline the guidelines to be followed in a SOA design.
3. Explain the various advantages of a business centric SOA

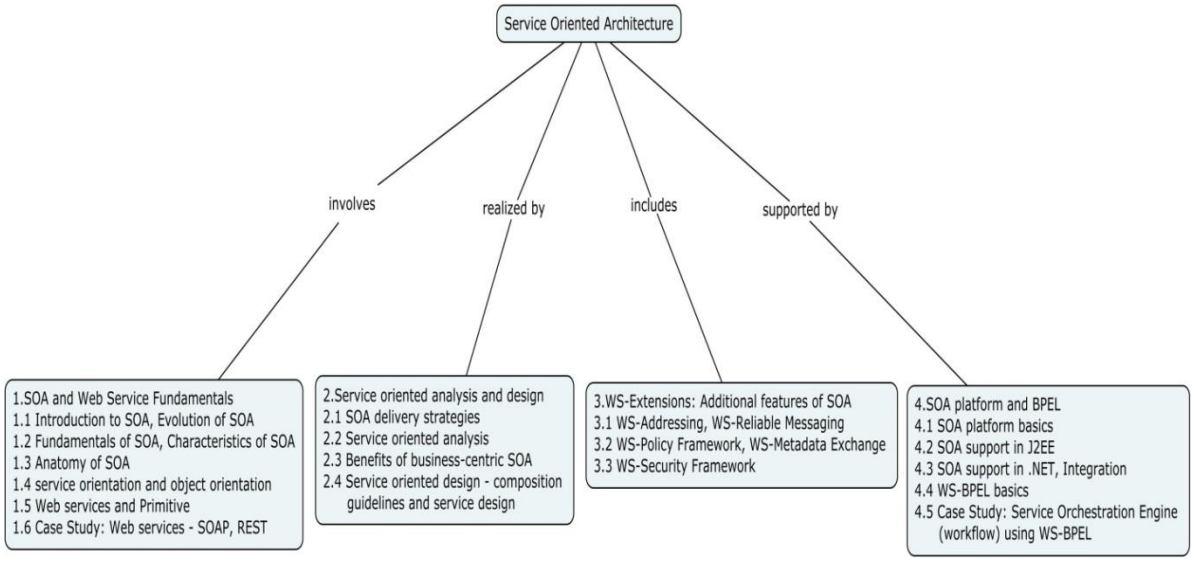
Course Outcome 4 (CO4):

1. Build a web service with a standardized way of including the address of the intended recipient in SOAP headers.
2. Develop a web service that securely transmits the data between distributed applications
3. Choose an appropriate security token model for a given web service scenario

Course Outcome 5 (CO5):

1. Extend the Web Services interaction model to support business transactions.
2. Construct a workflow using Business Process Management Notation for a banking application.
3. Develop a Service Orchestration Engine (workflow) using WS-BPEL and implement service composition. For example, a business process for planning business travels will invoke several services. This process will invoke several airline companies to check the airfare price and buy at the lowest price.

Concept Map



Syllabus

SOA and Web Service Fundamentals: Introduction to SOA**-**Evolution of SOA, Fundamentals of SOA, Characteristics of SOA, Anatomy of SOA, service orientation and object orientation-Web services and Primitive – WSDL, Messaging with SOAP, Message ex-change patterns, coordination, Atomic transactions, Case Study**:** Web services-SOAP,REST.

Service oriented analysis and design - SOA delivery strategies, Service oriented analysis, Benefits of business-centric SOA, Service oriented design - composition guidelines and service design.

WS-Extensions: Additional features of SOA - WS-Addressing, WS-Reliable Messaging, WS-Policy Framework, WS-Metadata Exchange, WS-Security Framework

SOA platform and BPEL – SOA platform basics, SOA support in J2EE, SOA support in .NET, Integration, WS-BPEL basics **Case Study:** Service Orchestration Engine (workflow) using WS-BPEL.

Text Book

1. ThomasErl**, "**Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

Reference Books

1. Thomas Erl, "SOA Principles of Service Design "(The Prentice Hall Service-Oriented Computing Series from Thomas Erl), 2005.
2. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
3. SandeepChatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education, 2005
4. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation" O'REILLY, First Edition, 2006

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**SOA and Web Service Fundamentals**	
1.1	Introduction to SOA ,Evolution of SOA	1
1.2	Fundamentals of SOA, Characteristics of SOA	1
1.3	Anatomy of SOA	1
1.4	Service orientation and Object orientation	1
1.5	Web services and Primitive	1
1.5.1	WSDL	2
1.5.2	Messaging with SOAP	2
1.5.3	Message ex-change patterns	2
1.5.4	Message coordination, Atomic transactions	2
1.5.5	Case Study**:** Web services- SOAP,REST	2
2	**Service oriented analysis and design**	
2.1	SOA delivery strategies	1
2.2	Service oriented analysis	2
2.3	Benefits of business-centric SOA	2
2.4	Service oriented design - composition guidelines and service design	2
3	**WS-Extensions: Additional features of SOA**	
3.1	WS-Addressing, WS-Reliable Messaging	2

Module No.	Topic	No. of Lectures
3.2	WS-Policy Framework, WS-Metadata Exchange	2
3.3	WS-Security Framework	2
4	**SOA platform and BPEL**	
4.1	SOA platform basics	1
4.2	SOA support in J2EE	2
4.3	SOA support in .NET, Integration	2
4.4	WS-BPEL basics	1
4.5	Case Study: Service Orchestration Engine (workflow) using WS-BPEL	2
	Total Lectures	**36**

Course Designers:

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2. Mr.M.ArunFera fera@tce.edu

		Category	L	T	P	Credit
14ITRB0	**PARALLEL COMPUTING**	PE	3	0	0	3

Preamble

This course is an introduction to parallel computing and aims at teaching basic models of parallel machines and tools to program them. It is also an introduction to parallel programming, how to parallelize programs, and how to use basic tools like MPI and POSIX threads.

Prerequisite

- 14IT330 -Computer Organization
- 14IT350 - Operating System

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Describe parallel algorithms, analysis and architectures	Understand
CO2:	Design a parallel algorithm for a problem from the area of computing;	Apply
CO3:	Write a parallel program based on an algorithm that solves the problem	Apply
CO4:	Prepare a report on the algorithm, its performance metrics, and numerical experiments performed	Apply
CO5:	Examine the cost of the algorithm in terms of computing time, communication time, and synchronisation time;	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											
CO2.	S	M			L				M	M	L	
CO3.	S	M			L				M	M	L	
CO4.	S	M			L				M	M	L	
CO5.	S	S	M	L	M	L			S	S	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	10	0	10
Understand	50	40	30	30
Apply	30	60	50	40
Analyse	0	0	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

Course outcomes 2, 3, 4 and 5 is partially evaluated through Assignments.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss in detail classification parallel computers?
2. Explain different factors affecting decision of parallelism?
3. Discuss different performance metrics for parallel systems.
4. Describe different characteristics of Threads

Course Outcome 2 (CO2):

1. Write an algorithm for sorting a given set of numbers using parallel programming.
2. Prove that a k-stage linear pipeline can be atmost k times faster than that of a non-pipelined serial processor.
3. Write a note on applications of Parallel Computing.

Course Outcome 3(CO3):

1. Write a parallel pseudo code for performing an even-odd transportation sort on a linear array of n processors. Show the computation time and the communication time at each step .What is the overall time complexity?
2. Illustrate the sorting process for a sequence of8numbers: 3,1,9,7,5,2,0,6.
3. Suppose the links are 1bytewide and operating at300MHzinanetwork where the average routing distance between nodes in log4P for Pnodes. Compare the unloaded latency for 80-byte packets under store-and- forward and cut-through routing, assuming 4 cycles of delay per hop to maketheroutingdecisionandPrangingfrom16to1,024nodes.Perform the comparison for32-KBtransferfragmentedinI-KB packets.

Course Outcome 4 (CO4):

1. Consider two different implementations, PI and P2,of the same instruction set. There are five classes of instructions (A,B,C,DandE) in the instruction set. PI has a clock rate of 4GHz and P2 has a clock rate of 6GHz.The average number of cycles for each instruction for PI and P2 are as follows: .

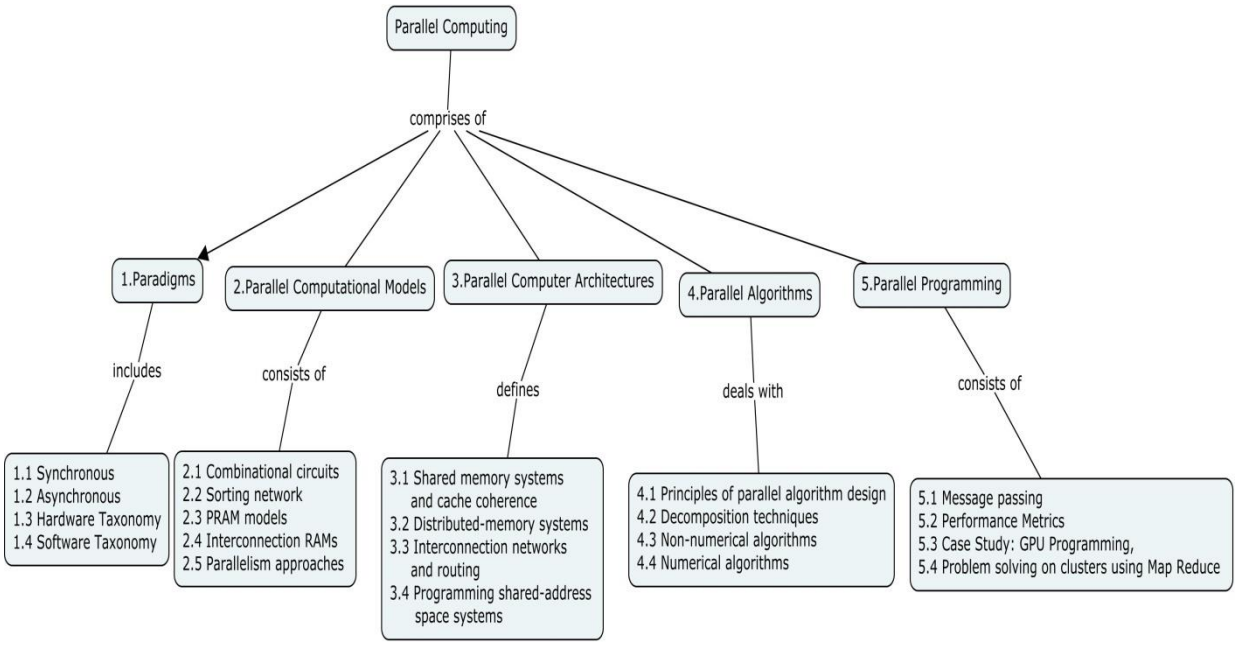
Class	*CPIon PI*	*CPIonP2*
A	1	2
B	2	2
C	3	2
D	4	4
E	5	4

2. Assume that the peak performance is defined as the fastest rate that a computer can execute any instruction sequence. What are the peak performances of PI and P2 expressed in instructions per second?
3. A program has only two modes of operation; purely sequential mode for 40% of the program and fully parallel for the remaining program. The program is run on a multiprocessor system in which the total number of processors n is much greater than the maximum degree of parallelism of the program m (n»m).Calculate the percentage increase in speedup performance of the multiprocessor system when the number of processors is increased from 4to10 for the following models, ignoring all system overheads.
   (i) Fixed workload model
   (ii) Fixed execution time model.
   (iii) Memory bound model.

Course Outcome 5 (CO5):

1. Summarize all forms of parallelism that can be exploited at different processing levels of a computer system, including both multiprocessor and unprocessed approaches. Indicate example computers that have achieved various forms of parallelism.
2. Write in detail about performance metrics and the laws governing performance metrics. Take into account all the parameters like speedup, efficiency, utilization etc.
3. Compare and contrast the shared memory and distributed memory programming approaches

Concept Map



Syllabus

Paradigms of Parallel Computing: Synchronous - vector/array, SIMD, Systolic; Asynchronous - MIMD, reduction paradigm .Hardware taxonomy: Flynn's classifications, Handler's classifications. Software taxonomy: Kung's taxonomy, SPMD.

Parallel Computational Models: Combinational circuits, Sorting network, PRAM models, Interconnection RAMs. Parallelism approaches - data parallelism, control parallelism.

Parallel Computer Architectures: shared memory systems and cache coherence, distributed-memory systems, interconnection networks and routing. Programming shared-address space systems: OpenMP, Pthreads, Collective communication, Synchronization

Parallel Algorithms: Principles of parallel algorithm design: decomposition techniques-mapping & scheduling computation –templates. Non-numerical algorithms: Sorting, graphs, dynamic programming. Numerical algorithms: dense matrix algorithms, sparse matrix algorithms

Parallel Programming: Message passing: MPI, global address space languages .Performance Metrics: speedups, efficiency, utilization, communication overheads, single/multiple program performances, bench marks.Case Study: GPU Programming, Problem solving on clusters using Map Reduce

Text Book

1. Peter S Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann ,2011
2. MJ Quinn, Parallel Computing: Theory and Practice, Tata McGraw Hill, 2002.

References

1. M J Quinn,Parallel Programming in C with MPI and OpenMP , McGraw-Hill Education , 2008
2. DB Kirk and W-m W Hwu. Programming Massively Parallel Processors, Morgan Kaufmann, 2010.
3. Programming Massively Parallel Processors by D. Kirk and W. Hwu, Morgan Kaufmann ,2012

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Paradigms of Parallel Computing**	
1.1	Synchronous	
1.1.1	Vector/array	2
1.1.2	SIMD	
1.1.3	Systolic	
1.2	Asynchronous	
1.2.1	MIMD	1
1.2.2	Reduction paradigm	1
1.3	Hardware taxonomy	
1.3.1	Flynn's classifications	1
1.3.2	Handler's classifications	1
1.4	Software taxonomy	
1.4.1	Kung's taxonomy	1
1.4.2	SPMD	1
2	**Parallel Computational Models**	
2.1	Combinational circuits	1
2.2	Sorting network	1
2.3	PRAM models, Interconnection RAMs	1
2.4	Parallelism approaches	
2.4.1	Data parallelism	1
2.4.2	Control parallelism	
3	**Parallel Computer Architectures**	
3.1	Shared memory systems and Cache coherence	2
3.2	Distributed-memory systems	1
3.3	Interconnection networks and routing	2
3.4	Programming shared-address space systems:OpenMP	2
3.4.1	Pthreads	1
3.4.2	Collective communication	
3.4.3	Synchronization	1
4	**Parallel Algorithms**	
4.1	Principles of parallel algorithm design	1
4.2	Decomposition techniques	
4.2.1	Mapping & scheduling computation	2
4.2.2	Templates.	
4.3	Non-numerical algorithms	
4.3.1	Sorting	1
4.3.2	Graphs	

4.3.3	Dynamic programming	1
4.4	Numerical algorithms	
4.4.1	Dense matrix algorithms	1
4.4.2	Sparse matrix algorithms	1
5	**Parallel Programming**	
5.1	Message passing	
5.1.1	MPI	1
5.1.2	Global address space languages	1
5.2	Performance Metrics	
5.2.1	Speedups, Efficiency	2
5.2.2	Utilization, communication overheads	
5.2.3	Single/multiple program performances, Bench marks	
5.4	Case Study: GPU Programming	2
5.5	Problem solving on clusters using Map Reduce	2
	Total Lectures	**36**

Course Designers:

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2. Ms.T.Manju tmanju@tce.edu

		Category	L	T	P	Credit
14ITRC0	**SOFTWARE DEFINED NETWORKS**	PE	3	0	0	3

Preamble

This course presents the basic architectural principles, fundamental mechanisms and technical challenges of the emerging software-defined networking (SDN) paradigm

Prerequisite

- **14IT540-Computer Networks**

Course Outcomes

On successful completion of the course, the students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Explain the fundamental components and behaviors of control and data planes	Understand
CO2:	Use Openflow Protocols standard to communicate with network components	Apply
CO3:	Demonstrate virtualization of network functions	Apply
CO4:	Discover Network topological information using SDN controllers	Analyze
CO5:	Extend programmability of modern network element Interfaces	Analyze

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1.	M											
CO2.	S	L										
CO3.	S	L										
CO4.	S	S	L		L							
CO5.	S	S	L	L	M							L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	20	20
Understand	40	20	20	20
Apply	40	40	40	40
Analyze	-	20	20	20
Evaluate	-	-	-	-
Create	-	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate Control and Data Plane
2. Why the separation of Control and Data Planes are important?
3. List the protocols used in Control and Data Planes

Course Outcome 2 (CO2):

1. Outline the OpenFlow port abstraction and the various types of OpenFlow ports supported
2. Demonstrate the Packet Replication Mechanisms in Openflow
3. Discuss the Core features of SDN: abstractions, structured state, and state semantics

Course Outcome 3 (CO3):

1. Identify the issues that may results from Network virtualization in terms of the virtualization technique used
2. Describe end to end correctness in network vitualization and develop a suitable algorithm to implement the same
3. Discuss in detail the security issues that could result due to network virtualization and give some corrective measures for the same

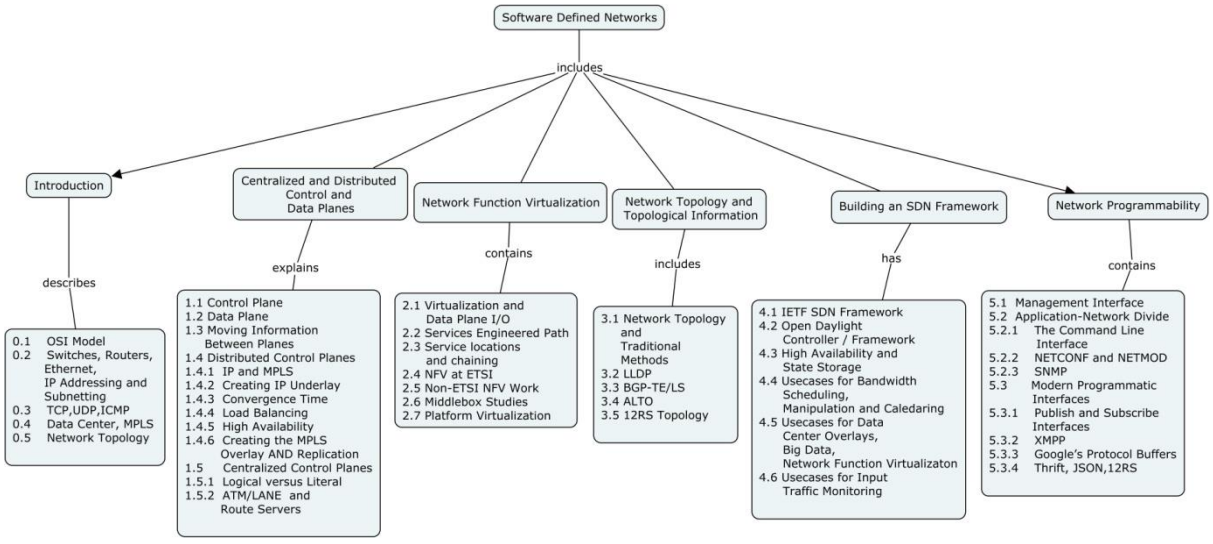
Course Outcome 4 (CO4):

1. Compare available open-source and commercial controllers and hence justify the suitable controller based on Performance considerations for any real world application.
2. Examine the use of LLDP as a switch port discovery protocol by an SDN Controller.
3. Identify a suitable routing Protocol that standardizes the topology information for applications that do not interact directly. Also examine if the above protocol can be combined with one or more protocols to enhance the scalability of the application.

Course Outcome 5 (CO5):

1. Discuss how Google's Protocol Buffers are better than the traditional XML and JSON.
2. List out and describe the common forms of filtering available in Message Processing.
3. Discuss how Publish and Subscribe Interfaces are better than other Programmatic Interfaces.

Concept Map



Syllabus

Introduction OSI Model, Switches, Routers, Ethernet, IP Addressing and Sub netting, TCP,UDP,ICMP, MPLS, Network Topology, Data Centre

Centralized and Distributed Control and Data Planes Control Plane**,** Data Plane**,** Moving Information Between Planes**,** Distributed Control Planes**,** IP and MPLS**,** Creating IP Underlay**,** Convergence Time**,** Load Balancing**,** High Availability**,** Creating the MPLS Overlay AND Replication, Centralized Control Planes, Logical versus Literal, ATM/LANE and Route Servers

Network Function Virtualization Virtualization and Data Plane I/O, Services Engineered Path, Service locations and chaining,NFV at ETSI,MiddleboxStudies,Plateform Virtualization

Network Topology and Topological Information Abstraction Network Topology and Traditional Methods**,** LLDP**,** BGP-TE/LS**,** ALTO**,** 12RS Topology

Building an SDN Framework IETF SDN Framework, Open Daylight Controller / Framework ,High Availability and State Storage ,Use cases for Bandwidth Scheduling, Manipulation and Caledaring , Use cases for Data Centre Overlays, Big Data, Network Function Virtualizaton,Usecases for Input Traffic Monitoring

Network Programmability Management Interface, Application-Network Divide, The Command Line Interface, NETCONF and NETMOD, SNMP,Modern Programmatic Interfaces,Publish and Subscribe Interfaces,XMPP,Google's Protocol Buffers, Thrift, JSON,12RS

Text Books

1. Thomas D Nadeau and ken Gray, "SDN", O'Reilly publication, First Edition, 2014

References

1. https://www.sdxcentral.com/flow/sdn-software-defined-networking/
2. http://queue.acm.org/detail.cfm?id=2560327
3. http://www.cs.princeton.edu/~jrex/papers/rcp-nsdi.pdf
4. http://networkheresy.com/2011/06/05/what-openflow-is-and-more-importantly-what-its-not/

Course Contents and Lecture Schedule

Module No	Topic	No. of Lectures
0	**Introduction**	
0.1	OSI Model	1
0.2	Switches, Routers, Ethernet, IP Addressing and Subnetting	
0.3	TCP,UDP,ICMP	
0.4	Data Center, MPLS	1
0.5	Network Topology	
1	**Centralized and Distributed Control and Data Planes**	
1.1 1.2 1.3	Control Plane Data Plane Moving Information Between Planes	1
1.4	Distributed Control Planes	1
1.4.1	IP and MPLS	
1.4.2 1.4.3 1.4.4 1.4.5	Creating IP Underlay Convergence Time Load Balancing High Availability	1
1.4.6	Creating the MPLS Overlay AND Replication	1
1.5	Centralized Control Planes	1
1.5.1	Logical versus Literal	1
1.5.2	ATM/LANE and Route Servers	1
2	**Network Function Virtualization**	
2.1	Virtualization and Data Plane I/O	1
2.2	Services Engineered Path	1
2.3	Service locations and chaining	1
2.4	NFV at ETSI	1
2.5	Non-ETSI NFV Work	
2.6	Middle box Studies	1
2.7	Platform Virtualization	1
3	**Network Topology and Topological Information Abstraction**	
3.1	Network Topology and Traditional Methods	1
3.2	LLDP	1
3.3	BGP-TE/LS	1
3.4	ALTO	1
3.5	12RS Topology	1
4	**Building an SDN Framework**	
4.1	IETF SDN Framework	1
4.2	Open Daylight Controller / Framework	1
4.3	High Availability and State Storage	1
4.4	Use cases for Bandwidth Scheduling, Manipulation and Caledaring	1
4.5	Use cases for Data Center Overlays, Big Data, Network Function Virtualizaton	1
4.6	Use cases for Input Traffic Monitoring	1

5	**Network Programmability**	
5.1 5.2	Management Interface Application-Network Divide	1
5.2.1	The Command Line Interface	1
5.2.2	NETCONF and NETMOD	1
5.2.3	SNMP	1
5.3	Modern Programmatic Interfaces	1
5.3.1	Publish and Subscribe Interfaces	1
5.3.2	XMPP	1
5.3.3	Google's Protocol Buffers	
5.3.4	Thrift, JSON,12RS	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITRD0	**NETWORK ADMINSTRATION**	PE	3	0	0	3

Preamble

This course on network administration covers network management technology which includes challenges and solutions for enterprise environment. It provides a strong understanding of network management tools and also enable to make decisions in an increasingly complex IT environment.

Prerequisite

- 14IT440 – Computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	**Bloom's Level**
CO1	Explain the communication protocols and standards in the network management.	Understand
CO2	Choose the information model for SNMP network management.	Apply
CO3	Illustrate the Abstract Syntax Notation for the specified Network.	Apply
CO4	Select any network management tool to measure network statistics.	Apply
CO5	Compare various parameters of network statistics measurement.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M	M										
CO2.	M	S	S	M	L		L		M			M
CO3.	M	M	M	M	M							
CO4.	S	M	M	M	M							
CO5.	S	M	M		M		L		M			S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	10	20
Understand	50	30	30	40
Apply	30	50	60	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 will be evaluated through mini project.
Miniproject includes the following modules,
1. Design and development of simple applications
2. Select any network management tool
3. Measure network statistics.

Course Level Assessment Questions

Course Outcome1 (CO1):

1. Educational institutions in your state or province are networked. Discover that network by tracing the route from your institute or organization to other institutions or organizations.
2. Draw the route diagram identifying each node for the following data obtained using a trace routing tool.
3. Identify the hosts in the neighbouring sub networks and draw the configuration of the interconnected sub networks.
4Draw the message structure of ASN.
5. Compare SNMPv2 and SNMPv3
6. List out the services in SNMPv3

Course Outcome 2 (CO2):

1. Explain the decimal notation in representing the classes of IPV4 addresses. Give an example for each class.
2. Your are establishing a small company. Give an example of each of the five functions Applications that you would implement in your network management system
3. Draw the SNMPv2 PDU formats

Course Outcome 3 (CO3):

1. Illustrate the Abstract Syntax Notation for the specified
2. Illustrate the ASN .1 data type definition for any network.
3. Illustrate the Informal Description of a personal record maintenance

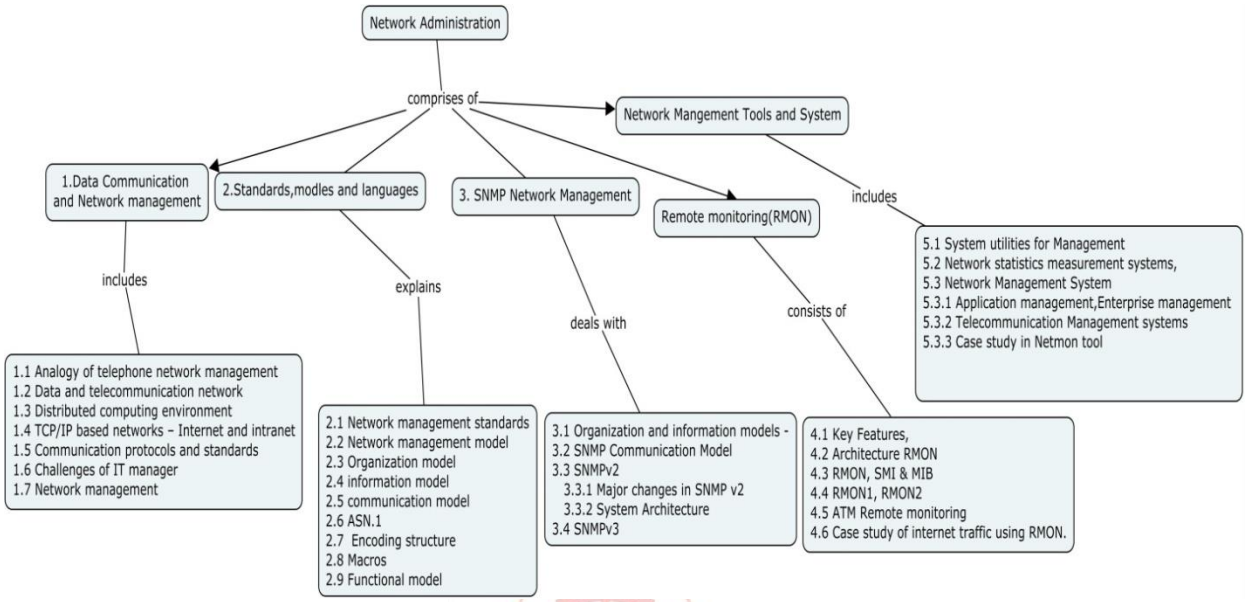
Course Outcome 4 (CO4):

1. Compare the different network model suits for any enterprise application.
2. Illustrate the use of network management organization model with MoM
3 .Demonstrate the need dual role management process.
4 .Install and Configure netmon tool and measure network statistics.

Course Outcome 5 (CO5):

1. Illustrate the hosts in the neighbouring sub networks and draw the configuration of the interconnected sub networks
2. Demonstrate the performance metrics for any specified network topology.

Concept Map



Syllabus

Data Communication and network management overview: Analogy of telephone network management, Data and telecommunication network, distributed computing environment, TCP/IP based networks – Internet and intranet, communication protocols and standards, challenges of IT manager. **Network management**: goals, organization and functions, Network management system platform, current status and future of network management.

Standards, models and languages: Network management standards, Network management model, Organization model, information model, communication model, ASN.1, Encoding structure, Macros, Functional model.

SNMP Network Management: Organization and information models - Managed network, Internet organizations and standards, SNMP Communication Model-SNMPv2-Major changes in SNMP v2, System Architecture, SNMPv3

RMON Key Features, Architecture RMON(Remote monitoring) - RMON, SMI & MIB, RMON1, RMON2, ATM Remote monitoring, Case study of internet traffic using RMON.

Network management tools and systems: System utilities for Management, Network statistics measurement systems, network management systems - Network Management System and Application management, Enterprise management, Telecommunication Management systems. Case study in **Network monitoring-** Netmon tool

Text Book

1. Mani Subramanian ,"Network Management and Practice" Pearson, Second Edition, 2012

References

1.Marc Farley, "Building Storage Networks",TataMcGraw Hill, Osborne.2001.
2.MeetaGupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.

Course Contents and Lecture Schedule

Module.No.	Topic	No. of Lectures
1	Data Communication and network management overview:	
1.1	Analogy of telephone network	1
1.2	Data and telecommunication network	1
1.3	Distributed computing environment	1
1.4	TCP/IP based networks – Internet and intranet	1
1.5	Communication protocols and standards	1
1.6	Challenges of information technology manager	1
1.7	Network management – goals, organization and functions	
1.7.1	Network and system management	1
1.7.2	Current status and future of network management	1
2	Standards, models and languages	
2.1	Network management standards	1
2.2	Network management model	1
2.3	Organization model	1
2.4	Information model	
2.5	Communication model	1
2.6	ASN.1, Encoding structure	1
2.7	Encoding structure	
2.8	Macros	1
2.9	Functional Model	
3	SNMP network management:	
3.1	Organization and information models	1
3.1.1	Managed network	1
3.1.2	Internet organization and standard SNMP model	1
3.2	SNMP Communication model	1
3.3	SNMPv2	1
3.3.1	Major changes in SNMP v2	1
3.3.2	System Architecture	1
3.4	SNMPv3	1
4	RMON Remote Monitoring	
4.1	Key Features	1
4.2	Architecture RMON	1
4.3	RMON, SMI & MIB	1
4.4	RMON1, RMON2	1
4.5	ATM Remote monitoring	1
4.6	Case study of internet traffic using RMON.	1
5	Network management tools and systems:	
5.1	System utilities for Management	1
5.2	Network statistics measurement systems	1
5.3	Network management systems	1
5.3.1	Application management, Enterprise management	1
5.3.4	Telecommunication Management systems	1

Module.No.	Topic	No. of Lectures
5.3.5	Case study in Network monitoring-Netmon tool	1
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITRE0	**SOFTWARE TESTING**	PE	3	0	0	3

Preamble

This course presents a comprehensive study of software testing concepts, principles, methodologies, management strategies. The purpose of this course is to build the skills necessary to perform software testing at the function, class and application level.

Prerequisite

- 14IT370 - Software Engineering

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	**Bloom's Level**
CO1	Explain the various testing techniques and processes	Understand
CO2	Prepare test cases by using various test generation approaches	Apply
CO3	Identify the test adequacy criteria for white box and black box testing techniques.	Apply
CO4	Illustrate minimized and prioritized test suite by using test selection methods.	Apply
CO5	Compare various test techniques ensuring effective test cases for various real time applications.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										M
CO2	M	L										S
CO3	S	M			M			S				S
CO4	S	M			S			S		S	M	S
CO5	S	M			S	S		S	S	S	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	30	10	10
Understand	30	30	20	20
Apply	40	40	50	50
Analyse	0	0	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 is evaluated through mini project assessment.

Guidelines for the Mini-project:

- Group formation: Students are split into project groups with around 3 members in each group. Project groups are responsible for organising themselves, keeping records on the progress of the project, including the minutes of meetings held.
- At the end of the semester, the team has to present their project, submit their report and share their lessons learnt/best practices with other teams.
- Some of the activities may include: (but not limited to)
- Application identification and Requirements gathering
- Project planning
- Requirements Analysis
- Testing Tools identification
- Design and Development
- Testing demonstration
- Documentation

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the PDCA cycle and where testing fits in?
2. Describe how test documents in a project span across the software development lifecycle.
3. Identify how a defect which could have been removed during the initial stage is removed in a later stage.
4. Predict how testing affects cost in industry.
5. Associate testing process in the build and execution phases.

Course Outcome 2 (CO2):

1. Differentiate between white box, black box, and gray box testing?
2. Explain regression testing and confirmation testing
3. Compare System testing and Acceptance testing?
4. Classify the different types of coverage techniques?
5. Summarize the configuration management?

Course Outcome 3 (CO3):

1. Construct a control flow graph for this program and calculate cyclomatic complexity.

```
bool find(int n, Tree * t)
        {
found = false;
while (t != NULL)
        {
if (n == t->n)
       {
found = true; break;
        }
else if (n < t->n) t = t->l;
else t = t->r;
          } }
```

2. Sketch down the sorting program and draw CFG .Construct the dominator and post dominator trees for the CFG.
3. Construct a PDG for the matrix multiplication program.
4. Show how tests designed for testing a component of a system might not be useful during system test.

5. One can expect that in many cases, participants in an inspection session are able to suggest solutions for a detected defector, at least, point out possible directions for its solution. While it is clear that these suggestions are crucial for the development team, it is commonly recommended to avoid any discussion about solutions during the inspection session.

(1) List your arguments in favour of this recommendation.

(2) What other kinds of cooperation between the moderator and the review team would you prefer to observe in a session?

Course Outcome 4 (CO4):

1. The preparations made by members of inspection teams are considered to beof greater depth and thoroughness when compared with the preparations forwalkthroughs.

(1) What activities are included in such high levels of preparation?

(2) Do you think that inspection teams having 15 members can achieve similarly high levels of preparation?

2. The following example illustrates the definition of (valid and invalid) equivalence classes and the corresponding test case values. The software module in question calculates entrance ticket prices for the Golden Splash Swimming Centre.

The Centre's ticket price depends on four variables: day (weekday, weekend), visitor's status (OT = one time, M = member), entry hour (6.00–19.00,19.01–24.00) and visitor's age (up to 16, 16.01–60, 60.01–120).Identify the valid and invalid EC's for the above.

3. Bengal Tours is a city centre travel agency that specializes in tours and vacations in Canada. The agency regularly employs 25 permanent employees. During the spring and summer, the agency employs an additional 20–25 temporary staff, mostly senior citizens and students. The agency is considering purchasing the right to use the software system "Tourplanex", which supports the planning with flight and vacation site vacancies and price information. If purchased, the software will become the main working tool for the agency staff.

(1) Discuss the importance of the training usability and operational usability tests to be performed by the agency before it purchases "Tourplanex".

(2) Suggest to Bengal Tours management that they should apply training usability and operational usability tests to be performed on the program.

4. Write down any C program for identifying prime numbers between 1 to 100 and do the following.

(1) Prepare a flow chart for the module.

(2) Prepare a program flow graph for the module.

(3) Calculate the cyclomatic complexity for the module.

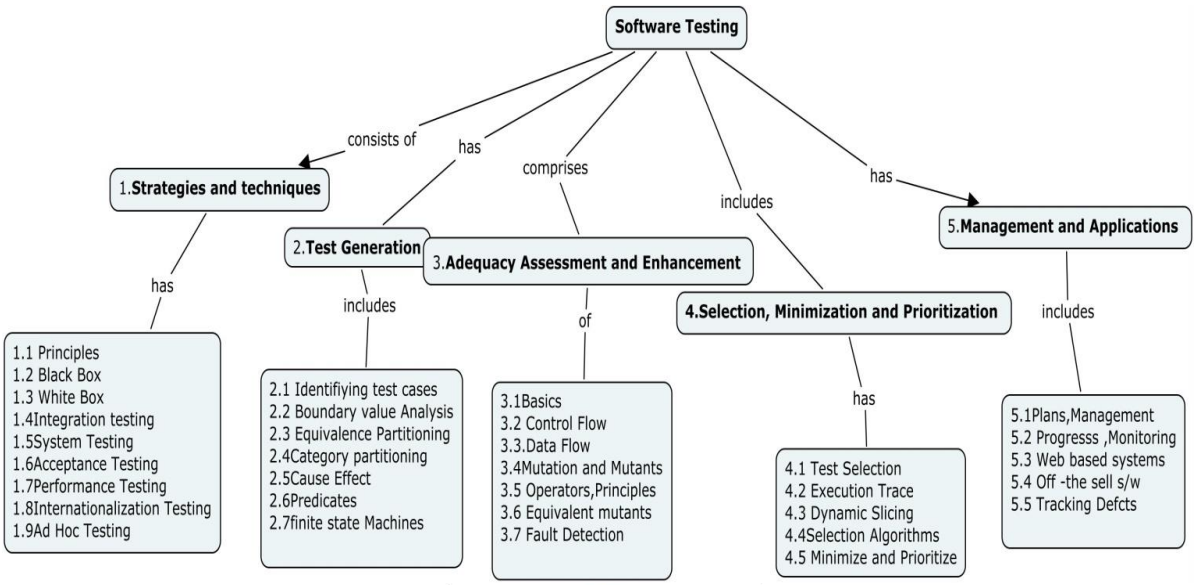
(4) Prepare the maximal set of independent paths according to (3). Document the basic paths and indicate the added edges of each independent path

5. Write the role of testing tools in software field? How these tools have been selected and used**.**

Course Outcome 5 (CO5):

Evaluated through mini project.

Concept Map



Syllabus

Testing Strategies and techniques: Principles of Testing – Black Box testing – White Box testing –Integration testing- System Testing- Acceptance Testing ,Performance Testing, Internationalization Testing, Ad Hoc Testing.

Test Generation- Identifying test conditions and designing test cases -Boundary Value Analysis- -Equivalence Partitioning-Category partitioning method-Cause Effect Graphing, Test Generation from Predicates, Test Generation from finite state Machines.

Test Adequacy Assessment and Enhancement – Basics, Adequacy criteria based on Control Flow, Adequacy criteria based on data flow, Mutation and Mutants ,Test Assessment using mutation, mutation operators ,Principles of Mutation Testing , Equivalent Mutants , Fault Detection using Mutation.

Test Selection, Minimization and Prioritization – Selecting Regression Tests, Test selection using Execution trace, Test Selection Using Dynamic Slicing, Scalability of test Selection Algorithms, Test Minimization and Prioritization,.

Test Management and Applications -Test Plans, Test Management-Test progress monitoring and control - Testing Web based Systems, Testing Off-the shelf software, Tracking Defects , Case Study(Open Source Testing Tools such as .R.T.M.R, Tarauntula)

Text Books

1. SrinivasanDesikan ,Gopalasamy Ramesh, ”Software Testing – principles and practices”, Pearson Education , First Edition ,2009.
2. Aditya P.Mathur “Foundations of Software Testing “, Pearson education, First Edition. 2008.

References Books

1. William E.Perry ,” Effective methods for software testing”, John wiley& Sons, Second Edition ,2000.
2. Roger S.Pressman, Software Engineering A Practitioner’s Approach, McGraw Hill International Edition , Seventh Edition. 2010.

Course Contents and Lecture Schedule

Sl. No	Topic	No.of Lectures
1.	Testing Strategies and techniques	
1.1	Principles of Testing	1
1.2	Black Box testing	1
1.3	White Box testing	1
1.4	Integration testing	1
1.5	System Testing	1
1.6	Acceptance Testing	1
1.7	Performance Testing	
1.8	Internationalization Testing	1
1.9	Ad Hoc Testing	
2	Test Generation	
2.1	Identifying test conditions and designing test cases	1
2.2	Boundary Value Analysis	2
2.3	Equivalence Partitioning	1
2.4	Category partitioning method	1
2.5	Cause Effect Graphing	1
2.6	Test Generation from Predicates	1
2.7	Test Generation from finite state Machines	1
3	Test Adequacy Assessment and Enhancement	
3.1	Basics	1
3.2	Adequacy criteria based on Control Flow	2
3.3	Adequacy criteria based on Data Flow	2
3.4	Mutation and Mutants	1
3.5	Test Assessment using mutation	1
3.6	Mutation operators, Principles of Mutation Testing	1
3.7	Equivalent Mutants	1
3.8	Fault Detection using Mutation.	1
4	Test Selection, Minimization and Prioritization	
4.1	Selecting Regression Tests	1
4.2	Test selection using Execution trace	1
4.3	Test Selection Using Dynamic Slicing	1
4.4	Scalability of test Selection Algorithm	1
4.5	Test Minimization and Prioritization	1
5	Test Management and Applications	

5.1	Test Plans, Management	1
5.2	Test progress monitoring and control	
5.3	Testing Web based Systems	1
5.4	Testing Off-the shelf software	1
5.5	Tracking Defects	1
	Case Study –Open Source Tools	2
	Total Lectures	**36**

Course Designers:

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		Category	L	T	P	Credit
14ITRF0	**C# AND .NET FRAMEWORK**	PE	3	0	0	3

Preamble

This subject will enable students to understand the .Net Framework as a whole and technologies that constitute the framework. The student will gain programming skills in C# both in basic and advanced levels. It will help them to develop applications (windows based application, web based application and web services) using C#.

Prerequisite

- 14IT320-Object Oriented Programming

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	Bloom's Level
CO1.	Explain the .Net framework components of CLR, CTS and JIT.	Understand
CO2.	Implement the basic concepts of OOP and delegates-events using C# programming language and apply Framework Base Classes for different applications	Apply
CO3.	Create components in assemblies and implement the reflection class in applications	Apply
CO4.	Analyze the different types of applications like windows based application, web based applications and able to retrieve data using ADO.Net	Analyze
CO5.	Compare Windows Communication Foundation, Windows Presentation Foundation, Windows Workflow Foundation	Apply
CO6.	Create a simple project to incorporate .NET Framework.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M										
CO2.	S	M	M		S						M	
CO3.	S	S	S								L	
CO4.	M	M	M		M							
CO5.	M										L	S
CO6	S	S	S						M			S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment			Terminal Examination
	Test 1	Test 2	Test 3	
Remember	40	20	20	20
Understand	40	40	30	20
Apply	20	30	30	20
Analyse	0	10	10	20
Evaluate	0	0	0	0
Create	0	0	10	20

- CO2, CO3, CO4 and CO6 are evaluated by laboratory sessions/assignments.

Attainment of course outcome 7 is evaluated through mini project which involves design and development of simple applications in .NET framework.
Assignments are evaluated through rubrics. Some of the assignment problems include: (but not limited to)

1. Implement delegates and events to solve the complex programming areas.
2. Create a DLL component that may be used by another application
3. Implement crystal report in any application
4. Include different database for your application
5. Prepare the best Desktop framework for any application

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List .Net framework components like a CLR, CTS, and CLS.
2. Recall the features of Managed Code.
3. List any of different types of compilation.
4. Retrieve the use of delegates and events
5. List the types of assemblies.
6. Describe the namespace in which .Net have the data functionality classes.
7. Describe are the two fundamental objects in ADO.NET.
8. List difference between dataset and data reader.
9. Recall the major difference between classic ADO and ADO.NET.

Course Outcome 2 (CO2):

1. Summarize .Net framework with core components.
2. Summarize various Base classes in the .Net Framework.
3. Explain jagged array and its use with simple example.
4. Explain the Lambda Expression with examples.
5. Explain various types of Assemblies with necessary examples.
6.How will you handle the Language Integrated Query for Relational Data in the applications.
7. Classify the Basic components of ADO.NET environment for different data providers.
8. How do you access the different web service from various web applications?
9. Interpret the need of windows workflow foundation in the application.

Course Outcome 3 (CO3):

1. Implement a program for System.IO namespace.
2. Implement a program to connect the database using System.Data.OleDb.
3. Carryout C# program to implement the string manipulation.
4. Implement a C# program for the following concepts.

a. Delegates
b. Event handling

5. Implement the LIQRD operation for the following

a. Select
b. Count
c. Min, Max
d. Distinct
e. Intersect

6. Implement a window based application for Employee payroll management.
7. Using C# implement the following assemblies:

a) Private
b) Shared
c) Single file
d) Multi file

Course Outcome 4 (CO4):

1. Compare and contrast the characteristic of the following Namespace
   - System.Data
   - System.Collection
   - System.Drawing
   - System.Text

2. Explain the difference between an ADO.NET Dataset and an ADO Record set? If a table contains 20000 records in a page at each time 100 records to be displayed. What is the steps you will take to improve performance? Will you use dataset or data reader?

3. Compare the different ways to get the assembly (System.Reflection.Assembly.) for a given type in .Net4. Compare the different types of assemblies and justify usage.

4. Compare and contract LINQ to SQL attribute-based approach to mapping a LINQ to SQL object model to a SQL Server database.

Course Outcome 5 (CO5):

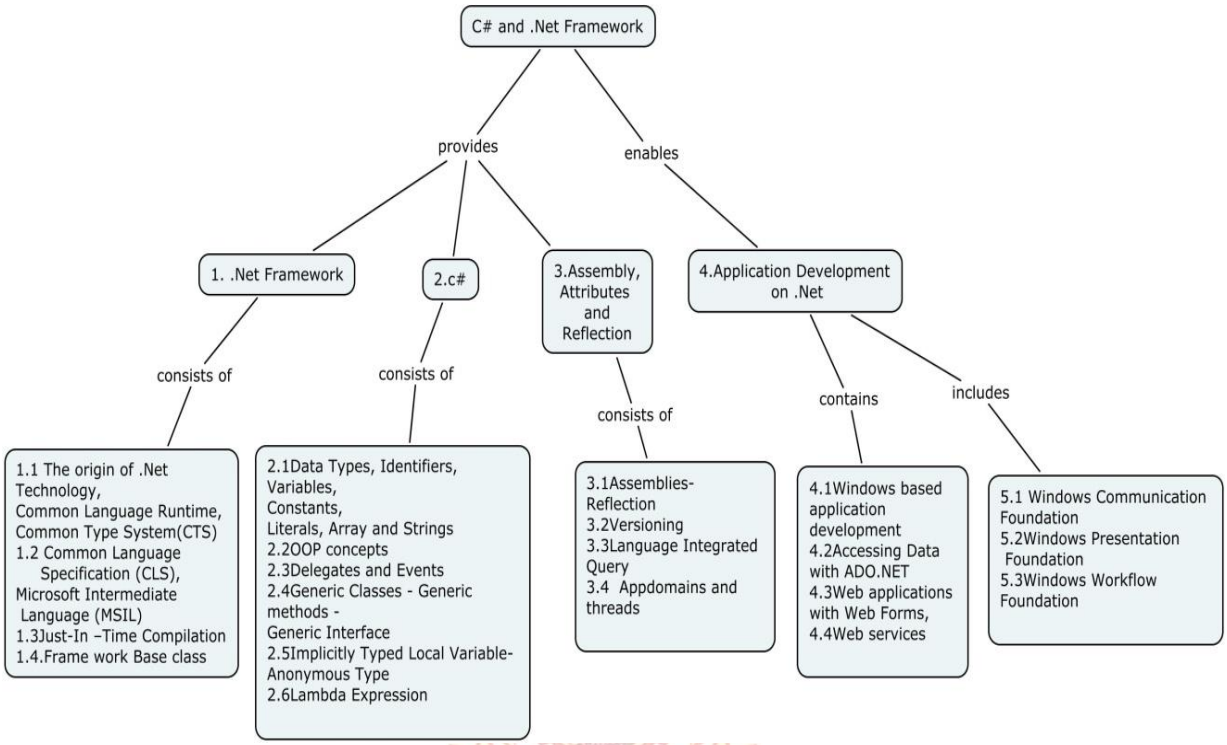
1.Create WCF application to implement any webservice..

2. Create a Windows Workflow foundation for flight booking system which includes the following condition1.Ask for passenger name.2.Ask for city from where passenger wants to fly.3.Ask for destination city.4.Project will have list of cities in a dictionary. It will search city names in same.5.If it finds both cities in dictionary, it will display 'Booking confirmed'. (Assuming there is unlimited space in airplane and everyone can get a window seat!)6. Otherwise, apologize with passenger...

Course Outcome 6 (CO6):

1. Design and implement a C# Program for making Student mark list using Delegates and event
2. Design and implement a C# Program for Online Bus Reservation system using Generic classes, methods and interfaces.
3. Design a service oriented architecture to provide weather services. Implement the same using C#
4. Design and implement a C# program using ADO.NET to perform operations of a library
5. Design a calculator web-service. Test this program using a client program.
6. Create a program structure that can connect with multiple databases seamlessly to display the details of student table in a data grid control

Concept Map



Syllabus

The .Net framework: Introduction, .Net framework, 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-Lambda Expression.

Assembly, Attributes and Reflection: Assemblies- Versioning- Attributes- Reflection. Language Integrated Query (Language Integrated Query for Relational Data)-

Overview of Appdomains and threads.

Application Development on .NET: Windows based Applications, Accessing Data with ADO.NET, -Web applications with Web Forms, XML Web Services- Distributed application-Implementing .NET Remoting-Develop peer-to-peer applications.

Overview of Advanced .Net features: Windows Communication Foundation-Windows Presentation Foundation-Windows Workflow Foundation-Case study in Windows Azure Cloud

Text Book

1. Andrew Troelsen, “Pro C#5 and the .NET 4.5 Framework”,Andrew Troelsen, Apress, Sixth Edition 2012

References

1. Herbert Schildt, “C# 4.0 The Complete Reference”, McGraw-Hill, 2010.
2. Karli Watson, Christian Nagel, etal, Professional C# 4.0 and .NET 4, Wrox, 2010
3. https://msdn.microsoft.com

Course Contents and Lecture Schedule

S. No	Topic	No. of Lecturers
1	**The .Net framework**:	
1.1	Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS)	2
1.2	Common Language Specification (CLS),Microsoft Intermediate Language (MSIL)	2
1.3	Just-In –Time Compilation	1
1.4	Framework Base Classes	1
2	**C –Sharp Language**	
2.1	Introduction – Data Types, Identifiers, Variables, Constants, Literals, Array and Strings	3
2.2	OOP concepts	2
2.3	Delegates and Events	2
2.4	Generic Classes – Generic methods – Generic Interface	1
2.5	Implicitly Typed Local Variable- Anonymous Type	2
2.6	Lambda Expression	1
3	**Assembly, Attributes and Reflection**	
3.1	Assemblies-Reflection	2
3.2	Versioning	1
3.3	Language Integrated Query (Language Integrated Query for Relational Data).	2
3.4	Overview of Appdomains and threads	1
4	**Application Development on .NET**	
4.1	Windows based application development	2
4.2	Accessing Data with ADO.NET	2
4.3	Web applications with Web Forms	2
4.4	XML Web service	1
4.4.1	Distributed application- Implementing .NET Remoting-.	1
4.4.2	Develop peer-to-peer applications	1
5	**Overview of Advanced .Net features**	
5.1	Windows Communication Foundation	2
5.2	Windows Presentation Foundation	1
5.3	Windows Workflow Foundation	1
5.4	Case study in Windows Azure Cloud	1
	Total Lectures	**36**

Course Designers:

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2. Ms.K.Indira kiit@tce.edu
3. Ms.C.Santhiya santhiya.c@gmail.com

		Category	L	T	P	Credit
14ITRG0	**MULTICORE ARCHITECTURE**	PE	3	0	0	3

Preamble

Multicore architecture is the science and art of selecting and interconnecting hardware components to create a computer that meets functional, performance and cost goals. The objective of this course is to introduce the fundamental techniques on which high-performance computing is based, to develop the foundations for analyzing the benefits of design options in computer architecture, to give some experience of the application of these techniques, and provide in-depth coverage of current and emerging trends in computer architectures, focusing on performance and the hardware/software interface. The course emphasis is on analyzing fundamental issues in architecture design and their impact on application performance.

Prerequisite

- 14IT340 - Computer Organisation

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1.	Use the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges.	Apply
CO2.	Examine the symmetric shared-memory architectures and multiprocessor cache coherence using the directory based and snooping class of protocols with their performance.	Analyze
CO3.	Relate the different types of Interconnection networks with Multicore architecture	Apply
CO4.	Compare the performance of different Multicore architectures, virtual memory and virtual machines.	Analyze
CO5.	Select the appropriate optimization technique from the several advanced optimizations to achieve cache performance for the given scenario.	Apply
CO6.	Improve application performance for different CPU architectures by using simulation and evaluation tools.	Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M	M	L	L	L							M
CO2.	M	M	M	M	L							M
CO3.	M	L	L	L								L
CO4.	M	M	M	M								M
CO5.	S	M	M	M	L							M
CO6.	S	M	M	M	M	M	M	L	L	L	L	S

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	10	10
Understand	30	20	10	30
Apply	50	50	50	50
Analyse	-	10	30	10
Evaluate	-	-	-	-
Create	-	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Suppose that we want to enhance the processor used for Web serving. The new processor is 10 times faster on computation in the Web serving application than the original processor. Assuming that the original processor is busy with computation 40% of the time and is waiting for I/O 60% of the time, what is the overall speedup gained by incorporating the enhancement?
2. Show the Reservation stations and register tags when all of the instructions have issued, but only the first load instruction has completed and written its result to the CDB for the following code sequence.

   L.D F6,32(R2)
   L.D F2,44(R3)
   MUL.D F0,F2,F4
   SUB.D F8,F2,F6
   DIV.D F10,F0,F6
   ADD.D F6,F8,F2
3. Show how the loop would look on MIPS, both scheduled and unscheduled, including any stalls or idle clock cycles. Schedule for delays from floating-point operations.

   for (j=50; j>0; j=j–1)
   a[j] = a[j] + c

Course Outcome 2 (CO2):

1. Assume that words c1 and c2 are in the same cache block, which is in the shared state in the caches of both A1 and A2. Assuming the following sequence of events, identify each miss as a true sharing miss, a false sharing miss, or a hit. Any miss that would occur if the block size were one word is designated a true sharing miss.

Time	A1	A2
1	Read c1	
2		Read c2
3	Write c1	
4		Write c2
5	Write c2	
6		Read c1
7	Read c2	

2. Draw the State transition diagram for an individual cache block in a directory based system.

3. Explain in detail about the protocol, which is the alternative to a snoop-based coherence protocol.

Course Outcome 3 (CO3):

1. Compare any four static interconnection networks used for multiprocessors.
2. Give the basic network structure and functions of Interconnection Networks.
3. Discuss briefly about the characterizing performance of interconnection networks.
4. Assume we have a dedicated link network with a data bandwidth of 8 Gbps for each link in each direction interconnecting two devices within an OCN, SAN, LAN, or WAN, and we wish to transmit packets of 100 bytes (including the header) between the devices. The end nodes have a per-packet sending overhead of x + 0.05 ns/byte and receiving overhead of 4/3(x) + 0.05 ns/byte, where x is 0 µs for the OCN, 0.3 µs for the SAN, 3 µs for the LAN, and 30 µs for the WAN, which are typical for these network types. Calculate the total latency to send packets from one device to the other for interconnection distances of 0.5 cm, 5 m, 5000 m, and 5000 km assuming that time of flight consists only of link propagation delay (i.e., no switching or other sources of delay).

Course Outcome 4 (CO4):

1. Explain in detail about INTEL Multi-core Architecture
2. Compare and contrast the features of IBM Cell and SUN CMP Architecture.
3. Discuss the essentials of GPU Computational structures, ISA and Memory structures.

Course Outcome 5 (CO5):

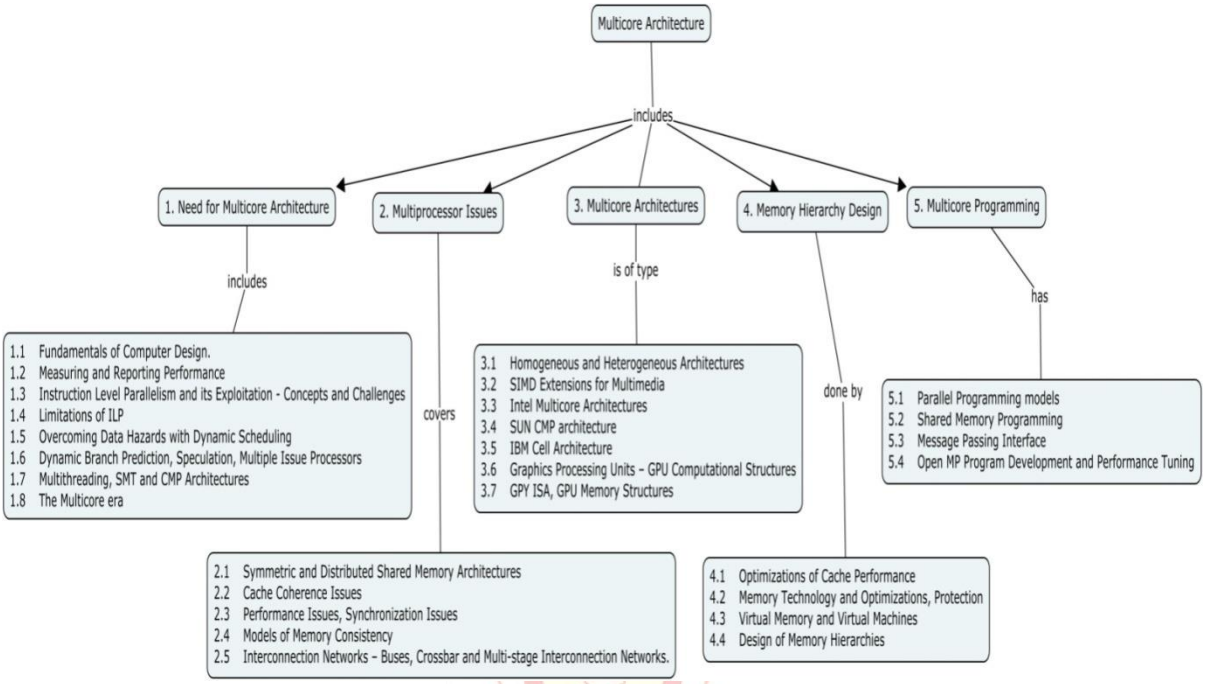
1. Discuss briefly about the Cache optimization technique by reducing the miss penalty.
2. Assume that the hit time of a two-way set-associative first-level data cache is 1.1 times faster than a four-way set-associative cache of the same size. The miss rate falls from 0.049 to 0.044 for an 8 KB data cache. Assume a hit is 1 clock cycle and that the cache is the critical path for the clock. Assume the miss penalty is 10 clock cycles to the L2 cache for the two-way set-associative cache, and that the L2 cache does not miss. Which has the faster average memory access time?
3. How can software pre-fetching used to optimize the following code?

```
for(int i=0;i<n;i++)
{
        for(j=0;j<n;j++)
        output[j][i] = input[i][j]
  }
```

Course Outcome 6 (CO6):

1. Explain in detail about Programming Models and Workloads for Warehouse-Scale Computers.
2. Explain briefly about Warehouse Scale Computers.
3. Using the programming models of the Warehouse scale computers, solve the WORD COUNT problem for the following sentence. “This is a test of test data and a good one to test this”

Concept Map



Syllabus

NEED FOR MULTICORE ARCHITECTURES: Fundamentals of Computer Design. Measuring and Reporting Performance, Instruction Level Parallelism and its Exploitation - Concepts and Challenges, Limitations of ILP, Overcoming Data Hazards with Dynamic Scheduling, Dynamic Branch Prediction, Speculation, Multiple Issue Processors, Multithreading, SMT and CMP Architectures, The Multicore era.

MULTIPROCESSOR ISSUES: Symmetric and Distributed Shared Memory Architectures, Cache Coherence Issues. Performance Issues, Synchronization Issues, Models of Memory Consistency, Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

MULTICORE ARCHITECTURES: Homogeneous and Heterogeneous Architectures, SIMD Extensions for Multimedia, Intel Multicore Architectures, SUN CMP architecture, IBM Cell Architecture, Graphics Processing Units – GPU Computational Structures, GPY ISA, GPU Memory Structures.

MEMORY HIERARCHY DESIGN: Optimizations of Cache Performance, Memory Technology and Optimizations, Protection: Virtual Memory and Virtual Machines, Design of Memory Hierarchies.

MULTICORE PROGRAMMING: Parallel Programming models, Shared Memory Programming, Message Passing Interface, Open MP Program Development and Performance Tuning.

Text Book

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann / Elsevier, Fifth edition, 2012.

References

1. Richard Y. Kain, “Advanced Computer Architecture a Systems Design Approach”, PHI, 2011.
2. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan Kaufmann / Elsevier, 2011.
3. Michael J Quinn, Parallel Programming in C with MPI and OpenMP, Tata McGraw Hill, 2003.
4. Darryl Gove, “Multicore Application Programming: For Windows, Linux, and Oracle Solaris”, Pearson, 2011.
5. David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture : A Hardware/ Software Approach” , Morgan Kaufmann / Elsevier, 1997.

Course Contents and Lecture Schedule

Module. No.	Topic	No. of Lectures
1.	NEED FOR MULTICORE ARCHITECTURES	
1.1	Fundamentals of Computer Design.	1
1.2	Measuring and Reporting Performance	1
1.3	Instruction Level Parallelism and its Exploitation - Concepts and Challenges	2
1.4	Limitations of ILP	1
1.5	Overcoming Data Hazards with Dynamic Scheduling	1
1.6	Dynamic Branch Prediction, Speculation, Multiple Issue Processors	2
1.7	Multithreading, SMT and CMP Architectures	1
1.8	The Multicore era	1
2.	MULTIPROCESSOR ISSUES	
2.1	Symmetric and Distributed Shared Memory Architectures	2
2.2	Cache Coherence Issues	1
2.3	Performance Issues, Synchronization Issues	1
2.4	Models of Memory Consistency	1
2.5	Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.	1
3.	MULTICORE ARCHITECTURES	
3.1	Homogeneous and Heterogeneous Architectures	2
3.2	SIMD Extensions for Multimedia	1
3.3	Intel Multicore Architectures	1
3.4	SUN CMP architecture	1
3.5	IBM Cell Architecture	1
3.6	Graphics Processing Units – GPU Computational Structures	2
3.7	GPY ISA, GPU Memory Structures	1

Module. No.	Topic	No. of Lectures
4.	MEMORY HIERARCHY DESIGN	
4.1	Optimizations of Cache Performance	1
4.2	Memory Technology and Optimizations, Protection	2
4.3	Virtual Memory and Virtual Machines	1
4.4	Design of Memory Hierarchies	1
5.	MULTICORE PROGRAMMING	
5.1	Parallel Programming models	1
5.2	Shared Memory Programming	1
5.3	Message Passing Interface	1
5.4	Open MP Program Development and Performance Tuning	3
	Total Lectures	**36**

Course Designers:

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2. Mr.M.Thangavel mtit@tce.edu

		Category	L	T	P	Credit
14ITRH0	**EMBEDDED SYSTEMS**	PE	3	0	0	3

Preamble

This course presents the basic hardware and software concepts in the design and analysis of embedded systems.

Prerequisite

- 14IT330 - Computer Organization
- Any programming language

Course Outcomes

On successful completion of the course, the students will be able to

	Course Outcomes	Bloom's Level
CO1	Differentiate general computing system from the embedded system	Understand
CO2	Summarize the basic properties of a real-time operating system	Understand
CO3	Produce efficient code for embedded systems using assembly, C and Java languages	Apply
CO4	Use embedded software development tools for embedded system designs	Apply
CO5	Evaluate debugging and testing methodologies of embedded systems	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											
CO2.	M											
CO3.	S	M	L				L		L			M
CO4.	S	M	L	L	S		L		L		L	L
CO5.	S	S	L	L	M					L	L	

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	20	20	20
Apply	40	40	40	40
Analyze	10	20	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate general computing system from embedded system.
2. List the important considerations when selecting a processor.
3. Classify the processors in embedded system.
4. Illustrate embedded system design process using flowchart.
5. Discuss the features of embedded processors using examples.

Course Outcome 2 (CO2):

1. Define Process
2. Explain RTOS – Inter Process Communication in detail
3. Recall any two important RTOS
4. State non-maskable interrupt
5. Mention the signals used by I/O devices for interrupting.
6. Write short notes on interrupt handling functions
7. Describe preemptive and non-preemptive real time operating systems.

Course Outcome 3 (CO3):

1. Summarize RTC interfacing and programming
2. List the advantages of assembly language coding in an application.
3. Review the real time constraints for an embedded system.
4. Compare programming in assembly language and in high level language 'C'
5. Explain the following program elements with suitable syntax and examples.
    a. Include directories
    b. Source files
    c. Configuration files
    d. Preprocessor directives
6. Compare and contrast the features of Mealy-Moore FSM controller.
7. State in-circuit emulator.

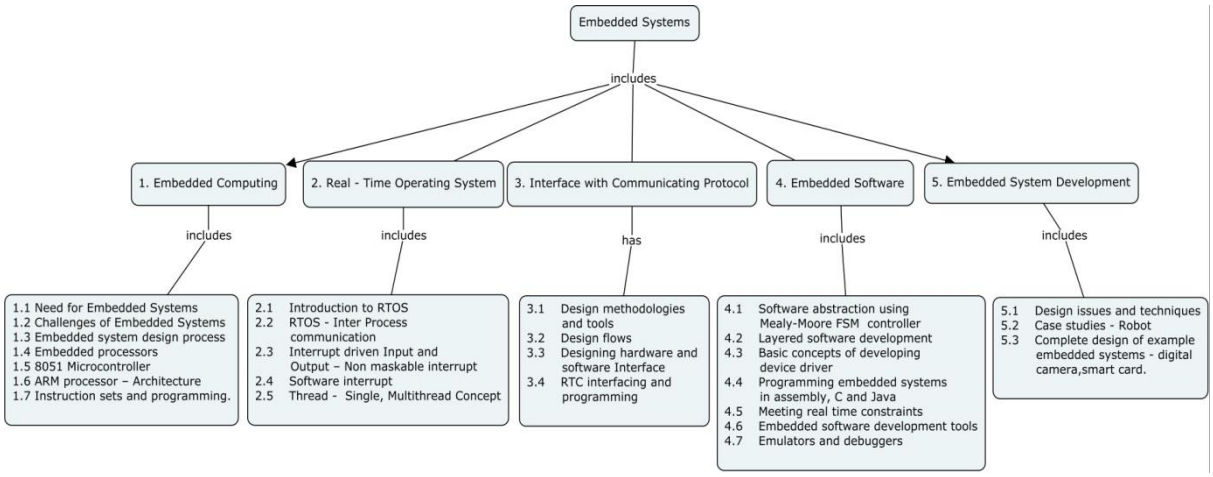
Course Outcome 4 (CO4):

1. List the various software tools of embedded system and its uses.
2. Design an embedded system for digital camera
3. Perform the case study of an embedded system for a smart card.

Course Outcome 5 (CO5):

1. Describe debugging strategies in embedded system in detail.
2. Categorize the hardware and software design issues while designing an embedded system.
3. Identify the security features needed in ATM. Draw and explain an embedded system for Automatic Teller Machine (ATM) security.

Concept Map



Syllabus

Embedded Computing Need for embedded systems**,** Challenges of Embedded Systems, Embedded system design process, Introduction to microprocessors and microcontrollers, embedded processors, 8051 Microcontroller, ARM processor, Architecture, Instruction sets and programming.

Real – Time Operating System Introduction to RTOS; RTOS - Inter Process communication, Interrupt driven Input and Output –Non maskable interrupt, Software interrupt; Thread - Single, Multithread Concept.

Interface with Communication Protocol Design methodologies and tools, design flows, designing hardware and software Interface, RTC interfacing and programming.

Embedded Software Software abstraction using Mealy-Moore FSM controller, Layered software development, Basic concepts of developing device driver, Programming embedded systems in assembly, C and Java, Meeting real time constraints, Embedded software development tools – Emulators and debuggers.

Embedded System Development Design issues and techniques – Hands On, Case studies – Robot, Complete design of embedded systems – digital camera, smart card.

Text Books

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, 2nd edition, 2008.
2. Raj Kamal, “Embedded Systems- Architecture, Programming and Design”, Tata McGraw Hill, 2nd edition, 2009.
1.

References

1. Steve Heath, “Embedded System Design”, Elsevier, 2005.
2. Muhammed Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2007.

Course Contents and Lecture Schedule

Module.No	Topic	No. Of Lectures
1	**Embedded Computing**	
1.1	Need for embedded systems	1
1.2	Challenges of Embedded Systems	1
1.3	Embedded system design process	1
1.4	Introduction to Microprocessors and Microcontrollers	1
1.5	Embedded processors	1
1.6	8051 Microcontroller	1
1.7	ARM processor - Architecture	1
1.8	Instruction sets and programming	1
2	**Real – Time Operating Systems**	
2.1	Introduction to RTOS	1
2.2	RTOS- Inter Process communication	1
2.3	Interrupt driven Input and Output – Non maskable interrupt	2
2.4	Software interrupt	1
2.5	Thread - Single, Multithread Concept	2
3	**Interface with Communication Protocol**	
3.1	Design methodologies and tools	1
3.2	Design flows	1
3.3	designing hardware and software Interface	2
3.4	RTC interfacing and programming	2
4	**Embedded Software**	
4.1	Software abstraction using Mealy-Moore FSM controller	1
4.2	Layered software development	1
4.3	Basic concepts of developing device driver	1
4.4	Programming embedded systems in assembly, C and Java	2
4.5	Meeting real time constraints	1
4.6	Embedded software development tools	1
4.7	Emulators and debuggers	2
5	**Embedded System Development**	
5.1	Design issues and techniques – Hands On	2
5.2	Case studies - Robot	2
5.3	Complete design of example embedded systems - digital camera, smart card	2
	Total Lectures	**36**

Course Designers:

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2. Ms.N. Nithya nnithya@tce.edu

		Category	L	T	P	Credit
14ITRI0	**ROBOTICS**	PE	3	0	0	3

Preamble

This course presents the introduction about robotics, types of robot driven system and end effectors, kinematics and the additional accessories like sensor and machine vision to support for real time home and industrial applications

Prerequisite

- H16-Basic Electrical and Electronics Engineering

Course Outcomes

On successful completion of the course, the students will be able to

	Course Outcomes	Bloom's Level
CO1	Understand the robot ethics, Specification of robot,	Understand
CO2	Differentiate the various robot driven system, end effectors, kinematics, sensors and machine vision supportive system	Understand
CO3	Produce efficient code /simulation software for real time need home and industry applications	Apply
CO4	Select end effectors, sensors and the environment for the robot to perform the real time task like picking up the object, moving the object	Apply
CO5	Illustrate the machine vision algorithm for the mobile robot to plan for navigation in the 10x10 indoor environment	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1.	S										
CO2.	S										
CO3.	S	M	M						L	L	L
CO4.	S	M	L	L					L	L	L
CO5.	S	S	M	L						L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	20	20	20
Apply	40	40	40	40
Analyze	10	20	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define the Robot Ethics
2. List the types of robot used in industrial applications
3. Classify the environment types used for the robot
4. Discuss the end effectors issues in real time applications
5. Illustrate the safety factors to be considered while designing the robot

Course Outcome 2 (CO2):

1. Define robot kinematics
2. Explain the working principle of pneumatic drive
3. Differentiate the stepper and servo motor.
4. What is the role of degrees of freedom associated with robot
5. Describe the need of Grippers in robots and mention its types

Course Outcome 3 (CO3):

1. Summarize different sensors nature and applications
2. List the merits of vision senor over the other sensors
3. Review the image processing role in robotics
4. Compare Robot programming using software and simulation
5. State the safety factors to be considered during design process

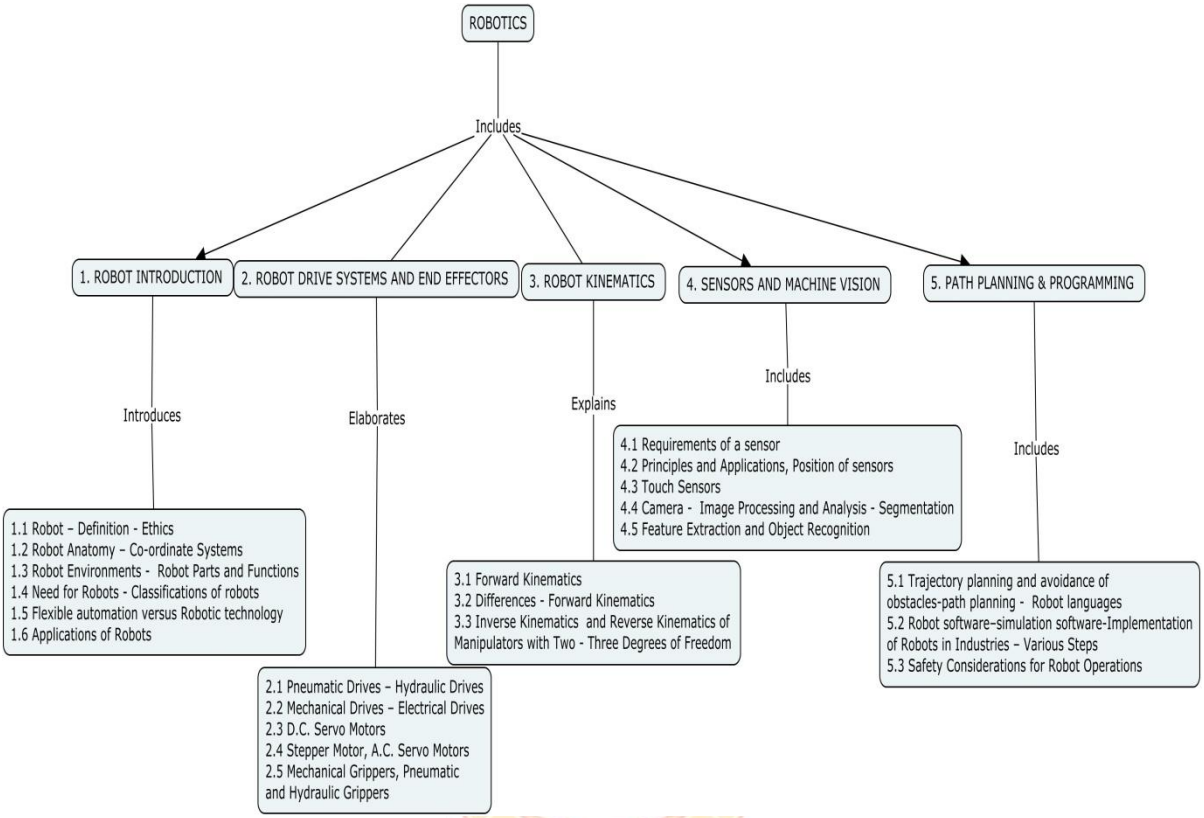
Course Outcome 4 (CO4):

1. List the various simulation software used for robot application a
2. Design an Environment, select the driven system, end effectors, sensors for the path planning robot to reach the goal
3. Perform the case study of service robot to assist the elderly people

Course Outcome 5 (CO5):

1. Describe machine vision algorithm to support for robot vision
2. Compare the various driven system feature and which one will be more suitable for the tiny robot.
3. Explain the path planning robot design and deployment in the grid environment of 10x10

Concept Map



Syllabus

ROBOT INTRODUCTION : Robot – Definition - Ethics – Robot Anatomy – Co-ordinate Systems, Robot Environments - Robot Parts and Functions – Need for Robots - Classifications of robots – Flexible automation versus Robotic technology – Applications of Robots

ROBOT DRIVE SYSTEMS AND END EFFECTORS: Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of Drives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers

ROBOT KINEMATICS: Forward Kinematics - Inverse Kinematics and Differences - Forward Kinematics and Reverse Kinematics of Manipulators with Two - Three Degrees of Freedom (In 2 Dimensional)

SENSORSANDMACHINEVISION:

Requirements of a sensor - Principles and Applications of sensors – Position sensors (Piezo Electric Sensor) - Range Sensors (Triangulation Principle) - Proximity Sensors , Touch Sensors - Camera - Image Processing and Analysis - Segmentation - Feature Extraction and Object Recognition

PATH PLANNING & PROGRAMMING: Trajectory planning and avoidance of obstacles-path planning - Robot languages - . Robot software – simulation software - Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operation

Text Books

1. Mikell P. Grooveret. al., "Industrial Robots -Technology, Programming and Applications", McGraw Hill, New York, 2008 (Reprint).
2. Deb S. R. and Deb S., " Robotics Technology and Flexible Automation " Tata McGraw Hill Education Pvt. Ltd, 2nd edition, 2010(Reprint).
3. John J.Craig , "Introduction to Robotics", Pearson, 3rd edition, 2009(Reprint).
4. http://nptel.ac.in/courses/112108093

Course Contents and Lecture Schedule

Module.No	Topic	No. of Lectures
1	ROBOT INTRODUCTION	
1.1	Robot – Definition - Ethics	1
1.2	Robot Anatomy – Co-ordinate Systems	1
1.3	Robot Environments - Robot Parts and Functions	1
1.4	Need for Robots - Classifications of robots	1
1.5	Flexible automation versus Robotic technology	1
1.6	Applications of Robots	2
2	ROBOT DRIVE SYSTEMS AND END EFFECTORS	
2.1	Pneumatic Drives – Hydraulic Drives	1
2.2	Mechanical Drives – Electrical Drives	1
2.3	D.C. Servo Motors	2
2.4	Stepper Motor, A.C. Servo Motors Salient Features, Applications and Comparison of Drives End Effectors	3
2.5	Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers	2
3	ROBOT KINEMATICS	
3.1	Forward Kinematics	1
3.2	Differences - Forward Kinematics	1
3.3	Inverse Kinematics and Reverse Kinematics of Manipulators with Two - Three Degrees of Freedom (In 2 Dimensional)	3
4	SENSORS AND MACHINE VISION	
4.1	Requirements of a sensor	1
4.2	Principles and Applications of Position of sensors (Piezo Electric Sensor)	1
4.3	Range Sensors (Triangulation Principle) - Proximity Sensors	1
4.4	Touch Sensors	2
4.5	Camera - Image Processing and Analysis - Segmentation	2
4.6	Feature Extraction and Object Recognition	2
5	PATH PLANNING & PROGRAMMING	
5.1	Trajectory planning and avoidance of obstacles- path planning - Robot languages	2
5.2	Robot software – simulation software - Implementation of Robots in Industries – Various Steps	2
5.3	Safety Considerations for Robot Operations	2
	Total Lectures	**36**

Course Designers

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		Category	L	T	P	Credit
14ITRJ0	**THEORY OF COMPUTATION**	PE	3	0	0	3

Preamble

This course introduces the theory of computation through a set of abstract machines that serve as models for computation - finite automata, pushdown automata, and Turing machines – and examines the relationship between these automata and formal languages. Additional topics beyond the automata classes themselves include deterministic and nondeterministic machines, regular expressions, context free grammars, undecidability, and the P = NP question.

Prerequisite

- 14IT310 -Discrete Mathematics

Course Outcomes

On the successful completion of the course, students will be able to

	Course Outcomes	Bloom's Level
CO1	Describe the formal relationship among machines, languages and grammars	Understand
CO2	Explain finite state machines and the equivalent regular expressions	Understand
CO3	Construct Push down automata by using context free grammars	Apply
CO4	Formalize an informal decidable problem into a formal language and design a Turing machine to decide the language	Apply
CO5	Analyze and design Finite automata, Push down automata, Turing machine, Formal languages and grammars	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	M											
CO2.	M	M										
CO3.	S			M								L
CO4	S	M	S	S				M	M	M		L
CO5	S	S	S	S				M	M	M		L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	10	0	10
Understand	40	50	20	20
Apply	30	40	50	50
Analyze	0	0	30	20
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Estimate that the following problem is undecidable."Given two CFG's G1 and G2, is L(G1)∩L(G2)=Φ?".
2. Differentiate between recursive and recursively enumerable languages.Mention any two undecidability properties for recursively enumerable language.
3. Restate that the function f(n)=2n does not grow at a polynomial rate, in other words, it does not satisfy f(n)=O(np) for any finite exponent p.
4. Demonstrate that "If a language L and its compliment L are both recursively enumerable, then both languages are recursive".
5. Whether the problem of determining given recursively enumerable language is empty or not? Is decidable? Justify your answer

Course Outcome 2 (CO2):

1. a)Check whether the language L=(0^n 1^n /n>=1) is regular or not? Justify your answer. b) Let L be a set accepted by a NFA then show that there exists aDFA that accepts L.
2. Draw the NFA to accept the following languages. (i) Set of Strings over alphabet {0,1,…….9} such that the final digit has appeared before. (ii)Set of strings of 0's and 1's such that there are two 0's separated by a number of positions that is a multiple of 4.
3. a) Explain the construction of NFA with ε transition from any given regular expression. b) Let A=(Q,∑, δ, q0 ,{qf) be a DFA and suppose that for all a in ∑ we have δ(q0, a)= δ(qf ,a).
4. Show that if x is a non empty string in L(A),then for all k>0,x^k is also in L(A).
5. a) Construct a NDFA accepting all string in {a,b}+ with either two consecutive a's or two consecutive b's. b) Give the DFA accepting the following language: set of all strings beginning with a 1 that when interpreted as a binary integer is a multiple of 5

Course Outcome 3 (CO3):

1. Consider the Turing Machine M and w=01, where M=({q1,q2,q3},{0,1}, {0,1,B},δ,q1,B,{q3}) and δis given by Reduce the above problem to Post's correspondence Problem and find whether that PCP has a solution or not.
2. Obtain the code for the TM M=({q1,q2,q3},{0,1}, {0,1,B}, δ,q1,B,{q2}) With the moves δ(q1,1) = (q3,0,R) δ(q3,0) = (q1,1,R) δ(q3,1) = (q2,0,R) δ (q3,B) = (q3,1,L) δ(q3,B)=(q3,1,L)
3. Obtain the Chomsky Normal Form equivalent to the given CFG.
4. Obtain the Greibach Normal Form equivalent to the CFG.
5. Prove that the function f(n)=2n does not grow at a polynomial rate, in other words, it does not satisfy f(n)=O(np) for any finite exponent p.

Course Outcome 4 (CO4):

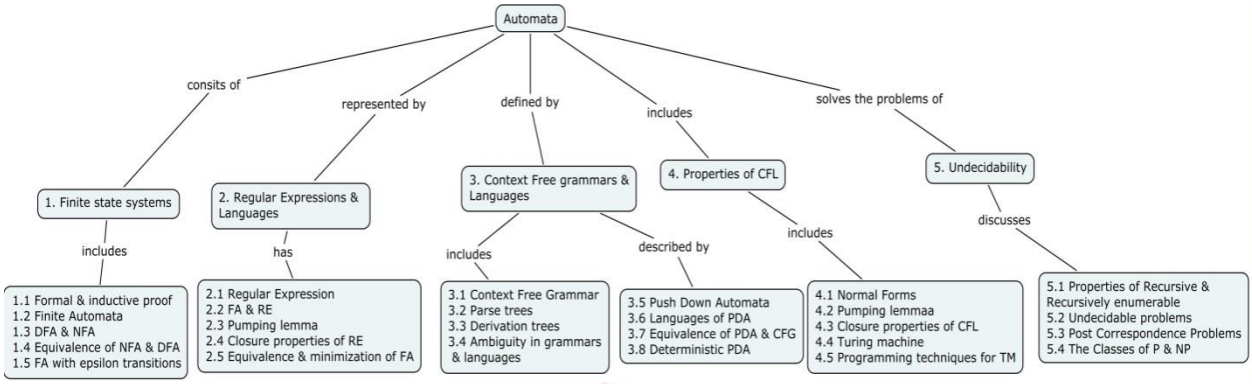
1. Construct a CFG for the language L = { a^n / n is odd}
2. Let G be a grammar s->OB/1A, A->O/OS/1AA, B->1/1S/OBB. For the string 00110101 find its leftmost derivation and derivation tree.
3. Construct a PDA accepting {$a^n b^m a^n$/m,n>=1} by empty stack. Also construct the corresponding context-free grammar accepting the same set.
4. Design a Turing Machine to accept the language L={0^n 1^n/n>=1}
5. Show that the language {0^n 1^n 2^n/n>=1}is not context free.

Course Outcome 5 (CO5):

1. Show that any non trivial property J of the recursively enumerable languages is undecidable.
2. Show that the following language is not decidable. L={<M>| M is a TM that accepts the string aaab}.

3. Consider the Turing Machine M and w=01, where M=({q1,q2,q3},{0,1}, {0,1,B},δ,q1,B,{q3}) and δis given by Reduce the above problem to Post's correspondence Problem and find whether that PCP has a solution or not.
4. Define Lne and show that L ne is recursively enumerable.

Concept Map



Syllabus

Automata:
Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence of NFA and DFA - Finite Automata with Epsilon transitions.

Regular Expression and Languages
Regular Expression – FA and Regular Expressions – Pumping lemma - Proving languages not to beregular – Closure properties of regular languages – Equivalence and minimization ofAutomata.

Context-free grammars and languages
Context-Free Grammar (CFG) – Parse Trees – Derivation Trees- Ambiguity in grammars and languages –Definition of the Pushdown automata – Languages of a Pushdown Automata –Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata.

Properties of context-free languages
Normal forms for CFG - Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

Undecidabality
Properties of Recursive – Recursively enumerable - A language that is not Recursively Enumerable (RE) – An undecidable problem that isRE – Undecidable problems about Turing Machine – Post's Correspondence Problem –The classes P and NP.

Text Book

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory,Languages and Computations", second Edition, Pearson Education, 2007.

Reference Books

1. H.R. Lewis and C.H. Papadimitriou, “Elements of the theory of Computation”, , Pearson Education, Second Edition ,2003.
2. Thomas A. Sudkamp,” An Introduction to the Theory of Computer Science, Languages and Machines”, Pearson Education, Third Edition, 2007.
3. Raymond Greenlaw an H.James Hoover, “ Fundamentals of Theory of Computation, Principles and Practice”, Morgan Kaufmann Publishers, 1998.
4. MichealSipser, “Introduction of the Theory and Computation”, Thomson Brokecole, 1997.
5. J. Martin, “Introduction to Languages and the Theory of computation”, Tata McGraw Hill, Third Edition ,2007
6. http://nptel.ac.in/courses/106104028/

Course Contents and Lecture Schedule

Module No.	TOPIC	No. of Lectures
1	**Automata**	
1.1	Introduction to formal proof – Additional forms of proof – Inductive proofs	1
1.2	Finite Automata (FA)	1
1.3	Deterministic Finite Automata (DFA)– Non-deterministic Finite Automata (NFA)	2
1.4	Equivalence of NFA and DFA	2
1.5	Finite Automata with Epsilon transitions.	1
2	**Regular expressions and languages**	
2.1	Regular Expression	1
2.2	FA and Regular Expressions	1
2.3	Pumping lemma - Proving languages not to be regular	2
2.4	Closure properties of regular languages	1
2.5	Equivalence and minimization of Automata.	2
3	**Context-free grammars and languages**	
3.1	Context-Free Grammar	1
3.2	Parse Trees	1
3.3	Derivation Trees	1
3.4	Ambiguity in grammars and languages	1
3.5	Definition of the Pushdown automata	1
3.6	Languages of a Pushdown Automata	1
3.7	Equivalence of Pushdown automata and CFG	1
3.8	Deterministic Pushdown Automata.	1
4	**Properties of context-free languages**	
4.1	Normal forms for CFG – CNF, GNF	2
4.2	Pumping Lemma for CFL	1
4.3	Closure Properties of CFL	1
4.4	Turing Machines	2
4.5	Programming Techniques for TM	2

5	**Undecidabality**	
5.1	Properties of Recursive and Recursively enumerable	2
5.2	Undecidable problems about Turing Machine	1
5.3	Post's Correspondence Problem	1
5.4	The classes P and NP.	2
	Total Lectures	**36**

Course Designers:

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14ITRK0	NUMERICAL METHODS	Category	L	T	P	Credit
		PE	2	2	0	3

Preamble

Numerical method deals with finding approximate solutions of algebraic and transcendental equations, system of simultaneous algebraic equations, Interpolations, Differentiation and Integration, ODEs and PDEs by various numerical techniques. The course is designed to impart the knowledge and understanding of the above concepts to B.Tech students and apply them in their areas of specializations.

Prerequisite

- Higher secondary level matrix theory , basic calculus and elementary algebra

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1	Find the approximate solutions of algebraic and transcendental equations through various methods.	Apply
CO2	Apply the convergence criterion for the positive root of polynomial equations.	Apply
CO3	Develop mathematical model for the comparison of approximate solutions of systems of simultaneous linear equations	Apply
CO4	Apply various methods to find the inverses of non-singular matrix	Apply
CO5	Apply various interpolation formulae to find values of given function f(x) corresponding to some interior values of x	Apply
CO6	Apply various predictor and corrector methods for finding approximate solutions of ODEs	Apply
CO7	Apply various computational methods for finding approximate solutions of PDEs of different types.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	S	L	S	L				L		L	L
CO2.	S	S	L	S	L				L		L	L
CO3.	S	S	L	S	S				L		L	L
CO4.	S	S	L	S	L				L		L	L
CO5.	S	S	L	S	M				L		L	L
CO6.	S	S	L	S	L				L		L	L
CO7.	S	S	L	S	L				L		L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	10
Understand	20	20	20	20
Apply	70	70	70	70
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Find an approximate root of $x\log_{10} x - 1.2 = 0$ by Regulafalsi method.
2. Using Newton's method, find the root between 0 and 1 of $x^3 = 6x - 4$ correct to 5 decimal places.

3.Find all the roots of $x^3 - 4.5x^2 + 6.56x - 3.12 = 0$ by Graeffe's root squaring method up to three squarrings.

Course Outcome 2 (CO2):

1. Find the quadratic factor of the equation $x^4 + 5x^3 + 3x^2 \_ 5x - 9 = 0.$ close to $x^2 + 3x - 5$ by Barstow's method.
2. Find the real positive root of $3x - \cos x - 1 = 0$ by Newton's method correct to 6 decimal places.

Course Outcome 3 (CO3):

1. Solve the following system of equations by Gauss Jordan method
   $9x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13.$
2. Find the approximate solution to the system of equations
   $8x + y + z = 8\ ; 2x + 4y + z = 4\ ; x + 3y + 3z = 5.$ by Gauss Jacobi method.

Course Outcome 4(CO4):

1. Calculate the inverse of the matrix $\begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$ by Crout's method.
2. Calculate the inverse of the matrix $\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & -0 & 3 \end{pmatrix}$ by Gauss Elimination method.

Course Outcome 5 (CO5):

1. The hourly declination of the moon on a day is given below. Calculate the declination at $3^h 35^m 15^s$ and 5^h.

   Hour: 0 1 2 3 4

   Dec: $8^0 29' 7''$ $8^0 18' 19.4''$ $8^0 6' 43.5''$ $7^0 55' 6.1''$ $7^0 43' 27.2''$

2. The Population of a certain town is given below. Find the rate of growth of the population in 1931 ,1941 , 1961 and 1971

Year x:	1931	1941	1951	1961	1971
Population y:	40.62	60.80	79.95	103.56	132.6

In 1000's

Course Outcome 6 (CO6):

1. Using Milne's method compute y(4.4) given $5xy' + y^2 - 2 = 0$ given that y(4)=1, y(4.1)=1.0049, y(4.2)=1.0097 and y(4.3)=1.0143.
2. Solve and get y(2) given $\frac{dy}{dx} = \frac{1}{2}(x+y), y(0) = 2, y(0.5) = 2.636, y(1) = 3.595, y(1.5) = 4.968$ by Adam's method.

Course Outcome 7 (CO7):

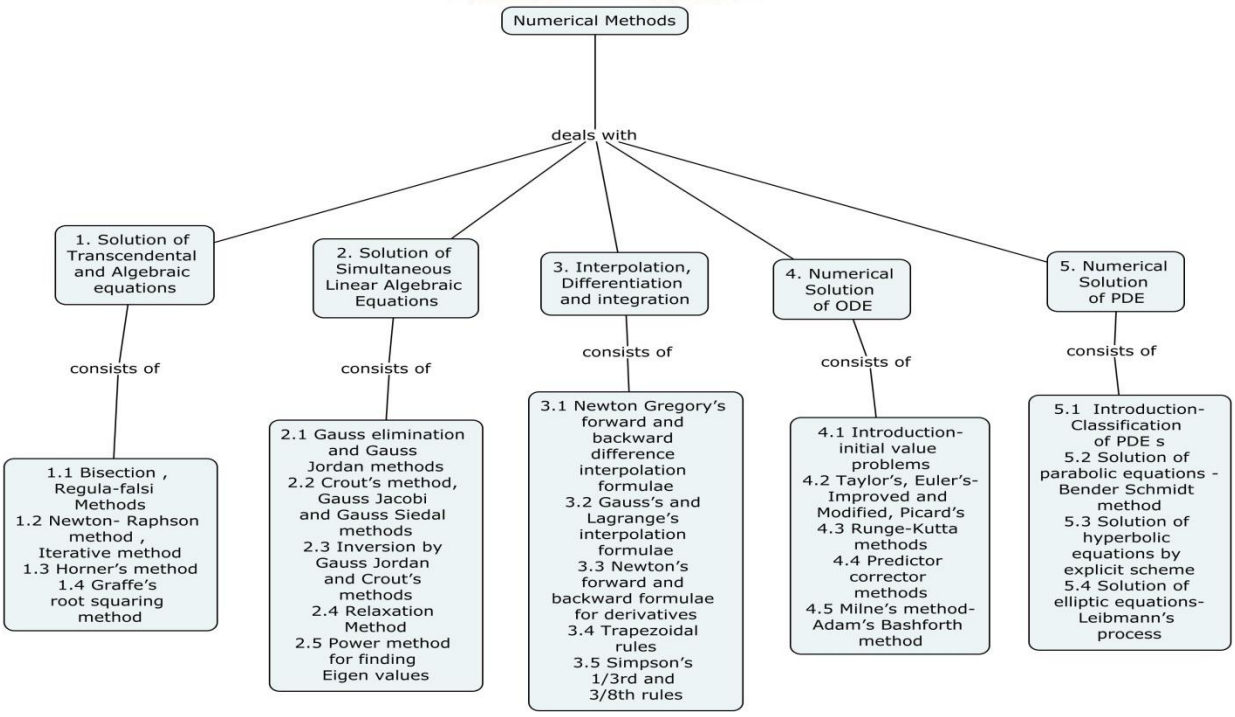
1. Solve: $u_{xx} + u_{yy} = 0$; over the square mesh of side 4 satisfying the following boundary conditions

$u(0, y) = 0$; $0 \le y \le 4$; $u(4, y) = 12 + y$; $0 \le y \le 4$;

$u(x,0) = 3x$; $0 \le x \le 4$; $u(x,4) = x^2$; $0 \le x \le 4$.

2. Using Bender Schmidt method find the solution of the parabolic equation $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$; *where* $u(0,t) = 0 = u(4,t)$; $u(x,0) = x(4-x)$.. Assume h=1.Find the values up to t=5.

Concept Map



Syllabus

Solution of Transcendental and Algebraic equations: Bisection, Regulafalsi, Newton-Raphson method-Iterative method-Horner's method-Graffe's root squaring method

Solution of Simultaneous Linear Algebraic Equations: Gauss elimination and Gauss Jordan methods-Crout's method-Gauss Jacobi and Gauss Siedal methods-Inversion by Gauss Jordan and Crout's methods-Relaxation method-Power method and - LU decomposition for systems of linear equations-numerical solutions of non-linear algebraic equations by Secant-bisection and Newton-Raphson methods

Interpolation, Differentiation and integration: Newton Gregory's forward and backward difference interpolation formulae-Gauss's and Lagrange's interpolation formulae-Newton's forward and backward formulae for derivatives- numerical integration by trapezoidal and Simpson's 1/3, & 3/8 rules.

Numerical Solution of Ordinary differential equations: Introduction-initial value problems-Taylor's, Euler's-Improved and Modified-Picard's -Runge-Kutta methods-Predictor corrector methods, Milne's method-Adam's Bashforth method.

Numerical Solution of Partial differential equations: Introduction-Classification of PDE s-Solution of parabolic equations -Bender Schmidt method-Solution of hyperbolic equations by explicit scheme-Solution of elliptic equations-Leibmann's process.

Text Book

1. Jain.M.K.Iyengar.S.R.K. JainR.K., "Numerical Methods for Scientific and Engineering Computation"-Fifth edition, New Age International Publishers, New Delhi-2009.
2. B.S.Grewal," Numerical Methods",-Nineth Edition- Khanna Publishing Company-New Delhi -2010.

Reference Books

1. Robert.J Schilling, Sandra L.Harris "Applied Numerical Methods for Engineers Using Mat lab and C" Thomson Books/cole,1999
2. Sastry S.S "Introductory Methods of Numerical Analysis" Fifth edition Prentice Hall of India , New Delhi -2006
3. P. Kandasamy, K. Thilagavathy, K. Gunavathy, Numerical Methods, S. Chand & Co. New Delhi, 1999.

Course Contents and Lecture Schedule

S.No	Topic	No. of Lectures
1	**Solution of Transcendental and Algebraic equations**	
1.1	Bisection , Regula-falsi Method	2
1.2	Newton- Raphson method , Iterative method	2
	Tutorial	1
1.3	Horner's method	1
1.4	Graffe's root squaring method	1
	Tutorial	1
2	**Solution of Simultaneous Linear Algebraic Equations**	
2.1	Gauss elimination and Gauss Jordan methods	1
2.2	Crout's method, Gauss Jacobi and Gauss Siedal methods	2
	Tutorial	1
2.3	Inversion by Gauss Jordan and Crout's methods	2
2.4	Relaxation Method	1

2.5	Power method for finding Eigen values	1
2.6	LU decomposition for systems of linear equations	1
	Tutorial	1
3	**Interpolation, Differentiation and integration**	
3.1	Newton Gregory's forward and backward difference interpolation formulae	2
3.2	Gauss's and Lagrange's interpolation formulae	2
	Tutorial	1
3.3	Newton's forward and backward formulae for derivatives	2
3.4	Trapezoidal rules	1
3.5	Simpson's 1/3rd and 3/8th rules	2
	Tutorial	1
4	**Numerical Solution of Ordinary differential equations**	
4.1	Introduction-initial value problems	1
4.2	Taylor's, Euler's-Improved and Modified, Picard's	2
	Tutorial	1
4.3	Runge-Kutta methods	1
4.4	Predictor corrector methods	1
4.5	Milne's method-Adam's Bashforth method	2
	Tutorial	1
5	**Numerical Solution of Partial differential equations**	
5.1	Introduction-Classification of PDE s	2
5.2	Solution of parabolic equations -Bender Schmidt method	2
	Tutorial	1
5.3	Solution of hyperbolic equations by explicit scheme	2
5.4	Solution of elliptic equations-Leibmann's process	2
	Tutorial	1
	Total hours	**48**

Course Designers

1. Dr..M. Kameswari mkmat@tce.edu
2. Dr..T. Lakshmi tlakshmimdu@tce.edu

14ITRL0	OPERATIONS RESEARCH	Category	L	T	P	Credit
		PE	2	2	0	3

Preamble

According to Hamdy A. Taha Operations Research is a scientific knowledge through interdisciplinary team effort for the purpose of determining the best utilization of limited resources. Due to high increase in population size, there is a need to increase the output of agriculture. Optimum allocation of land to different crops based on the climatic conditions and optimum distribution of water from various resources need scientific evaluation. This kind of problem can be modelled based on Linear ProgrammingProblem.

Based on the latest concept "systems approach" in the industries, management functions are divided based on department wise and given individual responsibilities. For example the production manager minimizes the cost of production and to maximize the profit or tries to minimize the wastages of the raw material used for production and maximizes the output. O.R. Techniques namely Integer Programming Problem, Transportation Programming Problem, and Replacement Programming Problem help the engineering executives to take the best decision regarding the allocation of various resources like men, machines, material, money, time, etc. Planning is a must for any type of organization either government or non-government. To take proper decision regarding the planning aspect O.R helps a lot in the form of Critical Path Method and Program Evaluation Review Technique. Queuing theory provides a rich and useful set of mathematical models for the analysis and design of service process for which there is contraption for shared resources.

In Purchase department in order to optimize the cost holding of raw materials one can make use of Inventory control technique. In Marketing O.R Methods can be very well applied inselecting the advertising media, in deciding the level of finished goods inventory, etc. Engineers, Mathematicians, Statisticians, Economists, Management experts, etc. use the O.R. techniques to take the best decision.

Prerequisite

- Higher secondary level matrix theory and basic statistics

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Comprehend the concept of linear programming problem and its real life application in the engineering field. They must be in a position to formulate the real life problem in to an LPP and the solution procedure also.	Apply
CO2:	Differentiate the concept of LPP and IPP, the need for Integer programming in the real life problem solving and the solution procedure using Cutting plane algorithm.	Apply
CO3:	Get the complete meaning of an TPP and must be in a position to understand all the different methods to get the initial solution followed by the MODI method to get the optimum solution too.	Apply
CO4:	Realize the concept of an APP along with the solution procedure to get the optimum solution.	Apply
CO5:	Know the need for the application of the Inventory Control model in order to reduce the cost of holding inventory and to evaluate the optimum units to be purchased each time.	Apply
CO6:	Recognize the need of the hour regarding, when to replace the machine in order to minimize the cost of production.	Apply

CO7: Know the art of optimizing the time and cost of production for completing many jobs with many machines using suitable algorithm. Apply

CO8: Apply the concepts of queuing theory in scheduling of jobs and in the areas that involve service systems whose demands are random**.** Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	**S**	**S**	**M**									**L**
CO2.	**S**	**L**	**L**									**L**
CO3.	**S**	**M**	**L**									**L**
CO4.	**S**	**M**	**M**									**L**
CO5.	**S**	**M**	**M**									**L**
CO6.	**S**	**M**	**M**									**L**
CO7.	**S**	**M**	**M**									**L**
CO8.	**S**	**M**	**M**									**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	10
Understand	20	20	20	20
Apply	70	70	70	70
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define slack, surplus and artificial variables(Remember).
   A sick patient has been advised by his doctor that his diet must contain at least 4000 units of vitamins, 50 units of minerals and 1400 units of Calories. Two foods, F1 and F2 are available at a cost of Rs.4 and Rs.3 per unit respectively. One unit of food F1 contains 200 units of vitamins, 1 unit of mineral and 40 units of Calories. One unit of food F2 contains 100 units of vitamins, 2 units of minerals and 40 units of calories. Formulate the above problem as an LPP and solve using graphical Method.
2. Solve the following LPP using simplex method
   Maximize $z = x_1 + x_2 + 3x_3$
   Subject to $3x_1 + 2x_2 + x_3 \le 3$
   $2x_1 + x_2 + 2x_3 \le 2$
   $x_1, x_2, x_3 \ge 0$
3. Solve the following using two-phase method
   Minimize $z = x_1 - 2x_2 - 3x_3$
   Subject to $-2x_1 + x_2 + 3x_3 = 2$

$$2x_1 + 3x_2 + 4x_3 = 1$$
$$x_1, x_2, x_3 \leq 0$$

Course Outcome 2 (CO2):

1. Solve the following IPP

   Minimize $z = -2x_1 - 3x_2$

   Subject to $2x_1 + 2x_2 \leq 7$

   $x_1 \leq 2$, $x_2 \leq 2$

   $x_1, x_2 \geq 0$ are integers.

2. Solve following IPP

   Maximize $z = 7x_1 + 9x_2$

   Subject to $-x_1 + 3x_2 \leq 6$

   $7x_1 + x_2 \leq 35$

   $x_1, x_2 \geq 0$ are integers.

Course Outcome 3(CO3):

1. Find a basic feasible solution to the following transportation problem using Vogel's approximation method.

	1	2	3	4	supply
I	21	16	25	13	11
II	17	18	14	23	13
III	32	27	18	41	19
demand	6	10	12	15	43

2. Find an initial basic feasible solution for the following transportation problem using North West corner rule.

	W_1	W_2	W_3	a_i
F_1	2	7	4	5
F_2	3	3	1	8
F_3	5	4	7	7
F_4	1	6	2	14
b_j	2	9	18	

Course Outcome 4(CO4):

1. A marketing manager has 5 salesmen and there are 5 sales districts. Considering the capabilities of the salesmen and the nature of districts, the estimates made by the marketing manager for the sales per month(in 1000 rupees) for each salesmen in each district would be as follows**.**

A	**B**	**C**	**D**	**E**
32	38	40	28	40
40	24	28	21	36
41	27	33	30	37
22	38	41	36	36
29	33	40	35	39

2. Four assignment problems are given to four students of Mathematics to solve them independently using Hungarian algorithm. Time taken in minutes to solve each of the problems by each of the student is estimated as below.

	S_1	S_2	S_3	S_4
P_1	2	10	9	7
P_2	15	4	14	8
P_3	13	14	16	11
P_4	4	15	113	9

Use Hungarian algorithm to solve this assignment problem in such a way that the total time taken is minimum.

3. The following table shows the jobs of a network along with their time estimates.

Job	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
a(days)	1	2	2	2	7	5	5	3	8
m(days)	7	5	14	5	10	5	8	3	17
b(days)	13	14	26	8	19	17	29	9	32

Draw the project network and find the probability of completing the project with in 40 days?

Course Outcome 5(CO5):

1.The demand rate for an item in a company is 18000 units per year. The company can produce at the rate of 3000 per month. The set-up cost is Rs. 500 per order and the holding cost is 0.15 per units per month. Calculate

(i) Optimum manufacturing quantity
(ii) The maximum inventory
(iii) Time between orders
(iv) The number of orders per year
(v) The time of manufacture
(vi) The optimum annual cost if the cost of an item is Rs.2 per unit.

2.The demand for an item in a company is 9000 uints per year. The company can produce the items at a rate of 1500 per month. The cost of one set-up is Rs.250 and the holding cost of 1 unit per month is Rs.0.15. The shortage cost of one unit is Rs.20 per year. Determine the optimum manufacturing quantity and the number of shortages. Also determine the manufacturing time and the time between set-ups.

Course Outcome 6(CO6):

1. The cost of a machine is Rs.61000 and its scrap value is Rs.1000. The maintenance cost found based on the past experience are as below.

Year	1	2	3	4	5	6	7	8
Maintenance cost in Rs.	1000	2500	4000	6000	9000	12000	16000	20000

When should the machine be replaced?

2. The following mortality rates have been observed for a certain type of light bulbs.

Week	1	2	3	4	5
Percent failing by the end of the week	10	25	50	80	100

There are 1000 bulbs in use and it costs Rs.2 to replace an individual bulb which has burnt out. If all the bulbs were replaced simultaneously it would cost 50 paise per bulb. It is proposed to replace all bulbs at fixed intervals whether or not they have burnt out and to continue replacing burnt out bulbs as they fail. At what intervals should all the bulbs be replaced?

Course Outcome 7(CO7):

1. Find the sequence that minimizes the total elapsed time (in hours) required to complete the following tasks on two machine.

Task	A	B	C	D	E	F	G	H	I
Machine I	2	5	4	9	6	8	7	5	4
Machine II	6	8	7	4	3	9	3	8	11

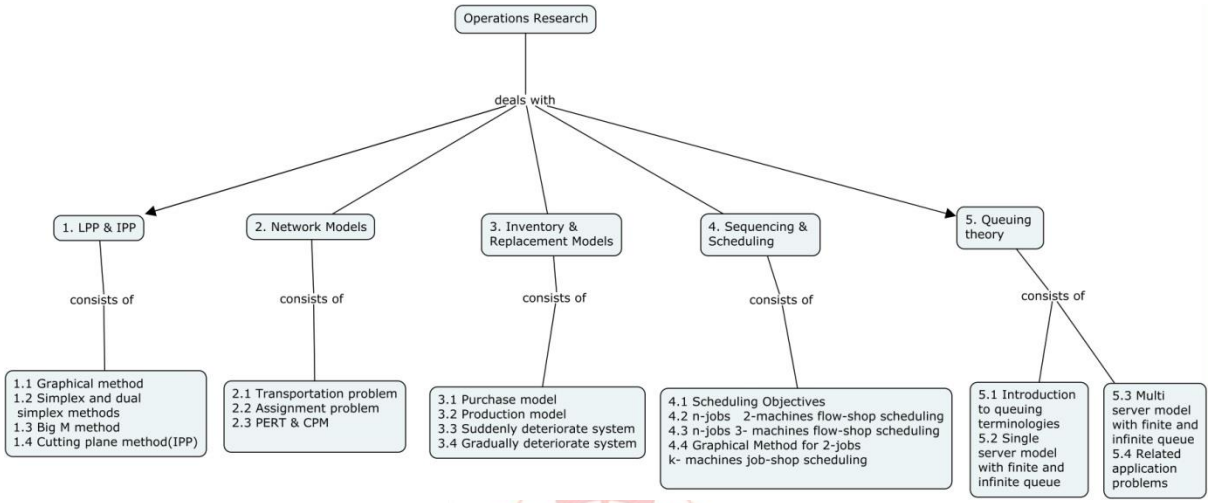
2. Four jobs 1,2,3&4 are to be processed on each of the five machines A, B, C, D and E in the order A B C D E. Find the total minimum elapsed time if no passing of jobs is permitted. Also find the idle time for each machine.

Machines	Jobs			
	1	2	3	4
A	7	6	5	8
B	5	6	4	3
C	2	4	5	3
D	3	5	6	2
E	9	10	8	6

Course Outcome 8 (CO8):

1. A dental surgery hospital has two operation rooms. The service times are assumed to be independent, exponentially distributed with mean 15 minutes. Andrew arrives when both operation room are empty. Bob arrives 10 minutes later while Andrew is still under medical treatment. Another 20 minutes later Barath arrives and both Andrew and Bob are still under treatment. No other patients arrives during this 30 minute interval. (i) What is the probability that Barath will be ready before Andrew? (ii) Determine the distribution function of the waiting time in the system for Barath. Find the mean and variance also.
2. If for a period of 2 hours in the day(8 to 10 am) trains arrive at the yard every 20 minutes but the service time continued to remain 36 minutes, then calculate for this period (i) the probability that the yard is empty (ii) Average number of trains in the system on the assumption that the line capacity of the yard is limited to 4 trains only.
3. A super market has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes and if people arrive in a Poisson fashion at the rate of 10 per hour, (i) what is the probability of having to wait for service? (ii) what is the expected percentage of idle time of each girl? (iii) If a customer has to wait what is the expected length of his waiting time?

Concept Map



Syllabus

LPP and IPP: Linear Programming(LP) : Formulation- Graphical Method for solving LP problems- Simplex and Dual Simplex method for solving LPP- Big M method(two phase method)- Integer Programming (IP) : Formulation- Cutting Plane method for solving IPP

Network Models: Transportation Problems(TP):LP Formulation- Initial Basic Feasible Solutions for TP using North-West Corner, Least cost and Vogel's Approximation Methods- Optimal Solutions for TP using Modified Distribution Method(MODI)- Assignment Problem(AP): Formulation- Hungarian method for AP- Critical Path Method(CPM) and Crashing- Programme Evaluation Review Technique (PERT)

Inventory and Replacement Models: Purchase Models (with and without shortages)- Production Models (with and without shortages)- Replacement of suddenly Deteriorate system- Replacement of gradually Deteriorate system

Sequencing and Scheduling: Scheduling Objectives- Setup time dependent single machine scheduling- n-jobs 2-machines flow-shop scheduling- n-jobs 3- machines flow-shop scheduling- Graphical Method for 2-jobs k- machines job-shop scheduling.

QUEUEING THEORY: Introduction - some queuing terminologies - Single server model with Infinite queue [M/M/1]:[infinity/FCFS] - Single server model with finite queue [M/M/1]:[N/FCFS] - Multi server model with Infinite queue [M/M/C]:[infinity/FCFS] - Multi server model with finite queue [M/M/C]:[N/FCFS] - related application problems

Text Book

1. HamdyA.Taha, "Operations Research — An Introduction"; Seventh edition, Prentice Hall of India Pvt Ltd.,2003.
2. Mariappan P., “Operations Research: An Introduction”, Pearson INDIA, First Edition – 2013, ISBN: 978-81-317-9934-5.

Reference Books

1. Sharma.J.K.. "Operations Research: Theory and applications", Macmillan India Ltd.,Fourth Edition 2009.
2. Pannerselvam, R., "Operation research", Prentice hall, Second Edition, 2007.
3. Ravindran A., Don. T. Phillips and James J. Solberg, "Operation research: principles and practice", John Wiley and Sons, Second Edition, 2000.
4. Hiller / Lieberman, "Introduction to Operation research" Tata Mcgraw Hill, Seventh Edition, 2001.
5. Wayne L. Winston, "Operation research: Applications and Algorithms", Thomson Brooks/Cole, Fourth Edition, 2003.
6. Ronald L Rardin,"Optimisation in Operation research" Pearson Education Asia, First Indian reprint, 2002.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1.	**LPP and IPP**	
1.1	Linear Programming(LP) : Formulation	1
1.2	Graphical Method for solving LP problems	1
1.3	Simplex and Dual Simplex method for solving LPP	2
	Tutorial	1
1.4.	Big M method(two phase method)	1
1.5	Integer Programming (IP) : Formulation	1
1.6	Cutting Plane method for solving IPP	1
	Tutorial	1
2.	**Network Models**	
2.1	Transportation Problems(TP):LP Formulation	1
2.2	Initial Basic Feasible Solutions for TP using North-West Corner, Least cost and Vogel's Approximation Methods	2
2.3	Optimal Solutions for TP using Modified Distribution Method(MODI)	2
	Tutorial	1
2.4	Assignment Problem(AP): Formulation	1
2.5	Hungarian method for AP	1
2.6	Critical Path Method(CPM) and Crashing	1
2.7	Programme Evaluation Review Technique (PERT)	1
	Tutorial	1
3.	**Inventory and Replacement Models**	
3.1	Purchase Models (with and without shortages)	1
3.2	Production Models (with and without shortages)	2
3.3	Replacement of suddenly Deteriorate system	2
3.4	Replacement of gradually Deteriorate system	2
	Tutorial	1
4.	**Sequencing and Scheduling**	
4.1	Scheduling Objectives	1
4.2	Setup time dependent single machine scheduling	2
4.3	n-jobs 2-machines flow-shop scheduling	2
	Tutorial	1
4.4	n-jobs 3- machines flow-shop scheduling	1
4.5	Graphical Method for 2-jobs k- machines job-shop scheduling	2
	Tutorial	1
5.	**Queuing Theory**	
5.1	Introduction, some queuing terminologies	1

Module No.	Topic	No. of Lectures
5.2	Single server model with infinite queue	2
5.3	Single server model with finite queue	1
	Tutorial	1
5.4	Multi server model with infinite queue	2
5.5	Multi server model with finite queue	1
5.6	Related application problems	1
	Tutorial	1
	Total Lectures	**48**

Course Designers:

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2. Dr..T. Lakshmi tlakshmimdu@tce.edu

		Category	L	T	P	Credit
14ITPZ1	**INTERNET OF THINGS**	PE	3	0	0	3

Preamble

This course aims at providing a basic understanding of Internet of Things. It aims at providing hands on training for building simple applications using appropriate sensors, microcontroller board and other components.

Prerequisite

Nil

Course Outcomes

Upon successful completion of this course students will be able to:

Course Outcomes		**Bloom's Level**
CO1:	Describe Internet of Things and the protocols of IoT	Understand
CO2:	Identify the various IoT components such as sensors, shields (Arduino, Raspberry Pi, Bluetooth, WiFi)	Apply
CO3:	Experiment various problems related with IoT using controllers and processors.	Apply
CO4:	Explain the role of cloud and security in IoT	Understand
CO5:	Demonstrate various applications of IoT integrating with Cloud and ensuring security	Apply

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M											
CO2	S	M										M
CO3	S	M										M
CO4	M	L										
CO5	S	M	L		S	M	S	L	S	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	40	30	30	20
Understand	40	40	30	40
Apply	20	30	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

CO5 is assessed through Mini -Project.

Mini Project Details

- Team formation (Team size: 5)
- Problem identification on various IT, societal, business and environmental needs

- Identify the appropriate components needed to build the microcontroller board.
- Assemble the components and program the board.
- Test the board with sample input.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss the Evolution of IoT.
2. List the some of the protocols involved in IoT.
3. Distinguish among Raspberry Pi,Arduino and Zigbee.
4. Describe the architecture of Cloud of Things.
5. Discuss the two pillars of IoT

Course Outcome 2 (CO2):

1. Write a program to read the input from a switch port and copy it to a LED.
2. Illustrate the Arduino board with a diagram and name its components.
3. Write a program to glow an LED using Arduino

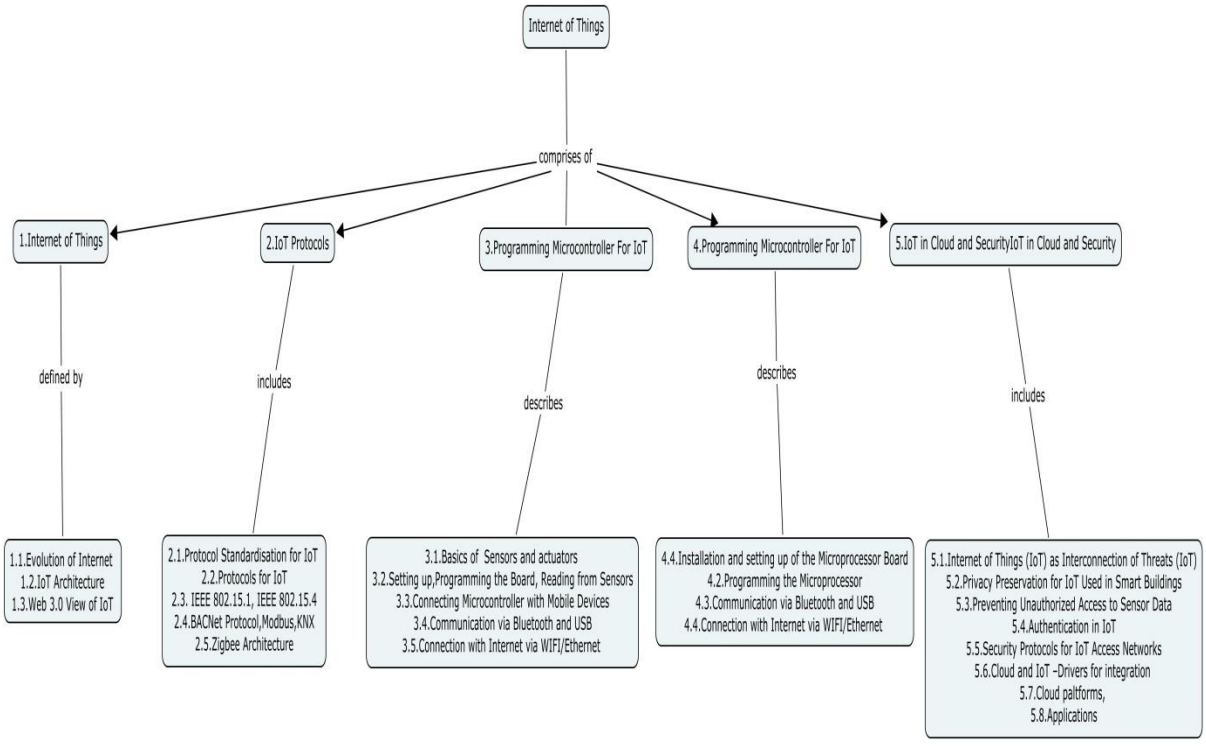
Course Outcome 3 (CO3):

1. Illustrate how a microcontroller can be connected to mobile device.
2. Show the connectivity of microcontroller with Bluetooth and USB.
3. Demonstrate the connectivity issues involved in IoT

Course Outcome 4 (CO4):

1. Discuss the integration of IoT with Cloud
2. Describe the right components to build cloud based applications in IoT
3. List the security issues related to IoT

Concept Map



Syllabus

Internet of Things: Evolution of Internet, IoT Architecture, Web 3.0 View of IoT

IoT Protocols: Protocol Standardisation for IoT ,Protocols for IoT, IEEE 802.15.1, IEEE 802.15.4,BACNet Protocol, Modbus, KNX, Zigbee Architecture

Programming Microcontroller For IoT: Basics of microcontroller, Setting up, Programming the Board, Reading from Sensors, Connecting Microcontroller with Mobile Devices, Communication via Bluetooth and USB, Connection with Internet via WIFI/Ethernet

Programming Microprocessor For IoT: Installation and Setting up of the Microprocessor board,Programming the Microprocessor, Communication via Bluetooth and USB,Connection with Internet via WIFI/Ethernet

IoT in Cloud and Security: Internet of Things (IoT) as Interconnection of Threats (IoT), Privacy Preservation for IoT Used in Smart Buildings, Preventing Unauthorized Access to Sensor Data, Authentication in IoT, Security Protocols for IoT Access Networks,Cloud and IoT –Drivers for integration ,Cloud paltforms, Applications

Text Book

1. CharalamposDoukas ,"Building Internet of Things with the Arduino", Create space, April 2012.
2. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black",Mc.Graw Hill,2015.
3. Fei Hu ," Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations",CRC press ,2016

Reference Books

1. Dieter Uckelmann,Mark Harrison,Florian Michahelles, "Architecting the Internet of Things",Springer,2011
2. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black",Mc.Graw Hill,2015.
3. CunoPfister, "Getting Started with the Internet of Things", O'Reilly Media, Inc.,2011
4. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective",CRC Press,2012
5. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things,Key applications and Protocols",Wiley, 2012
6. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011.
7. https://www.raspberrypi.org/
8. https://developer.ibm.com/iot/
9. http://www.microsoft.com/en-in/server-cloud/internet-of-things.aspx

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Internet of Things**	
1.1	Evolution of Internet	1
1.2	IoT Architecture	
1.3	Web 3.0 View of IoT	1
2	**IoT Protocols**	
2.1	Protocol Standardisation for IoT	1
2.2	Protocols for IoT	2

Module No.	Topic	No. of Lectures
2.3	IEEE 802.15.1, IEEE 802.15.4	1
2.4	BACNet Protocol,Modbus,KNX	1
2.5	Zigbee Architecture	1
3	**Programming Microcontroller For IoT**	
3.1	Basics of sensors and actuators	2
3.2	Setting up,Programming the Board,reading from Sensors	2
3.3	Connecting Microcontroller with Mobile Devices	2
3.4	Communication via Bluetooth and USB	2
3.5	Connection with Internet via WIFI/Ethernet	2
4	**Programming Microprocessor For IoT**	
4.1	Installation and Setting up of the Microprocessor board	2
4.2	Programming the Microprocessor	2
4.3	Communication via Bluetooth and USB	2
4.4	Connection with Internet via WIFI/Ethernet	2
5	**IoT in Cloud and Security**	
5.1	Internet of Things (IoT) as Interconnection of Threats (IoT)	1
5.2	Privacy Preservation for IoT Used in Smart Buildings	1
5.3	Preventing Unauthorized Access to Sensor Data	1
5.4	Authentication in IoT	1
5.5	Security Protocols for IoT Access Networks	1
5.6	Cloud and IoT –Drivers for integration	1
5.7	Cloud paltforms	1
5.8	Applications	1
Total Lectures		**36**

Course Designers:

1. Dr.S.Muthuramalingam smrit@tce.edu
2. Ms.C.V.Nisha Angeline nishaangeline@gmail.com

Changes in Course Code for the following Courses for B.Tech (Information Technology) – For students admitted from the year 2014-15 onwards.

Existing Course Code	Course Name	Revised Course Code
14ITPI0	WIRELESS AD HOC AND SENSOR NETWORKS	14ITRM0
14ITPO0	DESIGN AND ANALYSIS OF ALGORITHMS	14ITRN0
14ITPX0	ETHICAL HACKING	14ITRQ0
14ITQA0	SERVICE ORIENTED ARCHITECTURE	14ITRA0
14ITQB0	PARALLEL COMPUTING	14ITRB0
14ITQC0	SOFTWARE DEFINED NETWORKS	14ITRC0
14ITQD0	NETWORK ADMINISTRATION	14ITRD0
14ITQE0	SOFTWARE TESTING	14ITRE0
14ITQF0	C# AND .NET FRAMEWORK	14ITRF0
14ITQG0	MULTI-CORE ARCHITECTURE	14ITRG0
14ITQH0	EMBEDDED SYSTEMS	14ITRH0
14ITQI0	ROBOTICS	14ITRP0
14ITQJ0	THEORY OF COMPUTATION	14ITRJ0
14ITQK0	NUMERICAL METHODS	14ITRK0
14ITQL0	OPERATION RESEARCH	14ITRL0
14ITP10	INTERNET OF THINGS	14IT1A0
14ITP20	BIG DATA PLATFORM AND TECHNOLOGIES	14IT1B0
14ITP30	ENTERPRISE MOBILITY	14IT1C0
14ITP40	MALWARE ANALYSIS	14IT2A0

OUTCOME BASED EDUCATION

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

GENERAL ELECTIVES COURSES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2014-15 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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Passed in Board of Studies Meeting on 29.04.2016 Approved in 52 nd Academic Council Meeting on 18.06.2016

LIST OF GENERAL ELECTIVES COURSES

S. No.	COURSE CODE	COURSE NAME
1.	14ITGA0	OBJECT ORIENTED PROGRAMMING WITH C++
2.	14ITGB0	OBJECT ORIENTED PROGRAMMING WITH JAVA
3.	14ITGC0	SOFTWARE ENGINEERING
4.	14ITGD0	DATABASE MANAGEMENT SYSTEMS
5.	14ITGE0	DATA SCIENCE
6.	14ITGF0	MOBILE APP DEVELOPMENT USING ANDROID
7.	14ITGG0	CLOUD TECHNOLOGIES

		Category	L	T	P	Credit
14ITGA0	**OBJECT ORIENTED PROGRAMMING WITH C++**	GE	3	0	0	3

Preamble

This course introduces basic concepts of object oriented programming and makes the students to apply these programming concepts towards problem solving. It helps them to effectively build and use ADTs when compared to the traditional structured programming. The course helps in learning object oriented programming Languages. Topics include class definitions, polymorphism by overloading functions and operators, single and multiple inheritance, virtual functions, abstract classes, and exception handling.

Prerequisite

- An experience in any programming language is desirable.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Explain the differences between structural and object oriented programming	Understand
CO2:	Interpret data hiding, member functions, pointers, object creation and destruction for a given problem.	Apply
CO3:	Implement object oriented programming constructs like encapsulation, constructors, inheritance and polymorphism	Apply
CO4:	Illustrate the use of templates, exceptions and I/O classes for the given scenario.	Apply
CO5:	Identify suitable object oriented programming constructs for real time applications	Analyze

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	40	40	30	30
Understand	40	30	40	40
Apply	20	20	20	20
Analyze	0	10	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Attainment of course outcome 5 is evaluated through mini project which involves design and development of simple applications using object oriented programming.

Mini project details: (team size: 3)

1. Problem identification.
2. Problem analysis and design.

3. Develop programs at the module level, test and debug individually.
4. Integrate the modules and present the results in a team.
5. Document the above process.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Mention the need for OOP? Explain its benefits.
2. Explain the different types of data types that are used in C++?
3. Can a C++ and C structure be treated as same? Justify.
4. List the memory allocation operators.
5. Differentiate between constructor and destructor.
6. How does C++ file I/O library compare with its counterpart in C. Discuss how object orientation is achieved in the former?

Course Outcome 2 (CO2):

1. Write a C++ Language code program to Implement Weather report using Constructor & Destructor Concept of Object Oriented Programming language.
2. Write a C++ program which implements a generic Queue ADT. Demonstrate by writing an application to show the operations such as enqueue and dequeue for char data and double data. Can this queue be given to a consumer application without the source code? Justify.
3. Define a class Coord having two members type int as X ad Y. use this class to define another class Rectangle which has two members of type Coord as UpperLeftCoord and BotomRightCoord. Define constructors and member functions to get the length and breadth of rectangle. Write a global function which creates an instance of the class Rectangle and computes the area using the member functions.
4. Write a program to create a database of the students information such as name, roll no, and the program should have the following facilities.
   - Adds a new record to the file.
   - Modifies the details of an record.
   - Display the contents of the file.

Course Outcome 3 (CO3):

1. Clearly differentiate Runtime polymorphism and Runtime Type identification Virtual function and virtual inheritance
2. Differentiate specializing template functions by explicit specification with automatic invocation based on type of argument. Justify its usage.
3. Compare parameter passing mechanism using pointers and reference as arguments. Discuss the pros and cons
4. Write a program having a base class Student with data member rollno and member function getnum() to input rollno and putnum() to display rollno. A class Test is derived from class Student with data member marks and member functions getmarks() to input marks and putmarks() to display marks. Class Sports is also derived from class Student with data member score and member functions getscore() to input score and putscore() to display score. The class Result is inherited from two base classes, class Test and Class Sports with data member total and a member function display() to display rollno, marks, score and the total(marks+score).

Course Outcome 4 (CO4):

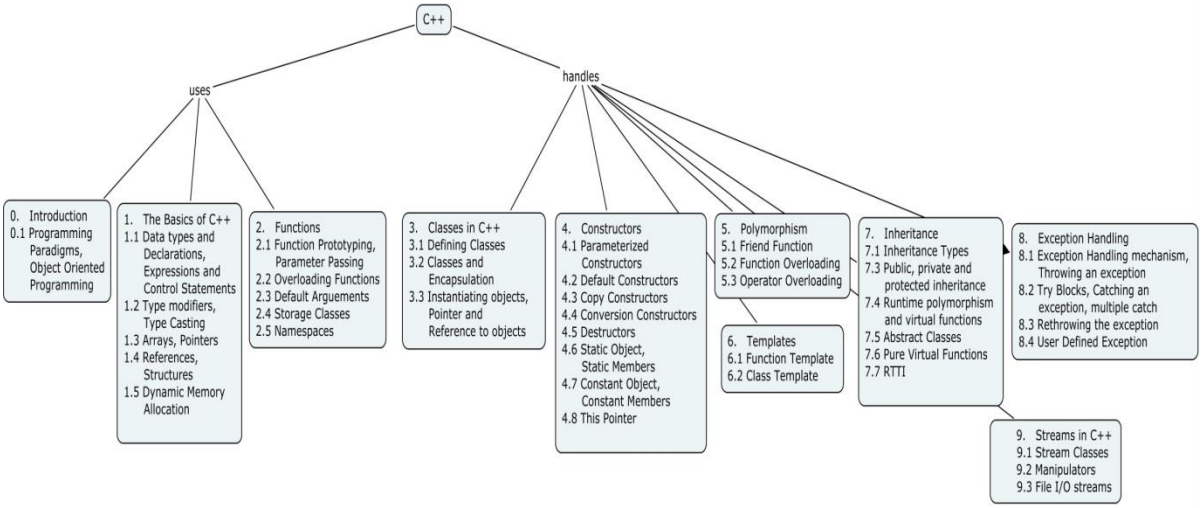
1. Write C++ program to copy the contents of file1.txt to file2.txt

2. Write C++ program to generate random number and store them in a file.
3. Write C++ program to copy the contents of file1.txt to file2.txt. Use appropriate file handling exceptions
4. Using I/O Stream Classes write C++ program to count the vowels in a file.
5. Write a C++ program using function template for sorting an array(assume for float array and int array)
6. Write a C++ file program to store the details of 10 students .Get inputs from user (name,m1,m2,m3).Find total & average and store it in a file called studin.dat
7. Write a C++ file program to store the details of employee in a file called emp.dat (empno, empname., deptno, salary). Read the contents of file emp.dat and if deptno =10 increment salary by 10% and store the new salary along with empname, empno and deptno in a new file called sal.dat.

Course Outcome 5 (CO5):
CO5 is evaluated through Mini Project.
Mini Project
Prerequisites for Mini Project:
Design and Development of applications like

a. Library Management System
b. Banking System
c. Payroll System
d. Hospital information system
e. Shopping applications

Concept Map



Syllabus

Introduction - Programming Paradigms - object oriented programming
The Basics of C++ - Data types and Declarations – Expressions and Control Statements – Type Modifiers – Type Casting. Arrays- Pointers – References - Structures - Dynamic Memory Allocation – New and Delete Operators – Functions – Function prototyping – Passing parameters – Call by Reference - Overloading Functions – Default Arguments –Inline Functions – Storage Classes – Namespace.

Classes in C++ - Defining Classes – Access specifiers – Classes and Encapsulation – Member Functions – Instantiating objects – pointer and reference to objects
Constructors – Parameterized Constructors – Default Constructors – Copy Constructors – Conversion Constructors – Destructors. Static Object – Static Members – Constant Object – Constant Members –This Pointer
Polymorphism – Friend Function – Function Overloading – Operator Overloading - Overloading unary and binary operator
Templates – Function Template – Class Template
Inheritance - Inheritance Types – Single Inheritance - multiple inheritance - multi level inheritance - hierarchical inheritance - hybrid inheritance. Public, private and protected inheritance-Runtime polymorphism and virtual functions– Abstract Classes - Pure Virtual Functions –RTTI – Dynamic cast – Type Id
Exception Handling - Exception Handling mechanism - Throwing an exception - Try Blocks– catching an exception – multiple catch – Rethrowing the exception – User Defined Exception - Exception Specification
Streams in C++ - Stream classes – Manipulators - File I/O streams.

Text Books

1. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition, Reprint 2004.
2. BjarneStourstrup, “The C++ programming language”, Addison Wesley Publication, Fourth Edition, 2013.

Reference Books

1. Stanley B.Lippman, “C++ Primer”, Addison-Wesley Professional, Fifth Edition, 2012.
2. Herbert Schildt, “C++ Programmer’s Reference”, McGraw-Hill, Berkely Publication 4th edition, 2003.
3. Tutorial on C++ www.tutorialspoint.com/c++
4. NPTEL online course http://nptel.ac.in/courses/106106127/41

Course Contents and Lecture Schedule

Module.No.	Topic	No. of Lectures
0	**Introduction**	
0.1	Programming Paradigms, object oriented programming	1
1	**The Basics of C++**	
1.1	Data types and Declarations, Expressions and Control Statements	1
1.2	Type Modifiers, Type Casting	1
1.3	Arrays, Pointers	1
1.4	References, Structures	1
1.5	Dynamic Memory Allocation, New and Delete Operators	1
2	**Functions**	
2.1	Function prototyping, Passing parameters, Call by Reference	1

2.2	Overloading Functions	1
2.3	Default Arguments, Inline Functions	1
2.4	Storage Classes	1
2.5	Namespace	
3	**Classes in C++**	
3.1	Defining Classes, Access specifiers	1
3.2	Classes and Encapsulation, Member Functions	1
3.3	Instantiating objects, Pointer and Reference to objects	
4	**Constructors**	
4.1	Parameterized Constructors	1
4.2	Default Constructors	1
4.3	Copy Constructors	1
4.4	Conversion Constructors	1
4.5	Destructors	1
4.6	Static Object, Static Members	1
4.7	Constant Object, Constant Members	1
4.8	This Pointer	
5	**Polymorphism**	
5.1	Friend Function	1
5.2	Function Overloading	1
5.3	Operator Overloading, Overloading unary and binary operator	1
6	**Templates**	
6.1	Function Template	1
6.2	Class Template	1
7	**Inheritance**	
7.1	Inheritance Types	1
7.2	Public, private and protected inheritance	1
7.3	Runtime polymorphism and virtual functions	1
7.4	Abstract Classes	1
7.5	Pure Virtual Functions	
7.6	RTTI - Dynamic cast, Type Id	1
8	**Exception Handling**	
8.1	Exception Handling mechanism, Throwing an exception	1
8.2	Try Blocks, Catching an exception, multiple catch	1

8.3	Rethrowing the exception	1
8.4	User Defined Exception, Exception Specification	1
9	**Streams in C++**	
9.1	Stream classes	1
9.2	Manipulators	1
9.3	File I/O streams	1
Total Lecture Hours		**36**

Course Designer:

1. A.Sheik Abdullah asait@tce.edu

14ITGB0	OBJECT ORIENTED PROGRAMMING WITH JAVA	Category	L	T	P	Credit
		GE	3	0	0	3

Preamble

This course provides a comprehensive introduction to the object-oriented approach through the widely-used Java programming language. Java is a multipurpose, easy to learn, powerful platform where virtually a complete application in any domain can be implemented. Java is the most widely used language for developing open source software systems. With Java, there comes huge library support which reduces the development time and enhances software reuse for faster development. This course concentrates on object oriented aspects of Java and from this course the student will gain a solid basis for further study of the object-oriented software development.

Prerequisite

Any programming language course

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Solve simple problems using basic Java programming constructs	Apply
CO2:	Demonstrate the concepts of object oriented programming like abstraction, encapsulation, inheritance and polymorphism	Apply
CO3:	Implement interfaces, packages, exceptions and files for the given problem using Java	Apply
CO4:	Design Applets and handle events using Java libraries	Apply
CO5:	Develop client-server applications using Java libraries	Apply

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	40	40	40	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Write Java program to perform operations of simple calculator.
2. Write Java program to find sum of 'n' numbers
3. Write Java program to find the factorial of a number.

Course Outcome 2 (CO2)

1. Define polymorphism.

2. Explain how data encapsulation is achieved in java.
3. Define Dynamic Method Dispatch.
4. Write Java program to add any type of numbers using method overloading concept.
5. Differentiate Java String and Java StringBuffer methods

Course Outcome 3 (CO3)

1. List and explain the different access modifiers.
2. Explain the role of the finally block in exception handling.
3. Differentiate interface and abstract classes
4. Write a Java program to have appropriate user defined exceptions for the student attendance management system. Use suitable packages.

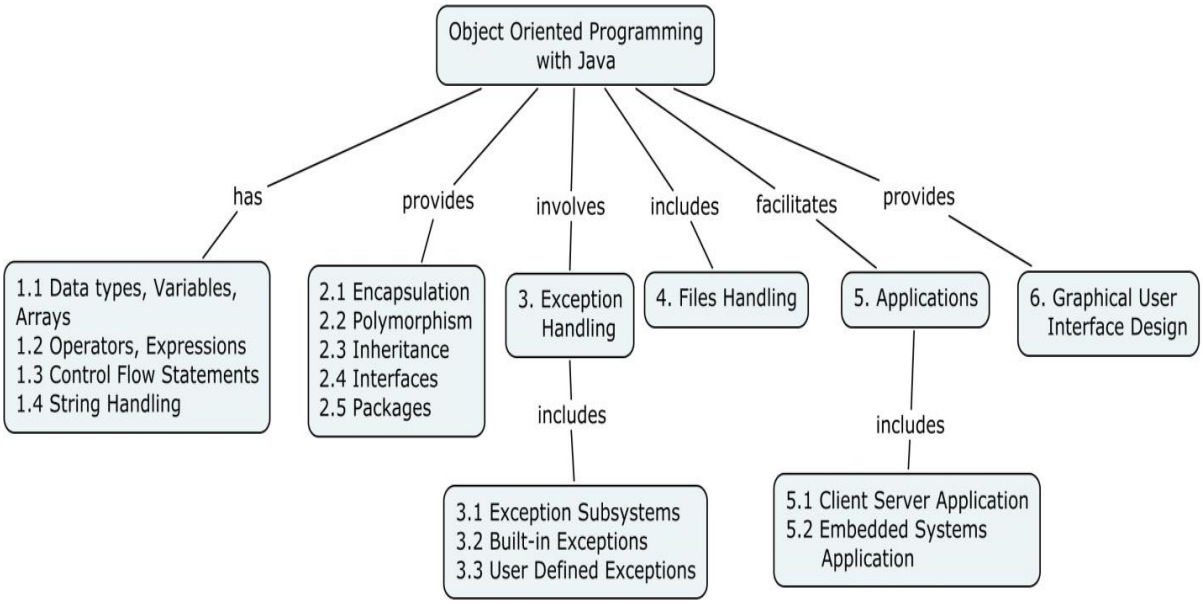
Course Outcome 4 (CO4)

1. Explain different I/O streams.
2. Use suitable Java AWT controls to design the registration form for Student workshop.
3. Use suitable Java applets to design the registration form for Student workshop.

Course Outcome 5 (CO5)

1. Write client server Java program to send 'hello' message from/to the client/server.
2. Use appropriate Java RMI packages to write program to add two numbers.
3. Write a Java program to check whether the given machine is connected to the network.

Concept Map



Syllabus

Genesis and Overview of JAVA Programming Constructs, Data types, Variables, Arrays, Operators and Expressions, Control Flow Statements, String Handling.
Object Oriented Constructs Encapsulation – Classes and Objects, Polymorphism – Constructor Overloading and Method Overloading, Inheritance, Interfaces and Packages.
Exception Handling Exception Subsystem, Built-in Exceptions, User Defined Exceptions.
File Handling Applications Client Server Applications, Embedded Application.
Graphical User Interface Design: Applets.

Text Book

1. Herbert Schildt: The complete reference – Java, Ninth Edition, Mc Graw Hill Companies, 2015.
2. Deitel and Deitel, Java How to Program, Ninth Edition, Pearson Education, 2014.

References

1. Thinking in Java, Bruce Eckel's Free e-book http://www.codeguru.com/java/tij/.
2. Tutorial on Java www.tutorialspoint.com/java.
3. Tutorial on Java www.javatpoint.com.
4. Tutorial on Java www.spokentutorial.org.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
0	**Genesis and Overview of JAVA**	2
1.	**Programming Constructs**	
1.1	Data types, Variable, Arrays	2
1.2	Operators and Expressions	2
1.3	Control Flow Statements	2
1.4	String Handling	2
2	**Object Oriented Constructs**	
2.1	Encapsulation - Classes and Objects	2
2.2	Polymorphism - Constructor Overloading, Method Overloading	2
2.3	Inheritance	3
2.4	Interfaces	2
2.5	Packages	2
3	**Exception Handling**	
3.1	Exception subsystems	3
3.2	Built-in Exceptions	2
3.3	User Defined Exceptions	2
4	**File Handling**	2
5	**Applications**	
5.1	Client Server Application	2
5.2	Embedded Application	1
6	**Graphical User Interface Design - Applets**	3
Total Lecture Hours		**36**

Course Designers:

1. A.M.Abirami abiramiam@tce.edu
2. P.Karthikeyan karthikit@tce.edu

		Category	L	T	P	Credit
14ITGC0	**SOFTWARE ENGINEERING**	GE	3	0	0	3

Preamble

This course presents methods, tools and procedures that enable to control the process of software development and provide the student with a foundation for building quality software in a productive manner. The course highlights the application of systematic, disciplined, quantifiable approach to the development, operation and maintenance of software.

Prerequisite

None

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Comprehend different process models and select suitable model for their project requirements	Understand
CO2:	Identify suitable requirements for the applications from the user specifications	Apply
CO3:	Design applications using appropriate design concepts and techniques	Apply
CO4:	Apply testing tactics and tools on software applications	Apply
CO5:	Use appropriate managerial solutions for software projects	Understand

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	30	20	20	20
Understand	30	40	50	50
Apply	40	40	30	30
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. List the components of S/W engineering.
2. Write down the differences between Incremental process model and evolutionary process model.
3. Explain the application where agile process model is implemented.
4. Select which software life cycle model is applicable for weather monitoring system.

Course Outcome 2 (CO2)

1. Prepare an SRS document for Online shopping S/W.
2. Draw Use-Case diagram for some of the use-cases of the library management system.
3. Analyze the tasks that the software Engineer needs to perform to ensure that he has specified a system that properly meets the customer needs and satisfy the customer's expectations.

Course Outcome 3 (CO3)

1. Discuss different design techniques used in software design.

2. Draw class diagram and activity diagram for the library management system
3. Draw sequence diagram for the library management system

Course Outcome 4 (CO4)

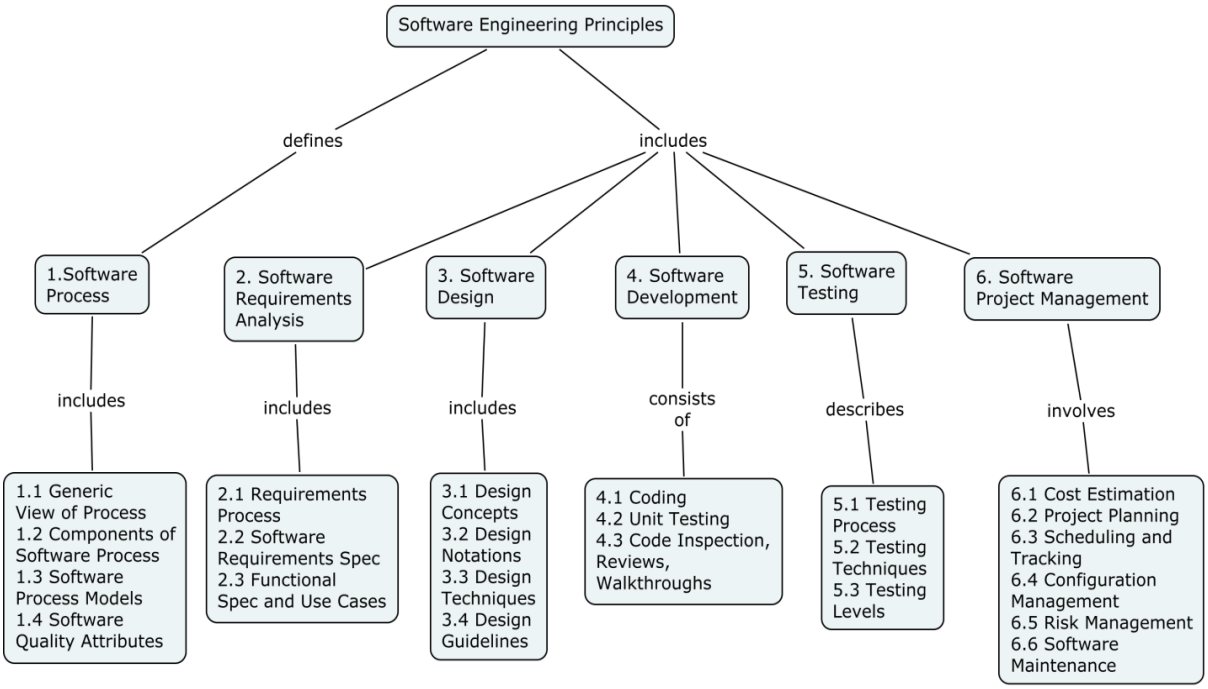
1. Exhaustive testing is not possible. Justify.
2. Recognize how an acceptance test is executed and evaluated.
3. Discuss about Software reviews.
4. Discuss how testing is performed in various levels of the software. Give examples.
5. Draw the CFG and Calculate the cyclomatic Complexity for the following program.

```
int compute_gcd(x, y)
int x, y;
{
while (x! = y){
if (x>y) then
x= x – y;
else y= y – x;
 }
 return x;
}
```

Course Outcome 5 (CO5)

1. Recall the important elements of SCM.
2. List out the software risks.
3. Mention the different approaches to the sizing problem.
4. Explain how Risk estimation is done during project development.
5. Using the Cocomo models, estimate the effort required to build a S/W for a Simple ATM that produces 24 screens, 15 reports and will require approximately 110 S/W components. Assume average complexity and average developer / environment maturity. Use the application composition model with object point

Concept Map



Syllabus

Software Process Generic view of Process, Components of Software Process, Software Process models, Software Quality Attributes.
Software Requirements Analysis Requirements Process, Software Requirement Specifications, Functional specifications and use cases.
Software Design Design concepts, Design notations, Design techniques, Design guidelines
Software Development Coding, Unit testing, code inspection reviews and walkthroughs.
Software Testing Testing process, Testing techniques, Black box testing, White box testing, Testing levels, Integration testing, System testing, User acceptance testing.
Software Project Management Cost Estimation, Project planning, Scheduling and tracking, Configuration Management, Risk Management, Software Maintenance.

Text Book

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House, 3rd edition, 2014.
2. Roger S.Pressman, "Software Engineering A Practitioner's Approach', McGraw Hill, 6th edition, 2014.

References

1. Rajib Mall, "Fundamentals of Software Engineering", PHI, 3rd edition, 2009.
2. Richard Fairley, "Software Engineering Concepts", TATA McGraw Hill, 2004.
3. Adithya P. Mathur, "Foundations of Software Testing", Pearson Education, 2008.
4. Ian Sommerville, "Software Engineering", Pearson Publishers, 9th edition, 2010.
5. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/.
6. www.nptel.ac.in/courses/softwareengineering.

Course Contents and Lecture Schedule

Module No	Topic	No of Lectures
1	**Software Process**	
1.1	Generic View of Process	1
1.2	Components of Software Process	1
1.3	Software Process Models	3
1.4	Software Quality Attributes	1
2	**Software Requirements Analysis**	
2.1	Requirements Process	1
2.2	Software Requirement Specifications	2
2.3	Functional Specifications and Use Cases	2
3	**Software Design**	
3.1	Design Concepts	1
3.2	Design Notations	1
3.3	Design Techniques	2
3.4	Design Guidelines	1
4	**Software Development**	
4.1	Coding	1
4.2	Unit Testing	2
4.3	Code Inspection, Reviews and Walkthroughs	2

5	**Software Testing**	
5.1	Testing Process	1
5.2	Testing techniques	
5.2.1	Black Box testing	2
5.2.2	White Box testing	2
5.3	Testing Levels	
5.3.1	Integration testing	1
5.3.2	System testing	1
5.3.3	User Acceptance testing	1
6	**Software Project Management**	
6.1	Cost Estimation	1
6.2	Project Planning	1
6.3	Scheduling and Tracking	1
6.4	Configuration Management	1
6.5	Risk Management	2
6.6	Software Maintenance	1
Total Lecture Hours		**36**

Course Designers:

1. A.M.Abirami abiramiam@tce.edu
2. R.Suganya rsuganya@tce.edu

		Category	L	T	P	Credit
14ITGD0	**DATABASE MANAGEMENT SYSTEMS**	GE	3	0	0	3

Preamble

This course aims at facilitating the student to understand the various functionalities of DBMS, to perform many operations related to creation, usage and maintenance of databases for real-world applications and to emphasize the need for design of database systems

Prerequisite

None

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Explain the concepts of Data Base Management System.	Understand
CO2:	Describe Entity Relationship (ER) diagrams for applications.	Understand
CO3:	Demonstrate how to Create, alter and modify databases.	Apply
CO4:	Use stored procedures and functions to interact with the databases.	Apply
CO5:	Apply normalization techniques and database connectivity to design a database for a given application	Apply

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	20	20	10	20
Understand	30	30	40	30
Apply	50	50	50	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Describe the three schema architecture of DBMS.
2. Identify the classification of DBMS.
3. Define a database model? Give any two types of data models with an example for each.

Course Outcome 2 (CO2)

1. Recall ER model.
2. Define strong entity set with an example.
3. Outline the desirable properties of decompositions.

Course Outcome 3 (CO3)

1. Consider the following relations:

Employee(empID, fname, lname, address, DOB, sex, position, dNo)

Department(dptNo, dName, mgr, empID)

Project(pNo, pName, dNo)

WorksOn(empID, pNo, hours_worked)

2. Write SQL statements for the following:
3. List the name and address of all employees who work for IT dept.
4. List the total hours worked by each employee, arranged in order of department number and within department, alphabetically by employee lname.
5. List the total number of employees in each department for those departments with more than 10 employees.
6. List the project number, project name and the number of employees who work on that project.
7. List the number of hours worked on each project group by manager.

Course Outcome 4 (CO4)

1. Write PL/SQL procedure to list the total hours worked by each employee, arranged in order of department number and within department, alphabetically by employee lname
2. Write PL/SQL function to list the employees if their hours worked goes below 10 hours/week.
3. Write a PL/SQL program to find the biggest of three number using loop.

Course Outcome 5 (CO5)

1. Suppose that we have the following requirements for a university database that is used to keep track of students' transcripts:

   a. The university keeps track of each student's name (SNAME); student number (SNUM); social security number (SSN); current address (SCADDR) and phone (SCPHONE); permanent address (SPADDR) and phone (SPPHONE); birth date (BDATE); sex (SEX); class (CLASS) (freshman, sophomore, ..., graduate); major department (MAJORCODE); minor department (MINORCODE) (if any); and degree program (PROG) (B.A., B.S., ..., PH.D.). Both SSSN and student number have unique values for each student.

   b. Each department is described by a name (DNAME), department code (DCODE), office number (DOFFICE), office phone (DPHONE), and college (DCOLLEGE). Both name and code have unique values for each department.

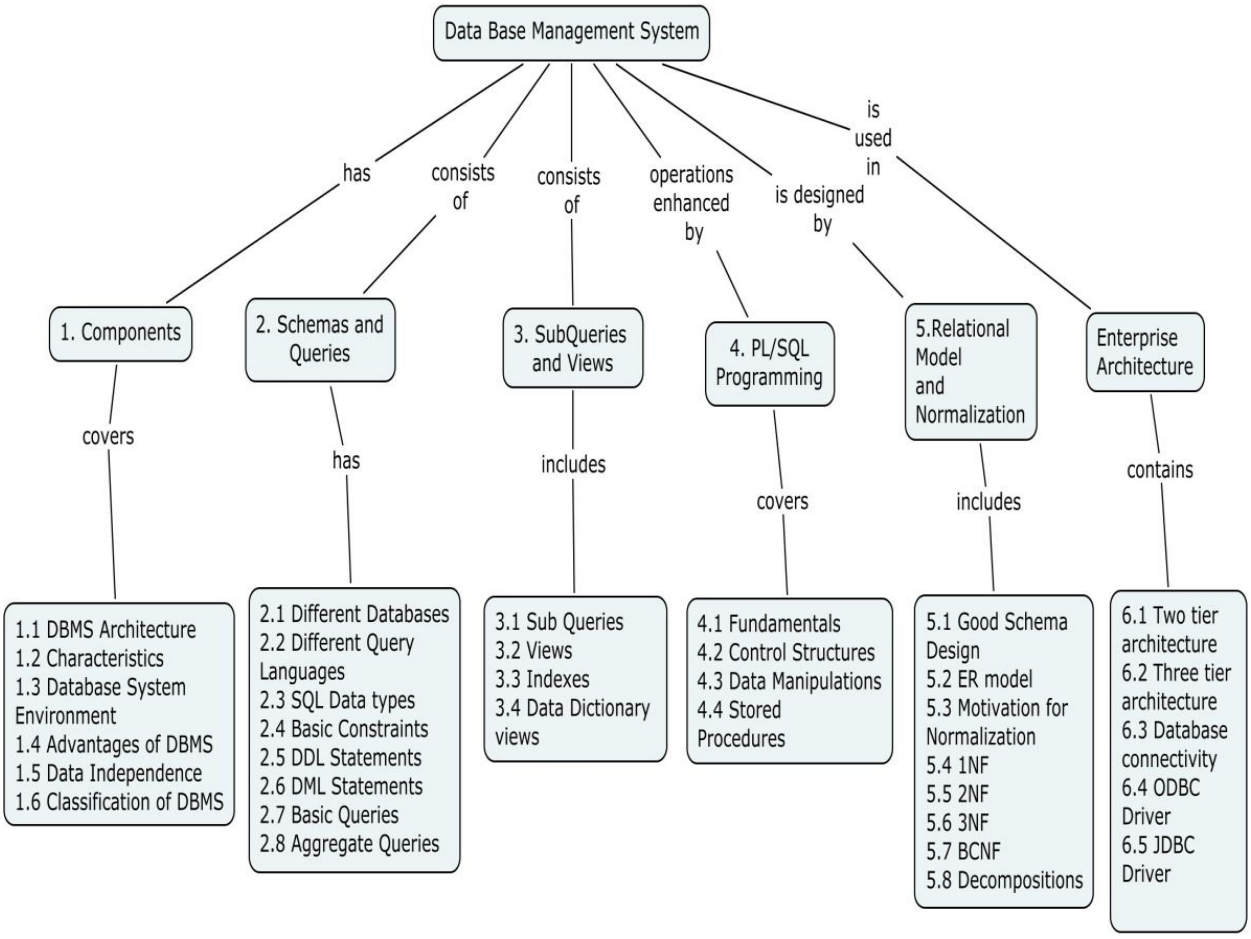
   c. Each course has a course name (CNAME), description (CDESC), course number (CNUM), number of semester hours (CREDIT), level (LEVEL), and offering department (CDEPT). The course number is unique for each course.

   d. Each section has an instructor (INAME), semester (SEMESTER), year (YEAR), course (SECCOURSE), and section number (SECNUM). The section number distinguishes different sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, .up to the total number of sections taught during each semester.

   e. A grade record refers to a student (SSN), a particular section, and a grade (GRADE).

2. Prepare a relational database schema for this database application. First show all the functional dependencies that should hold among the attributes. Then design relation schemas for the database that are each in 3NF or BCNF. Specify the key attributes of each relation. Note any unspecified requirements, and make appropriate assumptions to render the specification complete.

Concept Map



Syllabus

DBMS Components – Overview of DBMS Architecture, Characteristics of Database approach, Advantages of using DBMS approach, Data Independence, Database System Environment, Classification of DBMS .

Schema Definitions, Basic Constraints and Queries – Overview of databases – Oracle, Sybase and DB2, Overview of Database Query Languages – SQL, PL/SQL and MySQL, SQL data definition and data types, basic constraints in SQL, SQL DDL statements, SQL DML Statements, Basic queries in SQL, Aggregate Queries in SQL .

Sub Queries and Views - Sub Queries in SQL, Views in SQL, Indexes in SQL, Data Dictionary Views

Programming Language Extension to SQL (PL/SQL) – Fundamentals, Control Structures, Data Manipulations, Stored Procedures and Functions

Relational Data Model and Normal Forms –Importance of a good schema design, ER model, Motivation for Normal forms, Definitions of 1NF, 2NF, 3NF and BCNF, Decompositions

Enterprise Architecture – Two tier architecture, Three tier architecture, Database Connectivity, ODBC Driver, JDBC Driver.

Text Book

1. Ramez Elmasri and Shamkant B.Navathe, "Fundamentals of Database Systems", 6th edition, Pearson Education, 2011.
2. Nilesh Shah, "Database Systems using Oracle", 2nd edition, Prentice Hall of India Pvt Ltd, 2007.

References

1. C.J Date, A.Kannan, S.Swamynathan "An Introduction to database systems", Eighth Edition, Pearson Education, 2006.
2. Abraham Silberschatz, Henry F.Korth and Sudarshan, "Database System Concepts", Mcgraw-Hill, Fifth edition, 2006.
3. Web Technologies, Atul Kahate, Tata Mcgraw Hill, 2nd Edition, 2008.

Course Contents and Lecture Schedule

Module No	Topic	No of Lectures
1	**DBMS Components**	
1.1	Overview of DBMS architecture	1
1.2	Characteristics of DBMS	
1.3	Database System Environment	1
1.4	Advantages of using DBMS approach	1
1.5	Data Independence	1
1.6	Classification of DBMS	1
2	**Schema Definitions, Basic Constraints and Queries**	
2.1	Overview of databases – Oracle, Sybase, DB2	1
2.2	Database Query Languages – SQL, MySQL, PL/SQL,	1
2.3	SQL data definition and data types	1
2.4	Basic constraints in SQL	1
2.5	SQL DDL Statements	1
2.6	SQL DML Statements	1
2.7	Basic Queries in SQL	1
2.8	Aggregate Queries in SQL	1
3	**Sub Queries and Database Views**	
3.1	Sub Queries in SQL	2
3.2	Views in SQL	1
3.3	Indexes in SQL	1
3.4	Data Dictionary Views	1
4	**Programming Language Extension to SQL** (PL/SQL)	
4.1	Fundamentals	1
4.2	Control Structures	1
4.3	Data Manipulations	1
4.4	Stored Procedures and Functions	1
5	**Relational Data Model Normal Forms**	
5.1	Importance of a good schema design	1

5.2	ER model	2
5.3	Motivation for Normal forms	1
5.4	First Normal Form	1
5.5	Second Normal Form	1
5.6	Third Normal Form	1
5.7	BCNF Normal Form	1
5.8	Decompositions	1
6	**Enterprise Architecture**	
6.1	Two tier Architecture	1
6.2	Three tier Architecture	1
6.3	Database Connectivity	1
6.4	ODBC Driver	1
6.5	JDBC Driver	1
	Total Lecture Hours	36

Course Designers:

1. Raja Lavanya rlit@tce.edu

		Category	L	T	P	Credit
14ITGE0	**DATA SCIENCE**	GE	3	0	0	3

Preamble

Data Science is the art of converting raw data to useful information that can be used to draw conclusions and make decisions. Data Science is used in organizations to make better business decisions and is used in sciences to verify or disprove existing models or theories. This course will provide an overview of the wide area of data science, with a particular focus on to the tools required to store, clean, manipulate, visualize, model, and ultimately extract information from large amounts of data.

Prerequisite

- Some linear algebra and previous exposure to probability and statistics is ideal; as well as some programming experience.

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1:	Understand basic concepts of data mining process, storage and its applications.	Understand
CO2:	Experiment with exploratory data analysis and programming	Apply
CO3:	Distinguish among supervised and unsupervised learning techniques	Analyze
CO4:	Solve regression models, time series data using R programming	Apply
CO5:	Develop data models for any real time applications using data visualization techniques.	Apply

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	40	40	30	30
Understand	40	30	40	40
Apply	20	20	20	20
Analyze	0	10	10	10
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. State Data science
2. Differentiate between data warehousing and data mining.
3. Define data analytics and modeling.

Course Outcome 2 (CO2):

1. Compute the technique of cross validation and pre-processing for the data set of a bank application. Identify the fields and labels over the dataset and perform all the steps over pre-processing technique.
2. Model out the types of error usually occurs in data processing and justify the reasons of the occurrence of each type with respect to the data format chosen and illustrate with an example.
3. Differentiate among sampling and data pre-processing.

Course Outcome 3 (CO3):

1. Consider an application of hospital management system which contains records of large set of patients in various diseases such as diabetes, heart disease, cancer. Apply the concept of ensemble methods to overcome the difficulties in maintaining the records in various departments in the hospital and also justify with the method that you have chosen for evaluation with the classification of the datasets across different disciplines.
2. Point out the need for using a multiclass classification model in a system. Clearly provide the reasons over binary classification system with necessary illustrations
3. Depict a predictive model using multiclass classification techniques for any real-time application.

Course Outcome 4 (CO4):

1. Nine students held their breath, once after breathing normally and relaxing for one minute, and once after hyperventilating for one minute. The table indicates how long (in sec) they were able to hold their breath. Is there an association between the two variables?

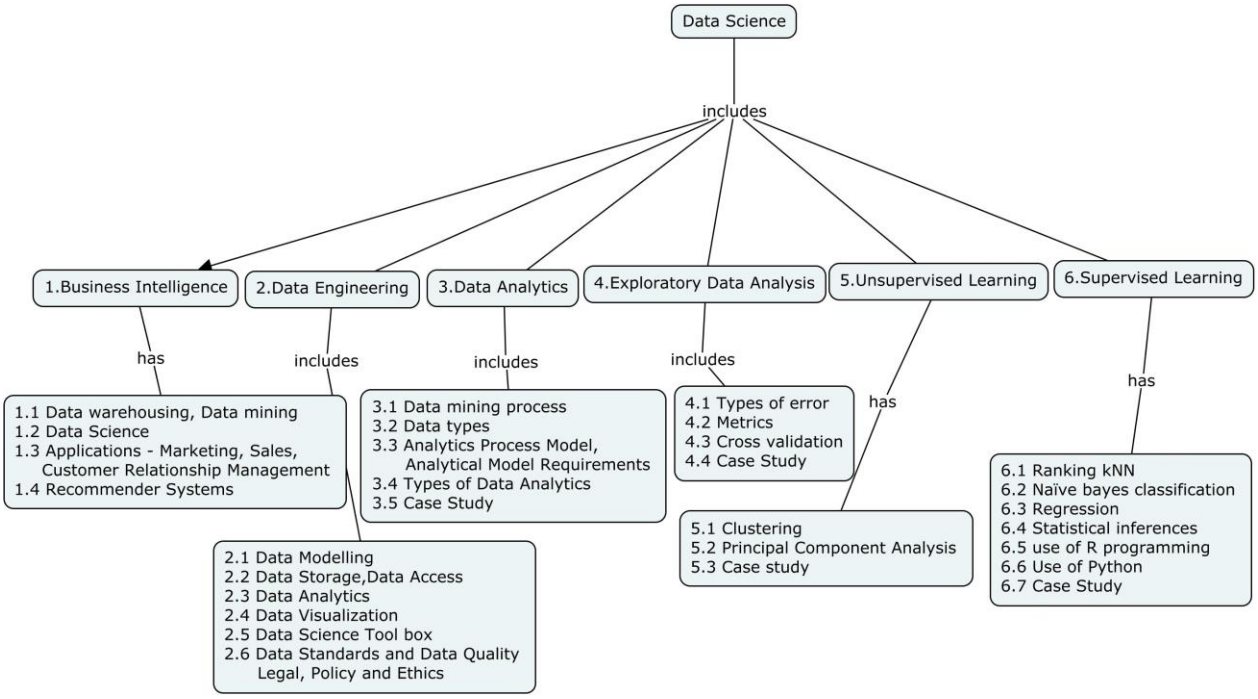
Subject	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Normal	56	56	65	65	50	25	87	44	35
Hyper vent	87	91	85	91	75	28	122	66	58

    1. Sketch the data. Do normal and hyper vent seem to have a linear relationship?
    2. Use the method of least squares to find an equation for the prediction of a student's normal and hyper vent breath rate.
    3. Identify the hyper vent value of a student who is having normal breath at 92.
2. In real-world data, tuples with missing values for some attributes are a common occurrence. Describe various methods for handling this problem.

Course Outcome 5 (CO5):

1. Prepare a predictive model for resource utilization by a computer system which has maximum size of RAM 512 MB, and 120 GB hard disk, which runs 6 processes at a given time with the time allotted for each of the process is about 2 milliseconds.
2. Model out visualization, for any of the real world application. Interpret with the standard graph based technique and clearly differentiate it with other ones.
3. Develop a data model for an social network application with user interaction visualization technique and depict its structure.

Concept Map



Syllabus

Business intelligence Data warehousing - Data mining – Data Science- Applications – Marketing, Sales, Customer Relationship Management – Recommender Systems

Data Engineering Data Modelling – Data Storage – Data Access - Data Analytics – Data Visualization - Data Science Toolbox – Data Standards and Data Quality - Legal, Policy and Ethics

Data Analytics – Data mining process - Data preparation - Data Cleaning – Data types - Analytics Process Model – Analytical Model Requirements - Types of Data Analytics – Image or Video analytics – Social media analytics – case study.

Exploratory Data Analysis – Types of error – Receiver Operating Characteristics RoC – Metrics Precision, Recall, F Measure, Accuracy – Cross validation – case study.

Unsupervised Learning Clustering – Principal Component Analysis – Applying PCA – Case study.

Supervised Learning Ranking kNN, Naïve bayes classification - Regression – linear, multiple, logistic regression – Statistical inferences – use of R programming – use of python – case study.

Text Books

1. Bart Baesens, “Analytics in a Big Data World”, The Essential Guide to Data Science and its Applications, , Wiley, First edition,2014.
2. Thomas H. Davenport, Jeanne G. Harris, “Competing on Analytics: The New Science of Winning”, Harvard Business Review Press ,First edition, 2007.

Reference Books

1. Paul C. Zikopoulos, Chris Eaton, “Understanding Big Data”, McGraw-Hill, 2012 (eBook from IBM)
2. http://www.bigdatauniversity.com

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Business intelligence**	
1.1	Data warehousing - Data mining	1
1.2	Data Science	1
1.3	Applications – Marketing, Sales, Customer Relationship Management	2
1.4	Recommender Systems	1
2	**Data Engineering**	
2.1	Data Modelling	1
2.2	Data Storage – Data Access	1
2.3	Data Analytics	1
2.4	Data Visualization	1
2.5	Data Science Tool box	1
2.6	Data Standards and Data Quality - Legal, Policy and Ethics	1
3	**Data Analytics**	
3.1	Data mining process - Data preparation - Data Cleaning	1
3.2	Data types	1
3.3	Analytics Process Model – Analytical Model Requirements	2
3.4	Types of Data Analytics – Image or Video analytics – Social media analytics	2
3.5	Case study	1
4	**Exploratory Data Analysis**	
4.1	Types of error – Receiver Operating Characteristics RoC	2
4.2	Metrics Precision, Recall, F Measure, Accuracy	1
4.3	Cross validation	1
4.4	Case study	1
5	**Unsupervised Learning**	
5.1	Clustering	2
5.2	Principal Component Analysis – Applying PCA	2
5.3	Case study	2
6	**Supervised Learning**	
6.1	Ranking kNN,	1
6.2	Naïve bayes classification	1
6.3	Regression – linear, multiple, logistic regression	1
6.4	Statistical inferences	1

6.5	Use of R programming	1
6.6	Use of Python	1
6.7	Case study	1
Total Lecture Hours		**36**

Course Designer:

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2. A.M.Abirami abiramiam77@gmail.com
3. A.Sheik Abdullah asait@tce.edu

14ITGF0	MOBILE APPLICATION DEVELOPMENT USING ANDROID	Category	L	T	P	Credit
		GE	3	0	0	3

Preamble

One of the roles of any engineering professional is to design, build and integrate them into a single system. To get knowledge for developing an IT based system, the developer should select, deploy, integrate and administer platforms or components to make the IT enabled system. This course is designed to get knowledge and skill for developing mobile applications using Android. The contents include basics, environment, packages, components and other supports such as location, database. Overall it enables the students to develop mobile application for any IT enabled real time problem.

Prerequisite

Programming skills

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		Bloom's Level
CO1	Implement object oriented concepts, packages and interfaces in java	Apply
CO2	Describe the Android features, architecture, environment etc	Understand
CO3	Distinguish the various APIs of Android	Understand
CO4	Implement various user interface components with Activities for any real-time mobile application scenario	Apply
CO5	Implement services, database and location-based services for the given mobile app scenario	Apply

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	50	50	50	40
Apply	30	30	30	40
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Note: CO4 & CO5 are also partially assessed through practical assignments/ projects.

Course Outcome 1

1. Write Java program to find the factorial of a number.
2. Write Java program to implement a class for finding the students result.
3. Implement method-overloading for the well-known problem.
4. Implement hierarchical inheritance for a medical shop application.
5. Differentiate various types of inheritance.

Course Outcome 2

1. Write the features of Android
2. Draw the architecture of Android
3. Explain the various layers of Android

Course Outcome 3

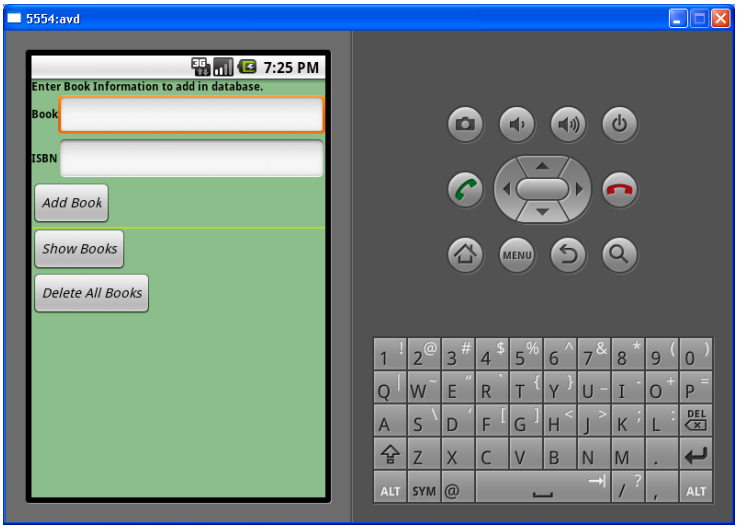
1. List any four APIs
2. Explain the classes of content API
3. List the classes of graphics API
4. What are the classes are needed for including audio and video for your app?
5. What utility support is available in android?

Course Outcome 4

1. Write an Android program to display the exam results in a table layout.
2. Define an intent object and invoke the components of Android platform.
3. Draw an activity to calculate an electricity bill using android. Label the components.
4. How do you add sound and vibrate in your application using 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.

Course Outcome 5

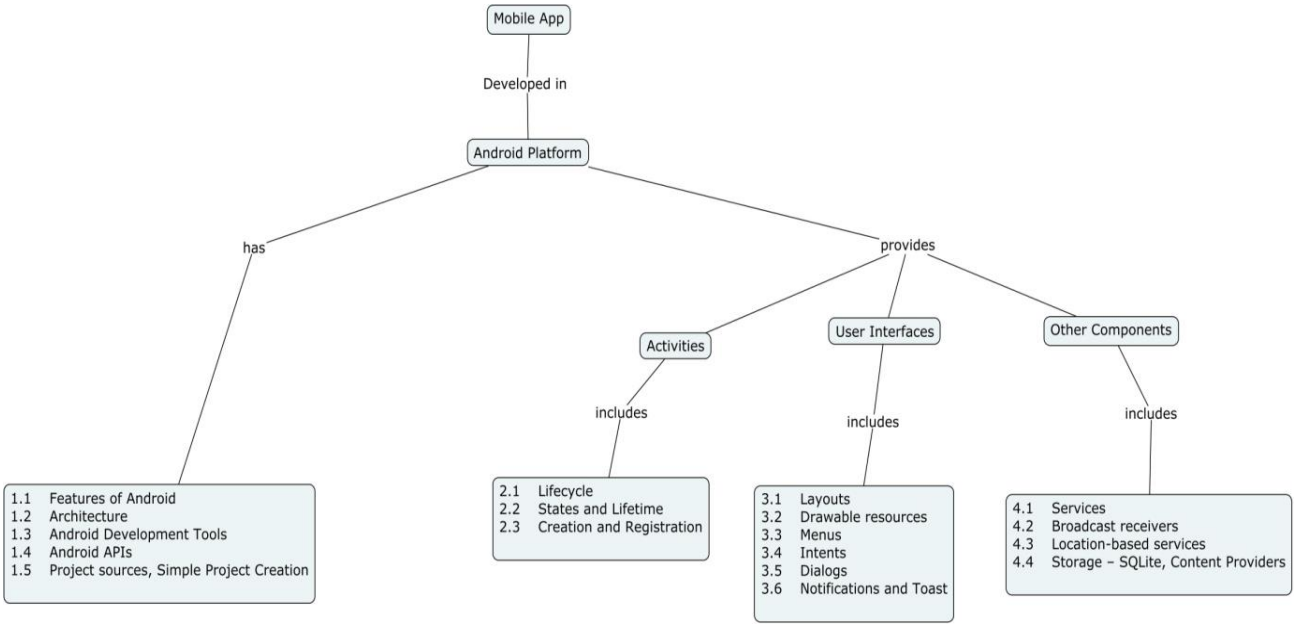
1. Write a database supported program to perform the following tasks
    i. Enter the Name of the book and ISBN number and click on Add Book.
    ii. Data will be added to Sqlite database.
    iii. Add multiple entries into database.
    iv. Click on Show Books to view the contents added so far.
    v. Click on Delete All Books button to delete the contents of database



2. Write a database supported program to perform the following tasks

    i. Add entries into database.
    ii. Display the employee details one by one by pressing the next button.

Concept Map



Syllabus

Object Oriented Programming Abstraction and Encapsulation,Classes and Objects, Inheritance,Polymorphism,Packages and Interfaces,Java Application Development
Basics of Mobile Application Development Features of Android,Architecture,Android Development Tools,Android APIs,Project sources, Simple Project Creation
Activities Lifecycle ,States and Lifetime,Creation and Registration
User Interfaces Layouts,Drawable resources,Menus,Intents,Dialogs,Notifications and Toast
Other Components Services, Location-based services, Storage – SQLite, Content Providers

Text Book

1. Herbert Schildt: The complete reference – Java, Ninth Edition, Mc Graw Hill Companies, 2015.
2. Professional Android Application Development, Reto Meier, Wrox, November 2010

References

1. Tutorial on Java www.tutorialspoint.com/java
2. Tutorial on Android http://developer.android.com/index.html

Course Contents and Lecture Schedule

Module No	Topics	No of Lectures
0	**Object Oriented Programming**	
0.1	Abstraction and Encapsulation	1
0.2	Classes and Objects	2
0.3	Inheritance	2

0.4	Polymorphism	1
0.5	Packages and Interfaces	1
0.6	Java Application Development	1
1	**Basics of Mobile Application Development**	
1.1	Features of Android	1
1.2	Architecture	1
1.3	Android Development Tools	1
1.4	Android APIs	2
1.5	Project sources, Simple Project Creation	1
2	**Activities**	1
2.1	Lifecycle	1
2.2	States and Lifetime	1
2.3	Creation and Registration	2
3	**User Interfaces**	
3.1	Layouts	2
3.2	Drawable resources	1
3.3	Menus	2
3.4	Intents	2
3.5	Dialogs	2
3.6	Notifications and Toast	2
4	**Other Components**	
4.1	Services	1
4.2	Broadcast receivers	1
4.3	Location-based services	1
4.4	Storage – SQLite, Content Providers	3
	Total Lecture Hours	**36**

Course Designers:

1. Dr.P.Karthikeyan karthikit@tce.edu
2. Mrs.C.V.Nisha Angeline nishaangeline@gmail.com

		Category	L	T	P	Credit
14ITGG0	**CLOUD TECHNOLOGIES**	GE	3	0	0	3

Preamble

The objective of the course is to provide inclusive knowledge of Cloud Computing concepts, technologies and architecture. The student will be exposed to basics of virtualization and will gain a good understanding in managing the cloud environment.

Prerequisite

None

Course Outcomes

On the successful completion of the course, students will be able to

Course Outcomes		**Bloom's Level**
CO1:	Identify the key technologies in cloud architecture and Models.	Understand
CO2:	Choose appropriate Virtualization tools by knowing its importance (including Virtualization of CPU, Memory, I/O Devices.)	Apply
CO3:	Solve the core issues of cloud computing infrastructure such as resource provisioning, managing the SLAs	Apply
CO4:	Implement the appropriate programming model (such as Hadoop, Google App Engine, etc.) in the cloud computing driven systems	Apply

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**			**Terminal Examination**
	1	**2**	**3**	
Remember	30	20	20	20
Understand	30	40	50	50
Apply	40	40	30	30
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Explain the key characteristic of cloud computing?
2. Interpret data footprint reduction?
3. Identify the importance of Cloud computing, Enlist and explain essential characteristics of cloud computing.
4. Illustrate the importance of different cloud services.

Course Outcome 2 (CO2)

1. Interpret the benefits of virtualization
2. Use self service provisioning in Virtualization
3. Adapt some of the common pitfalls that come with virtualization.
4. Transfer the ides for using cloud capital expenditure.
5. Collect the difference between process virtual machines, host VMMs and native VMMs.
6. Construct the fundamental differences between the virtual machine as perceived by a traditional operating system processes and a system VM.

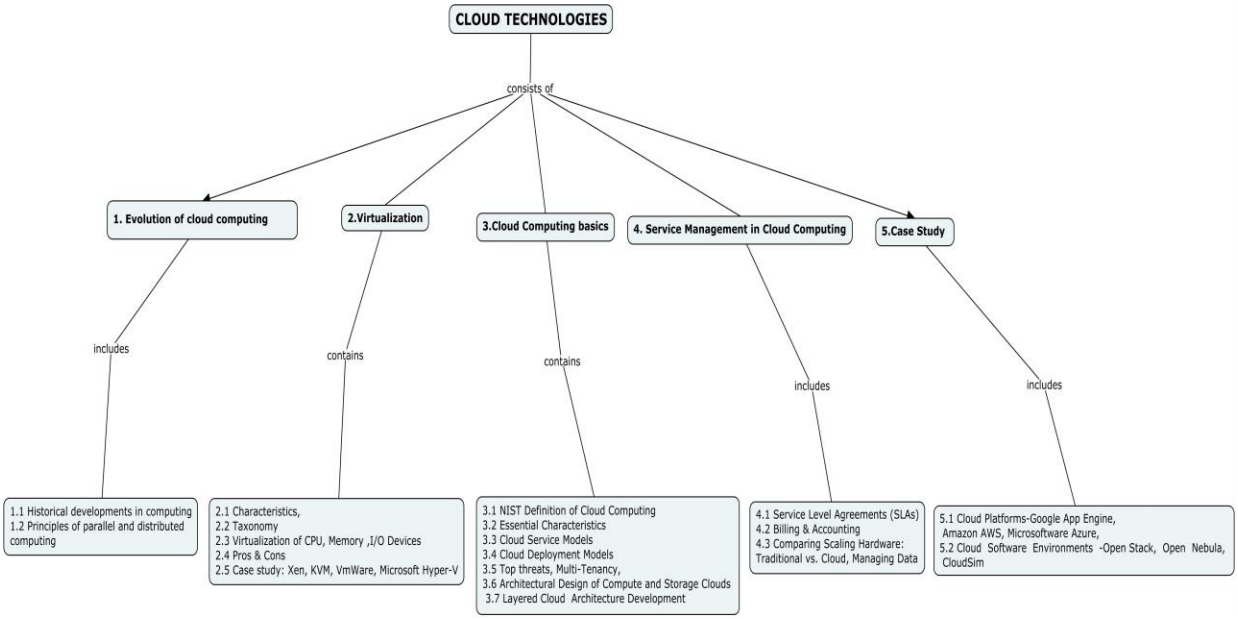
Course Outcome 3 (CO3)

1. Identify the importance of Cloud Infrastructure.
2. Illustrate the importance of Layered Cloud Architecture Development.
3. Interpret the significance of SLAs in Cloud Applications.
4. Prepare the report for Resource Provisioning and Platform Deployment for any Cloud Application.

Course Outcome 4 (CO4)

1. Show conceptual representation of the Eucalyptus Cloud. Explain in brief the components within the Eucalyptus system.
2. Illustrate Nimbus? What is the main way to deploy Nimbus Infrastructure? What is the difference between cloud init.data and the Context Broker?
3. Adapt Open Nebula Cloud? Use the main components of Open Nebula.
4. Choose Xen Cloud Platform (XCP) with suitable block diagram.
5. Manipulate the services provided by the Amazon infrastructure cloud from a user perspective.
6. Make a user to view Google App Engine with suitable block schematic.

Concept Map



Syllabus

Evolution of cloud computing: Historical developments in computing, Principles of parallel and distributed computing, web services and web 2.0
Virtualization: Characteristics, Taxonomy, Virtualization of CPU, Memory, I/O Devices, Pros & Cons, Case study: Xen, KVM, VmWare, and Microsoft Hyper-V.
Cloud Computing basics- NIST Definition of Cloud Computing, Essential Characteristics, Cloud Service Models, Cloud Deployment Models, Top threats, Multi-Tenancy, Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development
Service Management in Cloud Computing - Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Managing Data
Case Study – Cloud Platforms-Google App Engine, Amazon AWS, Microsoft Azure, Cloud Software Environments -Open Stack, Open Nebula,Cloud Sim

Text Book

1.Ki Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2.Rajkumar Buyya,Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing:Foundations and Applications Programming"2013
3.John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2014.
4. Greg Schulz,"cloud and Virtual DataStorage Networking",CRC Press,2012

References

1.Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011.
2.George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly 2009
3.James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
4. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer. 2010
5.Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.
6.Rajkumar Buyya, Christian Vecchiola, S.Tamarai Selvi, 'Mastering Cloud Computing", TMGH,2013.
7. Gautam Shroff, Enterprise Cloud Computing, Cambridge University Press, 2011
8. Michael Miller, Cloud Computing, Que Publishing, 2008
9. Nick Antonopoulos, Cloud computing, Springer Publications, 2010

Course Contents and Lecture Schedule

Module No	Topic	No of Lectures
1.	**Evolution of cloud computing**	
1.1	Historical developments in computing	2
1.2	Principles of parallel and distributed computing	2
2	**Virtualization**	
2.1	Characteristics	2

2.2	Taxonomy	2
2.3	Virtualization of CPU, Memory, I/O Devices	2
2.4	Pros & Cons	2
2.5	Case study: Xen, KVM, VmWare, Microsoft Hyper-V.	2
3.	**Cloud Computing basics**	
3.1	NIST Definition of Cloud Computing	1
3.2	Essential Characteristics	1
3.3	Cloud Service Models	2
3.4	Cloud Deployment Models	2
3.5	Top threats, Multi-Tenancy	2
3.6	Architectural Design of Compute and Storage Clouds	2
3.6	Layered Cloud Architecture Development	2
4	**Service Management in Cloud Computing**	
4.1	Service Level Agreements (SLAs)	2
4.2	Billing & Accounting	2
4.3	Comparing Scaling Hardware: Traditional vs. Cloud, Managing resources and data	2
5.	**Case Study**	
5.1	Cloud Platforms- Google App Engine, Amazon AWS, Microsoftware Azure	2
5.2	Cloud Software Environments -Open Stack, Open Nebula, CloudSim	2
Total Lecture Hours		**36**

Course Designers:

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