DAYANANDA SAGAR COLLEGE OF ENGINEERING

(An Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi)

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017-2018

B.E.COMPUTER SCIENCE & ENGINEERING

VI SEMESTER

Sl. No.	Subject Code	Subject	Teaching Department	Board	Teaching Hours/Week			Examination			Credit
					L	T	P	CIE	SEE	Total	
1	CS61	Internet and Web Technologies	CSE	CSE	4	0	0	50	50	100	4
2	CS62	Compiler Design	CSE	CSE	4	0	0	50	50	100	4
3	CS63	Computer Graphics & Visualization	CSE	CSE	4	0	0	50	50	100	4
4	CS64	Cloud & Big Data Applications	CSE	CSE	3	0	0	50	50	100	3
5	CS65X	Elective -B	CSE	CSE	3	0	0	50	50	100	3
6	CS66X	Elective-C	CSE	CSE	3	0	0	50	50	100	3
7	CSL67	Internet and Web Technologies Laboratory	CSE	CSE	1	0	2	50	50	100	2
8	CSL68	Computer Graphics Laboratory	CSE	CSE	1	0	2	50	50	100	2
							Total	400	400	800	25

Elective-B	Elective-C
CS651 – Switching and Telecommunication	CS661 – Storage Area Networks
CS652 - Pattern Recognition	CS662 - Building enterprise applications
CS653 - Software Architecture & Design patterns	CS663 – Software Testing
CS654 - Wireless sensor Networks	CS664 - Semantic Web

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VI Sem Syllabus

Internet and Web Technologies

Course Code: CS61
L: P: T: S: 4: 0: 0: 0
Exam Hours: 03
Total Hours: 50

Credits: 04
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. Identify the elements and attributes of creating a webpage.
2. Create web pages using XHTML and Cascading Styles sheets.
3. Understand the client and server side programming.
4. Create XML documents using XSLT style sheets.
5. Build interactive web applications using PHP, MySQL and Ruby on Rails.

Course Outcomes: At the end of the course, student will be able to:

CO1	Design and create web pages using XHTML and CSS
CO2	Design and implement advanced dynamic web pages using JavaScript.
CO3	Check forms for data entry validation on the server-side
CO4	Develop server-side scripts using PHP, Ruby and Rails programs.
CO5	Analyze the user preferences by developing scripts on session management for real time applications
CO6	Create and maintain responsive web pages

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		2			2	2	2	2	2
CO2	3	3	3		2			2	2	2	2	2
CO3	3	3	3		2			2	2	2	2	2
CO4	3	3	3		2			2	2	2	2	2
CO5	3	3	3		2			2	2	2	2	2
CO6	3	3	3		3			2	2	2	2	2

Unit.	Content of the Unit	Hours	COs
1.	**Fundamentals of Web, XHTML, CSS:** Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox. XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links, Lists, Tables, Forms, Frames. **CSS:** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags.	10	CO1
2.	**Javascript:** Overview of Javascript, Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples. **Javascript and HTML Documents, Dynamic Documents with Javascript:** The Javascript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM2 event model, The navigator object, DOM tree traversal and modification. Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click.	10	CO2 & CO3
3.	**XML:** Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors.	10	CO3
4.	**PHP:** Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form	10	CO4, CO5 & CO6

	handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.		
5.	**Ruby, Rails:** Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators. Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.	10	CO4, CO5 & CO6

Self-study component:

Develop an interactive web application to implement the skills learnt in the theory.

Note:

1. At the end of the course students should have cultivated the ability to develop an interactive web application to implement the skills learnt in the theory.

2. A project report of about 10 – 12 pages on the project developed, duly certified by the department must be submitted before the end of the course.

Contents /Structure of mini project report/profile:

1. Introduction
2. Business Requirement
3. UML Design
    - 3.1 Use case diagram
    - 3.2 UML classes
4. Framework of the development
    - 4.1 Logical architectural diagram
    - 4.2 IDE and tools
5. Prototype of the system
6. References and Bibliography

Text Book:

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008.(Listed topics only from Chapters 1 to 9, 11 to 15).

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide WebHow to Program, 4th Edition, Pearson Education, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rdEdition, Wiley India, 2007.
3. Xue Bai et al: The web Warrior Guide to Web Programming, Cengage Learning, 2003.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Mini Project**
Marks (Out of 50)	**30**	**05**	**15**
Remember	08		
Understand	07	03	03
Apply	10	02	05
Analyze	05		02
Evaluate			
Create			05

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	**Marks Theory(50)**
Remember	05
Understand	05
Apply	10
Analyze	10
Evaluate	10
Create	10

Compiler Design

Course Code: CS62
L: P: T: S: 4: 0: 0: 0
Exam Hours: 03
Total Hours: 50

Credits: 04
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To introduce the concepts language translation and compiler design
2. To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, machine code generation, and use of symbol table.
3. To extend the knowledge of parser by parsing LL parser and LR parser.
4. To provide practical programming skills necessary for constructing a compiler.

Course Outcomes: At the end of the course, student will be able to:

CO1	Develop scanner and parser for a given grammar.
CO2	Analyze and write the required context free grammar and program to solve complex problems.
CO3	Design and develop top down and bottom up parsers.
CO4	Construct syntax tree of an expression and use it in the evaluation for a given expression
CO5	Generation of intermediate code for the high-level language.
CO6	Design & conduct experiments for Intermediate Code Generation in compiler.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		2							2
CO2	3	3	3									2
CO3	3	3	3									2
CO4	3	3	3									2
CO5	3	3	3									2
CO6	3	3	3									2

Unit	Contents of the Unit	Hours	COs
1.	**Introduction to system software:** Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, with Simple Examples. A Simple SIC Assembler, Assembler Algorithm and Data Structures Introduction to Compilers: The structure of a Compiler, The Evolution of programming languages, compiler construction tools. Lexical analysis: The Role of Lexical Analyzer, Specifications of Tokens, Recognition of Tokens, Regular Expression.	10	CO1 & CO2
2.	**Syntax Analysis – 1:** Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing, Bottom-up Parsing.	10	CO3 & CO4
3.	**Syntax Analysis – 2:** Top-down Parsing; Bottom-up Parsing, Simple LR, CLR parser (excluding Efficient construction and compaction of parsing tables), Using ambiguous grammars, Parser Generators.	10	CO3 & CO4
4.	**Syntax-Directed Translation:** Syntax-directed definitions, Evaluation orders for SDDs, Applications of syntax-directed translation, Syntax-directed translation schemes.	10	CO4 & CO6
5.	**Intermediate Code Generation:** Variants of syntax trees, Three-address code, Translation of expressions, Control flow, Back patching, Switch statements and Procedure calls. **Code Generation:** Issues in the design of Code Generator, The Target Language,	10	CO5 & CO6

	Addresses in the target code, Basic blocks and Flow graphs, Optimization of basic blocks, A Simple Code Generator and Assembly code for the high level code.		

Self-study component:

Unit -1: Minimization of NFA.

Unit -2: Elimination of ambiguity in grammar.

Unit -3: Identification of type of parsers.

Unit -4: Conversion of synthesis to inheritance attributes.

Unit -5: Recursive function code optimization.

Text Books

1. Alfred V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2007

Reference Book

1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education.
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press.
3. Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 1997

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	05			01
Understand	05	05	01	01
Apply	05	05	02	01
Analyze	10		02	
Evaluate	05			
Create				02

AAT 1– Alternate Assessment Tool 1: Quiz
AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	**Marks Theory(50)**
Remember	05
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	05

COMPUTER GRAPHICS & VISUALIZATION

Course Code: CS63
L: P: T: S: 4: 0: 0: 0
Exam Hours: 03
Total Hours: 50

Credits: 04
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To provide an introduction to the theory and practice of computer graphics.
2. Apply graphics programming techniques to design, and create computer graphics scenes.
3. Analyze the two-dimensional transformations, line drawing, Clipping, and filling algorithms.
4. Create effective OpenGL programs to solve graphics programming issues, including objects modeling, 3D transformation, color modeling, lighting, and textures.

Course Outcomes: At the end of the course, student will be able to:

CO1	Discuss all aspects of computer graphics including hardware, software and applications.
CO2	Use display systems, image synthesis, and interactively control computer graphics applications.
CO3	Illustrate the 2D graphics algorithms like the line drawing, polygon filling, clipping, and transformation algorithms.

CO4	Integrate the concepts and techniques used in interpretation of 2D and 3D visual information.
CO5	Apply the concepts of viewing, transformations, hierarchical modeling, color, lighting and texture mapping.
CO6	Design and develop graphics applications using OpenGL API

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											2
CO2	3	2			3							2
CO3	3	2	2									2
CO4	3	3	2									2
CO5	3	2	2		3							2
CO6	3	3	3		3							2

Unit.	**Content of the Unit**	**Hours**	**COs**
1.	**Graphics systems and models:** Applications of computer graphics; A graphics system; Images: Physical and synthetic; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics. **Graphics Programming:** The Sierpinski gasket; Programming two-dimensional applications, The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting implicit functions.	10	CO1 & CO2
2.	**From Vertices to Fragments:** Basic implementation strategies; The major tasks; Clipping; Line-segment clipping; Polygon clipping; Rasterization; Bresenham's algorithm; Polygon rasterization; Hidden-surface removal; Antialiasing.	10	CO3, CO4 & CO6
3.	**Goemetric Objects & Transformations:** Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems & frames; Frames in OpenGL, Modeling a colored cube; Affine transformations; Rotation, translation, & scaling, Transformations in	10	CO3, CO4 & CO6

	homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices.		
4.	**Viewing:** Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Parallel-projection matrices; Perspective-projection matrices;	10	CO4 & CO5
5.	**Lighting & Shading:** Light and matter; Light sources; The Phong lighting model; Computation of vectors; Polygonal shading; Light sources in OpenGL; Specification of materials in OpenGL;	10	CO5 & CO6

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Imaging systems, Display lists; Programming event-driven input.
UNIT 2: Clipping of other primitives; Clipping in three dimensions.
UNIT 3: Quaternions.
UNIT 4: Projections and shadows.
UNIT 5: Shading of the sphere model; Global illumination.

Text Book:

1. Edward Angel: Interactive Computer Graphics A Top-Down Approach with OpenGL, 5th Edition, Pearson Education, 2008.

Reference Books:

1. Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, 3rd Edition, Pearson Education, 2004.
2. F.S. Hill Jr.: Computer Graphics Using OpenGL, 3rd Edition, PHI, 2009.
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Pearson Education 1997.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Tests	Assignments	AAT1	AAT2

Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			01
Understand	08	05	01	01
Apply	07	05	02	01
Analyze	05		02	
Evaluate				
Create				02

***AAT 1– Alternate Assessment Tool 1: Quiz**
AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	**Marks Theory(50)**
Remember	05
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	05

CLOUD & BIG DATA APPLICATIONS

Course Code: CS64
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To build understanding of the basic concepts and terms relating to cloud computing and big data
2. To impart knowledge relating to big data applications and programming models like map reduce.
3. To provide basic understanding of the popular distributed file system Hadoop.

Course Outcomes: At the end of the course, student will be able to:

CO1	Discuss basic concepts and models relating to Cloud computing
CO2	Apply architectural styles in cloud computing
CO3	Apply Big Data technology to business applications
CO4	Use hadoop to solve big data problems
CO5	Develop applications using map-reduce programming model
CO6	Analyze job scheduling of map reduce programs

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	3	3	3		3							3
CO3	3	3	3		3							3
CO4	3	3	3		3							
CO5	3	3	3		3							
CO6	3	3	3		3							

Unit	Contents of the Unit	Hours	COs
1.	**Introduction, Cloud Infrastructure** Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing.	08	CO1
2.	**Cloud Computing: Application Paradigms and Concepts:** Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The GrepTheWeb application **Cloud Resource Virtualization:** Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and para virtualization, Hardware support for virtualization,	08	CO1, CO2
3.	**UNDERSTANDING BIG DATA:** What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data– web analytics – big data marketing – fraud and big data – credit and big data - Introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics	08	CO3
4.	**BASICS OF HADOOP:** Data format – analyzing data with Hadoop- scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop, distributed file system (HDFS) – HDFS concepts – Java interface, – data flow – Hadoop I/O – data integrity-compression, – serialization – Avro – file-based data structures.	08	CO4
5.	**MAPREDUCE APPLICATIONS:** MapReduce Workflows - unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run- classic Map-reduce – YARN -– failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution- MapReduce types – input formats – output formats	08	CO5, CO6

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Unit-3: Risk and big data – credit risk management-big data and algorithmic trading- big data and health care- big data –in medicine - advertising and big data– big data technologies.

Text Books:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.
2. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
3. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

Reference Books:

1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.
3. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
5. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
6. Alan Gates, "Programming Pig", O'Reilley, 2011

Moocs:

1. Introduction to cloud computing : http://ieeexplore.ieee.org/courses/details/EDP381?tag=1 (5 hrs Introductory)
2. EdX Microsoft course: https://www.edx.org/course/introduction-cloud-computing-microsoft-cloud200x#! (6 weeks 3-4 hrs/week)
3. Introduction to Big Data : https://www.coursera.org/learn/big-data-introduction (3 weeks)
4. Cloud Computing Applications Part-2: Big Data and Applications in Cloud (4 weeks) https://www.coursera.org/learn/cloud-applications-part2

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Tests	Assignments	AAT1	AAT2	Moocs*
Marks (Out of 50)	**30**	**10**	**05**	**05**	**20**
Remember	10			01	
Understand	10	05	01	01	
Apply	10	05	02	01	
Analyze			02		
Evaluate					
Create				02	

AAT 1– Alternate Assessment Tool 1: Quiz
AAT 2 - Alternate Assessment Tool 2: Surprise Test
***Moocs – completion of online courses in place of Assignments, quiz and surprise test**

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	05
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	05

Switching and Telecommunication

Course Code: CS651
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To learn Switching, Signaling and traffic in the context of telecommunication network.
2. To expose through the evolution of switching systems from manual and electro mechanical systems to stored-program-controlled digital systems.
3. To study signaling, packet switching and networks.

Course Outcomes: At the end of the course, student will be able to:

CO1	Discuss the main concepts of telecommunication network design
CO2	Analyze and evaluate fundamental telecommunication traffic models.
CO3	Analyze in depth the basic modern signaling system
CO4	Solve traditional interconnection switching system design problems
CO5	Analyze and compare the different types of switching.
CO6	Analyze charging and Routing in various types of networks.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										0
CO2	3	3	3									0

CO3	3											0
CO4	3	3	3									0
CO5	3	3	3									0
CO6	3											1

Unit	Contents of the Unit	Hours	COs
1.	Switching **Systems:** Evolution of Telecommunications; Basics of a Switching System; Functions of a Switching System; Crossbar Switching-Principle of Crossbar Switching; Crossbar Switch Configurations; Cross-Point Technology; Crossbar Exchange Organization; A General Trunking; Electronic Switching; Digital Switching Systems. Telecommunications Traffic: Introduction; The Unit of Traffic; Congestion.	8	CO 1
2.	**Switching Networks:** Single Stage Networks , Grading-Principle; Two Stage Networks; Three Stage Networks; Four Stage Networks **Time Division Switching:** Basic Time Division Space Switching; Basic Time Division Time Switching; Time Multiplexed Space Switching; Time Multiplexed Time Switching; Combination Switching; Three Stage Combination Switching. Control of Switching Systems: Call Processing Functions-Sequence of Operations; Signal Exchanges; State Transition Diagrams; Common Control; Reliability; Availability and Security.	8	CO 2
3.	**Signaling:** Introduction; Customer Line Signaling; Audio Frequency Junctions and Trunk Circuits; FDM Carrier Systems-Outband Signaling; inband (VF) Signaling; PCM Signaling; Inter Register Signaling;_Common Channel Signaling Principles-General Signaling Networks; CCI I I Signaling System Number 6; CCI i I Signaling System Number 7; The High Level Data Link Control Protocol.	8	CO 3
4.	**Packet Switching:** Introduction; Statistical Multiplexing; Local Area And Wide Area Networks-Bus Networks; Ring Networks; Comparison of Bus and Ring Networks; Optical Fiber Networks; Large Scale Networks-General; Datagrams and Virtual Circuits; Routing; Flow Control; Standards; Frame Relay; Broadband Networks-General.	7	CO 4 & CO 5
5.	**Networks:** Introduction; Analog Networks; Integrated Digital Networks; Integrated Services Digital Networks; Cellular Radio Networks; Intelligent Networks; Private Networks; Charging; Routing .	9	CO 6

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Traffic Measurement
UNIT 2: Stored Program Control
UNIT 3: Signal Units
UNIT-4: ATM switches
UNIT 5: Automatic Alternative Routing

Text Book:

1. J. E Flood, "Telecommunications Switching and Traffic Networks," Pearson Education, 2006.
2. Tyagarajan Viswanathan, "Telecommunications Switching Systems and Networks," Prentice Hall of India Pvt. Ltd., 2006.

Reference Books:

1. John C Bellamy, "Digital Telephony,N John Wiley International Student Edition,3rd Edition, 2000.
2. Behrouz A. Forouzan, "Data Communications and Networking," TMH, 2nd Edition, 2002.
3. Tomasi," Introduction to Data Communication and Networking," Pearson Education, 1 st Edition, 2007.

Assessment Pattern:
CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			
Understand	10			
Apply	10	10		
Analyze			05	
Evaluate				05
Create				

***AAT 1– Alternate Assessment Tool 1: Quiz**
AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	15
Understand	20
Apply	15
Analyze	
Evaluate	
Create	

Pattern Recognition

Course Code: CS652
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To understand various Image processing and Pattern recognition techniques.
2. To illustrate mathematical morphology necessary for Pattern recognition.
3. To understand principles of decision trees and clustering in pattern recognition.

Course Outcomes: At the end of the course, student will be able to:

CO1	Apply pattern recognition principles.
CO2	Develop algorithms for Pattern Recognition.
CO3	Develop and analyze decision tress.
CO4	Design the nearest neighbor classifier.
CO5	Apply Decision tree and clustering techniques to various applications
CO6	Evaluate image representations and feature descriptors.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											2
CO2	3	3	3									0
CO3	3	3	3									0
CO4	3	3	3									2
CO5	3	3	3									2
CO6	3	3	3									2

Unit	Contents of the Unit	Hours	COs
1.	**Introduction:** Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.	8	CO 1
2.	**Representation**: Data structures for PR, Representation of clusters, proximity measures, size of patterns, abstraction of Data set, Feature extraction, Feature selection, Evaluation.	8	CO 2
3.	**Nearest Neighbor based classifiers & Bayes classifier:** Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Bayessian belief network.	8	CO 3
4.	**Naive Bayes classifier, Bayessian belief network, Decision Trees:** Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over fitting & Pruning, Examples , Hidden Markov models: Markov models for classification, Hidden Markov models and classification using HMM	8	CO 4 & CO 5
5.	**Clustering:** Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Isodata), clustering large data sets, examples, An application: Handwritten Digit recognition	8	CO 6

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Introduction

UNIT 2: Representation

UNIT 3: Nearest Neighbor based classifiers & Bayes classifier

UNIT-4: Naive Bayes classifier, Bayessian belief network, Decision Trees.

UNIT 5: Clustering.

Text Book:

1. Pattern Recognition (An Introduction) , V Susheela Devi, M Narsimha Murthy, 2011 Universities Press, ISBN 978-81-7371-725-3
2. Pattern Recognition & Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PH ISBN-81-203-1484-0, 1996.

Reference Books:

1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			
Understand	10			
Apply	10	10		
Analyze			05	05
Evaluate				
Create				

***AAT 1– Alternate Assessment Tool 1: Quiz**

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	**Marks Theory(50)**

Remember	15
Understand	20
Apply	15
Analyze	
Evaluate	
Create	

Software Architecture and Design Patterns

Course Code: CS653
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To understand the importance of software Architecture in the software development life cycle.
2. To understand the architectural styles/patterns and how to apply the architectural styles and viewpoints in different design contexts.
3. To use design-patterns and its principles in the context of software design and development.

Course Outcomes: At the end of the course, student will be able to:

CO1	Describe software architecture and architecture business cycle
CO2	Justify the importance of software architecture in SDLC with the aim quality software product.

CO3	Specify quality attributes and select associated design strategies for their accomplishment.
CO4	Apply key architectural styles and design patterns in case studies
CO5	Implement different design patterns using modeling tools.
CO6	Design and document software architectures using appropriate views.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											2
CO2	3											2
CO3	3	3	3									2
CO4	3	3	3									2
CO5	3	3	3		3							2
CO6	3	3	3									2

Unit	Contents of the Unit	Hours	COs
1.	**Overview:** The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; Other points of view; Architectural patterns, Design Patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views. **:** What is a pattern and what makes a pattern? How to use a Design Pattern? Pattern categories; Relationships between patterns	8	CO 1
2.	**Architectural styles and case studies:** Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.	8	CO 4
3.	**Software Quality Attributes and Tactics:** Functionality and architecture; Architecture and key quality attributes; System quality attributes; Business qualities; Architecture qualities Quality attribute scenarios in practice; Achieving Quality: **Introducing tactics**: Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to arch. Patterns and styles.	8	CO 3
4.	**Behavioural Design Patterns**: Idiom and styles; What can idioms provide? Where to	8	CO 5

	find Idioms; Counted Pointer example, Management Patterns, Command processor, View handler.		
5.	**Structural Design Patterns:** Structural decomposition, Whole-part; Organization of work, Master-Slave; Access Control: Proxy. Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.	8	CO 5

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Recapitulate Software development lifecycle phases previously learnt

UNIT 2: UML notations and tools for system models

UNIT 3: Designing and documenting Architecture (CO6)

Text Book:

1. Software Architecture in Practice, Len Bass, Paul Clements, Rick Kazman, 2nd Edition, Pearson Education, 2003.
2. Software Architecture- Perspectives on an Emerging Discipline, Mary Shaw and David Garlan, Prentice-Hall of India, 2007.
3. Pattern-Oriented Software Architecture, A System of Patterns - Volume 1 –Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, John Wiley and Sons, 2006.

Reference Books:

1. Design Patterns- Elements of Reusable Object-Oriented Software, E. Gamma, R. Helm, R. Johnson, J. Vlissides, Addison-Wesley, 1995.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			
Understand	10			

Apply	10	10		
Analyze			05	05
Evaluate				
Create				

***AAT 1– Alternate Assessment Tool 1: Quiz**
AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	15
Understand	20
Apply	15
Analyze	
Evaluate	
Create	

Wireless Sensor Network

Course Code: CS654
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. Explain fundamentals of Wireless Sensor Network
2. Understanding the Physical layer, Data Link Layer, Network Layer, Transport Layer.
3. Analyze and design complex problems critically in the domains of wireless communications and wireless sensor networks.
4. Demonstrate the knowledge and understanding of wireless sensor networks and apply the same in practice.

Course Outcomes: At the end of the course, student will be able to:

CO1	Demonstrate advanced knowledge in Wireless Sensor Networks, Physical layer, Data link layer, Network layer, Transport layer
CO2	Analyze and design solutions for complex problems using Wireless Communications and Wireless sensor Network technologies.
CO3	Apply appropriate techniques in Wireless Sensor Networks.
CO4	Demonstrate knowledge and understanding of wireless sensor networks and apply the same in practice.
CO5	Implement network layers using various deployment models.
CO6	Design and implement the network protocols.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											2
CO2	3	3	3									2
CO3	3	3	3									2
CO4	3											2
CO5	3	3	3									2
CO6	3	3	3									2

Unit	Contents of the Unit	Hours	COs
1.	**INTRODUCTION TO WIRELESS SENSOR NETWORKS:** Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network, Single node architecture - Hardware components, energy consumption of sensor nodes. Network architecture: Sensor network scenarios - types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources. Design principles for wireless sensor networks.	9	CO1 & CO2
2.	**PHYSICAL LAYER:** Introduction, wireless channel and communication fundamentals – frequency allocation, modulation and demodulation, wave propagation effects and noise, channels models, spread spectrum communication, packet transmission and synchronization, quality of wireless channels and measures for improvement. Physical layer and transceiver design consideration in wireless sensor networks - Energy usage profile, choice of modulation, Power Management.	8	CO3 & CO4
3.	**DATA LINK LAYER:** MAC protocols: fundamentals of wireless MAC protocols - Requirements and design constraints for wireless MAC protocols, Important classes of MAC protocols, MAC protocols for wireless sensor networks. Low duty cycle protocols and wakeup concepts - Sparse topology and energy management (STEM), S-MAC, Wakeup radio concepts. Contention-based protocols - CSMA protocols, PAMAS. Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA). Link Layer protocols – fundamentals task and requirements, error control - Causes and characteristics of transmission errors, ARQ techniques, FEC techniques, Hybrid schemes, Power control,	8	CO3 & CO4
4.	**NETWORK LAYER:** Gossiping and agent-based unicast forwarding - Basic idea, Randomized forwarding. Energy-efficient unicast, Broadcast and multicast - Source-based tree protocols, Shared, core-based tree protocols, Mesh-based protocols. Geographic routing - Basics of position-based routing, Geocasting. Data centric and content-based networking - Introduction, Data-centric routing, Data aggregation.	7	CO4 & CO6
5.	**TRANSPORT LAYER:** The transport layer and QoS in wireless sensor networks - Quality of service/reliability, Transport protocols. Coverage and deployment - Sensing models, Coverage measures, Uniform random deployments: Poisson point processes, Coverage of random deployments: Boolean sensing model, general sensing model, Coverage determination, Coverage of grid deployments. Reliable data transport, Single packet delivery - Using a	8	CO5 & CO6

	single path, Multiple paths, Multiple receivers.		

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Types of wireless Sensor Networks and its applications.

UNIT 2: Applications of Physical Layer

UNIT 3: Importance of protocols in Networks.

UNIT 4: Difference between Wireless Sensor Network and Mobile Sensor Network

UNIT 5: Various data transmission methods in Wireless Sensor Networks

Text Book:

1. Holger Karl, Andreas willig "Protocol and Architecture for Wireless Sensor Networks", John Wiley publication, Oct 2007.

Reference Books:

1. Feng zhao, Leonidas guibas, Elsivier , "Wireless Sensor Networks: an information processing approach –publication, 2004.
2. Edgar H .Callaway, First Edition,"Wireless Sensor Networks : Architecture and protocol", CRC press 2003.
3. C.S.Raghavendra Krishna, M.Sivalingam and Tarib znati, "Wireless Sensor Networks", Springer publication, 2006.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			01
Understand	10	05	01	01
Apply	10	05	02	01
Analyze			02	
Evaluate				
Create				02

***AAT 1– Alternate Assessment Tool 1: Quiz**

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	05
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	05

Storage Area Networks

Course Code: CS661
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. Understand storage system, security and management.
2. Understand various storage models, virtualization of storage.
3. Understand business continuity and various storage infrastructure.

Course Outcomes: At the end of the course, student will be able to:

CO1	Review storage system and its management
CO2	Describe Security and data protection in a storage network
CO3	Analyze the Models an protocols for storage area network
CO4	Implement Business continuity strategy along with backup and recovery models
CO5	Plan a model that could be adaptable for the storage of data
CO6	Asses the storage infrastructure suitable for the working environment.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											1
CO2	3											1
CO3	3	3										1

CO4	3	3	3									1
CO5	3	3	3									1
CO6	3	3										1

Unit	Contents of the Unit	Hours	COs
1.	**Introduction to Information Storage and Management, Storage System Environment:** Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Application Requirements and Disk Performance	8	CO1
2.	**Data Protection, Intelligent Storage system:** Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, Components of an Intelligent Storage System.	8	CO2
3.	**Direct-Attached Storage, SCSI, and Storage Area Networks:** Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Overview of Fibre Channel, The SAN and Its Evolution, Components of SAN. **NAS, IP SAN:** General – Purpose Service vs. NAS Devices, Benefits of NAS, NAS File I / O, Components of NAS, NAS Implementations, NAS 95 File-Sharing Protocols, NAS I/O Operations, iSCSI.	8	CO3
4.	**Content-Addressed Storage, Storage Virtualization:** Fixed Content and Archives, Types of Archive, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, Forms of Virtualization, SNIA Storage Virtualization Taxonomy, Storage Virtualizations Configurations, Storage Virtualization Challenges, Types of Storage Virtualization **Business Continuity, Backup and Recovery:** Information Availability, BC terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, Backup Purpose, Backup Methods, Backup Process, Backup and restore Operations	8	CO4, CO5
5.	**Local Replication, Remote Replication:** Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Modes of Remote Replication, Remote Replication Technologies. **Securing the Storage Infrastructure, Managing the Storage Infrastructure**: Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking	8	CO6

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Fundamental Laws Governing Disk Performance, Logical Components of the Host

UNIT 2: RAID Impact on Disk Performance, Hot Spares, Intelligent Storage Array

UNIT 3: Factors Affecting NAS Performance and Availability

UNIT 4: BC Technology Solutions, Backup Topologies, Backup in NAS Environments, Backup Technologies.

UNIT 5: Developing an Ideal Solution, Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges

Text Book:

1. G. Somasundaram, Alok Shrivastava (Editors): Information Storage and Management, EMC Education Services, Wiley India, 2009.

Reference Books:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2003.
2. Rebert Spalding: Storage Networks, the Complete Reference, Tata McGraw Hill, 2003.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			
Understand	10			
Apply	10	10		
Analyze			05	05
Evaluate				
Create				

***AAT 1– Alternate Assessment Tool 1: Quiz**

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	15
Understand	20
Apply	15
Analyze	
Evaluate	
Create	

Building Enterprises Applications

Course Code: CS662
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To understand what software Engineering is and why it is important
2. To understand the software process models and to select the appropriate model for a particular project
3. To know how to manage people , process and problems during software project

Course Outcomes: At the end of the course, student will be able to:

CO1	Select enterprise system for a particular project.
CO2	Evaluate web applications for use in an enterprise.
CO3	Create enterprise system architecture
CO4	Design Data-driven web applications
CO5	Analyze the activities involved in managing ERP
CO6	Design Specialty Enterprise Systems.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										0
CO2	3	3										0
CO3	3	3	3		3							0
CO4	3	3	3									0
CO5	3											0
CO6	3	3	3		3							2

Unit	Contents of the Unit	Hours	COs
1.	**The Enterprise, Enterprise Systems, and ERP:** Business functions, business processes, and functional areas of business operation Data needs of each functional area of business Data production by each functional area of business Definition of integrated information system What is an enterprise information system? What is enterprise resource planning (ERP)? History of ERP Definition of Enterprise Resource Planning system Modular nature of ERP systems ERP pros and cons Current issues with respect to ERP implementation – security and privacy, global	8	CO 1
2.	**Web Applications:** Characteristics of web applications versus web sites Accepted design principles for web sites Accepted design principles for web applications Factors that impact the quality of a web application Review of Internet and World Wide Web technologies OOP basic terminology	8	CO 2
3.	**Enterprise Systems Architectures:** Modular approach to application development Modular approach to ERP systems Terminology of object-oriented programming Reusable objects for business processes Multitier applications Creating classes Variable scope Constructors (parameterized and not) and destructors Error handling Model-view-controller architecture Creating an n-tier web-based user interface Server controls in a web application Systems development life cycle (SDLC) ERP implementation life cycle	8	CO 3
4.	**Database-Driven Web Applications:** Database access objects Server controls for user-friendly data display Application of XML in database-driven applications Building a data tier Using the application to protect the data Using the RDBMS to protect the data Privacy and security issues	7	CO 4 & CO 5
5.	**Managing an ERP and Specialty Enterprise Systems:** Types of Process modeling Process improvement ERP implementation-Costs and benefits, Change management	9	CO 6

	Relationships between sales and marketing Advantages of integrated sales and marketing information Sales and marketing from a typical ERP implementation perspective Customer relationship management software Production planning processes Procurement and materials handling Production and supply chain management from a typical ERP implementation perspective		

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

UNIT 1: security and privacy, global
UNIT 2: World Wide Web technologies OOP basic terminology
UNIT 3: Systems development life cycle (SDLC)
UNIT-4: security issues
UNIT 5: ERP implementation perspective

Text Book:

2. Motiwalla, L. F., & Thompson, J. (2009). Enterprise Systems for Management. Upper Saddle River, NJ: Pearson Education, Inc.
3. Bradley, J. C., & Millspaugh, A. (2010). Advanced Programming Using Visual Basic 2008 (4 ed.): McGraw-Hill.

Reference Books:

1. Boehm, A. Murach's ASP.NET 3.5 Web Programming with VB 2008: Murach.

Assessment Pattern:
CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			
Understand	10			
Apply	10	10		
Analyze			05	05

Evaluate				
Create				

***AAT 1– Alternate Assessment Tool 1: Quiz**
AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	**Marks Theory(50)**
Remember	15
Understand	20
Apply	15
Analyze	
Evaluate	
Create	

SOFTWARE TESTING

Course Code: CS663
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. Provide a basic understanding of the fundamentals of software testing and related terminology
2. In depth understanding of functional, structural and system level testing techniques and their use in real life applications
3. Exposure to test adequacy criteria and fault analysis.
4. Know how on test strategy plans, risk assessment and documentations.

On completion, the students will be able to:

CO1	Use the basic terminology and concepts related to testing and test execution.
CO2	Apply functional testing techniques BV, equivalence class, Decision table to real life problems
CO3	Apply concepts like basis path, definition-use and slice in white-box test design.
CO4	Apply integration testing, system testing and interaction testing techniques to real life problems.
CO5	Analyze test results for assessing test adequacy through use of coverage metrics.
CO6	Discuss steps related to planning, monitoring and documentation of software testing

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											3
CO2	3	3	3									3
CO3	3	3	3		3							3
CO4	3	3	3									3
CO5	3	3			3						3	3

CO6	3	3			3						3	3

Unit	Contents of the Unit	Hours	COs
1.	**A Perspective on Testing, Examples:** Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudo code, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper. .	6	CO1
2.	**Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.	7	CO2
3.	**White-box Testing Techniques, Test Execution :** **White-box testing Techniques:** DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Definition-Use testing, Slice-based testing, Fault based testing: Overview, Assumptions in faultbased testing, Mutation analysis. **Test Execution:** Overview, from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.	10	CO3
4.	**Levels of Testing, Integration Testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations. **System, acceptance and Regression Testing:** System Testing, Acceptance Testing and Regression Testing.	7	CO4 &CO5
5.	**Process Framework:** Validation and verification, Degrees of freedom, Varieties of software. Quality goals, Dependability properties, Analysis, Testing. **Planning and Monitoring the Process, Documenting Analysis and Test:** Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.	10	CO6

Self-study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 2: pair-wise testing

UNIT 3: Coverage tools

UNIT 5: Defect tracking tools

Text Book:

1. Paul C Jorgensen. Software Testing, A craftsman's Approach, 3rd edition, Auerbach Publications, 2008
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2008

Reference Books:

1 Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008.

2 Srinivasan Desikan. Gopalswamy Ramesh: Software Testing Principles and Practices, 2nd edition, Pearson Education, 2007.

3 Brian Marrick: The Craft of Software, Pearson Education, 1995

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**	**Mini Project***
Marks (Out of 50)	**30**	**10**	**05**	**05**	**20**
Remember	10			01	
Understand	10	05	01	01	5
Apply	10	05	02	01	10
Analyze			02		5
Evaluate					
Create				02	

AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Surprise Test

Mini project* - Optional for 20 marks. Mini project can be considered in place of Assignments, AAT1, AAT2.

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	**Marks Theory(50)**
Remember	05
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	05

Semantic Web

Course Code: CS664
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course objectives:

- Outline the overall architecture of the Semantic Web.
- Recognize the constituent technologies of the Semantic Web and explain their roles.
- Demonstrate the design principles of the Semantic Web by applying the technologies.
- Understand certain restrictions of the Semantic Web technologies, and be aware of the kinds of services it can and cannot deliver.

Course Outcomes: At the end of the course, student will be able to:

CO1	Analyze and understand the current trends in web technologies
CO2	Design and Build Ontologies
CO3	Implement the semantic web inference rules
CO4	Develop logic and demonstrate the working semantic web
CO5	Transform the current syntactic web to semantic web
CO6	Justify the importance of machine learning

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3	3									

CO3	3	3	3									
CO4	3	3	3									
CO5	3	3	3									2
CO6	3	3										2

Unit	Contents of the Unit	Hours	COs
1.	**Vision of Semantic Web:** Today's Web, From Today's Web to the Semantic Web: Examples, Semantic Web Technologies, A Layered Approach **Structured Web Documents in XML:** Introduction, The XML Language, Structuring, Namespaces, Addressing and Querying XML Documents	8	CO1, CO6
2.	**Describing Web Resources in RDF:** Introduction, RDF: Basic Ideas, RDF: XML-Based Syntax, RDF Schema: Basic Ideas, The Language, An Axiomatic Semantics for RDF and RDF Schema, A Direct Inference System for RDF and RDFS	8	CO1
3.	**Web Ontology Language:** OWL – Introduction to OWL, The OWL Language Examples – Ontology creation using Protege, OWL in OWL, Future Extensions	8	CO2
4.	**Logic and Inference Rules:** Introduction, Example of Monotonic Rules: Family Relationships, Monotonic Rules: Syntax, Semantics, Nonmonotonic Rules: Motivation and Syntax, Rule Markup in XML: Monotonic Rules, Rule Markup in XML: Nonmonotonic Rules	8	CO3, CO4
5.	**Ontology Engineering:** Introduction, Constructing Ontologies Manually, Using Semiautomatic Methods, On-To-Knowledge Semantic Web Architecture	8	CO5

Self-study component:
Note: 1.Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: XML documents processing
UNIT 5: Reusing Existing Ontologies.

Text Book:

1. Grigoris Antoniou and Frank van Harmelen, "Semantic Web Primer", 1st Edition, The MIT Press Cambridge, Massachusetts London, England.

Reference Books:

1. Colin Evans, Jamie Taylor, and Toby Segaran, "Programming the Semantic Web", 1st Edition, O'Reilly Media, July 2009.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	05			
Understand	10			
Apply	10	10		
Analyze			05	05
Evaluate				
Create	05			

***AAT 1– Alternate Assessment Tool 1: Quiz**
AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	**Marks Theory(50)**
Remember	15
Understand	20
Apply	15
Analyze	
Evaluate	
Create	

Internet and Web Technologies Laboratory

Course Code: CSL67
L: P: T: S: 1: 2: 0: 0
Exam Hours: 03

Credits: 02
CIE Marks: 50
SEE Marks: 50

Course objectives:

1. To provide an introduction to the theory and practice of web technologies.
2. Apply web programming techniques to design, and create web applications.
3. Create effective web based programs to develop web based applications using XHTML, PHP, Java script
4. Analyze and design an application using ruby on rails.

Course Outcomes: At the end of the course, student will be able to:

CO1	Design and create web pages using XHTML and CSS
CO2	Design and implement advanced dynamic web pages using JavaScript.
CO3	Check forms for data entry validation on the server-side
CO4	Design server-side scripts using PHP.
CO5	Design and implement a Ruby and Rails application
CO6	Create and maintain responsive web pages

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		3			2				2
CO2	3	3	3		3			2				2
CO3	3	3	3		3			2				2
CO4	3	3	3		3			2				2
CO5	3	3	3		3			2				2
CO6	3	3	3		3			2				2

Design, develop, and implement the following programs in C / C++ and OpenGL

Program No.	List of Programs	COs
1	a. Write an external cascading style sheet to define the font, font color, background and foreground colors and various <table> tag properties. Also use CSS to design the web page with tables. b. Create a simple text editor with pop-up menus using HTML.	CO1,CO6
2	Develop and demonstrate a XHTML file that includes Javascript script for the following problems: a) Input: A number n obtained using prompt Output: The first n Fibonacci numbers b) Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert	CO1
3	Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected. b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)	CO1
4	Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.	CO1

	b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.	
5	a) Design an XML document to store information about a student in an Engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document. b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.	CO3,CO6
6	Develop a simple online shopping application using a javascript	CO2, CO6
7	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.	CO4
8	Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page	CO4
9	Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.	CO1
10	Build a Rails application to accept book information 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.	CO5

Assessment Pattern:

CIE –Continuous Internal Evaluation Laboratory (50 Marks)

Bloom's Category	**CIE**		
	Continuous Evaluation	**Internal Test**	**Total**
Marks (Out of 50)	**25**	**25**	**50**
Remember		5	5
Understand	5	5	10
Apply	10	10	20
Analyze	5	5	10
Evaluate	5		5
Create			

SEE –Semester End Examination Laboratory (50 Marks)

Bloom's Category	Test	Quiz (Viva)
Marks (Out of 50)	**45**	**05**
Remember	05	
Understand	05	03
Apply	20	
Analyze	10	02
Evaluate	5	
Create		

COMPUTER GRAPHICS & VISUALIZATION LABORATORY

Course Code: CSL68 **Credits: 02**
L: P: T: S: 1: 2: 0: 0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**

Course objectives:

1. To provide an introduction to the theory and practice of computer graphics.
2. Apply graphics programming techniques to design, and create computer graphics scenes.
3. Analyze the two-dimensional transformations, line drawing, Clipping, and filling algorithms.
4. Create effective OpenGL programs to solve graphics programming issues, including objects modeling, 3D transformation, color modeling, lighting, and textures.

Course Outcomes: At the end of the course, student will be able to:

CO1	Implement the core concepts of computer graphics and visualization
CO2	Implement 2D graphics and algorithms including line drawing, polygon filling, clipping, and transformations.
CO3	Create and compose the geometric transformations on graphics objects and their application in composite form.
CO4	Integrate the concepts and techniques used in 3D computer graphics, including viewing, transformations, hierarchical modeling, color, lighting and texture mapping.
CO5	Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
CO6	Develop a graphics application using C++ and OpenGL through planning and completing a mini project included in lab curriculum.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3		3			2	3	3	3	3
CO2	3	3	3		3			2	3	3	3	3
CO3	3	3	3		3			2	3	3	3	3
CO4	3	3	3		3			2	3	3	3	3
CO5	3	3	3		3			2	3	3	3	3
CO6	3	3	3		3			2	3	3	3	3

PART - A

Design, develop, and implement the following programs in C / C++ and OpenGL

Program No.	**List of Programs**	**COs**
1.	Program to display a set of values {fij} as a rectangular mesh.	CO1
2.	Program to recursively subdivide a tetrahedron to form 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.	CO4
3.	Program to create a cylinder and a parallel piped by extruding a circle and quadrilateral respectively. Allow the user to specify the circle and quadrilateral.	CO2
4.	Program to fill any given polygon using scan-line area filling algorithm. (Use	CO2,CO4

	appropriate data structures.)	
5.	Program to implement Liang-Barsky line clipping algorithm.	CO2
6.	Program to implement the Cohen-Sutherland line-clipping algorithm. Make provision to specify the input line, window for clipping and view port for displaying the clipped image.	CO2,CO4
7.	Program to draw a color cube and spin it using OpenGL transformation matrices.	CO3,CO4,CO5
8.	Program to create a house like figure and rotate it about a given fixed point using OpenGL functions.	CO3
9.	Program to draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing. Use OpenGL functions.	CO3,CO4,CO5
10.	Program using OpenGL functions, to draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.	CO4,CO5

PART - B

Develop a suitable Graphics package to implement the skills learnt in the theory and the exercises indicated in Part A. Use the OpenGL API.

Note:

1. Any question from Part A may be asked in the examination.
2. A report of about 10 – 12 pages on the package developed in Part B, duly certified by the department must be submitted during examination.

Instructions:

In the examination, one exercise from Part A is to be asked for a total of 30 marks. The package developed under Part B has to be evaluated for a total of 20 marks.

Assessment Pattern:

CIE –Continuous Internal Evaluation Laboratory (50 Marks)

Bloom's Category	**CIE**		
	Continuous Evaluation	**Internal Test**	**Total**
Marks (Out of 50)	**25**	**25**	**50**
Remember			

Understand	5	5	10
Apply	15	15	30
Analyze	5	5	10
Evaluate			
Create			

SEE –Semester End Examination Laboratory (50 Marks)

Bloom's Category	**Program write up, Execution & Viva**	**Mini Project Evaluation**	**Total**
Marks (Out of 50)	**30**	**20**	**50**
Remember	5		5
Understand	5	3	8
Apply	10	10	20
Analyze	5	1	6
Evaluate	5	1	6
Create		5	5