



**VEL TECH MULTI TECH  
Dr RANGARAJAN Dr.SAKUNTHALA  
ENGINEERING COLLEGE**

(An ISO 9001: 2008 Certified Institution)

(Owned by Vel Trust)

(Approved by Govt. of Tamil Nadu and affiliated to Anna University and  
Accredited by NBA, New Delhi)



**SYLLABUS**

**WEEKLY SCHEDULE**

**V SEMESTER**

**2015 - 2016**

**DEPARTMENT OF CSE**

**IV DEGREE COURSE**

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## **WEEK DETAILS**

<b>SL.NO.</b>	<b>WEEK</b>	<b>FROM</b>	<b>TO</b>
1	<b>WEEK1</b>	<b>24.06.2015</b>	<b>26.06.2015</b>
2	<b>WEEK2</b>	<b>29.06.2015</b>	<b>03.07.2015</b>
3	<b>WEEK3</b>	<b>06.07.2015</b>	<b>10.07.2015</b>
4	<b>WEEK4</b>	<b>13.07.2015</b>	<b>17.07.2015</b>
5	<b>WEEK5</b>	<b>20.07.2015</b>	<b>24.07.2015</b>
6	<b>WEEK6</b>	<b>27.07.2015</b>	<b>28.07.2015</b>
7	<b>WEEK7</b>	<b>03.08.2015</b>	<b>07.08.2015</b>
8	<b>WEEK8</b>	<b>10.08.2015</b>	<b>14.08.2015</b>
9	<b>WEEK9</b>	<b>17.08.2015</b>	<b>21.08.2015</b>
10	<b>WEEK10</b>	<b>24.08.2015</b>	<b>28.08.2015</b>
11	<b>WEEK11</b>	<b>31.08.2015</b>	<b>04.09.2015</b>
12	<b>WEEK12</b>	<b>07.09.2015</b>	<b>11.09.2015</b>
13	<b>WEEK13</b>	<b>14.09.2015</b>	<b>18.09.2015</b>
14	<b>WEEK14</b>	<b>21.09.2015</b>	<b>25.09.2015</b>
15	<b>WEEK15</b>	<b>28.09.2015</b>	<b>30.09.2015</b>
16	<b>WEEK16</b>	<b>05.10.2015</b>	<b>09.10.2015</b>
17	<b>WEEK17</b>	<b>12.10.2015</b>	<b>16.10.2015</b>
18	<b>WEEK18</b>	<b>19.10.2015</b>	<b>20.10.2015</b>
19	<b>WEEK19</b>	<b>27.10.2015</b>	<b>30.10.2015</b>

## SUBJECT CONTENTS

SL.NO	SUBJECT CODE	SUBJECT NAME
<b>THEORY</b>		
<b>1</b>	MA6566	Discrete Mathematics
<b>2</b>	CS6501	Internet Programming
<b>3</b>	CS6502	Object Oriented Analysis and Design
<b>4</b>	CS6503	Theory of Computation
<b>5</b>	CS6504	Computer Graphics
<b>PRACTICAL</b>		
<b>6</b>	CS6511	Case Tools Laboratory
<b>7</b>	CS6512	Internet Programming Laboratory
<b>8</b>	CS6513	Computer Graphics Laboratory

**TEST / EXAM SCHEDULE**

<b>SL.NO</b>	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>	<b>UNIT TEST I</b>	<b>UNIT TEST II</b>	<b>Pre Model Exam</b>	<b>UNIT TEST IV</b>
1	MA6566	Discrete Mathematics	13.07.2015	03.08.2015	21.08.2015	14.09.2015
2	CS6501	Internet Programming	14.07.2015	04.08.2015	22.08.2015	15.09.2015
3	CS6502	Object Oriented Analysis and Design	15.07.2015	05.08.2015	24.08.2015	16.09.2015
4	CS6503	Theory of Computation	16.07.2015	06.08.2015	25.08.2015	18.09.2015
5	CS6504	Computer Graphics	17.07.2015	07.08.2015	26.08.2015	21.09.2015

<b>SL.NO</b>	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>	<b>MODEL EXAM</b>
1	MA6566	Discrete Mathematics	05.10.2015
2	CS6501	Internet Programming	06.10.2015
3	CS6502	Object Oriented Analysis and Design	07.10.2015
4	CS6503	Theory of Computation	08.10.2015
5	CS6504	Computer Graphics	09.10.2015

## **MA6566 DISCRETE MATHEMATICS**

### **UNIT I LOGIC AND PROOFS**

**WEEK 1:** Propositional Logic – Propositional equivalences

**WEEK 2:** Predicates and Quantifiers – Nested Quantifiers

**WEEK 3:** Rules of inference - Introduction to proofs – Proof methods and strategy

### **UNIT II COMBINATORICS**

#### **WEEK 4: UNIT TEST-I**

Mathematical induction – Strong induction and well ordering – The basics of counting

**WEEK 5:** The pigeonhole principle – Permutations and combinations – Recurrence relations

**WEEK 6:** Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

#### **WEEK 7: UNIT TEST-II**

### **UNIT III GRAPHS**

**WEEK 8:** Graphs and graph models – Graph terminology and special types of graphs

**WEEK 9:** Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths

### **UNIT IV ALGEBRAIC STRUCTURES**

#### **WEEK 10:– UNIT TEST-III**

Algebraic systems – Semi groups and monoids - Groups – Subgroups

**WEEK 11:** Homomorphism's – Normal subgroup and cosets – Lagrange's theorem

**WEEK12:** Definitions and examples of Rings and Fields

#### **WEEK 13 : UNIT TEST-IV**

### **WEEK 14 :- UNIT V LATTICES AND BOOLEAN ALGEBRA**

Partial ordering – Posets – Lattices as posets – Properties of lattices

**WEEK 15:–** Lattices as algebraic systems – Sub lattices

**WEEK 16:** Direct product and homomorphism – Some special lattices – Boolean algebra

#### **WEEK 17: UNIT TEST-V**

#### **WEEK 18: MODEL PRACTICAL EXAM**

#### **WEEK 19: MODEL EXAM**

## **TEXT BOOK**

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

## **REFERENCES**

1. Ralph.P.Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4<sup>th</sup> Edition, Pearson Education Asia, Delhi, 2007.
2. Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Seymour Lipschutz and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

## **CS6501 INTERNET PROGRAMMING**

### **UNIT I JAVA PROGRAMMING**

**WEEK 1** An overview of Java – Data Types – Variables and Arrays – Operators – Control Statements

**WEEK 2:** Classes – Objects – Methods – Inheritance - Packages – Abstract classes – Interfaces and Inner classes

**WEEK 3:** Exception handling - Introduction to Threads – Multithreading – String handling – Streams and I/O – Applets.

### **UNIT II WEBSITES BASICS, HTML 5, CSS 3, WEB 2.0**

#### **WEEK 4 : UNIT TEST-I**

**Web 2.0:** Basics-RIA Rich Internet Applications - Collaborations tools - Understanding websites and web servers: Understanding Internet – Difference between websites and web server

**WEEK 5:** Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML, CSS 3.

#### **WEEK 6 :- UNIT TEST-II**

### **UNIT III CLIENT SIDE AND SERVER SIDE PROGRAMMING**

**WEEK 8: Java Script:** An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript.

**WEEK 9: Servlets:** Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server;

**WEEK 10 : DATABASE CONNECTIVITY:** JDBC perspectives, JDBC program example - **JSP:** Understanding Java Server Pages-JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

#### **UNIT IV PHP and XML**

#### **WEEK 11: UNIT TEST-III**

**An introduction to PHP:** PHP- Using PHP- Variables- Program control- Built-in functions-Connecting to Database – Using Cookies- Regular Expressions; **XML:** Basic XML

**WEEK 12:** Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM)

#### **WEEK 13: UNIT TEST-IV**

**WEEK 14:** UNIT V INTRODUCTION TO AJAX and WEB SERVICES

**WEEK 15: -AJAX:** Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; **Web Services:** Introduction- Java web services Basics

**WEEK 16 :** Creating, Publishing ,Testing and Describing a Web services (WSDL)-Consuming a web service

**WEEK 17:** Database Driven web service from an application – SOAP.

#### **WEEK 18:- UNIT TEST-V**

#### **WEEK 19: MODEL EXAM**

#### **TEXT BOOKS**

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2011.
2. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional,2011.

## **REFERENCES:**

1. Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.
3. Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011.
4. Paul Dietel and Harvey Deitel, “Java How to Program”, , 8th Edition Prentice Hall of India. Mahesh P. Matha, “Core Java A Comprehensive Study”, Prentice Hall of India, 2011.
5. Uttam K.Roy, “Web Technologies”, Oxford University Press, 2011.

## **CS6502 OBJECT ORIENTED ANALYSIS AND DESIGN**

### **UNIT I UML DIAGRAMS**

**WEEK 1:.** Introduction to OOAD – Unified Process - UML diagrams – Use Case – Class Diagrams

**WEEK 2:** Interaction Diagrams – State Diagrams – Activity Diagrams

**WEEK 3:** Package, component and Deployment Diagrams

### **UNIT II DESIGN PATTERNS**

#### **WEEK4:– UNIT TEST-I**

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling

**WEEK 5:** High Cohesion – Controller - Design Patterns – creational - factory method - structural – Bridge – Adapter -behavioral – Strategy – observer..

#### **WEEK 6: UNIT TEST-II**

#### **WEEK 7:**

### **UNIT III CASE STUDY**

#### **Internetworks**

**WEEK 8:** – Case study – the Next Gen POS system, Inception -Use case Modeling - Relating Use cases –include, extend and generalization



**WEEK 9:** Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes

**WEEK 10 :** Domain model refinement – Finding conceptual class Hierarchies - Aggregation and Composition

#### **UNIT IV APPLYING DESIGN PATTERNS**

##### **WEEK 11: UNIT TEST-III**

System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram

**WEEK 12:** Logical architecture refinement - UML class diagrams – UML interaction diagrams - Applying GoF design patterns.

##### **WEEK 13: UNIT TEST-IV**

#### **UNIT V CODING AND TESTING**

**WEEK 15:** Mapping design to code – Testing: Issues in OO Testing

**WEEK 16:** Class Testing – OO Integration Testing

**WEEK 17:-** – GUI Testing – OO System Testing

##### **WEEK 18:- UNIT TEST-V**

##### **WEEK 19: MODEL EXAM**

#### **TEXT BOOKS**

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.

#### **REFERENCES**

1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and
2. Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
3. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.
4. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.
5. Paul C. Jorgensen, "Software Testing:- A Craftsman's Approach", Third Edition, Auerbach Publications, Taylor and Francis Group, 2008

# **CS6503 THEORY OF COMPUTATION**

## **UNIT I FINITE AUTOMATA**

**WEEK 1:** Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA & N DFA

**WEEK 2:** Finite Automaton with  $\epsilon$ - moves – Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of N DFA 's with and without  $\epsilon$ -moves

**WEEK 3:** – Equivalence of finite Automaton and regular expressions –Minimization of DFA- - Pumping Lemma for Regular sets – Problems based on Pumping Lemma

## **UNIT II GRAMMARS**

### **WEEK 4: – UNIT TEST-I**

Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity

**WEEK 5:** – Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions.

**WEEK 6:** Null productions – Greiback Normal form – Chomsky normal form – Problems related to CNF and GNF.

### **WEEK 7: UNIT TEST-II**

## **UNIT III PUSHDOWN AUTOMATA**

**WEEK 8:**– Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata

**WEEK 9:** Equivalence of Pushdown automata and CFL - pumping lemma for CFL

**WEEK 10:** problems based on pumping Lemma

## **UNIT IV TURING MACHINES**

### **WEEK 11: UNIT TEST-III**

Definitions of Turing machines – Models – Computable languages and functions

**WEEK 12:** Techniques for Turing machine construction – Multi head and Multi tape Turing Machines.

**WEEK 13 :** The Halting problem –Partial Solvability – Problems about Turing machine- Chomskian hierarchy of languages

**WEEK 14: UNIT TEST-IV**

**UNIT V UNSOLVABLE PROBLEMS AND COMPUTABLE FUNCTIONS**

**WEEK 15:** Unsolvable Problems and Computable Functions – Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine

**WEEK 16 :** MEASURING AND CLASSIFYING COMPLEXITY: Tractable and Intractable problems-

**WEEK 17:** Tractable and possibly intractable problems – P and NP completeness - Polynomial time reductions.

**WEEK 18:- UNIT TEST-V**

**WEEK 19: MODEL EXAM**

**TEXT BOOK**

1. Hopcroft J.E., Motwani R. and Ullman J.D, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2008. (UNIT 1,2,3)
2. John C Martin, “Introduction to Languages and the Theory of Computation”, Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007. (UNIT 4,5)

**REFERENCES**

1. Mishra K L P and Chandrasekaran N, “Theory of Computer Science - Automata, Languages and Computation”, Third Edition, Prentice Hall of India, 2004.
2. Harry R Lewis and Christos H Papadimitriou, “Elements of the Theory of Computation”, Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
3. Peter Linz, “An Introduction to Formal Language and Automata”, Third Edition, Narosa Publishers, New Delhi, 2002.
4. Kamala Krithivasan and Rama. R, “Introduction to Formal Languages, Automata Theory and Computation”, Pearson Education 2009

# **CS6504 COMPUTER GRAPHICS**

## **UNIT I INTRODUCTION**

**WEEK 1:** Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software

**WEEK 2:** – Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function;

**WEEK 3:** circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

## **UNIT II TWO DIMENSIONAL GRAPHICS**

### **WEEK 4: UNIT TEST-I**

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations;

**WEEK 5:** Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation

**WEEK 6:** Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

### **WEEK 7: UNIT TEST-II**

## **UNIT III THREE DIMENSIONAL GRAPHICS**

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations

**WEEK 8:** Bezier curves and surfaces -B-Spline curves and surfaces.

**TRANSFORMATION AND VIEWING:** Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations

**WEEK 9:** Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods

### **WEEK 10: UNIT TEST-III**

## **UNIT IV ILLUMINATION AND COLOUR MODELS**

Light sources - basic illumination models – halftone patterns and dithering techniques;

**WEEK 11:** – Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model

**WEEK 12:** YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection

**WEEK 13 : UNIT TEST-IV**

**WEEK 14:**

**UNIT V ANIMATIONS & REALISM**

**WEEK15:** ANIMATION GRAPHICS: Design of Animation sequences – animation function – raster animation –

**WEEK 16:** key frame systems – motion specification –morphing – tweening. COMPUTER GRAPHICS REALISM:

**WEEK 17:** Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons –space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing

**WEEK 18:- UNIT TEST-V**

**WEEK 19: MODEL EXAM**

### **TEXT BOOK**

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,”Computer Graphics: Principles and Practice”, , 3rd Edition, Addison- Wesley Professional,2013. (UNIT I, II, III, IV).
2. Donald Hearn and Pauline Baker M, “Computer Graphics”, Prentice Hall, New Delhi, 2007 (UNIT V).

### **REFERENCES**

1. Donald Hearn and M. Pauline Baker, Warren Carithers,“Computer Graphics With Open GL”, 4th Edition, Pearson Education, 2010.
2. Jeffrey McConnell, “Computer Graphics: Theory into Practice”, Jones and Bartlett Publishers, 2006.
3. Hill F S Jr., "Computer Graphics", Maxwell Macmillan” , 1990.
4. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.
5. William M. Newman and Robert F.Sproull, “Principles of Interactive Computer Graphics”, Mc Graw Hill 1978.
6. <http://nptel.ac.in/>

## **CS6511 CASE TOOLS LABORATORY**

### **LIST OF EXPERIMENTS**

**To develop a mini-project by following the 9 exercises listed below.**

1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios, find the interaction between objects and represent them using
5. UML Sequence diagrams.
6. Draw relevant state charts and activity diagrams.
7. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered,
8. logical architecture diagram with UML package diagram notation.
9. Develop and test the Technical services layer.
10. Develop and test the Domain objects layer.
11. Develop and test the User interface layer.

#### **SUGGESTED DOMAINS FOR MINI-PROJECT:**

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System
13. BPO Management System
14. Library Management System
15. Student Information System

## **CS6512 INTERNET PROGRAMMING LABORATORY**

### **LIST OF EXPERIMENTS**

#### **WEBPAGE CONCEPTS**

- a) Create a web page with the following using HTML
  - a. To embed a map in a web page
  - b. To fix the hot spots in that map
  - c. Show all the related information when the hot spots are clicked.
- b) Create a web page with the following.
  - a. Cascading style sheets.
  - b. Embedded style sheets.
  - c. Inline style sheets. Use our college information for the web pages.
- c) Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.

#### **SOCKETS & SERVLETS**

- a) Write programs in Java using sockets to implement the following:
  - I. HTTP request
  - II. FTP
  - III. SMTP
  - IV. POP3
- b) Write a program in Java for creating simple chat application with datagram sockets and datagram packets.
- c) Write programs in Java using Servlets:
  - i. To invoke servlets from HTML forms
  - ii. To invoke servlets from Applets
- d) Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
- e) Write a program to lock servlet itself to a particular server IP address and port number. It requires an init parameter key that is

appropriate for its servlet IP address and port before it unlocks itself and handles a request

f) Session tracking using hidden form fields and Session tracking for a hit count

g) Install TOMCAT web server. Convert the static webpages of programs 1&2 into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

**ADVANCE CONCEPTS:**

a) Implement a simple program using following frameworks

a. JSP Struts Framework b. Hibernate c. Spring

b) Explore the following application in AJAX: Searching in real time with live searches, Getting the answer with auto complete, Chatting with friends ,Dragging and dropping with Ajax,

Getting instant login feedback, Ajax-enabled popup menus, and Modifying Web pages on the fly

c) Write a web services for finding what people think by asking 500 people's opinion for any consumer product

d) Write a web services for predicting for any product sales



**CS6513 COMPUTER GRAPHICS LABORATORY**  
**IMPLEMENT THE EXERCISES USING C / OPENGL / JAVA**

1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes  
Circle (Midpoint)
2. 2D Geometric transformations –  
Translation  
Rotation Scaling  
Reflection Shear  
Window-Viewport
3. Composite 2D Transformations
4. Line Clipping
5. 3D Transformations - Translation, Rotation, Scaling.
6. 3D Projections – Parallel, Perspective.
7. Creating 3D Scenes.
8. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
9. 2D Animation – To create Interactive animation using any authoring tool

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