

Nagindas Khandwala College



**Revised Syllabus
And
Question Paper Pattern
Of Course
Of
Bachelor of Science Information Technology
(BSC IT) Programme**

**(Department Of IT) Second Year
*Semester IV***

Under Autonomy

(To be implemented from Academic Year- 2017-2018)

Bachelor of Computer Science (BSC IT) Program
Under Choice Based Credit, Grading and Semester System
Course Structure

SYBSC IT

(To be implemented from Academic Year- 2017-2018)

SYBSC IT – SEMESTER IV							
Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1741UITCJ	Skill Enhancement Core Java	4	2 1/2 Hours	25	75	100	3
1742UITES	Core Subject: Introduction to Embedded Systems	4	2 1/2 Hours	25	75	100	3
1743UITST	Core Subject: Computer Oriented Statistical Techniques	4	2 1/2 Hours	25	75	100	3
1744UITSE	Core Subject: Software Engineering	4	2 1/2 Hours	25	75	100	3
1745UITCG	Core Subject : Computer Graphics and Animation	4	2 1/2 Hours	25	75	100	3
1741UITPR	Skill enhancement Practical: Core Java	2	2 Hours		50	50	1
1742UITPR	Core Subject Practical :	2	2 Hours		50	50	1

	Introduction to Embedded Systems						
1743UITPR	Core Subject Practical: Computer Oriented Statistical Techniques	2	2 Hours		50	50	1
1744UITPR	Core Subject Practical 3: Software Engineering	2	2 Hours		50	50	1
1745UITPR	Core Subject Practical: Computer Graphics and Animation	2	2 Hours		50	50	1
	TOTAL	30					20

Course Code	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1741UITCJ	Skill Enhancement: Core Java	3	2 ½ hrs	25	75	100	3

Sr. No.	Modules / Units
1	<p>UNIT 1</p> <p>Introduction:History, architecture and its components,Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name</p> <p>Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.</p>
2	<p>UNIT 2</p> <p>Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement</p> <p>Iterations: The While Loop, The Do ... While Loop, The For Loop, The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement</p> <p>Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection.</p>
3	<p>UNIT 3</p> <p>Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords.</p> <p>Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An</p>

	<p>Interface, Implementing Interfaces.</p> <p>Packages: Creating Packages, Default Package, Importing Packages, Using A Package.</p>
4	UNIT 4
	<p>Enumerations, Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector.</p> <p>Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class.</p> <p>Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause</p> <p>Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file</p>
5	UNIT 5
	<p>Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes.</p> <p>Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames</p> <p>Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout.</p>

Reference Books
Core Java
<p>Reference book:</p> <ol style="list-style-type: none"> 1. Core Java 8 for Beginners , Vaishali Shah, Sharnam Shah SPD 1st edition 2015. 2. Java: The Complete Reference Herbert Schildt McGraw Hill 9th edition 2014 3. Murach’s beginning Java with Net Beans Joel Murach , Michael Urban SPD 1st edition 20116 4. Core Java, Volume I: Fundamentals Hortsman Pearson 9th edition 2013. 5. Core Java, Volume II: Advanced Features Gary Cornell and Hortsman Pearson 8th edition 2008 6. Core Java: An Integrated Approach R. Nageswara Rao Dreamtech 1st edition 2008

Practical (1741UITPR)

1. Java Basics

- Write a Java program that takes a number as input and prints its multiplication table upto 10.
- Write a Java program to display the following pattern.

```
*****  
****  
***  
**  
*
```

- Write a Java program to print the area and perimeter of a circle.

2. Use of Operators

- Write a Java program to add two binary numbers.
- Write a Java program to convert a decimal number to binary number and vice versa.
- Write a Java program to reverse a string.

3. Java Data Types

- Write a Java program to count the letters, spaces, numbers and other characters of an input string.
- Implement a Java function that calculates the sum of digits for a given char array consisting of the digits '0' to '9'. The function should return the digit sum as a long value.
- Find the smallest and largest element from the array

4. Methods and Constructors

- Designed a class SortData that contains the method asc() and desc().
- Designed a class that demonstrates the use of constructor and destructor.
- Write a java program to demonstrate the implementation of abstract class.

5. Inheritance

- Write a java program to implement single level inheritance.
- Write a java program to implement method overriding
- Write a java program to implement multiple inheritance.

6. Packages and Arrays

- Create a package, Add the necessary classes and import the package in java class.
- Write a java program to add two matrices and print the resultant matrix.
- Write a java program for multiplying two matrices and print the product for the same.

7. Vectors and Multithreading

- Write a java program to implement the vectors.
- Write a java program to implement thread life cycle.
- Write a java program to implement multithreading.

8. File Handling

- Write a java program to open a file and display the contents in the console window.
- Write a java program to copy the contents from one file to other file.
- Write a java program to read the student data from user and store it in the file.

9. GUI and Exception Handling

- Design a AWT program to print the factorial for an input value.
- Design an AWT program to perform various string operations like reverse string, string concatenation etc.
- Write a java program to implement exception handling.

10. GUI Programming.

- Design an AWT application that contains the interface to add student information and display the same.
- Design a calculator based on AWT application.
- Design an AWT application to generate result marks sheet.

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1742UITES	Core 1: Introduction to Embedded System	4	2 ½ hrs	25	75	100	3

Sr. No.	Modules / Units
1	UNIT 1
	<p>Introduction: Embedded Systems and general purpose computersystems, history, classifications, applications and purpose of embedded systems</p> <p>Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.</p> <p>Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.</p>
2	UNIT 2
	<p>Embedded Systems – Application and Domain Specific: Application specific – washing machine, domain specific - automotive.</p> <p>Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.</p> <p>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers.</p>
3	UNIT 3
	<p>The 8051 Microcontrollers: Microcontrollers and Embedded processors, Overview of 8051 family. 8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.</p> <p>8051 Programming in C: Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.</p>
4	UNIT 4
	<p>Designing Embedded System with 8051 Microcontroller: Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051.</p> <p>Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging.</p>

5	UNIT 5
	<p>Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.</p> <p>Design and Development: Embedded system development Environment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.</p>

Reference Books

Introduction to Embedded System

1. Programming Embedded Systems in C and C++ , Michael Barr , O'Reilly first edition 1999.
2. Introduction to embedded systems ,Shibu K V , Tata magraw hill , first edition 2012.
3. The 8051 Microcontroller and Embedded Systems , Muhammad Ali Mazidi , Pearson second edition 2011
4. Embedded Systems , Rajkamal Tata mcgraw hill.

Practical (1742UITPR)

1. Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects.
 - a. Programming
 - b. Execution
 - c. Debugging
2. A. Configure timer control registers of 8051 and develop a program to generate given time delay.
B. To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.
3. A. Port I / O: Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's
B. To interface 8 LEDs at Input-output port and create different patterns.
C. To demonstrate timer working in timer mode and blink LED without using any loop delay routine.
4. A. Serial I / O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen. Signify end of message by carriage return.
B. To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay.
C. Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.
5. A. Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.
B. Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.
6. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction
7. Generate traffic signal

8. Implement Temperature controller
 9. Implement Elevator control
10. Using FlashMagic
 A. To demonstrate the procedure for flash programming for reprogrammable embedded system board using FlashMagic
 B. To demonstrate the procedure and connections for multiple controllers programming of same type of controller with same source code in one go, using flash magic.

Course Code	Course	Hrs. of Instruction /Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1743UITST	Core 2: Computer Oriented Statistical Techniques	4	2 1/2 Hours	25	75	100	3

Sr. No.	Modules / Units
1	<p>UNIT 1</p> <p>The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles,Software and Measures of Central Tendency.</p> <p>The Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation,The Range, The Mean Deviation, The Semi-Interquartile Range,The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation,Properties of the Standard Deviation,Charlie’s Check, Sheppard’s Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient of Variation,Standardized Variable; Standard Scores, Software and Measures of Dispersion.</p> <p>Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays.</p>
2	<p>UNIT 2</p> <p>Moments, Skewness, and Kurtosis :Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data,</p>

	<p>Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis.</p> <p>Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's Approximation to $n!$, Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability.</p> <p>Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Diff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory.</p>
3	UNIT 3
	<p>Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, Efficient Estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error.</p> <p>Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, p-Values for Hypotheses Tests, Control Charts, Tests Involving Sample Differences, Tests Involving Binomial Distributions.</p> <p>Statistics in R: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R.</p>
4	UNIT 4
	<p>Small Sampling Theory: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The Chi-Square Distribution, Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution.</p> <p>The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coeffi Contingency, Correlation of Attributes, Additive Property of chi-square.</p>
5	UNIT 5
	<p>Curve Fitting and the Method of Least Squares: Relationship Between Variables, Curve Fitting, Equations of Approximating Curves, Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares, The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.</p>

	<p>Correlation Theory: Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coefficient of Correlation, Remarks Concerning the Correlation Coefficient, Product-Moment Formula for the Linear Correlation Coefficient, Short Computational Formulas, Regression Lines and the Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression.</p>
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Reference Books
Computer Oriented Stastical techniques
<p>Reference:</p> <ol style="list-style-type: none"> 1. Statistics , Murray R. Spiegel, Larry J. Stephens, McGRAW –HILL ITERNATIONAL , fourth edition 2006. 2. A Practical Approach using R , R.B. Patil, H.J. Dand and R. Bhavsar , SPD 1st edition 2017. 3. FUNDAMENTAL OF MATHEMATICAL STATISTICS , S.C. GUPTA and V.K. KAPOOR , SULTAN CHAND and SONS , 11th revised, 2011. 4. MATHEMATICAL STATISTICS , J.N. KAPUR and H.C. SAXENA , S. CHAND TWENTIETH REVISED 2005.

Practical (1743UITPR)
<ol style="list-style-type: none"> 1. Using R execute the basic commands, array, list and frames. 2. Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations. 3. Using R Execute the statistical functions:mean, median, mode, quartiles, range, inter quartile range histogram 4. Using R import the data from Excel / .CSV file and Perform the above functions. 5. Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance. 6. Using R import the data from Excel / .CSV file and draw the skewness. 7. Import the data from Excel / .CSV and perform the hypothetical testing. 8. Import the data from Excel / .CSV and perform the Chi-squared Test. 9. Using R perform the binomial and normal distribution on the data. 10. Perform the Linear Regression using R. 11. Compute the Least squares means using R. 12. Compute the Linear Least Square Regression

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1744UITSE	Core 3: Software Engineering	4	2 1/2 Hours	25	75	100	3

Sr. No.	Modules / Units
1	<p>UNIT 1</p> <p>Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.</p> <p>Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.</p> <p>Software Processes: Process and Project, Component Software Processes.</p> <p>Software Development Process Models.</p> <ul style="list-style-type: none"> • Waterfall Model. • Prototyping. • Iterative Development. • Rational Unified Process. • The RAD Model • Time boxing Model. <p>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p>
2	<p>UNIT 2</p> <p>Socio-technical system:Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems.</p> <p>Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.</p> <p>Requirements Engineering Processes: Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management.</p> <p>System Models: Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.</p>

3	UNIT 3
	<p>Architectural Design: Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.</p> <p>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.</p> <p>Project Management Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management.</p> <p>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.</p>
4	UNIT 4
	<p>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods.</p> <p>Software Testing: System Testing, Component Testing, Test Case Design, Test Automation.</p> <p>Software Measurement: Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics</p> <p>Software Cost Estimation: Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing</p>
5	UNIT 5
	<p>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.</p> <p>Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services.</p> <p>Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse.</p> <p>Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service</p>

Reference Books
Software Engineering
<p>References:</p> <ol style="list-style-type: none"> 1. Software Engineering, edition, Ian Somerville , pearson education 9th edition. 2. Software Engineering, Pankaj Jalote , Narosa Publication 3. Software engineering, a practitioner’s approach , Roger Pressman , tata- mcgraw hill, 7th edition. 4. Software Engineering principles and practice , WS Jawadekar , Tata mc-graw hill. 5. Software Engineering-A Concise Study , S.A.Kelkar, PHI India. 6. Software Engineering Concept and Applications , SubhajitDatta , Oxford Higher education 7. Software Design , D.Budgen , Pearson education 2nd edition 8. Software Engineering KL James , PHI EEE 2009.

9. Object - Oriented Modeling and Design , Michael Blaha, James Rumbaugh , pearson 2011
10. Learning UML 2. 0 Kim Hamilton, Russ Miles O'Reilly Media 2006
11. The unified modeling language user guide , Grady Booch, James Rumbaugh, Ivar Jacobson Addison-Wesley , 2005
12. UML A Beginners Guide Jason T. Roff McGraw Hill Professional 2003

Practical (1744UITPR)

1. Study and implementation of class diagrams
2. Study and implementation of Use Case Diagrams.
3. Study and implementation of Entity Relationship Diagrams.
4. Study and implementation of Sequence Diagrams.
5. Study and implementation of State Transition Diagrams.
6. Study and implementation of Data Flow Diagrams.
7. Study and implementation of Collaboration Diagrams.
8. Study and implementation of Activity Diagrams.
9. Study and implementation of Component Diagrams.
10. Study and implementation of Deployment Diagrams.

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1745UITCG	Core 4: Computer Graphics and Animation	4	2 ½ hrs	25	75	100	3

Sr. No.	Modules / Units
1	UNIT 1
	<p>Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays.</p>

	<p>Scan conversion – Digital Differential Analyzer (DDA) algorithm, Bresenham's Line drawing algorithm, Bresenham's method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Lines algorithms– Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components.</p>
2	UNIT 2
	<p>Two-Dimensional Transformations: Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations.</p> <p>Three-Dimensional Transformations: Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotation, Three-Dimensional Reflection, Three-Dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections.</p>
3	UNIT 3
	<p>Viewing in 3D Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid. Light: Radiometry, Transport, Equation, Photometry Color: Colorimetry, Color Spaces, Chromatic Adaptation, Color Appearance</p>
4	UNIT 4
	<p>Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.</p> <p>Plane Curves and Surfaces: Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation</p>

	of a Hyperbola, Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces.
5	UNIT 5
	<p>Computer Animation: Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects.</p> <p>Image Manipulation and Storage: What is an Image? Digital image file formats, Image compression standard – JPEG, Image Processing - Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.</p>

Reference Books
Computer Graphics and Animation
<p>References:</p> <ol style="list-style-type: none"> 1. Computer Graphics - Principles and Practice , J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes , Pearson 2nd edition. 2. Fundamentals of Computer Graphics , Steve Marschner, Peter Shirley , CRC press 4th edition 2016 3. Computer Graphics ,Hearn, Baker , pearson , 2nd edition. 4. Principles of Interactive Computer Graphics ,William M. Newman and Robert F. Sproull , TMH 2nd edition 5. Mathematical Elements for CG ,D. F. Rogers, J. A. Adams TMH 2nd edition.

Practical (1745UITPR)
<ol style="list-style-type: none"> 1. Solve the following: <ol style="list-style-type: none"> a. Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them. b. Draw a co-ordinate axis at the center of the screen. 2. Solve the following: <ol style="list-style-type: none"> a. Divide your screen into four region, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message. b. Draw a simple hut on the screen. 3. Draw the following basic shapes in the center of the screen : <ol style="list-style-type: none"> i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line 4. Solve the following: <ol style="list-style-type: none"> a. Develop the program for DDA Line drawing algorithm. b. Develop the program for Bresenham's Line drawing algorithm. 5. Solve the following: <ol style="list-style-type: none"> a. Develop the program for the mid-point circle drawing algorithm. b. Develop the program for the mid-point ellipse drawing algorithm.

6. Solve the following:

- a. Write a program to implement 2D scaling.
- b. Write a program to perform 2D translation

7. Solve the following:

- a. Perform 2D Rotation on a given object.
- b. Program to create a house like figure and perform the following operations.
 - i. Scaling about the origin followed by translation.
 - ii. Scaling with reference to an arbitrary point.
 - iii. Reflect about the line $y = mx + c$.

8. Solve the following:

- a. Write a program to implement Cohen-Sutherland clipping.
- b. Write a program to implement Liang - Barsky Line Clipping Algorithm

9. Solve the following:

- a. Write a program to fill a circle using Flood Fill Algorithm.
- b. Write a program to fill a circle using Boundary Fill Algorithm.

10. Solve the following:

- a. Develop a simple text screen saver using graphics functions.
- b. Perform smiling face animation using graphic functions.
- c. Draw the moving car on the screen.

Evaluation Scheme

I. Internal Exam-25 Marks

(i) Test– 20 Marks - Duration 40 mins

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular object-oriented dynamic learning environment) Or a test based on an equivalent online course on the contents of the concerned course(subject) offered by or build using MOOC (Massive Open Online Course) platform.

(ii) 5 Marks - Active participation in routine class instructional deliveries

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

II. External Examination- 75 Marks

(i) Duration - 2.5 Hours.

(ii) Theory question paper pattern:-

All questions are compulsory		
Question	Based on	Marks
Q.1	Unit 1	15
Q.2	Unit 2	15
Q.3	Unit 3	15
Q.4	Unit 4	15
Q.5	Unit 5	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d & e, etc & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination – 50 marks (Duration: 2 Hours)

- Each practical course carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam)