

## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### Course Curriculum

#### DIGITAL MEMORY SYSTEMS (Code: 3331601)

Diploma Programme in which this course is offered	Semester in which offered
Information Technology	3 <sup>rd</sup> Semester

### 1. RATIONALE

The objective of Digital Memory Systems is to make the students understand the design, types and classification of a digital memory circuit. The recent trend of technology is towards efficient memory structures design and hence it becomes very crucial for the students of diploma in I.T. to understand fundamentals of memory designing and related topics. This Course will enable student to comprehend basic architecture of memory systems including processor architecture and its implementation.

### 2. COMPETENCIES (Programme Outcomes (POs) according to NBA Terminology):

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competencies:

- **Comprehend various digital circuits, their logical functioning and applications.**
- **Illustrate typical architecture of memory and processor.**

### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	2	2	7	70	30	20	30	

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

**Note:** It is the responsibility of the institute heads that marks for **PA of theory & ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

#### 4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – I Digital Memory Systems Basics</b>	1a.Explain various types of logic gates.	1.1 Logic gates such as AND, OR, NOR, NAND, EX-OR, X-NOR.
	1b. Classify Digital logic families on the basis of various parameters.	1.2 Definition, Classification, Characteristics (Propagation delay, power dissipation, fan-out, fan-in, Noise Margin), comparison between various logic families.(No circuit design)
	1c. Design Memory registers for simple applications.	1.3 Flip-flop definition, types and design ( R-S , clocked R-S, J-K, D and T )
<b>Unit – II Sequential Circuit Design</b>	2a. Discriminate various types of clock Pulses.	2.1 Definations, requirement and types of clock pulse. ( Level triggered and Edge triggered )
	2b. Solve race around problem.	2.2 Issues with J-K Flip-Flop, Master-Slave Flip Flop, Edge Triggered Flip-flop.
	2c. Design sequential circuits for simple applications.	2.3 Excitation table, state table and designing steps of simple sequential circuit design.
<b>Unit – III Complex Sequential Circuit Design</b>	3a.Describe the advanced sequential circuit design.	3.1 4-bit parallel load register design. 3.2 4-bit bi-directional shift register design. 3.3 4-bit binary synchronous counter design. 3.4 4-bit binary(ripple) asynchronous counter design.
<b>Unit – IV Memory Architecture</b>	4a. Describe the various types of memory architecture.	4.1 Memory classification 4.2 Random Access Memory (RAM) (Static and Dynamic RAM) 4.3 Read Only Memory (ROM)(Types, Design of 32 x4 ROM) 4.4 Programmable Logic Array (PLA)(comparison with ROM,simple PLA design) 4.5 Cache(Physical address model, Cache performance, cache addressing)
<b>Unit – V Processor Architecture</b>	5a Classify Flynn’s taxonomy .	5.1 Flynn’s taxonomy classification.
	5a Explain the various blocks of 8086 processor architecture.	5.2 8086 architecture,Registers,flags,addressing modes, pin diagram) 5.3 Memory segmentation of 8086
	5b Calculate physical and logical address in 8086 processor.	5.4 Physical and logical address calculation

## 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Digital Memory System Basics	8	2	4	4	10
II	Sequential circuit design	6	2	4	6	12
III	Complex sequential circuit design	8	4	6	6	16
IV	Memory architecture	10	4	5	6	15
V	Processor architecture	10	4	5	8	17
<b>Total</b>		<b>42</b>	<b>16</b>	<b>24</b>	<b>30</b>	<b>70</b>

**Legends:** R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

**Note:** This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may slightly vary from above table.

## 6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

**Note:** Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical/Exercise (Course outcomes in Psychomotor Domain according to NBA terminology)	Approx. Hrs. Required
1	I (Any Four)	Simulate basic logic gates using MultiSim/Electronic Work Bench.	2
2		Classify digital logic families.	2
3		Design of NAND logic gate using CMOS logic family.	2
4		Design of NOR logic gate using CMOS logic family.	2
5		Discriminate between flip-flop.	2
6		Design of R-S Flip Flop.	2
7		Design of J-K Flip Flop.	2
8	II (Any Two)	Design of clock pulse generator circuit.	2
9		Simulate clock pulse generator circuit using MultiSim/Electronic Work Bench .	4
10		Develop the excitation table of J-K Flip Flop	2
11		Develop the excitation table of R-S Flip Flop	2
12	III (Any three)	Design of master slave JK Flip Flop.	2
13		Solve simple sequential design problem.	2
14		Solve simple sequential design problem	2
15		Design 4 –bit Register using D- Flip Flop.	2
16		Design 4 –bit Register using T- Flip Flop.	2
17		Design 4 –bit Counter using R-S Flip Flop.	2
18	Design 4 –bit Counter using JK- Flip Flop.	2	
19	IV	Design 32x4 ROM	4
20		Design PLA	2
21	V	Identify various blocks of 8086 Architecture	2

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

- i. Seminar Presentation
- ii. Chart and model Preparation

## 8. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

- i. The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various application areas.
- ii. In Unit I & II, III, IV & V the teacher has to play an active role in demonstrating the designing of various sequential circuits and their implementation
- iii. The designed circuits available as listed in unit III should be shown to students so they can understand where & how the various circuits are implemented in real application applications.
- iv. Students are assigned to prepare various comparative charts for register and counters as mentioned in Unit III.
- v. Students should be given enough exposure to variety of simulation software also should be given to students

## 9. SUGGESTED LEARNING RESOURCES

### (A) List of Books:

S. No.	Title of Books	Author	Publication
1	Digital Electronics, 1 <sup>st</sup> Edition	Mandal, Soumitra Kumar	McGraw Hill
2	Digital Electronics, 5 <sup>th</sup> Edition	Green ,D.C.	Pearson Education
3	The x86 microprocessor architecture, programming and interfacing 8086 to Pentium, 1 <sup>st</sup> Edition	Das, Lyla B.	Pearson
4	Advanced computer Architecture, 4 <sup>th</sup> Edition	Kai Hwang	TMH

### B. List of Major Equipment/Materials with Major Specifications.

- i. Power supply: 10 V.
- ii. Digital Trainer kit for flip flops.
- iii. Digital Multimeter 3<sub>1/2</sub> digit to measure 5 volt.
- iv. CRO with 1 MHz frequency, single trace
- v. Clock Pulse Generator for square wave generation of 5 volts.
- vi. Components: IC 7400 NAND gate IC, IC 7402 NOR gate IC, IC 7404 NOT gate IC, LED
- vii. Consumables: Connecting wires single stranded, Patch Chords with banana jack connector with multiple outputs.

### C List of Software

- i. MultiSIM (Latest version)
- ii. Electronic Work Bench (Latest version)

## 10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof. Nandu Fatak**, Lecturer IT, Govt. Polytechnic. Ahmedabad
- **Prof. Pooja Garach**, Lecturer IT, Govt. Girls. Polytechnic. Ahmedabad

### Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K. J. Mathai**, Associate Professor Dept. of Computer Engg. and Applications,
- **Dr. R.K. Kapoor**, Associate Professor Dept. of Computer Engg. and Applications,

## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### Course Curriculum

#### OPERATING SYSTEMS (Code: 3330701)

<b>Diploma Programme in which this course is offered</b>	<b>Semester in which offered</b>
Computer Engineering, Information Technology	3 <sup>rd</sup> Semester

#### 1. RATIONALE

An operating system is the core software of any computer system. This is the basic software or platform on which other software work. Every student of computer science and IT must therefore understand basic structure of an operating system. After learning this subject student will be able to discriminate between various types of operating systems, its processor, processes, and memory and file management. The subject also emphasis on Linux utilities and scripting.

#### 2. COMPETENCY (Programme Outcome (PO) according to NBA Terminology):

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **To install & configure various Operating Systems.**

#### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

#### 4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – I Operating System Concepts</b>	1a. Explain different operating system	1.1 Need of operating system 1.2 Evolution of operating system
	1b. Explain types of operating system	1.3 Operating systems i. Batch ii. Multi programming iii. Time Sharing iv. Real Time v. Multitasking vi. Multithreading 1.4 Operating System Services 1.5 Case study i. Linux ii. Windows 7
<b>Unit – II Processor &amp; Process Management</b>	2a. Describe process model	Process and Process management i. Process model overview ii. Programmers view of process iii. Process states
	2b. Describe process state	
	2c. Compare processor scheduling algorithm.	2.2 Process and Processor Scheduling i. Scheduling Criteria ii. First Come First Serve iii. Round Robin iv. SJF v. SRTN
	2d. Compare different scheduler 2e. Describe race condition & mutual exclusion	2.3 Schedulers i. Inter Process communication & synchronization ii. Race condition iii. Mutual Exclusion iv. Monitors
2f. Identify Deadlocks 2g. Apply Deadlock recovery procedure	2.4 Dead lock i. Prevention ii. Avoidance iii. Detection and recovery	
<b>Unit – III Memory Management</b>	3a. Describe memory management	3.1 Memory management
	3b. Differentiate Contiguous and Non-contiguous memory 3c. Differentiate physical and virtual primary memory	3.2 Contiguous allocation i. Partitioned memory allocation ii. Fixed & variable partitioning iii. Swapping iv. Relocation v. Protection and Sharing 3.3 Non contiguous allocation i. Page allocation ii. Segmentation iii. Virtual Memory

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – IV File Management</b>	4a. Apply file management concepts in Operating System	4.1 File management i. User view of file system ii. Attributes and operations iii. File system design iv. Disk space
	4b. Explain Directory structure of Operating System	4.2 Directory structure
	4c. Describe Disk organization	4.3 Disk Organization i. Physical structure ii. Logical structure iii. Addressing
	4d. Implement file system security.	4.4 Security and Protection mechanism
<b>Unit – V Linux Basics</b>	5a. Install Free & Open Source Software / Open source Operating System	5.1 Overview of Linux 5.2 Installation and upgrade
	5b. Test and Execute basic Linux commands	5.3 Introduction to shell and commands i. Commands: pwd, cd, mkdir, rmdir, ls, cat, cp, rm, mv, wc, split, cmp, comm, diff, head, tail, grep, sort, apt-get install, apt-get remove
	5c. Test and Execute shell commands in a script	5.4 Editing files with “vi”, “vim”, “gedit”, “gcc” 5.5 Linux Shell Basic shell scripts

## 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Operating System Concepts	06	04	06	0	10
II	Processor & Process Management	12	06	10	04	20
III	Memory Management	10	06	08	02	16
IV	File Management	06	04	06	0	10
V	Linux Basics	08	02	04	08	14
<b>Total</b>		<b>42</b>	<b>22</b>	<b>34</b>	<b>14</b>	<b>70</b>

**Legends:** R = Remember; U = Understand; A = Apply and above levels (Bloom’s revised taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



## 6. SUGGESTED LIST OF EXERCISES/PRACTICAL

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S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Apprx. Hrs. Required
1	I	Install & test different types of Operating System & compare its features.	2
2	II	Compare various process scheduling algorithm	2
3	V	Test and run basic unix commands.	2
4		Test and run Advanced unix commands.	2
5		Test commands related with File editing with Vi, Vim, gedit, gcc.	2
6		Create a shell script to print "Hello".	2
7		Create a Shell script to read and display content of a file.	2
8		Create a Shell script to read from command line.	2
9		Create a Shell script to append content of one file to another	2
10		Create a Shell script to accept a string in lower case letters from a user, & convert to upper case letters.	2
11		Create a Shell script to find numbers of characters, words & lines of a given input file.	2
12		Create a Script to reverse a string and display it.	2
13		Create a Script to check a string is palindrome.	2
14		Create a Shell script to add two numbers.	2
15		Create a shell script to reverse the digits of a given 5-digit number. (for eg. , if the no. is 57429 then answer is 92475).	2
<b>Total</b>			<b>30</b>

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- PowerPoint Presentation
- Seminar based Presentation
- Case study

## 8. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

Concepts should be explained thoroughly in theory sessions and should be implemented in laboratory appropriately along with the problem solving. Concept should be developed by giving problems to students as assignments and in tutorials.

## 9. SUGGESTED LEARNING RESOURCES

### (A) List of Books:

S. No.	Title of Books	Author	Publication
1	Operating systems	Dhamdhere	MGH
2	Unix Concepts And Application	Sumitabha Das	MGH
3	Modern Operating System 3 <sup>rd</sup> Edition, 2008	Andrew Tanenbaum	PHI
4	Operating System Concepts, 3 <sup>rd</sup> Edition	James Peterson Wesley Abraham Silberschatz	JOHN WILEY & SONS. INC
5	Operating Systems, 2010 Edition	Sibsankar Haldar	Pearson Education
6	Operating System, 2005 Edition	Milan Milenkovic	MGH
7	Operating Systems concept based approach (3 <sup>rd</sup> Edition)	Dhananjay M.	MGH
8			
9	Linux –Application and administration, 2009 Edition	Ashok Kumar Harnal	TMH

### B. List of Major Equipment/Materials

- i Linux based Host machines (Free & Open Source Software or Open source)
- ii Computers with latest hardware configuration

### C List of Software/Learning Websites

- i Operating System concepts: [http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-ANG/Operating%20Systems/New\\_index1.html](http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-ANG/Operating%20Systems/New_index1.html)
- ii Linux basics: [www.freeos.com/guides/lsst](http://www.freeos.com/guides/lsst)
- iii Linux basics: [www.linuxcommand.org/writing\\_asell\\_scripts.php](http://www.linuxcommand.org/writing_asell_scripts.php)
- iv Linux basics: [www.distro.ibiblio.org/damnsmall/current/dsl-4.4.10-embedded.zip](http://www.distro.ibiblio.org/damnsmall/current/dsl-4.4.10-embedded.zip)

## 10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof. Manoj P. Parmar**, In-charge Head of Department, Information Technology, Government Polytechnic, Ahmedabad.
- **Prof. Parvez K. Faruki**, Lecturer, Information Technology, Government Polytechnic, Ahmedabad.
- **Prof. (Mrs.) Harsha P. Chauhan**, In-charge Head of Department, Information Technology, Government Polytechnic for Girls, Ahmedabad.
- **Prof. Darshan M. Tank**, In-charge Head of Department, Information Technology, Lukhdhirji Engineering College (Diploma), Morbi

### Coordinator and Faculty Members from NITTTR Bhopal

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## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### Course Curriculum

#### COMPUTER GRAPHICS (Code: 3331602)

Diploma Programme in which this course is offered	Semester in which offered
Information Technology	3 <sup>rd</sup> Semester

### 1. RATIONALE

The Computer Graphics course prepares students for activities involving the design and development of graphics and animations found in media, entertainment, sciences and engineering. The students needs to learn the basic elements of graphics, perform operation of translation, scaling, rotation of two/three dimensional pictures, develop interactive graphics user interface and prepare media elements for the above applications.

In this course the students will be able to learn basics of Computer Graphics, Output Primitives, 2/3-Dimensional Geometry and Viewing, and Application of Computer graphics in Image Processing. For some students this course may lead to a career in the area of graphics and animations.

### 2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Develop capability to perform the operation of translation, scaling, rotation of two/three dimensional pictures and implement it using functions in C.**

### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P	C	Theory Marks		Practical Marks		Total Marks
				ESE	PA	ESE	PA	
3	2	2	7	70	30	20	30	<b>150</b>

**Legends:** **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** - Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

## 4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – I</b>  <b>Introduction to Computer Graphics</b>	1a. Identify the need of Computer Graphics.	1.1 Identify evolution of graphics system.
	1b. Describe various applications of Computer Graphics.	1.2 Application in different areas i. Presentations Graphics. ii. Education and Training. iii. Computer Art. iv. Image Processing. v. Multimedia. vi. Entertainment. vii. Computer Aided Design. viii. Virtual Reality. ix. Advertisement.
	1c. Demonstrate working of input/output Devices.	1.3 Scanning Systems. i. Raster and Random Scanning. ii. Vector Scanning. 1.4 Video Display Devices i. Raster and Random Display System. ii. CRT and Color CRT. iii. Flat panel displays. iv. VGA. 1.5 Hardcopy Devices i. Halftoning scheme. ii. Types of Printers. 1.6 Input Devices. i. Keyboard. ii. Touch Panel. iii. Digitizing Tablet. iv. Mouse. v. Trackball. vi. Data Glove. vii. Light Pen. viii. Image Scanners. ix. Postscript.
<b>Unit – II</b> <b>Output Primitives</b>	2a. Test and Implement Line drawing Algorithm	2.1 Simple line drawing algorithm. 2.2 DDA algorithm. 2.3 Bresenham's Line Algorithm.
	2b. Test and Implement Circle and Ellipse Drawing Algorithm.	2.4 Mid-point circle generating algorithm. 2.5 Mid-point ellipse generating algorithm.
	2c. Test and Implement Area filling algorithms.	2.6 Scan Line polygon fill algorithm. 2.7 Boundary fill algorithm. 2.8 Flood fill algorithm.
	2d. Explain Types of Polygon.	2.9 Convex and Concave Polygons.

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	2e. Describe Character Generation Methods.	2.10 Methods of Character generation. i Hardware Based. ii Vector Based. iii Bitmap Based.
<b>Unit – III</b> <b>2Dimensional Geometry and Viewing</b>	3a. Explain Basic 2-Dimensional Transformations.	3.1 General procedures for applying translation, rotation and scaling parameters to reposition and resize two-dimensional objects.
	3c. Explain Matrix representation and 3d. Homogeneous Co-ordinates of Basic Transformation	3.2 Matrix representations of Basic Transformation. 3.3 Homogenous Co-ordinates of Basic Transformations.
	3e. Generate Composite transformations by using 3f. Basic Transformations	3.4 Generating composite transformations by calculating the matrix product of the individual transformations. 3.5 General Pivot Point Rotation and General Fixed Point Scaling. 3.6 Inverse transformation. 3.7 Study of Reflection, Zooming, Panning, Jaggies.
	3g. Explain Viewing pipeline.	3.8 Windows to Viewport co-ordinate transformation.
	3h. Test and Implement Clipping algorithms.	3.9 Point Clipping algorithm. 3.10 Line clipping algorithms. i. Cohen Sutherland. ii. Liang Barsky 3.11 Polygon Clipping algorithms. i Sutherland Hodgeman ii Weiler Atherton 3.12 Text clipping algorithm. 3.13 Exterior clipping.
<b>Unit – IV</b> <b>3Dimensional Geometry and Viewing</b>	4a. Explain 3-Dimensional transformations.	4.1 Translation, rotation and scaling in 3Dimensional. 4.2 Coordinate Axes Rotation and General Three Dimensional Rotations. 4.3 Reflections and Shears.
	4b. Explain Viewing Pipeline in 4c. 3-Dimensional.	4.4 3Dimensional viewing pipeline.
	4d. Describe the types of 4e. Projections.	4.5 Parallel projections. 4.6 Perspective projection.

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – V Application of Computer graphics in Image Processing	5a. Explain Importance of 5b. Image Processing.	5.1 Importance of Image processing i Importance of Graphics in Image Processing. ii Computer Graphics and Image Processing in 2Dimensional, 3Dimensional graphics and Images. iii GUI, Typesettings, visualization, CAD, photocollaging, artwork etc.
	5c. Explain methods for 5d. Manipulating Digital Image.	5.2 Difference between digital and real image. 5.3 Different methods to display same digital image i Halftoning, Nearest neighbor. ii Image sampling, Quantization and levels iii Human perception to images iv Discrimination, adaptation, contrast, Persistence 5.4 Requirements for human vision i. Illumination. ii. Objects. iii. Eyes.
	5e. Explain Color classification System.	5.5 Color classification System i Munsell's color classification ii XYZ Color space

### 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Computer Graphics	6	4	4	2	10
II	Output Primitives	8	5	4	6	15
III	2-Dimensional Geometry and Viewing	11	4	6	6	16
IV	3-Dimensional Geometry and Viewing	9	4	5	6	15
V	Application of Computer graphics in Image Processing	8	2	4	8	14
<b>Total</b>		<b>42</b>	<b>19</b>	<b>23</b>	<b>28</b>	<b>70</b>

**Legends:** R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

**Note:** This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may slightly vary from above table.

## 6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

**Note:** Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
1	I	Demonstrate working of different input devices.	2
2		Demonstrate working of different output devices.	2
3	II	Implement the algorithm to draw line using different line style	2
4		Implement the DDA algorithm to draw the line. Generalize it for co-ordinates.	2
		Implement the Bresenham's algorithm to draw the line. Generalize it for co-ordinates.	2
5		Implement the midpoint circle generation algorithm to draw circle.	4
		Implement the ellipse generation algorithm to draw Ellipse using	4
6		Implement the algorithm to Draw the polygon using filling technique.	4
7	III	Perform the operation of scaling for two dimensional pictures.	2
8		Perform the operation of translation for two dimensional pictures.	2
9		Perform the operation of Rotation for two dimensional pictures.	2
10		Perform the operation of windowing and clipping techniques	2
12	IV	Perform the operation of translation for three dimensional pictures.	2
		Perform the operation of scaling for three dimensional pictures.	2
		Perform the operation of Rotation for three dimensional pictures.	2



Sr. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
13		Develop an application to implement animations using built in functions in C.	4
14	V	Perform the Resizing and cropping of different images	2
15		Perform the application of quantisation levels on different digital images	2
		Total	46

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- Prepare computer graphics as per specification.
- Prepare programs for games.

## 8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various application areas.
- The teacher has to play a very active role for Units I, II, III, IV and V demonstrating the fundamentals and their applications.
- Students will be able to learn fundamentals of graphics through practical from unit II, III and IV.
- Students are assigned to prepare power point presentations on the various applications of computer graphics.

## 9. SUGGESTED LEARNING RESOURCES

### (A) List of Books:

S. No.	Title of Books	Author	Publication
1	Computer Graphics 2 <sup>nd</sup> Edition	Donald Hearn &M Pauline Baker	PHI Learning
2	Computer Graphics 2 <sup>nd</sup> Edition	Steven Harington	McGraw Hill
3	Digital Image Processing 3 <sup>rd</sup> Edition	Gonzalez & Woods	Addison Wesley
4	Computer Graphics: Principals and Practices in C 2E	James D. Foley	Pearson Education
5	Image Processing for Computer Graphics 3 <sup>rd</sup> Edition	Jonas Gomes Luiz Velho	Springer

**(B) List of Software/Learning Websites**

- i. Introduction to Computer Graphics:  
<http://www.cs.umd.edu/~mount/427/Lects/427lects.pdf>
- ii. Output Primitives:  
[http://www.technicalsymposium.com/Computer\\_Graphies\\_1.html](http://www.technicalsymposium.com/Computer_Graphies_1.html)
- iii. 2-Dimensional Geometry and viewing:  
<http://www.cs.uic.edu/~jbell/CourseNotes/ComputerGraphics/2DTransforms.html>
- iv. 3-Dimensional Geometry and viewing:  
<http://courses.cs.vt.edu/~cs4204/lectures/transformations.pdf>
- v. Application of Computer graphics in Image Processing:  
[http://www.cs.utexas.edu/~fussell/courses/cs384g/lectures/lecture04-Image\\_Processing.pdf](http://www.cs.utexas.edu/~fussell/courses/cs384g/lectures/lecture04-Image_Processing.pdf)

**10. COURSE CURRICULUM DEVELOPMENT COMMITTEE****Faculty Members from Polytechnics**

- **Prof. Parvez Faruki**, Lecturer in IT, Government Polytechnic, Ahmedabad.
- **Prof. (Mrs.) Sheenam P. Garg**, Lecturer in IT, Govt. Polytechnic, Ahmedabad

**Coordinator and Faculty Members from NITTTR Bhopal**

- **Dr. K. J. Mathai**, Associate Professor, Deptt. of Computer Engg. and Applications
- **Dr. R. K. Kapoor**, Associate Professor, Deptt. of Computer Engg. and Applications

## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### Course Curriculum

#### DATA STRUCTURES (Code: 3330704)

Diploma Programme in which this course is offered	Semester in which offered
Computer Engineering, Information Technology	3 <sup>rd</sup> Semester

#### 1. RATIONALE

Development of application systems and software that use underlying architecture of machines efficiently and effectively requires the ability to use and manipulate various types of Data Structures and other constructs. This being a fundamental ability which is language neutral, yet requires use of a language for its implementation. This is a basic course which goes along with other programming courses to develop an integrated ability to efficient software development, hence this course is very important for computer and IT diploma engineers.

#### 2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course content should be taught and implemented with the aim to develop various types of skills so that students are able to acquire following competency:

- **Implement various types of algorithms using Data Structures.**

#### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	2	2	7	70	30	20	30	

**Legends:** L -Lecture; T -Tutorial/Teacher Guided Student Activity; P -Practical; C - Credit;ESE-End Semester Examination; PA -Progressive Assessment

#### 4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – I</b> <b>Basic Concepts of Data Structures</b>	1a. Represent the data in relevant memory	1.1 Data Structure Basic Concepts 1.2 Types of data structures
	1b. Differentiate primitive and non-primitive data structures	1.3 Primitive and non-primitive data structures
	1c. List key features of an algorithm	1.4 Introduction to Algorithms 1.5 Key features of an algorithm
	1d. Define time complexity and space complexity	1.6 Analysis Terms (for the definitions purpose only) : a. Time Complexity b. Space Complexity c. Asymptotic Notations ,Big ‘O’, Notation , Best case Time Complexity, Average case Time Complexity, Worst case Time Complexity
	1e. Design and Implement programs to represent array in row major and column major order	1.7 Array : i. Row Major Arrays ii. Column Major Arrays 1.8 Overview of various array operations.
	1f. Design and Implement search algorithms	1.9 Searching an element into an array – i. Linear Search ii. Binary Search
<b>Unit– II</b> <b>Strings</b>	2a. Create strings	2.1 String representation : Reading and Writing Strings
	2b. Develop algorithms to implement various operations on string	2.2 String operations : Finding length of a string, Converting Characters of a string into upper case and lower case, Concatenation of two strings to form a new string, Appending, Reversing a string, Copying a string, Comparing strings, Insertion, Substring, Deletion
<b>Unit– III</b> <b>Stack and Queues</b>	3a. Define linear and non-linear data structures and develop algorithms to push an element into stack, pop an element from the stack.	3.1 Linear and Non-Linear Data Structures 3.2 Stack : Array representation of Stack, PUSH POP Operations on Stack, Implementation of Stack, Application of Stack, Infix, Prefix and Postfix Forms of Expressions, Recursive Functions (factorial, greatest common divisor, Fibonacci series)

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	3b. Implement Queue with various operations like insert delete	3.3 Queue: Array representation of Queue, Operations on Queue, Implementation of Queue, Limitation of Single Queue
	3c. Differentiate circular and simple queue	3.4 Concepts of Circular Queue 3.5 Application of queue 3.6 Difference circular queue and simple queue
<b>Unit- IV Linked List</b>	4a. Define linked list	4.1 Pointers Revision 4.2 Revision of Structure 4.3 Revision of structure using pointers 4.4 Dynamic Memory Allocation 4.5 Linked list Presentation 4.6 Types of Linked List
	4b. Develop algorithms to insert node from front, to the end, at any position, delete element, insert into sorted list, delete node from singly linked list	4.7 Basic operations on singly linked list : Insertion of a new node in the beginning of the list, at the end of the list, after a given node, before a given node, in sorted linked list, Deleting the first and last node from a linked list, Searching a node in Linked List, Count the number of nodes in linked list
	4c. Distinguish circular linked list and singly linked list	4.8 Concepts of circular linked list 4.9 Difference between circular linked list and singly linked list
	4d. Develop algorithms to insert node from front, to the end, at any position, delete node from doubly linked list	4.10 Basic operations on Doubly linked list : Insertion of a new node in the beginning of the list, at the end of the list, after a given node, before a given node. Deleting the first and last node from a linked list, Searching a node in Linked List, Count the number of nodes in linked list
	4e. List the applications of linked list	4.11 Applications of linked list
<b>Unit- V Sorting and Hashing</b>	5a. Arrange data in ascending and descending orders using appropriate sorting algorithm	5.1.Sorting Methods : a. Bubble Sort, b. Selection Sort, c. Quick Sort, d. Insertion Sort, e. Merge Sort, f. Radix Sort
	5b. Apply various hashing techniques	5.2.Hashing Concepts 5.3.Hash functions : Division Method, Middle Square Method, Folding Method,

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	5c. Apply collision resolution techniques	5.4. Collision in Hashing 5.5. Collision resolution techniques: Linear Probing
<b>Unit– VI Trees</b>	6a Define non-linear data structure	6.1 Non-linear data structures
	6b Develop algorithms to manipulate tree	6.2 Binary trees : Complete Binary Tree, Basic Terms: level number, degree, in-degree and out-degree, leaf node, similar binary trees, copies of binary trees, directed edge, path, depth, General Tree, Conversion of General Tree to Binary Tree, Forest.
	6c Implement various tree manipulation algorithms	6.3 Binary Search Tree : Insertion of a node in binary tree, Deletion of a node in binary tree, Searching a node in binary tree 6.4 Tree Traversal : Inorder, Preorder, Postorder
	6d List applications of tree	6.5 Applications of binary tree

### 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basic Concepts of Data Structures	4	4	3	0	7
II	Strings	4	2	2	3	7
III	Stack and Queues	8	2	6	6	14
IV	Linked List	10	4	8	2	14
V	Sorting and Hashing	8	2	6	6	14
VI	Trees	8	4	4	6	14
<b>Total</b>		42	18	29	23	70

**Legends:** R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may slightly vary from above table.

## 6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

**Note:** Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercises (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
1	I	Define various terms such as algorithm, various approaches to design an algorithm, time complexity, space complexity, big 'o' notation, best case, average case and worst case time complexity etc. Develop simple program using pointer to a structure	2
2	I	Implement array using row major order and column major order	2
3	I	Implement Sequential search algorithms	2
4	I	Implement Binary search algorithms	2
5	II	Implement various string algorithms	2
6	III	Implement push and pop algorithms of stack using array	2
7	III	Implement recursive functions	2
8	III	Implement insert, delete algorithms of queue using array	2
9	III	Implement insert, delete algorithms of circular queue	2
10	IV	Implement simple structure programs using pointers	2
11	IV	Implement insertion of node in the beginning of the list and at the end of list in singly linked list	4
12	IV	Implement insertion of node in sorted linked list	2
13	IV	Implement insertion of node at any position in linked list	2
14	IV	Implement searching of a node, delete a node and counting no of node algorithms in singly linked list	4
15	IV	Implement insertion of node in the beginning and at the end of doubly linked list	2
16	IV	Implement insertion of node at any position in doubly linked list	2
17	IV	Implement searching of a node, delete a node and counting no of node algorithms in doubly linked list	4
18	V	Implement Bubble sort, Selection sort algorithms	2
19	V	Implement Quick Sort	2
20	V	Implement Insertion sort, Shell sort algorithm	2

21	V	Implement Merge Sort algorithm	2
22	V	Solve hash table example using division method, method square method, folding method (paper work only)	2
23	VI	Implement construction of binary search tree	2
24	VI	Implement inorder, preorder and postorder traversal methods in binary search tree	2
25	VI	Implement searching algorithm in binary search tree	2
<b>Total</b>			<b>56</b>

**Note:** In tutorials - Students will write programs and in practical session -execute program

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

Prepare seminars on various topics like stack, queue, singly linked list algorithms, doubly linked list, sorting algorithms, tree algorithms etc.

Prepare diagrams/chart to display various sorting methods, string representation; data representations etc.

Develop a program with real life application example of particular topic.

Compare various sorting and searching methods. Prepare hash tables using given methods.

## 8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

The course activities include Lectures, Supervised Tutorials and Practical Exercises as per teaching scheme. The programmes in C++ would be prepared during tutorials and would be executed during practicals sessions. Following needs attention:

- i. Concepts will be introduced in lectures using charts.
- ii. Role play by students for explaining concepts of array, stack, queue and sorting
- iii. Problem solving will be done through tutorials.
- iv. Practical work will be through laboratory sessions.
- v. Debate/Group Discussions for comparison of searching and sorting methods
- vi. Solving Puzzles

## 9. SUGGESTED LEARNING RESOURCES

### A. List of Books

S. No.	Title of Books	Author	Publication
1	Data and File Structures using C	Thareja, Reema	Oxford University Press New Delhi 2011
2	Data Structures using C	ISRD Group	McGraw Hill, New Delhi, 2013
3	Data Structures	Chitra, A Rajan, P T	Tata McGraw Hill, New delhi, 2009
4	Classic Data Structures	Samanta, D.	PHI Learning, New Delhi



**B. List of Major Equipment/Materials with broad specifications**

- i. Hardware: Computer System with minimum PIV processor ( or equivalent) and minimum 1 GB MB RAM.
- ii. Software: Turbo C++/ Borland C++/ any other higher software

**C. List of Software/Learning Websites**

- i. Turbo C/C++ or Borland C/C++ or any software that support c/c++ compiler
- ii. Data Structure  
Introduction:<http://nptel.iitm.ac.in/video.php?subjectId=106102064>
- iii. Data Structure Tutorial: <http://www.roseindia.net/tutorial/datastructure/>
- iv. Data Structure Fundamentals: <http://www.cprograms.in/index.htm>
- v. Data structure video<http://www.youtube.com/watch?v=tORLeHHtazM>

**10. COURSE CURRICULUM DEVELOPMENT COMMITTEE****Faculty Members from Polytechnics**

- **Dr. P.P.Kotak**, Head Deptt. of Computer Engineering, AVPTI, Rajkot
- **Prof. K. N. Raval**, Head Deptt. of Computer Engg., RCTI, Ahmedabad
- **Prof. Rahul B. Pancholi**, Lecturer, Deptt. of Computer Engg., L. J. Ahmedabad
- **Prof.(Mrs.) R.K.Vaghela**, Deptt. of Computer Engg., RCTI , Ahmedabad

**Coordinator and Faculty Members from NITTTR Bhopal**

- **Dr. Shailendra Singh**, Professor & Head Deptt. of Computer Engg. and Applications
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# GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

## Course Curriculum

### SOFTWARE PRACTICES WITH VB.NET (Code: 3331603)

Diploma Programme in which this course is offered	Semester in which offered
Information Technology	3rd Semester

#### 1. RATIONALE

VB.NET is widely used technology for development of web based applications in industry and commerce. Integrated development environment (IDE) is comprehensive integrated suit that helps in development and debugging from the single user interface which is predominantly GUI based. Competence in development of VB.NET based web-applications is primary ability deemed necessary for an IT professionals, hence this course is important for students.

#### 2. COMPETENCY(Programme Outcome according to NBA Terminology):

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Develop relevant software applications in VB.NET.**

#### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	100
0	2	2	4	00	00	40	60	

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

#### 4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – I Introduction to Visual Studio 2008</b>	1a. Describe the use of IDE components.	1.1 Concept IDE- Menu, Tool Bars, Property Window, Solution Explorer, Windows Form
	1b. Use IDE environment to develop application.	1.2 Designer, Visual Basic Code Editor
	1c. Create simple console program.	1.3 Console Applications Development- an Introduction
	1d. Write simple program.	1.4 Writing First VB.NET Program
	1e. Debug simple application.	1.5 Debugging – an introduction

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – II Fundamentals Of VB.NET</b>	2a. Define storage capacity and range of different data types and variables.	2.1 Data Types, Variables and Constants
	2b. Apply control statements according to logic of program.	2.2 Program Control Statements i. Loop Structure(For/Next, While, Do while, Do Until) ii. Test Structure (If Else, Nested If, Select Case)
	2c. Compare subroutines, Functions and Events.	2.3 Subroutines, Functions and Events
	2d. Define advanced data types. 2e. Apply different properties and methods of advanced data types in simple application.	2.4 Arrays, Enumerations, Structures
<b>Unit – III Windows Forms Common Controls</b>	3a. Design windows form of simple application. 3b. Set properties of different windows form controls. 3c. Identify appropriate control for the given program. 3d. Apply different methods of controls in simple application. 3e. Develop simple application using different controls – Facilitating user interaction.	3.1 Form, Label, Button 3.2 Textbox, Rich text box 3.3 Radio Button, Check Box, 3.4 List Box, Combo Box 3.5 Scrollbar, Trackbar 3.6 TreeView, Listview <b>(Basic properties, methods and events of each control)</b>
<b>Unit – IV Advance Form Controls</b>	4a. Use dialog boxes to open & save file to the local disk. 4b. Apply formatting options.	4.1 Dialog Boxes(OpenFileDialog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog)
	4c. Create menu driven simple application.	4.2 Menus
	4d. Create Multiple Document Interface application.	4.3 MDI Form
<b>Unit – V Exception Handling</b>	5a. State types of errors. 5b. Differentiate Errors.	5.1 Types Of Error
	5c. Analyse error prone code.	5.2 Error Detection
	5d. Handle exception occurred at runtime.	5.3 Exception Handling
		5.4 Structured Error Handling(Try-Catch-Finally) 5.5 Throwing Manual Exception

## 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Note: There is no end of the term exam in this course and hence this table is not applicable.

## 6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

**Note:** Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx Hrs. Required
1	I	Implement Arithmetic calculator using console.	2
2	II	Develop a program to produce grade sheet using console.	2
3		Develop a program to check given number is prime or not using console.	2
4		Develop a program to print Fibonacci series using console.	2
5		Develop a program to check given number is palindrome or not using console.	2
6		Develop a program to factorial of a number using function using console.	2
7		Create form to demonstrate use of methods and properties of array.	2
8	III	Display message using Textbox, Label and ButtonControl.	2
9		Implement simple textpad to perform undo, redo, cut, copy, paste, select all, find, replace, loadfile, savefile operations using richtextbox.	2
10		Create employee registration form to collect details (using radio button, checkbox and other controls).	2
11		Create form to select hobbies and nationality using checkbox and radio button.	2
12		Create a form to demonstrate use of methods and properties of listbox.	2
13		Create a form to demonstrate use of methods and properties of combobox.	2
14		Implement canteen order form to take order from customer (using listbox and combobox)	2
15		Create a form to change the height and width of label using trackbar.	2
16		Implement colour palate to change the bgcolor and forecolor of textbox using scrollbar.	2
17		Create form to demonstrate use of methods and properties of treeview.	2

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx Hrs. Required
18		Create form to demonstrate use of methods and properties of Listview.	2
19	IV	Create MDI application having file menu (New, Open, Save, Print, Close) and Format menu (Font, Forecolor, Backcolor).	2
20	V	Create form to demonstrate use of structured exception handling.	2
<b>Total</b>			<b>40</b>

**Notes:** (i) Develop or create means write, debug, execute and test the program  
(ii) In tutorials - Students will write programs and in practical session -execute program

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- i Develop programs related with topics, in accordance with the sequence of the units, states in the course in computer laboratory.
- ii Develop at least one programming module of a real life application.
- iii Prepare multimedia presentation of module developed.
- iv Search internet for VB.NET based learning resources, programming examples and code segments for re-use in your application.
- v Consult Library and the internet to find & state title, and features of periodicals/journals in area of VB.NET based applications development.

## 8. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

Concepts should be explained thoroughly in tutorial sessions and should be implemented in laboratory appropriately along with the problem solving. Concepts should be developed by giving problems to students as assignments and in tutorials.

## 9. SUGGESTED LEARNING RESOURCES

### (A) List of Books:

S. No.	Title of Books	Author	Publication
1	Beginning Visual Basic 2008	Thearon Willis, Bryan Newsome	Wrox Publication, New Delhi, 2008
2	Visual Basic 2008 Programmer's Reference	Rod Stephens	Wrox Publication, New Delhi, 2008
3	VB.Net in Nutshell , 2 <sup>nd</sup> Edition.	Steven Roman, Paul Lomax	Oreilly

**B. List of Major Equipment/Materials**

- i Computer with configuration to work with MS visual studio
- ii Multimedia Projector
- iii Internet access, and
- iv Access to library resources

**C List of Software/Learning Websites**

- i. Software : Microsoft Visual Studio 2008
- ii. VB2008 Tutorial - Visual Basic Tutorial:  
[www.vbtutor.net/vb2008/vb2008tutor.html](http://www.vbtutor.net/vb2008/vb2008tutor.html)
- iii. Visual Basic .NET 2008 Tutorial:  
<http://www.sourcecodester.com/Tutorials/visual-basic-net/visual-basic-net-2008-tutorial.html>

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