



**Name of the Course:** MAT(Multimedia and Animation Technology) O Level

**Course Code:** LTC-5

**Duration of the Course:** 1 Year (Semester System).

**Yearly Session:** January to June Session, July to December Session.

**Fees:** 15650 /- (Including Course fees, Examination fees, Course Material) which is inclusive of the present Service Tax. *Note- Course fees, Examination fees is free for SC/ST candidates.*

**Minimum Eligibility Criteria and pre-requisites:** 10+2 [Any Discipline]

**National Institute of Electronics & Information Technology  
(NIELIT)**

**Course structure of Diploma in Multimedia & Animation  
Technology  
(MAT-O) Level**

**Recommended by Syllabus Sub-Committee  
(NIELIT standing syllabus Committee)**

**June 2013**

*Approved  
Shankar  
9/7/2013*

## **Course structure:**

### **Diploma in Multimedia & Animation Technology (MAT-O) Level**

#### **Objective:**

- a. To acquire the basic knowledge to appreciate the basic Multimedia systems, tools, and techniques.
- b. To acquire the basic skills to implement components of Multimedia productions and Web Designing
- c. To acquire the basic knowledge for Animation production skills

#### **Likely Career Options:**

As per the recent market trend and the objective of the course as well as the projected skill sets of the 'O' level qualifiers, it is envisaged that the likely career options will be as Multimedia Production Assistant, Multimedia Technician and as Web Developer.

#### **Eligibility**

MAT-O Level: 10+2 [Any Discipline]

#### **MAT-O level**

MAT.O1.R0 : - Introduction to Information Technology.

MAT.O2.R0 : - Introduction to Multimedia.

MAT.O3.R0 : - Multimedia Processing Techniques

MAT.O4.R0 : - Multimedia Design Principles and Applications

## **MAT.O1.R0: - Introduction to Information Technology**

### **Objective of the Course**

The objective of this course is to provide an introduction to Information Technology and IT tools. The student will become IT literate, and will understand the basic IT terminology. The students will be able to understand the role of Information Technology and more specifically computers, communication technology and software in the present social and economic scenario.

### **Outline of Course**

<b>Topic</b>	<b>Minimum No. of Hours</b>
<b>1. Computer Appreciation</b>	<b>04</b>
<b>2. Computer Organization</b>	<b>11</b>
<b>3. Operating Systems</b>	<b>13</b>
<b>4. Office Automation</b>	<b>12</b>
<b>5. Intellectual Property Right and Copyright Issue</b>	<b>04</b>
<b>6. Handheld devices</b>	<b>04</b>
<b>7. Basic Networking and Internet</b>	<b>08</b>
<b>8. Information Technology and Society</b>	<b>04</b>

**Lecture=60**

**Practical=60**

**Total Hours=120**

# **MAT.O1.R0 : - Introduction to Information Technology**

## **Detailed Syllabus**

1. **Computer Appreciation:** **04 Hrs**  
What is a computer, basic structure of computer, data representation in computer [Binary number system, Hexadecimal number system, Binary to Decimal Conversion, Decimal to Binary Conversion, Binary Coded Decimal (BCD) Code, ASCII Code, UNICODE], representation of visual data.
  
2. **Computer Organization:** **11 Hrs**
  - 2.1 **Central Processing Unit** **(02 Hrs)**  
Fundamentals of Control Unit, Arithmetic Unit, Instruction Set, Register. Concept of Processor Speed, illustration with popular processors. Basic introduction to GPU
  
  - 2.2 **Memory and Storage** **(02 Hrs)**  
Memory Organization, RAM., Read Only Memories, Flash memory. Basics of other storage devices – HDD, CD/DVD, Blue-Ray, magnetic tape etc.
  
  - 2.3 **Input Devices** **(02 Hrs)**  
Keyboard, Mouse, microphone, trackball, joystick, Scanner. OMR, Bar/QR-code reader, MICR Digitizer, Card Reader, cameras, fingerprint scanner and other biometric devices, tablets etc.
  
  - 2.4 **Output Devices** **(02 Hrs)**  
Display (CRT, LCD, LED), Printers - Dot matrix, Inkjet, laser, Plotters, Projector and visualiser,
  
  - 2.5 **Ports and Interfaces** **(01 Hrs)**  
Serial and Parallel ports, Connectors: DIN, RCA, AV; USB, Fire wire (IEEE1394), HDMI
  
  - 2.6 **Computer Software** **(02 Hrs)**  
Relationship between Hardware and Software; System Software, Application Software, compiler, assemblers, linkers, loaders

3. **Operating Systems:** **13 Hrs**
- 3.1 Basic concepts of OS** **(04 Hrs)**  
Function of OS; Basic concept of resource management, CPU, memory, I/O;  
Power-up process: BIOS, Bootstrap Loader; File systems and user management
- 3.2 Case Study**
- 3.2.1 Microsoft Windows** **(03 Hrs)**  
An overview of different versions of Windows, Basic Windows elements,  
files management through Windows. Using essential accessories: Systems  
tools- Disk cleanup, Disk defragmenter
- 3.2.2 Linux** **(03 Hrs)**  
An overview of Linux, Basic Linux elements: System Features, Software  
features. File Structure, File handling in Linux
- 3.2.3 Mac Environment** **(03 Hrs)**  
Overview of Mac OS, features of the Mac OS. File and User management,  
GUI and Mac devices and tools
4. **Office Automation:** **12Hrs**  
Word Processing, Spreadsheet, Presentation tools, HTML Tools, Publishing tools.
5. **Intellectual Property Right and Copyright Issue:** **04Hrs**  
Introduction to Intellectual Property Right and Copyright Issue,  
Exceptions to Copyright Protection, Guidelines for Clearance, Copyright  
Elements, Payments, Collaboration.
6. **Handheld Devices (Mobiles and Tabs)** **04Hrs**  
Features of different handheld devices like – mobile phone, smart phone,  
Tablets, introduction to Android as OS for hand-held devices. Concepts of  
Apps, some popular applications
7. **Basic Networking & Internet:** **08Hrs**  
Overview of the Internet, protocols, Basic definition: networks and  
topologies; Access networks and physical media, Concept of OSI protocol  
Layers. TCP/IP (features of IPV4, IPV6), WWW, FTP, Email, DNS, ISP.  
Concept of multimedia streaming. Basics of Wireless communications,  
Introduction to Wi-Fi, Bluetooth, GSM, CDMA, GPRS, 3G, 4G.

## 8. Information Technology and Society:

04Hrs

Social Networks, e-Governance, e-Commerce, e-Learning, IT-ethics

### Laboratory Assignments (broad areas):

User Level hands-on experience of using Windows, Linux, Mac, Android  
Use of I/O Devices & Connectors/Ports, network components and basic network configuration  
Use of Office automation tools (Word-processor, spreadsheet, presentation tools)  
Exposure to multimedia streaming, messaging, chatting, searching on Internet

### Reference:

#### MAIN READING

1. P.K. Sinha and P. Sinha, "Foundations of Computing", BPB Publication, 2008.
2. Sagman S, "MS Office for Windows XP", Pearson Education, 2007.
3. ITL Educational Society, "Introduction to IT", Pearson Education, 2009.
4. Miller M, "Absolute Beginners Guide to Computer Basics", Pearson Education, 2009.

#### SUPPLEMENTARY READING

1. Turban, Mclean and Wetherbe, "Information Technology and Management" John Wiley & Sons.
2. Mansfield Ron, "Working in Microsoft Office", 2008, Tata McGraw-Hill
3. Balagurusamy E, "Fundamentals of Computers", 2009, Tata McGraw-Hill
4. Mavis Beacon, "All-in-one MS Office" CD based views for self learning, BPB
5. Publication, 2008
6. Perry G, "MS Office 2007", Pearson Education, 2008.
7. D'Suoza & D'souza, "Learn Computer Step by Step", Pearson Education, 2006.
8. Kulkarni, "IT Strategy for Business", Oxford University Press

Refer: Open Office/ MS Office Environment for practice.

## **MAT.O2.R0 : - Introduction to Multimedia**

### **Objective of the Course**

The objective of this course is to provide concept about an application, which uses a collection of multiple media sources e.g. text, graphics, images, audio, animation and video. Students will learn about Multimedia, which is a field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally.

### **Outline of Course**

<b>Topic</b>	<b>Minimum No. Of Hours</b>
<b>1. Introduction to Multimedia.</b>	<b>08</b>
<b>2. Representation of Multimedia Objects</b>	<b>20</b>
<b>3. Concept of Multimedia Editing</b>	<b>10</b>
<b>4. Introduction to Compression Technology</b>	<b>06</b>
<b>5. Multimedia Application Design</b>	<b>06</b>
<b>6. Multimedia Authoring and Publishing</b>	<b>10</b>

**Lecture =60**

**Practical =60**

**Total Hours =120**



# **MAT.O2.R0: - Introduction to Multimedia**

## **Detailed Syllabus**

### **1. Introduction to Multimedia:**

**08 Hrs**

Definition of Multimedia, Multimedia objects: Text, Graphics, Animation, Audio, images, Video. Definition of HyperText and HyperMedia. Multimedia Applications in Education, Entertainment. Advertising world etc. Components of a Multimedia System, Desirable Features for a Multimedia System, requirements of Multimedia Communication,

### **2. Representation of Multimedia Objects:**

**20 Hrs**

**2.1 Representation of Analog Signals, A/D:** Sampling and quantization

**2.2 Text:** Font and their representation (bitmap, true type)

**2.3 Graphics:** Raster & Vector representation, aliasing problems

**2.4 Image:** (bit depth, resolution, color (RGB, CMYK, HSB), introduction to BMP, GIF, TIFF, PNG and JPEG formats)

**2.5 Audio** (speech and wideband audio, sampling rate and aliasing, quantisation, introduction to MP3, WMA, WAV, MIDI etc.)

**2.6 Video** (frame rate and resolution, interlaced and non-interlaced video, colour planes (YCBCR, YUV), Video broadcast standards (PAL, NTSC, SECAM), HD Video, 3D TV, Video representation: AVI, MPEG, Quick Time, real video (.rm)

### **3. Concepts of Multimedia Editing:**

**10Hrs**

Digital Audio, Music Sequencing and Notation, Image/Graphics Editing, Video Editing (Linear, Non-linear), Subtitling

### **4. Introduction to Compression Technology**

**06 Hrs**

Concept of lossy and lossless compression. Concept of rate-distortion characteristics, Basics image compression (JPEG, JPEG 2000), Basics of Audio compression (MP3, MP4), Basics of Video Compression (MPEG, H.264)

### **5. Multimedia Application Design:**

**06 Hrs**

Content design, technical design, visual design, design metaphors, example studies, interactivity

### **6. Multimedia Authoring and Publishing**

**10 Hrs**

Definition of an Authoring System, uses of an authoring system, Definition and function of Authoring Metaphor, Different Metaphors.

Offline Publishing: Flash, Power Point

Online Publishing: HTML5, Dreamweaver

**Laboratory Assignments (broad areas):**

Capturing & basic processing of media, Media cataloguing, Story boarding, scripting Basic animation & authoring tools.

**MAIN READING**

1. Tay Vaughan, "Multimedia making it work", Tata McGraw-Hill, 2008.
2. Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007.
3. Li & Drew, "Fundamentals of Multimedia" , Pearson Education, 2009.

**SUPPLEMENTARY READING**

1. Parekh Ranjan, "Principles of Multimedia", Tata McGraw-Hill, 2007
2. Anirban Mukhopadhyay and Arup Chattopadhyay, "Introduction to Computer Graphics and Multimedia", Second Edition, Vikas Publishing House.

## **MAT.O3.R0 : - Multimedia Processing Techniques**

### **Objective of the Course**

The objective of this course is to provide a basic knowledge about processing and editing of multimedia content with more emphasis on image processing. The students will be able to understand how to create, edit and modify the multimedia content using different software tools.

### **Outline of Course**

<b>Topic</b>	<b>Minimum No. Of Hours</b>
1. Introduction.	02
2. Digital representation of Color	02
3. Image Capture.	02
4. Scanning.	02
5. Image Processing.	04
6. Scalable Vector Graphics (SVG)	02
7. Introduction to MIDI	02
8. Image Editing	20
9. Image and Graphics Pattern Generation	10
10. Sound Editing	06
11. Video Editing	08

**Lecture =60**

**Practical =60**

**Total Hours=120**

# **MAT.O3.R0 : - Multimedia Processing Techniques**

## **Detailed Syllabus**

- 1. Introduction:** **02 Hrs**  
Definition of Image, Raster Graphics, Vector Graphics, Digital Image Representation, Bit allocation for intensity range.
  
- 2. Digital representation of Color:** **02Hrs**  
Basic Color Models (RGB, CMYK, HSV) and their use Color Characteristics, Color Palette, Monitor vs Print Display.
  
- 3. Image Capture:** **02Hrs**  
Exposure, aperture, field of view, resolution, focal length
  
- 4. Scanning:** **02Hrs**  
Basic principles of image and slide scanning
  
- 5. Image Processing:** **04Hrs**  
Thresholding, Intensity histogram, histogram manipulation for image enhancement, Basic low pass, high pass, Filters: median filtering, Layer, Image Manipulation (cropping, scaling, rotation), Bitmap image editing,
  
- 6. Scalable Vector Graphics (SVG):** **02 Hrs**  
Introduction, Why SVG, use of SVG in HTML, SVG elements, SVG shapes, filters, effects, gradients-linear and nonlinear
  
- 7. Introduction to MIDI:** **02 Hrs**  
  
Definition, MIDI Interfaces, MIDI Instruments, MIDI file structures, MIDI file formats
  
- 8. Image Editing: (Photoshop as reference software tool)** **20 Hrs**  
  
**8.1) Masks and Channels:**  
  
Working with masks and channels, Creating a quick mask, Editing a quick mask, Saving a selection as a mask, Editing a mask, Loading a mask as a selection and applying effects, Creating a gradient mask, Loading the gradient mask as a selection and applying effects.

## **8.2) Retouching and Repairing:**

Using the Clone Stamp tool for repair, Using the Pattern Stamp tool to create, Using the Healing Brush and Healing Patch to repair flaws, History palette and snapshots.

## **8.3) Painting and Editing:**

Using the Photoshop paint engine, Using blending modes, Painting shadows and highlights, Smoothing the edges of strokes, Using the History Brush and the Art History Brush, Brush palette, Painting with specialty brushes, Using the Color and Swatch palettes, Adding brush libraries, Saving customized preset brushes, Image and canvas size, Creating and painting with custom brushes, Pattern Maker filter.

## **8.4) Basic Pen Tool Techniques:**

Drawing paths with the pen tool, Drawing straight paths, Drawing curved paths, Combining straight and curved lines, Drawing a path around artwork, Using keyboard shortcuts.

## **8.5) Creating Special Effects:**

Automating multi-step tasks, Playing and batch-playing actions, Using guides, Saving and loading a selection, Hand-coloring selections on a layer, Combining and moving selections, Colorizing a selection, Adjusting color balance, Applying filters, Creating a cutout effect, Improving performance with filters.

## **9. Image and Graphic Pattern Generation: 10Hrs (Adobe Illustrator & Indesign as reference software tool)**

### **9.1) Creating Basic Shapes:**

Setting up the document, Using the tools, Drawing shapes, Painting artwork, Copying & scaling shapes, Painting, Filling with color, Stroking with color, Building a custom palette, Copying paint attributes, Saturating colors, Painting with patterns and gradients, Painting with a pattern brush, Drawing with the Pen, Drawing straight lines, Drawing curves, Editing curves.

### **9.2) Working with Brushes:**

Using the Art Brushes, Using Scatter Brushes, Changing the color attributes of brushes, Using a fill color with brushes, Using Calligraphic brushes, Using Pattern brushes, Using Pattern brushes, Creating brushes.

### **9.3) Transforming Objects:**

Scaling objects, Rotating objects, Distorting objects, Changing the perspective, Using the Free Transform tool, Making multiple transformations.

### **9.4) Blending Shapes and Colors:**

Creating a gradient fill, Adjusting the direction of the gradient blend, Adding colors to a gradient, Creating smooth-color blends, Blending intermediate steps, Modifying the blend, Combining blends with gradients, Creating Shapes with the Pathfinder, Uniting shapes, Removing shapes to create a new object, Intersecting objects, Trimming objects, Blending colors with the Soft Mix command, Blending colors with the Hard Mix command, Dividing shapes with the Divide command.

### **9.5) Creating Layers:**

Moving objects and layers, Locking layers, Viewing layers, Pasting layers, Merging layers.

### **9.6) Creating Watercolor or Airbrush Effects:**

Setting Smart Guide preferences, Painting with the gradient mesh tool, Specifying the number of mesh lines, Applying colors to the mesh, Highlighting a mesh object, Editing mesh points, Reflecting mesh objects, Modifying mesh lines.

### **9.7) Drawing Cylinders and Boxes:**

Drawing three-dimensional objects, Drawing Cylinders, Drawing boxes.

### **9.8) Printing Artwork & Producing Color Separations:**

Overview of printing, Color management, Printing B&W proofs, Document info command, Creating Color separations, Working with two-color illustrations, Creating a trap, Overprinting objects, Combining Photoshop & Illustrator, Vector vs. bitmap, Placing a Photoshop file, Copying a placed image, Adjusting color in a placed image, Masking an image, Sampling colors in placed images, Replacing a placed image.

### **9.9) Preparing Graphics for Web Publication:**

Optimizing images for the Web, Exporting flat-color artwork, Exporting continuous- tone and gradient artwork, Linking objects in an image map to URL's.

**10. Sound Editing: (Sonic Soundforge as reference software tool) 06 Hrs**

Introduction to Sound editing software, Working with existing sound files, Editing sound files, adding effect, Recording sound clips, Dubbing.

**11. Video Editing: (Adobe Premier as reference software tool) 08 Hrs**

Introduction to video editing tools, Importing and capturing projects, working with clips, Editing techniques, Transitions, Video Effects.

Laboratory experiments:

**Image Editing:** Selection, painting and transformation tools, Layers, Channels, Masks, Anti-aliasing, Dithering, Filters

**Sound Editing:** Normalising, Mixing, Cross-fading, Dynamics, Filters, Mono/ stereo formats, Noise Gate

**Video Editing:** Importing Clips, trimming clips, splitting clips, manipulating audio content, adding transitions, changing the speed of a clip, changing opacity, applying special effects, superimposing an image, exporting a movie

Multimedia processing using tools such as Adobe Photoshop, Adobe illustrator, Adobe Premier/ Final Cut-Pro, Adobe InDesign and Sonic Soundforge, advanced features of MS Powerpoint, Publisher, Corel Tools.

**MAIN READING**

1. Tay Vaughan, "Multimedia making it work", Tata McGraw-Hill, 2008.
2. Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007.
3. Li & Drew, "Fundamentals of Multimedia" , Pearson Education, 2009.

**SUPPLEMENTARY READING**

1. Parekh Ranjan, "Principles of Multimedia", Tata McGraw-Hill, 2007
2. Anirban Mukhopadhyay and Arup Chattopadhyay, "Introduction to Computer Graphics and Multimedia", Second Edition, Vikas Publishing House.

## **MAT.O4.R0 : - Multimedia Design Principles and Applications**

### **Objective of the Course**

This course will teach the use of visually rich and dynamic graphics elements to enhance web pages and sites. Advanced concepts in page layout and site optimization will be studied with emphasis on principles used to craft dynamic web pages that get noticed. Exercises and projects will allow students to apply the principles of web design to their own sites that will be created in the course.

### **Outline of Course**

<b>Topic</b>	<b>Minimum No. Of Hours</b>
<b>1. Design Overview</b>	<b>06</b>
<b>2. Elements of visual design:</b>	<b>12</b>
<b>3. Human Computer Interface Design</b>	<b>10</b>
<b>4. Information Architecture</b>	<b>08</b>
<b>5. Animation Design</b>	<b>12</b>
<b>6. Visual Effects</b>	<b>08</b>
<b>7. Application Examples/ Case studies</b>	<b>04</b>

**Lecture =60**

**Practical =60**

**Total Hours =120**



# **MAT.O4.R0 : - Multimedia Design Principles and Applications**

## **Detailed Syllabus**

### **1. Design Overview 06 Hrs**

Need for design, Human factors, fundamentals of Human perception, Human skill level and behavior, dialogues and tasks, Learning and Learning Modes, Cognitive Domain Learning, Affective and Psychomotor Domain Learning, Multimedia Educational Software Modeling, System Quality, Elements of user Interface.

### **2. Elements of visual design: 12 Hrs**

Introduction to basic visual elements - Line shape, colour, texture, layout, motion, framing, surfaces, visual hierarchy, typography

Elements of composition, Visual rhetoric, organizing information, factors designers consider when creating illustration and visual design, designing for screen, spatial relationships in the interface, symbols and semiotics in the interface. Visual design methodology: Clarity, consistency, appearance, visual coding layout principles.

### **3. Human Computer Interface Design: 10 Hrs**

Information design, interaction and sensorial design, guidelines for user interface design, dialogue design, Cognitive Walkthrough- case studies/ examples – Different Android applications, like Talking Tom, Monkey Trap etc.

### **4. Information Architecture: 08 Hrs**

Definitions of Story, Flowchart, scripts, storyboard. Necessity of the pre-production documentations, Interactive flowchart and storyboard. Examples and case studies

### **5. Animation Design: 12 Hrs**

- i. Introduction & Learning perspective drawing - Drawing for Animation: Gesture Drawing, Action Drawing, Line of action, Dynamic Poses, Action Sketches (Key Poses)
- ii. 2D Design concepts & Composition.
- iii. Principles of Animation.
- iv. Process of 2D Animation film making.
- v. Editing & Animatics.
- vi. Input Sound- Sound Effects – Sound Recording.
- vii. Designing, Developing Characters (Realistic, Exaggerated & Stylized)

### **6. Visual Effects: 08 Hrs**

What are visual effects; when to use visual effects, examples of simple visual effects – glare effect, fade-in/ fade-out, motion blur

## **7. Application Examples/ Case studies:**

**04 Hrs**

Need for design, Design Specifics, Scripts, Storyboards, Advantages and Effectiveness of Storyboards, Flowcharts, Writing a script, Screen Layout Designs. Human Computer Interaction, Hypermedia & navigation.

### **Laboratory experiments:**

Creating website using Flash, Aftereffects, Dreamweaver, Fireworks, Visual InterDev.

#### MAIN READING

1. Designing Interactive Systems: People, Activities, Contexts, Technologies, by David Benyon
2. Designing Visual Interfaces: Communication Oriented Techniques , by Kevin Mullet and Darrell Sano
3. Show Me the Numbers: Designing Tables and Graphs to Enlighten , by Stephen Few
4. An Introduction to Digital Multimedia by Terry Michael Savage and Karla E Vogel
5. Basics Animation: Digital Animation by Andy Chong
6. Envisioning Information by Edward R. Tufte
7. Thinking with Type: A Primer for Designers: A Critical Guide for Designers, Writers, Editors, & Students by Ellen Lupton
8. Design Basics by David Lauer, Stephen Pentak