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To
Managing Director
National Institute of Electronics & Information Technology (NIELIT)
Electronics Niketan, 6, CGO Complex,
Lodhi Road, New Delhi – 110 003

Dear Dr. Sharma,

As the Chairman of the Syllabus Sub-Committee (NIELIT standing syllabus committee) I have carefully examined the curriculum. They are in order. The programme may start soon.

To start with the AMT-'O' level curriculum on Multimedia and Animation Technology may be initiated at selected NIELIT centres on a pilot basis, to be introduced by the other centres progressively.

Further, the 'O' & 'A' level curricula on Multimedia and Animation Technology being a new one of inter-disciplinary nature involving experts from various fields including IT, media design, Film/Video Production etc., NIELIT may take up a project towards content creation for the different modules under the supervision of a suitable Group/ Expert Committee

Considering the objective and coverage of the AMT-O & AMT-A Level courses which are more oriented towards multimedia elements and their processing than animation, the committee had recommended the change of names of the above two courses to - NIELIT 'O' and 'A' Level Courses in Multimedia and Animation Technology (**MAT-O and MAT-A Level** respectively).

I also seriously advice NIELIT to frame a 'B' level curriculum and work for its approval by AICTE/Universities so that professionals/students can obtain a formal degree. This will enhance job opportunities, scope for further studies and in general, raise level of technical and creative input in the field.

Thanking you

Yours sincerely,

Santanu Chaudhury

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

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

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

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 Wiely & 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

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

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

Topic	Minimum No. Of Hours
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

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

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

National Institute of Electronics & Information Technology (NIELIT)

Course structure of Diploma in Multimedia & Animation Technology

(MAT-A) Level

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

June 2013

Course structure:
Diploma in Multimedia & Animation Technology (MAT-A) Level

Objective:

d. To acquire the knowledge to apply multimedia authoring, editing and animation in digital multimedia productions.
e. To acquire the skills to implement and supervise Multimedia productions and Web application Development.

Likely Career Options:

As per the recent market trend and the objective of the course as well as the projected skill sets of the 'A' level qualifiers, it is envisaged that the likely career options will be as Multimedia Production Assistant, Multi-Media content developer, 2D/3D Animator, Audio/Video editor and Web Application Developer.

Eligibility

Graduate in any discipline (The final year students are also eligible for admission) as per NIELIT norms

MAT-A level

MAT.A1.R0 : - Introduction to Multimedia.
MAT.A2.R0 : - Multimedia Processing Techniques
MAT.A3.R0 : - Multimedia Design Principles and Applications
MAT.A4.R0 : - Human-Computer Interaction Design
MAT.A5.R0 : - Video Editing
MAT.A6.R0 : - Sound Processing
MAT.A7-R0 : - Web Application Development
MAT.A8-R0 : - Animation in 2D and 3D

Electives (MAT-AE9)

MAT.AE9.1-R0 : - Videography and Cinematography
MAT.AE9.2-R0 : - Motion Picture Production

Electives (MAT-AE10)

MAT.AE10.1-R0 :- Computer Programming and Problem Solving through 'C' Language
MAT.AE10.2-R0 :- Introduction To Object Oriented Programming Through Java.
MAT.AE10.3-R0 :- Advanced Animation Techniques

MAT.A1.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

Topic	Minimum No. Of Hours
7. Introduction to Multimedia.	**08**
8. Representation of Multimedia Objects	**20**
9. Concept of Multimedia Editing	**10**
10. Introduction to Compression Technology	**06**
11. Multimedia Application Design	**06**
12. Multimedia Authoring and Publishing	**10**

Lecture =60
Practical =60
Total Hours =120

MAT.A1.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.A2.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

Topic	Minimum No. Of Hours
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.A2.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 assignments:

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.A3.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

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

Lecture =60
Practical =60
Total Hours =120

MAT.A3.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**

viii. Introduction & Learning perspective drawing - Drawing for Animation: Gesture Drawing, Action Drawing, Line of action, Dynamic Poses, Action Sketches (Key Poses)
ix. 2D Design concepts & Composition.
x. Principles of Animation.
xi. Process of 2D Animation film making.
xii. Editing & Animatics.
xiii. Input Sound- Sound Effects – Sound Recording.
xiv. 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 assignments:

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

MAT.A4-R0 : Human-Computer Interaction Design

Objective of the Course

The objective of this course is to provide a basic idea about Metaphors and conceptual models, Visual design, Cognitive principles, Prototyping Interaction design tools, Human emotions and Social Interfaces

Outline of Course

	Topic	Minimum No. of Hours
1.	**Introduction to Human-Computer Interaction**	**04**
2.	**User-oriented process**	**05**
3.	**Working with users**	**05**
4.	**Fundamentals of Interaction**	**06**
5.	**Metaphors and conceptual models**	**06**
6.	**Design of Visual elements**	**04**
7.	**Cognitive principles**	**06**
8.	**Prototyping**	**06**
9.	**Interaction design tools**	**06**
10.	**Emotions and Affect**	**04**
11.	**Physical devices and tangible interaction**	**04**
12.	**Introduction to Social Media**	**04**

Lecture = 60
Practical/Tutorial = 60
Total Hours =120

MAT. A4-R0 : Human-Computer Interaction Design

Detailed Syllabus

1. Introduction to Human-Computer Interaction: 04 Hrs

Desktop GUIs and Applications, Web Applications, 3D Desktops, Mobile Devices, Pen-based Interaction, Interactive Workspaces, Voice and Multimodal Interaction.

2. User-oriented process: 05 Hrs

Design Process Overview, Idea Generation, Need Analysis, Exploring Design Ideas Low-Fidelity "Paper" Prototype, User Testing, High Fidelity "Interactive" Prototype

3. Working with users: 05 Hrs

The Roles of Users in Design, Engaging User Participation, Data Gathering Techniques, Likert Scales and Semantic Differentials, Interviews, Naturalistic observation.

4. Fundamentals of Interaction: 09 Hrs

Direct Manipulation, Seven Stages of Action, The Interaction Cycle, Conceptual Models Engagement, Affordances, Natural mapping Constraints, Feedback, Error

5. Metaphors and conceptual models: 09 Hrs

Metaphors, the Desktop Metaphor, Notebook Metaphor Bookshelf, Metaphor Web Book Physical Device Metaphors, Conversational Agents, Timeline Metaphor, design aspects.

6. Design of Visual elements: 04 Hrs

Types of visual presentations, Visual language, Visual complexity, Scanning, Grouping. Design of Icons, buttons, layout, menus

7. Cognitive principles: **06 Hrs**

Limited Processing Resources, Visual Search and Pre-attentive Processing, Short term (working) memory, Long-term memory.

8. Prototyping: **06 Hrs**

Introduction to Prototype, Iterative Prototyping vs. the Waterfall Model, Uses of Prototypes, Prototype Dimensions, Designing the Prototype, Early Stage Prototypes.

9. Interaction design tools: **06 Hrs**

Tools, Success of Tools, Application Types, Threshold & Ceiling, Window Managers, Toolkits, Event Languages, Graphical Interactive Tools, Interactive Prototypes

10. Physical devices and interaction tools: **04 Hrs**

Input device issues, Dimensions of Performance, The Dominant Interface, Keystroke devices, Pointing/Marking, Trackball, Trackpad, Joysticks, Trackpoint. Introduction to software tools.

11. Introduction to Social Media: **04 Hrs**

Aspects of the Social Interface, Computer Supported Collaborative Work, Peer-to-peer Applications, Social behavior, Social Network Applications.

Laboratory assignments:

Using and authoring package viz. Adobe Director: Basic features – Stage, Cast, Score, Sprite, Markers, Behaviours, Property Inspector, Behaviour Inspector, Control Panel, Registration Point, Inks, Paint window, Vector window, Text window;
Creating animations – Tweening, Exchanging cast members, Cast to Time, Space to Time, Film loop, Step recording, Real time recording, Onion skinning;
Additional features – Transition channel, Audio channel, Script channel, Tempo channel, Xtras, Shockwave;
Creating and modifying behaviours, Using Cue points in Audio and Video, Editing Quicktime Video, Changing cursor appearance, Sending message between sprites, Modifying sprites at runtime;
Working with multiple movies;
Publishing – Director movies (DIR) and Projector (EXE) files, External casts (CST files), Protected external casts (CXT files), Protected movies (DXR files), shockwave movies (DCR files)

MAIN READING

1. Designing Interactive Systems: People, Activities, Contexts, Technologies, by David Benyon
2. Alan Dix, Taret Finlay, Gregory D. ABOWD, Russell Beale-- “HUMAN-COMPUTER INTERACTION”—Third Edition

MAT.A5-R0 : - Video Editing

Objective of the Course

The objective of this course is to provide knowledge about how to manipulate video images. Video editing includes cutting segments (*trimming*), re-sequencing clips, and adding transitions and other special effects.

Outline of Course

Topic	Minimum No. of Hours
1. **Basics of Video.**	**10**
2. **Video Formats**	**08**
3. **Video Editting**	**30**
4. **Special Effects on Video.**	**12**

Lecture =60
Practical =60
Total class =120

MAT.A5-R0 : - Video Editing

Detailed Syllabus

1. Basics of Video: 10 Hrs

Basics of Video, Lines, Frames, Fields, Raster Scan, Frame rate and resolution, Aspect Ratio, interlaced and non-interlaced video, colour planes (YCBCR, YUV), Video broadcast standards (PAL, NTSC, SECAM), HD Video, 3D TV, Audio-Video Synchronization,

2. Video Standard: 08 Hrs

Video overview (MPEG-1, MPEG-2, MPEG-4, H.264), CODECs (Cinepak etc.)

3. Video Editing: 30 Hrs

Introduction to Editing, introduction to digital nonlinear editing software (Video & Film), Digital film making & the difference between Film & Video, Media management (Pre-edit), Capturing from different media storage devices & formats, Interface & basic tools of a video editing software, Understanding the timeline, Tools & techniques for advance editing, Media management (Post-edit), Alpha correction, Chroma correction, Audio tools, Adding audio, Audio editing, Colour correction, Titleing & composting , Packaging timeline, Edit to tape (mastering) & Exporting to different media.

4. Special Effects for Video 12 Hrs

Overview of special effects for video, working with effects, keyframing effects, effects presets, overview of frequently used effects, overview of colour correction and colour oriented effects, special colour effects, colour keying, working with the opacity effect, working with alpha-channel transparencies.

Lab Assignments

Create a movie trailer of 30 Seconds duration.

MAIN READING

1. Video Editing and Post-Production: A Professional Guide -by Gary H Anderson
2. An Editor's Guide to Adobe Premiere Pro - by Richard Harrington, Robbie Carman,Jeff I. Greenberg
3. Creating Motion Graphics with After Effects: Essential and Advanced Techniques- by Chris Meyer, Trish Meyer
4. Premiere Pro Editing Workshop - by Marcus Geduld

MAT.A6-R0 : - Sound Processing

Objective of the Course

The objective of this course is to provide an introduction to Sound and Audio. The students will understand the basic editing of sound and assembling sound recordings in preparation for the final sound mixing or mastering of a television program or motion picture.

Outline of Course

Topic	Minimum No. Of Hours
1. Introduction.	04
2. Musical Sound and Noise.	06
3. Elementary Sound system.	06
4. Digital Representation of Sound.	06
5. Digital Audio recording and reproduction.	03
6. Audio Production	09
7. Digital Music Making	06
8. Sound Editing	20

Lecture = 60
Practical = 60
Total class =120

MAT.A6-R0 : - Sound Processing

Detailed Syllabus

1. Introduction: 04Hrs

Basic of Acoustics, Psycho Acoustics, Frequency range of human Hearing, Dynamic Range of Human Hearing, Spectral Characteristics of Human Hearing, Spatial Hearing, and Masking.

2. Musical Sound and Noise: 06 Hrs

Definition, note and tone, characteristics of a musical sound. S/N Ratio, Noise Cancellation

3. Elementary Sound system: 06 Hrs

Microphones, Pressure Microphones, Velocity Microphones, Amplifier. Loudspeaker, Sound Channels and their spatial reproduction : 2.1 channels, 5.1, phases

4. Digital Representation of Sound: 06 Hrs

Early Sound Storage and transmission technology, Pulse Code Modulation, Sampling Rate, Sampling Resolution, Bit Rate.

5. Digital Audio recording: 03 Hrs

Recording from different source, digital audio consoles and controllers, overview of MP3

6. Audio Production: 09 Hrs

Multi–track recording, Mixer, Delay, Reverb, Noise gate and compressor.

7. Digital Music Making: 06 Hrs

Synthesizer, MIDI, MIDI file format, Sound Cards, PCM playback and recording.

8. Sound Editing: 20 Hrs

8.1) Sound Format and Settings:

Audio Interchange File Format (AIFF, AIF), Musical Instrument Digital Interface (MID, MDI, MFF), Resource Interchange File Format (RIFF), Wave (WAV).

8.2) Adobe Audition:

Recording your Voice in the Studio, Importing Music into a Project, Editing Audio in Edit View, Editing Audio in Multi-track View, Exporting and Finishing an Audio Project, Using CD Project View to Burn an Audio CD, Adding Music from a regular CD

8.3) Simple Editing and Navigation:

Cut, Copy, Paste, Clear, Trim/Crop, Mix, Crossfade, Magnification and Zooming.

8.4) Advanced Editing:

Changing Sound Formats, Using Markers, Using Regions.

8.5) Recording:

Recording Basics, Recording modes, Remote Recording.

8.6) Applying Sound Effects:

Acoustic Mirror, Amplitude Modulation, Chorus, Delay/Echo, Distortion, Dynamics, Envelop, Flange/ Wah-Wah, Gapper/Snipper, Noise Gate, Pitch, Reverb, Stutter, Vibrato, Wave Hammer.

8.7) Applying Sound Process:

Auto Trim/Crop, Bit-Depth Converter, Channel Converter, DC Offset, EQ, Fade, Insert Silence, Invert/Flip, Mute, Normalize, Pan/Expand, Resample, Reverse, Smooth/Enhance, Swap Channels, Time Stretch, Volume.

Lab Assignments

Record voice and music; mixing background music; apply effects, saving in different formats

MAIN READING

1. Digital Sound Processing for Music and Multimedia, by Ross Kirk, Andy Hunt.
2. Sound Forge Power - By Scott R Garrigus.
3. JBL Audio Engineering for Sound Reinforcement - by John Eargle, ChrisForeman.

MAT.A7-R0 : - Web Application Development

Objective of the Course

The objective of this course is to provide basic knowledge about the software technologies and their applications in web based applications and applications for handheld devices.

Outline of Course

	Topic	Minimum No. of Hours
1.	Programming Logic	08
2.	Concept of Markup Language	10
3.	Concept of Client Side Scripting	08
4.	Concept of Server Side Scripting	08
5.	Interacting with the server: Forms	02
6.	String Handling	02
7.	Introduction to Databases	04
8.	Designing and Creating a Database	02
9.	Using Databases: Storing and Retrieving Data	02
10.	Cookies and Sessions	02
11.	User Authentication	01
12.	File Uploading	01
13.	Working with Dates and Times	01
14.	XML and XHTML	04
15.	Development and Deployment	02
16.	Web based Tools	03

Lecture=60
Practical=60
Total Hours=120

MAT.A7-R0 : - Web Application Development

Detailed Syllabus

1. Programming Logic **08 Hrs**

Algorithm (Definition and Procedures), Flow Chart (Definition, Procedure & Symbols) Problem Solving Techniques (Problem Decomposition, Top Down Design, Bottom Up Design), Simple programming examples (Concept can be illustrated through pseudo codes).

2. Concept of Markup Language: **10 Hrs**

2.1 HTML: Create an index page from HTML, Developing a Web page, Working with Text and Graphics, Working with Links, Working with Tables, Collecting Data with Forms, Positioning Objects with Layers, Using Frames for Page Layout, Adding Multimedia Elements, Creating and Using Templates, Creating Interactions Using Behaviors, Using Styles and Style Sheets, Working with Library Items and Snippets, Managing a Web Server and Files.

2.2 DHTML: CSS Introduction, CSS Syntax, CSS Background, CSS Text, CSS Font, CSS Border, CSS Margin, CSS Padding, CSS List.

3. Concept of Client Side Scripting **08 Hrs**

Javascript: Document Object Model, object reference – objects, Methods and Properties, Event Handlers, Language Constructs – Statements and operators.

4. Concept of Server Side Scripting: **08 Hrs**

PHP: Introduction, Configuration, Object oriented programming knowledge, Variable and Operator, Control statement, working with array, Using inbuilt function.

5. Interacting with the server: Forms: **02 Hrs**

An example of forms, Working with HTML forms, Adding a form to your page, How Data is submitted, Accessing the form data within script, Character sets and forms, Working With The Server, Server considerations, Server Variables, Environment Variables, Redirecting the user.

6. String Handling **02 Hrs**

Strings & PHP, Character Sets and Unicode, Configuring PHP for Unicode, Operating on String

7. **Introduction to Databases:** **04 Hrs**
   Basics, DBMS and RDMS concept, Motivations for using a Database, The case against simple files or spreadsheets, Database Servers, Major Database Servers, MySQL, PostgreSQL, Oracle Database, Microsoft SQL Server, Other Servers, How to select a database server, Data analysing, Capabilities, Performance, Accessibility from within PHP

8. **Designing and Creating a Database:** **02 Hrs**
   Organising Data, Primary Keys, Choosing Data Types, Organizing Data into Tables, Indexes for faster searching, An introduction to SQL, Creating Databases, Setting user permissions, Creating Tables, Deleting Tables and Databases

9. **Using Databases: Storing and Retrieving Data:** **02 Hrs**
   Inserting Data into Tables, Retrieving Data from Tables, Modifying Data in Your Tables, Deleting Data from Tables

10. **Cookies and Sessions:** **02 Hrs**
    Introduction to Cookies and Sessions, Session Security

11. **User Authentication:** **01 Hr**
    Planning for Members, Web Sever Provided Authentication, Implementing Our Own Authentication

12. **File Uploading** **01 Hr**
    Uploading User File, A File Uploading Example, Security Consideration

13. **Working with Dates and Times:** **01 Hr**
    Sources of Dates and Times, Dates and Times in PHP, More Dates and Times in Database Servers.

14. **XML and XHTML:** **04 Hrs**
    XML, Working with XML in PHP, XHTML

15. **Development and Deployment** **02 Hrs**
    Coding Standards, Source Code Control, Testing, Deployment

16. **Web based Tools** **03 hrs**
    Overview of moodle, joomla, drupal, wordpress.

Laboratory Assignments:

Web page designing with HTML and Java script.

Use of DHTML, XML

Basic server side Coding for handling user inputs; accessing, inserting, updating, deleting data from database. Basic coding for handling XML data from PHP.

MAIN READING

1. Internet and World Wide Web How to Program. Author: P.J. Deitel & H.M. Deitel
2. Database System Concepts, Sixth Edition by Avi Silberschatz , Henry F. Korth , S. Sudarshan. McGraw-Hill

MAT.A8-R0 : - Animation in 2D and 3D

Objective of the Course

The objective of this course is to make the students understand 2D Animation. The students will be able to create moving pictures in a two-dimensional environment. This is done by sequencing consecutive images, or "frames", that simulate motion by each image showing the next in a gradual progression of steps. Further the students will also be exposed to basics of 3D Animation.

Outline of Course

Topic	Minimum No. Of Hours
1. Introduction.	**04**
2. Animation Techniques.	**04**
3. 2D Animations.	**08**
4. Image Manipulation Techniques.	**06**
5. Spatial transformation.	**02**
6. Creating Animation.	**20**
7. Introduction to 3D animation and Special Effects	**16**

Lecture =60
Practical =60
Total class =120

MAT.A8-R0 : - Animation in 2D and 3D

Detailed Syllabus

1. **Introduction:** **04Hrs**

2. **Animation Techniques:** **04Hrs**
   Traditional Animation, Computer Based Animation.

3. **2D Animations:** **08Hrs**
   Sprite Animation, Rendered Animation.

4. **Image Manipulation Techniques:** **06Hrs**
   Tweening, Warping, Morphing, Walk Cycle, Colour cycle.

5. **Spatial transformation:** **02Hrs**
   Image Translation, Image Rotation, Image Scaling, Key-framing, Lofting. Lighting, Revolving.

6. **Creating Animation:** **20Hrs**

   6.1) Introduction to the Flash MX Environment and Basic Object Creation
   Definition of Flash? The Flash MX Work Environment, Vector vs. Raster Graphics, Basic Drawing and Painting Tools, Creating Custom Colours, Gradients, and Line Styles.

   6.2) Manipulating Objects
   Selecting Objects, Object Interaction, Transforming and Grouping Objects, Working with Bitmap Images.

   6.3) Text and Multiple Layers
   Text Blocks, Converting Text into Shapes, Creating and Managing Multiple Layers, Using Mask Layers, Aligning Objects.

   6.4) Creating Animation
   Frame-by-Frame Animation, Shape-Tweened Animation, Motion-Tweened Animation, Guide Layers, Masked Animations, Selecting Your Publishing Settings, Previewing and Publishing Files.

   6.5) Flash MX:

   a) An Animation Review and an Introduction to Symbols and Instances
   Animation Overview, Understanding Symbols and Instances, Editing Symbols and Instances, Creating a Shared Symbol Library, Creating Buttons. Using the Movie Explorer.

b) Interactivity and Sound in Flash

Introduction to Interactivity, Using the Stop and Go To Actions, Linking from Flash. Using Drag and Drop within Flash, Using the If Frame is Loaded Action, Adding Sounds to a Flash Movie, Importing and Editing Sound Properties.

c) Advanced Interactivity

Working with Form Fields and Variables, Using Action Script to Set Variables, Using String Operators to Format a Variable Display, Evaluating the Position of an Object, Dynamically Setting Properties, Web-Native Printing in Flash.

d) Testing and Publishing

Evaluating Download Performance, Importing, Exporting, and Publishing Movies.

7. Introduction to 3D animation and Special Effects 16Hrs

Introduction to 3D animation, History of 3D Animation, understanding of 3D coordinate systems, concept of Viewport, navigation in space, modeling of objects in 3D space.

7.1) Introduction to Polygons

a) Sub - Division Modeling
b) Nurbs Modeling
c) Advanced Modeling

7.2) Introduction to Sharers and Textures

a) Using Hyper shade
b) Applying texture to models/ Ch.
c) Photoshop, shaders, bump mapping
d) Displacement mapping
e) Utility nodes

7.3) UV Mapping

a) UV's
b) Planner map
c) Automatic/spherical/ cylindrical map
d) Unfold
e) Repace

7.4) Rigging- Introduction-

a) Building skeleton- understanding joints
b) Forward & inverse kinematics
c) Constraint
d) Skinning
e) Local Rotation Axis
f) Controllers

g) Set driver key
h) Blend Shapes
i) Reverse foot
j) Spline I.K.
k) FK - IG Switch

7.5) Lighting - Introduction

a) Basic 3 point lighting
b) Directional light
c) Ambient light
d) Spot light
e) Depth map shadow
f) Indoor lighting
g) Outdoor lighting

7.6) Animation - Introduction

a) Key frames
b) Squash & stretch
c) Graph editor
d) Posing a character
r) Keys - Extreme & in-betweens

7.7) Dynamics

a) Particle
b) Emitters
c) Fields
d) Soft bodies
e) Springs
f) Rigid bodiess
g) Hardware Rendering

7.8) Camera

a) Creating Camera
b) Angle of view
c) Focal length
d) Depth of field
e) Aperture
f) Film aspect ratio
g) Pixel aspect ratio
h) Clip planes
i) Z – depth
j) Motion blur

7.9) Rendering

a) Using software renderer
b) Sean Line renders
c) Render settings

7.10) Nurbs Modeling

a) Nurbs curves & surfaces
b) Components
c) Nurbs continuity
d) Tools

Laboratory Assignments:

2D Animation – Creating vector graphics, Creating 2D animation, working with layers, Symbols and libraries, Buttons, Movie clips, Grouping, aligning and transforming objects, Colour gradients and transperencies, Creating animated GIF files, Motion tweening, Motion guides, Shape tweening, Shape hints, Masking, Animating a mask, Interaction, Using 2d animation software, Using scripting languages (e.g. Actionscript), Publishing an animated movie;

3D Animation – Modeling: Creating 3D animation, view-ports and projections, wire-frame and rendered models, Selecting objects, Translating rotating and scaling objects, Creating on customised planes, Rendering scenes, Pivot points, Linear and circular array of objects, Creating 2D shapes, Methods of extrusion, Lathing and Lofting, Using boolean operations, Using space warps and particle systems;
Surface texture: Adding surface materials, Using material editors, Creating transparent object, Creating metallic objects;
Lights: Placing lights, Adjusting light parameters, Shadows, Reflections;
Cameras: Placing cameras, camera movements, Camera motion paths;
Animation: Creating key frames, Tweening, Rendering, Time-scaling, Adding background sound and images.

MAIN READING

1. Adobe Flash Professional Bible by Todd Parkins.
2. Computer Graphics by Donald Hearn, M. Pauline Baker. Pearson Education
3. Autodesk 3ds Max 2013 Bible, Kelly L. Murdock

MAT.AE9.1-R0 : - Videography and Cinematography

Objective of the Course:

The objective of this course is to develop expertise related to video and audio related works and towards orientation of Cameraperson and Cinematographers. After completing the module the students will have an overall conception about camera, photography and cinematography.

Outline of Course:

Topic	Minimum No. of Hours.
1. Introduction to cinematography **1.1) The Nature of Light.** **1.2) The Human Eye.** **1.3) Film Stock and Processing.**	**04**
2. Basics of Camera	**12**
3. Lighting.	**08**
4. Camera movement	**10**
5. Advanced Exposure Control.	**04**
6. Cameras & film, digital cameras, film scanners:	**08**
7. Digital storage	**04**
8. Shooting Principles	**10**

Lecture =60
Practical =60
Total Hours =120

MAT.AE9.1-R0 : - Videography and Cinematography

Detailed Syllabus

1. Introduction to cinematography: 04 Hrs

Conventional aerial photography, Small-format aerial photography. Chemistry of film exposure.

1.1) The Nature of Light:

The Electromagnetic Spectrum, Rectilinear Propagation, Specular, Diffuse and Total Reflection, Refraction and Absorption, Wavelength and Colour, Temperature.

1.2) The Human Eye:

Morphology, Rods & Cones, Acuity & Circle of Confusion, Persistence of Vision, Parallax and Perspective, Photography versus the Human Eye.

1.3) Film Stock and Processing:

Photochemical Spectrum, Structure and Anti-Halation, Speed and Exposure, Processing, Densitometry, Sensitometry, Contrast Control, Gamma. Controls of Exposure. , Light Meters and Automatic Cameras, Color-Infrared Film.

2. Basics of Camera: 12 Hrs

Drive, Film Transport, Gate, Lenses, Back Focus, Claw and Registration. Components and properties of camera. Basic principles of photographic representation Close, Long shots. Response function of a camera. CCD cameras (1 CCD, 3CCD etc) and their usage, Optical and geometric properties of lens, Depth of Field.

Basic Structure – Pin Hole camera model, Wide angle lens, Telephoto lens

3. Lighting: 08 Hrs

Photometry, Measurement of Incident and Reflected Light, Colour Temperature, Reflectance, Foot Candles, Brightness and Contrast Ratios, Reciprocity Law, Exposure Control. Lights: Hollywood lighting, Expressionist lighting, Neo-realist lighting, Softening of images, Tonal variations.

4. Camera movement: 10 Hrs

Camera angles. Camera movements – Tracking, panning, tilting, rolling. Dolly Shots, Cranes, Steadicam, Wide Screen, Aspect Ratios and TV Safe Areas.

Use of Lenses : Zooming v Tracking, Studio Effects, Back and Front Projection, Depth of Focus, Glass Shots, Trombone shots.

5. Advanced Exposure Control: 04Hrs

Studio Lighting, Key and Filler Ratios, Exteriors, Day for Night, Window Filters, Spot and Colour Temperature Meters, Key Tone Pegging.

6. Cameras & film, digital cameras, film scanners: 08 Hrs

Conventional Photography – file formats and quality settings, Digital Exposure, creative control of aperture and shutter speeds, exposure evaluation, low light photography, controlling white balance and other aspects in camera, composition and lens choice, Digital Imagery, Digital image scale, Scanning analog photographs.

Features of DSLR video & still cameras, use of features for realization of different effects.

7. Digital Storage: 04 Hrs

Digital storage – Tapes,-DVDs, Blueray, Zip drives, [techniques for storage on these media] Digital file formats, Studio uncompressed file formats (DVcam etc.)

8. Shooting Principles: 10 Hrs

Shot design and composition (selection of close-up, mid-shot, wide angle etc.) through case studies drawing examples with clippings from important films (*Pather Panchali, Meghe Dhaka Tara, Tare Zamin Par*, etc.)

Lab Assignments:

Introduction to 3-point lighting through demonstration and discussion, Identify aesthetics in a composition, Identify different features of different cameras, Use of Light-meters, determine set and lighting needs, Demonstrate effective design of 'filmspace' and continuity; Demonstrate effective exterior filming and controlling light; Demonstrate effective planning of shots – panning, tracking, dolly and steadicam

MAIN READING

1. How to read a film – by James Monaco, Oxford University Press
2. Film Art – An introduction by Bordwell Thompson, Wisconsin University Press
3. Manual of Photography by Ralph.e.Jacobson.
4. Video Camera Techniques by G.Millerson.
5. Basics of Video Production by G. Swainson.
6. Lighting for Video by G.Millerson.
7. Video Camera Operators Handbook by Peter Hodges.
8. Sound Techniques fro Video and TV by Glen Alkin.
9. Creating Special Effects for TV and Video by Bernard Wilkie.
10. Sound Recording an introduction by Mc. Kormick.
11. Digital Non Linear Editing by Thomas A Ohanian.
12. Use of Microphone by Alec Nisbett.
13. Motion Picture Camera Techniques by D.W.Samuelson.
14. Motion Picture and Video Camera Filters and Lab Techniques by Gerald Hirschfeld.
15. Lighting for Photography by W. Nurenb.

MAT.AE9.2-R0 : - Motion Picture Production

Objective of the Course:

The objective of this course is to develop capability for taking care of the total production work related to videography or cinematography to enable the students in understanding motion picture production. The course would emphasize Motion Picture as a form of entertainment that enacts a story by a sequence of images giving the illusion of continuous movement.

Outline of Course:

Topic	Minimum No. of Hours
1. Basics of Optics	04
2. The Cinematographic apparatuses	04
3. Lighting.	06
4. The Moving Camera.	06
5. Advanced Exposure Control.	02
6. The Screenplay.	02
7. Pre-production	08
8. Production	12
9. Post-production	08
10. Assignment – Analysis of feature films.	08

Lecture =60
Practical =60
Total Hours =120

MAT.A9.2-R0: - Motion Picture Production

Detailed Syllabus

1. Basics of Optics: 04hrs

Conventional aerial photography, Small-format aerial photography. Chemistry of film exposure, The Electromagnetic Spectrum, Rectilinear Propagation, Specular, Diffuse and Total Reflection, Refraction and Absorption, Wavelength and Colour, Temperature. Morphology, Rods & Cones, Acuity & Circle of Confusion, Persistence of Vision, Parallax and Perspective, Photography versus the Human Eye.

2. The Cinematographic apparatuses: 04hrs

Photochemical Spectrum, Structure and Anti-Halation, Speed and Exposure, Processing, Densitometry, Sensitometry, Contrast Control, Gamma. Controls of Exposure. , Light Meters and Automatic Cameras, Color-Infrared Film. Basic Structure, Drive, Film Transport, Gate, Lenses, Back Focus, Claw and Registration. Components and properties of camera. Basic principles of photographic representation Close, Long shots. Wide angle lens, Telephoto lens. Geometry, Structure and Types, Optical properties of lens, Reflection, refraction, Rarefaction. Depth of Field, Hyperfocal Distance, Perspective, Viewing Angles, Field of View, f and T Stop calibration.

3. Lighting: 06 Hrs

Photometry, Measurement of Incident and Reflected Light, Colour Temperature, Reflectance, Foot Candles, Brightness and Contrast Ratios, Reciprocity Law, Exposure Control. Lights: Hollywood lighting, Expressionist lighting, Neo-realist lighting, Softening of images, Tonal variations, Types of artificial lights – Zooming, Spot light. One film studio visit optional

4. The Moving Camera: 06Hrs

Camera angles. Camera movements – Tracking, panning, tilting, rolling. Dolly Shots, Cranes, Steadicam, Wide Screen, Aspect Ratios and TV Safe Areas.

5. Advanced Exposure Control: 02 Hrs

Studio Lighting, Key and Filler Ratios, Exteriors, Day for Night, Window Filters, Spot and Colour Temperature Meters, Key Tone Pegging.

6. The Screenplay: 02 Hrs

TV Commercials, Documentaries and Features, From Treatment to Screenplay to Shooting Script, Character and Plot development.

7. Pre-production: 08 Hrs

Requirements of pre-production, Location scouting – indoor & outdoor, Formalities to be observed, Selection of themes – fiction, non-fiction and animated images, Preparation of sequence from storyboard to final script

8. Production: **12 Hrs**

Direction - Use of space (Mise en Scene), use of time (Montage) and formation of meaningful narrative, Classical Hollywood paradigm, Alternative paradigms - (Indian, continental), Camera, Handling of actors and Decors, Recording direct sound, Concept of sound design, Lighting arrangement – natural and artificial, Studio visit optional

9. Post-production: **08 Hrs**

Introduction to Dubbing, Sound mixing, Special effects, Basics of editing – linear, non-linear, online, Punctuation Marks, Delivery mechanism (digital, analog, streaming video etc.), Dissemination vehicles

10. Assignment: **08 Hrs**

Mise-en-Scene analysis of selected portions from different fiction and non-fiction films (Report writing on the technical aspects)

Lab Assignments

Introduction to 3-point lighting through demonstration and discussion; Identify different features of different cameras; Demonstrate camera movements - panning, tracking, tilting; Basic aspects of script writing –workshop mode; Production management - workshop mode

MAIN READING

1. Understanding Films - Louis Gianetti
2. Learn Photography by Benu Sen (published by PAD)
3. 5 C's of Cinematography (published by Focal Press).
4. Modern Television Lighting by John Millerson.
5. Art of Lighting (published by Focal Press).
6. Manual of photography by Ralph Jacobson (published by Focal Press).
7. Videography Manual (published by Focal Press).
8. Lens (published by Focal Press).

MAT.AE10.1-R0:- Computer Programming and Problem Solving through 'C' Language

Objective of the Course

The objectives of this course are to make the student understand programming language, programming, concepts of Loops, reading a set of Data, stepwise refinement, Functions, Control structure, Arrays. After completion of this course the student is expected to analyze the real life problem and write a program in 'C' language to solve the problem. The main emphasis of the course will be on problem solving aspect i.e. developing proper algorithms.

After completion of the course the student will be able to

- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in "C" language.
- Use simple data structures like arrays, stacks and linked list in solving problems.
- Handling File in "C".

Outline of Course

Topic	Minimum number of hours
1. Introduction to Programming	**04**
2. Algorithms for Problem Solving	**10**
3. Introduction to 'C' Language	**04**
4. Conditional Statements and Loops	**07**
5. Arrays	**06**
6. Functions	**06**
7. Storage Classes	**03**
8. Structures and Unions	**06**
9. Pointers	**06**
10. Self Referential Structures and Linked Lists	**04**
11. File Processing	**04**

Lectures = 60
Practical/tutorials = 60
Total = 120

MAT.AE10.1-R0 :- Computer Programming and Problem Solving through 'C' Language

Detailed Syllabus

1. Introduction to Programming **04 Hrs**

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages,Compilation, Linking and Loading, Testing and Debugging, Documentation

2. Algorithms for Problem Solving **10 Hrs**

Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial

3. Introduction to 'C' Language **04 Hrs**

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs.

4. Conditional Statements and Loops **07 Hrs**

Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming .

5. Arrays **06 Hrs**

One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Standard library string functions

6. Functions **06 Hrs**

Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive, Functions, arrays as function arguments.

7. Storage Classes **03 Hrs**

Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in a multiple source files: extern and static

8. Structures and Unions **06 Hrs**

Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions

9. Pointers **06 Hrs**

Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

10. Self Referential Structures and Linked Lists **04 Hrs**

Creation of a singly connected linked list, Traversing a linked list, Insertion into a linked list, Deletion from a linked list

11. File Processing **04hrs**

Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file

MAIN READING

1. Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill, 2007 (Paper back)
2. R.G.Dromey, "How to solve it by Computer", Pearson Education, 2008.
3. Kanetkar Y, "Let us C", BPB Publications, 2007.
4. Hanly J R & Koffman E.B, "Problem Solving and Programm design in C", Pearson Education, 2009.

SUPPLEMENTARY READING

1. E. Balagurusamy, "Programming with ANSI-C", Fourth Edition,2008, Tata McGraw Hill.
2. Venugopal K. R and Prasad S. R, "Mastering 'C'", Third Edition, 2008, Tata McGraw Hill.
3. B.W. Kernighan & D. M. Ritchie, "The C Programming Language", Second Edition, 2001, Pearson Education
4. ISRD Group, "Programming and Problem Solving Using C", Tata McGraw Hill,2008.
5. Pradip Dey , Manas Ghosh, "Programming in C", Oxford University Press, 2007.

MAT.AE10.2-R0: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA.

Objective of the Course

The course is designed to impart knowledge and develop skills required to solve real world problems using object oriented approach, Java Language constructs and Unified Modelling Language. This course covers the subject in 3 sections, viz, Introductions to Object Oriented Programming, Introduction to Java Programming Language, Introduction to UML.

After the completion of the course the student is expected to understand:

- Basics of Object Oriented Programming.
- Various Object Oriented programming concepts - Abstraction, Objects and Classes, Inheritance, Polymorphism.
- Basic data structures in Java, Objects and Classes, Super Class, sub-class, Interfaces, Inner classes.
- GUI programming using AWT/Swing.
- Deploying Java Applications.
- Accessing Databases in Java.
- What is unified Modeling Language and Why is it used.
- Using Class, Interface, Interaction, State and Activity, Physical diagrams in modeling software.

Outline of Course

Topic	Minimum number of hours
1. Introduction to Object Oriented Programming	**14**
2. Introduction to Java programming Language.	**32**
3. Introduction to UML.	**14**

Lectures = 60
Practical/tutorials = 60
Total = 120

MAT.AE10.2-R0: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Detailed Syllabus

1. Introduction to Object Oriented Programming 14hrs

1.1) Thinking Object-Oriented 1hr

- Why Is OOP Popular? A New Paradigm, A Way of Viewing the World.
- Why Is OOP Popular? A New Paradigm, A Way of Viewing the World.

1.2) Abstraction 1hr

Layers of Abstraction, Other Forms of Abstraction.

1.3) Classes and Methods 1hr

Encapsulation, Class Definitions, Methods.

1.4) Messages, Instances, and Initialization 2hrs

Message-Passing Syntax, Statically and Dynamically Typed Languages, Accessing the Receiver from Within a Method, Object Creation, Pointers and Memory Allocation, Constructors{Constant Values}, Destructors and Finalizers.

1.5) Inheritance and Substitution 3hrs

An Intuitive Description of Inheritance, Inheritance in Various Languages, [Subclass, Subtype, and Substitution], Overriding and Virtual Methods, Interfaces and Abstract Classes, Forms of Inheritance, The Benefits of Inheritance, The Costs of Inheritance. Examples (Language independent)

1.6) Static and Dynamic Behavior 1hr

Static versus Dynamic Typing, Static and Dynamic Classes, Static versus Dynamic Method Binding.

1.7) Multiple Inheritance 1hr

Inheritance as Categorization, Problems Arising from Multiple Inheritance, Inner Classes.

1.8) Polymorphism and Software Reuse 1hr

Polymorphism in Programming Languages, Mechanisms for Software Reuse, Efficiency and Polymorphism, Will Widespread Software Reuse Become Reality?

1.9) Overloading and Overriding 3hrs

Type Signatures and Scopes, Overloading Based on Scopes, Overloading Based on Type Signatures, Redefinition, Notating Overriding, Replacement versus Refinement, Deferred Methods, Overriding versus Shadowing, Covariance and Contra variance.

2) Introduction to Java Programming Language 32hrs

2.1) An Introduction to Java 1hr

Java as a Programming Platform, The Java "White Paper" Buzzwords, Java and the Internet, A Short History of Java, Common Misconceptions About Java.

2.2) The Java Programming Environment 1hr

Installing the Java Development Kit, Choosing a Development Environment, Using the Command-Line Tools, Using an Integrated Development Environment, Compiling and Running Programs from a Text Editor, Running a Graphical Application, Building and Running Applets.

2.3) Fundamental Programming Structures in Java 2hrs

A Simple Java Program, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays.

2.4) Objects and Classes 2hrs

Introduction to Object-Oriented Programming, Using Predefined Classes, Defining Your Own Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages, Documentation Comments, Class Design Hints.

2.5) Inheritance 2hrs

Classes, Superclasses, and Subclasses, Object: The Cosmic Superclass, Generic ArrayLists, Object Wrappers and Autoboxing, Reflection, Enumeration Classes, Design Hints for Inheritance.

2.6) Interfaces and Inner Classes 2hrs

Interfaces, Object Cloning, Interfaces and Callbacks, Inner Classes, Proxies.

2.7) Introduction to GUI 2hrs

AWT Architecture, Light-Weight vs Heavy-Weight, AWT Event Model, AWT Event Hierarchy & Event Handling, Using Top-Levels, components and containers, Introduction to Layouts, Focus Architecture.

2.8) Graphics Programming 4hrs

Java2D Rendering Model, Strokes & Fills, Geometries, Fonts and Text Layout, Transformations, Display and manipulation of Images and off-screen buffers, Using Color, Printing through Java, Doing More with Images using Image IO, Hardware Acceleration and Active Rendering techniques.

2.9) User Interface Components with Swing 4hrs

The Model-View-Controller Design Pattern, Introduction to Layout Management, Text Input, Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes.

2.10) Deploying Applets and Applications **2hrs**

Applet Basics, The Applet HTML Tags and Attributes, Multimedia, The Applet Context, JAR Files, Application Packaging, Java Web Start, Storage of Application Preferences.

2.11) Exceptions and Debugging **2hrs**

Dealing with Errors, Catching Exceptions, Tips for Using Exceptions, Logging, Using Assertions, Debugging Techniques, Using a Debugger.

2.12) Streams and Files **3hrs**

The Complete Stream Zoo, ZIP File Streams, Use of Streams, Object Streams, File Management, New I/O, Regular Expressions.

2.13) Database Programming **5hrs**

The Design of JDBC, The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions, Advanced Connection Management, Introduction to LDAP.

3) Introduction to UML 14hrs

3.1) Introduction, An outline Development Process and Use cases **2hrs**

What Is the UML? How We Got Here, Notations and Meta-Models,
Why Do Analysis and Design?, Overview of the Process, Inception, Elaboration, Planning the Construction Phase, Construction, Transition, When to Use Iterative Development, Use Case Diagrams, Business and System Use Cases, When to Use Cases.

3.2) Class Diagrams and Advance Concepts **4hrs**

Perspectives, Associations, Attributes, Operations, Generalization, Constraint Rules, When to Use Class Diagrams, Stereotypes, Object Diagram, Class Scope Operations and Attributes, Multiple and Dynamic Classification, Aggregation and Composition, Derived Associations and Attributes, Interfaces and Abstract Classes, Reference Objects and Value Objects, Collections for Multivalued Association Ends, Frozen, Classification and Generalization, Qualified Associations, Association Class, Parameterized Class, Visibility.

3.3) Interaction Diagrams, Packages and Collaborations **1hrs**

Sequence Diagrams, Collaboration Diagrams, Comparing Sequence and Collaboration Diagrams, When to Use Interaction Diagrams, Packages, Collaborations, When to Use Package Diagrams and Collaborations.

3.4) State and Activity Diagrams **1hr**

Concurrent State Diagrams, When to Use State Diagrams, Decomposing an Activity, Dynamic Concurrency, Swimlanes, When to Use Activity Diagrams.

3.5) Physical Diagrams **1hr**

Deployment Diagrams, Component Diagrams, Combining Component and Deployment Diagrams, When to Use Physical Diagrams.

3.6) Case Studies **5hrs**

MAIN READING

1. Timothy Budo,"An Introduction to Object-Oriented Programming with Java", Pearson Education, 2009.
2. Martin Fowler,"UML Distilled: A Brief Guide to the Standard Object Modeling Language", 3rd Edition, Pearson Education, 2009.

SUPPLEMENTARY READING

1. H. Schildt, "The Complete Reference -Java2", Tata McGraw-Hill, 2008.
2. P. J Dietel and H. M Dietel, "Java How to Program", 7th Edition, Pearson Education, 2008.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2009.
4. Wu C Thomas, "Introduction to Object Oriented Programming with Java", 4th Edition, Tata McGraw-Hill, 2008.
5. Balaguruswamy E, "Programming with Java", Tata McGraw-Hill, 2007.
6. Muthu C, "Essentials of Java Programming", 2008, Tata McGraw-Hill, 2007.
7. Bhave M.P, Patekar S.A, "Programming with Java", Pearson Education, 2009.
8. Khurana Rohit , "Object Oriented Programming with C++", Vikas Publishing House

MAT.AE10.3-R0 : Advanced Animation Techniques

Objective of the Course

The objective of this course is to provide knowledge of simulation of movement created by displaying a series of pictures, or frames and develop concepts on platform and tools for creating 3D animated contents.

Outline of Course

Topic	Minimum No. Of Hours
1. Introduction	**10**
2. Sculpting a 3D Form	**12**
3. Spline Modeling.	**12**
4. Patch Modeling.	**10**
5. Painting Surface.	**06**
6. Light, Camera, Rendering	**10**

Lecture =60
Practical =60
Total class =120

MAT.AE10.3-R0 : Advanced Animation Techniques

Detailed Syllabus

1. **Introduction:** **10Hrs**

Introduction to 3D animation, History of 3D Animation, understanding of 3D coordinate systems, concept of Viewport, navigation in space, modeling of objects in 3D space, Viewing Transformations: Camera models (orthographic, perspective), modeling of light sources and shading techniques.

2. Sculpting a 3D Form: **12Hrs**

Creating a editable Mesh, sub object level, types of sub object level, Selection rollout, Boolean Function, Using Transformation tools, Select and Move tool, Selecting and Moving objects, Select and rotate.

3. Spline Modeling: **12Hrs**

Introduction to shapes, Creating shapes, working with lines, Designing line types, Spline sub-object, Customizing Splines, shapes, Making Splines 3D, Beveling a shape, Extrude modifier, Lathe modifier, The basics of Lofting.

4. Patch Modeling: **10Hrs**

Introduction to Patch Modeling, working with Patch Grides, Creating a Quad Patch, Working with Tri Patch, Subdividing Patches, Patch Typology.

5. Painting Surface: **06Hrs**

Bitmap versus Procedural material, Shader Shenanigans, Color maps, Importing Graphics for a material.

6. Light, Camera, Rendering: **10Hrs**

Standard Light objects, Lurking in the shadows, Basic light rigs, Additional Tidbits, Advanced Lighting, Virtual Camera, Building a shot.

Laboratory Assignments

Create an animated film of 1-2 minutes duration

MAIN READING

1. Exploring 3D Animation with Maya 6. -By Patricia Beckmann
2. Exploring 3D Modeling with 3ds Max 7 - By Steven Till