Multimedia Computing

Course Title: Multimedia Computing
Course No: CSC319
Nature of the Course: Theory + Lab
Semester: V

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course covers the basic concepts of Multimedia system including introduction, Sound / Audio System, Images and Graphics, Video and Animation, Data Compression, User Interfaces, Abstractions for programming and Multimedia Application

Course Objectives: This course covers three main objectives on multimedia system these are devices, systems and applications

Detail Syllabus:

Unit 1	Introduction to Computers	Teaching Hours (3)
Introduction	Introduction To multimedia system , history and applications	1 hr
Global structure of Multimedia	Device domain, system domain, application domain, cross domain with diagram	
Multimedia Application	Basic applications of multimedia system in all sectors	
Medium	The perception medium, the representation medium, the presentation medium, the storage medium, the transmission medium, the information exchange medium, representation values and representation spaces, representation dimensions	
Multimedia system and properties	Combination of media, independence ,computer support integration	1 hr
Characteristics of a Multimedia System	Multimedia systems must be **computer controlled**, Multimedia systems are **integrated**, the information they handle must be represented **digitally**, the interface to the final presentation of media is usually **interactive**.	
Challenges for Multimedia Systems	Synchronization, Sequencing, Distributed Network, Inter-media Scheduling	1hr
Components of a Multimedia System	**Capture devices, Storage Devices, Communication Networks, Computer Systems, Display Devices,**	
Unit 2	**Sound / Audio System**	**Teaching Hours (6)**
Concepts of sound system	Frequency, amplitude, Computer representation of sound, sampling rate, quantization, sound hardware	4
Music and speech	Basic MIDI concepts, MIDI devices, MIDI	

	messages, MIDI and SMPTE timing standards, MIDI software	
Speech Generation	Basic Notions, Reproduced Speech output, Time dependent sound concatenation, frequency – dependent sound concatenation	
Speech Analysis	Research area of speech analysis, speech recognition,	2 hr
Speech Transmission	Signal form coding, source coding in parametrized systems, recognition and synthesis systems	
Unit 3	**Images and Graphics**	**Teaching Hours (5)**
Digital Image Representation	Image format, storage image format	5 hrs
Image and graphics Format	Introduction about different Image and graphics Format	
Image Synthesis , analysis and Transmission	Computer Image processing, dynamics in graphics, the framework of interactive graphics systems, Graphics input/ output hardware, dithering, image analysis, Image recognition, Image recognition steps, Image transmission	
Unit 4	**Video and Animation**	**Teaching Hours (6)**
Video signal representation	Visual representation, Transmission, digitalization,	3 hr
Computer Video Format	Introduction to Computer video format	
Computer- Based animation	Input process, composition stage, inbetween process, Changing colours,	
Animation Language	Linear list notations, General purpose language, Graphical Languages,	
Methods of controlling Animation	Full explicit control, procedural control, constraint based systems, tracking live action, kinematics and dynamics,	2 hr
Display of Animation	Basic knowledge about Display of Animation	
Transmission of Animation	Basic knowledge about Transmission of Animation	1 hr
Unit 5	**Data Compression**	**Teaching Hours 8)**
Storage Space	Basic knowledge about Storage Space	4hr
Coding Requirements	Basic knowledge about Coding Requirements	
Source, Entropy and Hybrid Coding	Entropy coding, source coding, Huffman Encoding	

	Arithmetic encoding (introduction only), Run length encoding,	
Lossy Sequential DCT-based Mode	Steps of Lossy Sequential DCT- based Mode	4 hr
Expanded Lossy DCT-based Mode	Steps of Expanded Lossy DCT-based Mode	
JPEG and MPEG	JPEG and MPEG compression process	
Unit 6	**User Interfaces**	**Teaching Hours (5)**
Basic Design Issues	Architectural issues, information characteristics for presentation, presentation function, presentation design knowledge, effective human computer interaction	5 hr
Video and Audio at the User Interface	Classification of software: system software and application software, audio and video at the user interface	
User- friendliness as the Primary Goal	Easy to learn instruction, presentation, Dialogue boxes, additional design criteria, design specific criteria	
Unit 7	**Abstractions for programming**	**Teaching Hours (5)**
Abstractions Levels	Abstraction level of the programming of multimedia systems	2 hr
Libraries	Introduction to Libraries	
System Software	Data as Time capsules, data as Streams,	
Toolkits	Introduction to toolkits	3 hr
Higher Programming Languages	Media as types, Media as files, Media as processes, programming language requirements, Interprocess communication Mechanism, language,	
Object –oriented approaches	Class, object, Inheritance, Polymorphism, application-specific metaphors as classes, application-generic Metaphors as classes, devices as classes, processing units as classes, Distribution of BMOs and CMOS, Media as classes, Communication-specific Metaphors as classes	
Unit 8	**Multimedia Application**	**Teaching Hours (5)**
Media preparation and composition	Means, video support, scanner devices, recognition devices, tracking devices, motion based devices,	2 hr
Media integration and communication	Multimedia editors, Hypermedia/ Hypertext editors, authoring tools, tele-services, interactive services, Distributed services, Media Consumtion	
Media Entertainment	Virtual Reality, Interactive video, Interactive audio,	

	Games	
Telemedicine	Application of Telemedicine in Multimedia	
E-learning	Application of e-Learning in Multimedia	3 hr
Digital video editing and production systems	Application of in Digital video editing and production systems in Multimedia	
Video conferencing	Application of Video conferencing in Multimedia	
Video-on-demand	Application of Video-on-demand in Multimedia	

Laboratory Works:
After completing this course, students should have practical knowledge of different components of multimedia system, multimedia tools and applications
The laboratory work includes:

Macromedia FreeHand
Macromedia Flash
Swish Max
Macromedia Director
Morphing techniques
Audio and Video editing software
Data compression

Text Books:
1. Multimedia: Computing, Communications and Applications, Ralf Steinmetz and Klara Nahrstedt, Pearson Education Asia

Reference Books:
2. Multimedia Communications, Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education Asia
3. Multimedia Systems, John F. Koegel Buford, Pearson Education Asia

<div align="center">**Model Question**</div>

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Section A
Attempt any two questions. (2 × 10 = 20)
1. Explain application development life cycle of multimedia systems.
2. Explain with steps of the JPEG compression process in detail with example.
3. Explain the Huffman coding process to create Huffman code tree with example. Justify how Huffman code reduces the file size?

Section B
Attempt any eight questions. (8 × 5 = 40)
4. Compare quality with file size.
5. Explain the advantage and disadvantages of bitmap over vector image
6. Differentiate between Video and Animation.
7. Calculate the file size in bytes for a 30 second recording at 44.1 KHz, 8 bits resolution stereo sound.
8. Explain the lossy compression with example.
9. Explain the MPEG Compression with example.
10. Discuss the abstraction levels of the programming of multimedia system.
11. Discuss the User interface design.
12. Explain the applications of multimedia in telemedicine.