NATIONAL OPEN UNIVERSITY OF NIGERIA

CIT 742

Multimedia Technology

Course Guide

CIT 742 Multimedia Technology Course Guide

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Introduction

Multimedia Technology is a 2 credit unit course for students studying towards acquiring the Postgraduate Diploma in Information Technology and related disciplines.

The course is divided into 4 modules and 14 study units. It is aimed at giving the students a strong background on multimedia systems and applications. It gives an overview of the role and design of multimedia Systems which incorporate digital audio, graphics and video, underlying concepts and representations of sound, pictures and video, data compression and transmission. This course equally covers the principles of multimedia authoring systems, source coding techniques image histogram and processing.

At the end of this course, students should be able to describe the relevance and underlying infrastructure of the multimedia systems. They are equally expected to identify core multimedia technologies and standards (Digital Audio, Graphics, Video, VR, rudiments of multimedia compression and image histogram.

The course guide therefore gives you the general idea of what the course: CIT 642 is all about, the textbooks and other course materials to be referenced, what you are expected to know in each unit, and how to work through the course material. It suggests the general strategy to be adopted and also emphasizes the need for self assessment and tutor marked assignment. There are also tutorial classes that are linked to this course and students are advised to attend.

What You Will Learn In This Course

The overall aim of this course, CIT 742, is to boost the expertise of students in handling multimedia systems. This course provides extensive multimedia applications and reference materials designed to augment your multimedia expertise. In the course of your studies, you will be equipped with definitions of common terms, characteristics and multimedia techniques.

Course Aim

This course aims to give students an in-depth understanding of multimedia systems technology, data representation and rudiments of multimedia compression and image histogram. It is hoped that the knowledge gained from this course would enhance students' proficiency in using multimedia applications.

Course Objectives

It is appropriate that students observe that each unit has precise objectives. They are expected to study them carefully before proceeding to subsequent units. Therefore, it may be useful to refer to these objectives in the course of your study of the unit to assess your progress. You should always look at the unit objectives after completing a unit. In this way, you would be certain that you have accomplished what is required of you by the end of the unit.

However, below are overall objectives of this course. On successful completion of this course, you should be able to:

- Outline the development stages of multimedia
- Give a concise definition of multimedia
- State typical applications of multimedia
- Define the term 'hypermedia'
- Identify the difference between multimedia and hypertext
- Give a concise definition of multimedia
- State typical applications of multimedia
- Define the term 'hypermedia'
- Identify the difference between multimedia and hypertext
- Identify four characteristics of multimedia systems
- Outline the components of multimedia systems
- Describe the challenges for multimedia systems
- Describe the concept of an authoring system
- State the significance of an authoring system
- Discover the main authoring paradigms
- Give the authoring paradigm best suited for rapid prototyping
- State the correlation between iconic/flow control and frame authoring paradigm
- Distinguish between discrete and continuous media
- Explain the concept of synchronization
- Identify analog and digital signals
- State the common sources of text and static data
- Describe the terms graphics and images
- Describe the common procedure for capturing audio signals
- Explain the concept of a raw video

- List output devices for a basic multimedia system
- Describe the common modes of storage
- Identify the key issues I/O performance
- State the difference between DVD-Video and DVD-ROM
- List the key components of a RAID System
- Give the storage parameters that affect how data is stored
- Explain the theory of digitization
- Define the term 'sampling rate'
- List the typical audio formats
- Describe the concept of colour representation
- Identify the key role of the Adaptive Delta Pulse Code Modulation
- Give a concise definition of pixel
- State the factor that determines the quality of a monitors' image
- Discover typical image samples
- Identify how pixels are stored in different images
- Explain the concept of system dependent format
- List the popular system dependent formats
- Identify the standard system independent format best suited for photographic image compression
- Give a concise definition of colour
- Explain the concept of spectrum of light
- Describe the term 'chromatics'
- State the guidelines of using colour
- Explain what transform coding is
- Describe the notion of lossless compression
- Identify typical applications of lossy and lossless compression

- Discover how images are represented in the different forms of encoding
- Identify the basic lossy compression schemes
- State the significance of Fourier transform
- State the link between Fourier series coefficient and discreet cosine transform coefficient
- Give a concise description of the discrete time Fourier transform
- List the common image-coding standards
- Explain the properties of the two dimensional Fourier transform
- Explain the principle of video compression
- Describe the JPEG algorithm approach
- Explain the application of video compression
- Discover the sensitivity of human hearing
- Describe the notion of psychoacoustics
- Describe the concept of the histogram of an image
- Give an overview of image analysis
- Identify a bi-modal image
- State 2 main image enhancement operators
- Explain the notion of image restoration
- Define the term 'noise'

Working through this Course

To complete this course, you are required to study all the units, the recommended text books, and other relevant materials. Each unit contains some self assessment exercises and tutor marked assignments, and at some point in this course, you are required to submit the tutor marked assignments. There is also a final examination at the end of this course. Stated below are the components of this course and what you have to do.

Course Materials

The major components of the course are:

1. Course Guide

2. Study Units
3. Text Books
4. Assignment File
5. Presentation Schedule

Study Units

There are 14 study units and 4 modules in this course. They are:

Module 1 Introduction to Multimedia

Unit 1 Fundamentals of Multimedia

Unit 2 Multimedia Systems

Unit 3 Multimedia Authoring System

Module 2 Multimedia Systems Technology

Unit 1 Media and Signals

Unit 2 Media Sources and Storage Requirements

Unit 3 Output Devices and Storage Media

Module 3 Multimedia Data Representations

Unit 1 Basics of Digital Audio

Unit 2 Graphic/Image File Format

Unit 3 Standard System Formats

Unit 4 Colour in Multimedia

Module 4 Multimedia Compression

Unit 1 Rudiments of Multimedia Compression

Unit 2 Source Coding Techniques

Unit 3 Video and Audio Compression

Unit 4 Image Histogram and Processing

Recommended Texts

The following books are highly recommended as a supplement for learning this course:

1 Lowe and W. Hall, J. (1999). Hypermedia and the Web: An Engineering Approach, 1999 (ISBN 0-471-98312-8).

2 J.F.K, Buford. (1994). Multimedia Systems, ACM Press, 1994 (ISBN 0-201-53258-1).

3 Fluckiger. (1994). Understanding Networked Multimedia, Prentice Hall.

4 Boyle. (1998).Design for Multimedia Learning, Prentice Hall, (ISBN 0-13-242155-8)

5 P.W. Agnew and A.S. Kellerman. (1996). Distributed Multimedia: Technologies, Applications, and Opportunities in the Digital Information Industry (1st Edition) Addison Wesley.

6 Sloane, McGraw Hill. (2002). Multimedia Communication, (ISBN 0-077092228)

7 J. Vince, Addison Wesley, (1995).Virtual Reality Systems, (ISBN 0-201-87687-6)

8 Encyclopedia of Graphics File Formats, Second Edition by James D. Murray and William vanRyper, O'Reilly & Associates, 1996 (ISBN: 1-56592-161-5)

9 Vaughan, Tay, 1993, Multimedia: Making It Work (first edition, ISBN 0-07-881869-9), Osborne/McGraw-Hill, Berkeley, pg. 3.

10 J. G. Shuman, (2002). Multimedia Elements. *Multimedia In Action.* Vikas Publishing House Pvt Ltd.

11 H. Maurer, Addison Wesley, (1996). Hyperwave: The Next Generation Web Solution, (ISBn 0-201-40346).

12 T. Kientzle, Addison Wesley, 1997. A programmer's Guide to Sound, (ISBN 0-201-41972-6)

13 Watkinson, (2004). The Art of Digital Audio, -Heinmann. Synthesizer Basics, GPI Publications.

14 Brook and Wynne, Hodder and Stoughton (2001).Signal Processing: Principles and Applications.

15 A.M. Tekalp. (1995). Digital video processing, Prentice Hall PTR.

16 Intro. to Computer Pictures, http://ac.dal.ca:80/ dong/image.htm from Allison Zhang at the School of Library and Information Studies, Dalhousie University, Halifax, N.S., Canada

17 James D. Murray and William vanRyper, (1996). Encyclopedia of Graphics File Formats, Second Edition, O'Reilly & Associates.

Additional recommendations for understanding the concept of image histogram include:

- **R. Boyle and R. Thomas** 1988, *Computer Vision: A First Course*, Blackwell Scientific Publications, Chap. 4.
- **E. Davies** 1990, *Machine Vision: Theory, Algorithms and Practicalities*, Academic Press, Chap. 4.

- **Marion** 1991, *An Introduction to Image Processing*, Chapman and Hall, Chap. 5.
- **D. Vernon** 1991, *Machine Vision*, Prentice-Hall, p 49.

Assignment File

The assignment file will be given to you in due course. In this file, you will find all the details of the work you must submit to your tutor for marking. The marks you obtain for these assignments will count towards the final mark for the course. In sum, there are 14 tutor marked assignments for this course.

Presentation Schedule

The presentation schedule included in this course guide provides you with important dates for completion of each tutor marked assignment. You should therefore endeavour to meet the deadlines.

Assessment

There are two aspects to the assessment of this course. First, there are tutor marked assignments; and second, the written examination.

Therefore, you are expected to take note of the facts, information and problem solving gathered during the course. The tutor marked assignments must be submitted to your tutor for formal assessment, in accordance to the deadline given. The work submitted will count for 40% of your total course mark.

At the end of the course, you will need to sit for a final written examination. This examination will account for 60% of your total score.

Tutor-Marked Assignments (Tmas)

There are 14 TMAs in this course. You need to submit all the TMAs. The best 4 will therefore be counted. When you have completed each assignment, send them to your tutor as soon as possible and make certain that it gets to your tutor on or before the stipulated deadline. If for any reason you cannot complete your assignment on time, contact your tutor before the assignment is due to discuss the possibility of extension. Extension will not be granted after the deadline, unless on extraordinary cases.

Final Examination and Grading

The final examination for CIT 642 will be of last for a period of 3 hours and have a value of 60% of the total course grade. The examination will consist of questions which reflect the self-assessment exercise and tutor marked assignments that you have previously encountered. Furthermore, all areas of the course will be examined. It would be better to use the time between finishing the last unit and sitting for the examination, to revise the entire course. You might find it useful to review your TMAs and comment on them before the examination. The final examination covers information from all parts of the course.

Course Marking Scheme

The following table includes the course marking scheme

Table 1 Course Marking Scheme

Assessment	**Marks**
Assignments 1-14	14 assignments, 40% for the best 4 Total = 10% X 4 = 40%
Final Examination	60% of overall course marks
Total	100% of Course Marks

Course Overview

This table indicates the units, the number of weeks required to complete them and the assignments.

Table 2: Course Organizer

Unit	**Title of Work**	**Weeks Activity**	**Assessment (End of Unit)**
	Course Guide	Week 1	
Module 1	**Introduction to Multimedia**		
Unit 1	Fundamentals of Multimedia	Week 1	Assignment 1
Unit 2	Multimedia Systems	Week 2	Assignment 2
Unit 3	Multimedia Authoring Tools	Week 3	Assignment 3
Module 2	**Multimedia Systems Technology**		
Unit 1	Media and Signals	Week 4	Assignment 4
Unit 2	Media Sources and Storage Requirements	Week 5	Assignment 5
Unit 3	Output Devices and Storage Media	Week 6	Assignment 6
Module 3	**Multimedia Data Representation**		
Unit 1	Basics of Digital Audio	Week 7	Assignment 7

Unit 2	Graphical/Image File Format	Week 7	Assignment 8
Unit 3	Standard System Formats	Week 8	Assignment 9
Unit 4	Colour in Multimedia	Week 9	Assignment 10
Module 4	**Multimedia Compression**		
Unit 1	Rudiments of Multimedia Compression	Week 10	Assignment 11
Unit 2	Source Coding Techniques	Week 11	Assignment 12
Unit 3	Video and Audio Compression	Week 12	Assignment 13
Unit 4	Image Histogram and Processing	Week 13	Assignment 14

How to Get the Most from this Course

In distance learning, the study units replace the university lecturer. This is one of the huge advantages of distance learning mode; you can read and work through specially designed study materials at your own pace and at a time and place that is most convenient. Think of it as reading from the teacher, the study guide indicates what you ought to study, how to study it and the relevant texts to consult. You are provided with exercises at appropriate points, just as a lecturer might give you an in-class exercise.

Each of the study units follows a common format. The first item is an introduction to the subject matter of the unit and how a particular unit is integrated with the other units and the course as a whole. Next to this is a set of learning objectives. These learning objectives are meant to guide your studies. The moment a unit is finished, you must go back and check whether you have achieved the objectives. If this is made a habit, then you will increase your chances of passing the course. The main body of the units also guides you through the required readings from other sources. This will usually be either from a set book or from other sources.

Self-assessment exercises are provided throughout the unit, to aid personal studies and answers are provided at the end of the unit. Working through these self-tests will help you to achieve the objectives of the unit and also prepare you for tutor marked assignments and examinations. You should attempt each self-test as you encounter them in the units.

The following are practical strategies for working through this course

1. Read the course guide thoroughly

2. Organise a study schedule. Refer to the course overview for more details. Note the time you are expected to spend on each unit and how the assignment relates to the units. Important details, e.g. details of your tutorials and the date of the first day of the semester are available. You need to gather together all these information in one place such as a diary, a wall chart calendar or an organizer. Whatever method you choose, you should decide on and write in your own dates for working on each unit.

3. Once you have created your own study schedule, do everything you can to stick to it. The major reason that students fail is that they get behind with their course works. If you get into difficulties with your schedule, please let your tutor know before it is too late for help.

4. Turn to Unit 1 and read the introduction and the objectives for the unit.

5. Assemble the study materials. Information about what you need for a unit is given in the table of content at the beginning of each unit. You will almost always need both the study unit you are working on and one of the materials recommended for further readings, on your desk at the same time.

6. Work through the unit, the content of the unit itself has been arranged to provide a sequence for you to follow. As you work through the unit, you will be encouraged to read from your set books.

7. Keep in mind that you will learn a lot by doing all your assignments carefully. They have been designed to help you meet the objectives of the course and will help you pass the examination.

8. Review the objectives of each study unit to confirm that you have achieved them. If you are not certain about any of the objectives, review the study material and consult your tutor.

9. When you are confident that you have achieved a unit's objectives, you can start on the next unit. Proceed unit by unit through the course and try to pace your study so that you can keep yourself on schedule.

10. When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When the assignment is returned, pay particular attention to your tutor's comments, both on the tutor marked assignment form and also written on the assignment. Consult you tutor as soon as possible if you have any questions or problems.

11. After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed in this course guide).

Tutors and Tutorials

There are 8 hours of tutorial provided in support of this course. You will be notified of the dates, time and location together with the name and phone number of your tutor as soon as you are allocated a tutorial group.

Your tutor will mark and comment on your assignments, keep a close watch on your progress and on any difficulties you might encounter and provide assistance to you during the course. You must mail your tutor marked assignment to your tutor well before the due date. At least two working days are required for this purpose. They will be marked by your tutor and returned to you as soon as possible.

Do not hesitate to contact your tutor by telephone, e-mail or discussion board if you need help. The following might be circumstances in which you would find help necessary: contact your tutor if:

- You do not understand any part of the study units or the assigned readings.
- You have difficulty with the self-test or exercise.
- You have questions or problems with an assignment, with your tutor's comments on an assignment or with the grading of an assignment.

You should try your best to attend the tutorials. This is the only chance to have face-to-face contact with your tutor and ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefit from the course tutorials, prepare a question list before attending them. You will learn a lot from participating in discussion actively. Do have a pleasant discovery!