ONLINE COURSE FOR COMPUTING FUNDAMENTALS AT DEPARTMENT OF INDUSTRIAL MANAGEMENT UNIVERSITY OF KELANIYA

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Online Course for Computing Fundamentals at Department of Industrial Management University of Kelaniya

A dissertation submitted for the Degree of Master of Information Technology - eLearning

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Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of Mr. /Ms. J. Y. K. Hettiarachchi under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

Certified by:

Supervisor Name: Dr. Hakim Usoof

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Signature: Date:

Abstract

Information technology has permeated almost every aspect of people's lives. Technology is changing the way people, companies and institutions today disseminate, disseminate and communicate their messages, creating a ubiquitous environment and an accelerated information society. In an information society, achieving a high level of knowledge acquisition and management will be a key competitive advantage.

Against this backdrop, information technology has expanded education and added new dimensions of quality to the ever-changing definition of the quality of education. Educators now have to give a second thought to the very nature of learning, and they must seek alternative solutions to learning and development in the light of the rapid advancement of technologies. Teachers are encouraged to make greater use of these new technological developments. Students also face more flexible environments where self-education is possible and enable them to engage in lifelong learning.

As the eLearning Project, an interactive eLearning Course for "COMPUTING FUNDAMENTALS" that will aid undergraduate students to learn the fundamentals of Computing and apply them in their day-to-day operations at Department of Industrial Management (DIM), University of Kelaniya. (UOK) was developed.

In order to make effective course, requirements of it was identified by conducting needs assessment. By analysing the collected data, it was identified that all the teachers have positive attitude towards developing the eLearning course. By getting support from subject matter experts and analysed data, a syllabus was made with eight modules.

When developing eLearning environment it has been used variety of software including different types of multimedia applications to provide a variation of the content to the learner. Articulate Storyline, Adobe Creative Cloud, Audacity, Moodle were used as technologies in developing the course. As the course is designed for the undergraduate, an andragogy approach was implemented.

Course evaluation was done to identify the achievements and the drawback of the eLearning project. By analysing the data collected in the evaluation phase, it was identified that the eLearning course on Computer Fundamentals met the requirements of the learners as well as department.

Keywords: Fundamentals of Computer, eLearning, Interactive Learning

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Table 0.1: Abbreviations

Abbreviation	Description
VLE	Virtual Learning Environment
ICT	Information & Communication Technology
UOK	University of Kelaniya
DIM	Department of Industrial Management
CAL	Computer Aided Learning
HCI	Human Computer Interface

1. Chapter One: Introduction

1.1. Introduction

Information technology has permeated almost every aspect of people's lives. Technology is changing the way people, companies and institutions today disseminate, disseminate and communicate their messages, creating a ubiquitous environment and an accelerated information society. In an information society, achieving a high level of knowledge acquisition and management will be a key competitive advantage.

Against this backdrop, information technology has expanded education and added new dimensions of quality to the ever-changing definition of the quality of education. Educators now have to give a second thought to the very nature of learning, and they must seek alternative solutions to learning and development in the light of the rapid advancement of technologies. Teachers are encouraged to make greater use of these new technological developments. Students also face more flexible environments where self-education is possible and enable them to engage in lifelong learning.

Currently in Sri Lankan universities, e-Learning approaches are being used. However the studies describe, it is mostly implemented in an asynchronous way so that the collaboration between students is very low. In some cases, collaborative learning is practiced in a traditional teaching approach without the usage of electronic resources. Both cases result in lack of performance when compared with collaborating leaning. [1].

Therefore as the final year eLearning thesis, I thought of developing interactive content, teaching & learning activities and assessment for the online course for “COMPUTING FUNDAMENTALS” that will undergraduate students aid students to learn the fundamentals of Computing and apply them in their day-to-day operations at Department of Industrial Management (DIM), University of Kelaniya. (UOK)

1.2. The Context

The DIM of Faculty of Science, University of Kelaniya maintains high expectations for best practice and professional learning. Currently the department is conducting two Degree Programmes which are Bachelor of Science in Management and Information Technology and Bachelor of Science in Software Engineering.

Combining the fields of Management and Information Technology, the DIM meets the demands of global corporate. Its reputation for challenging the frontiers of knowledge with the support of an outstanding mix of academic faculty and world class facilities makes it an exciting, stimulating and fun place to learn and develop to one′s full potential in order to launch a successful professional career.

Vision: Become the centre of excellence in education in the field of Management and Information Technology in the South Asian region

Mission: In the areas of Management and Information Technology, we strive to excel in providing higher education to selected students, training industry clients, consultancy and research by collaborating with all stakeholders in the design and delivery of need oriented programs.

Since the prospective students come from different areas, backgrounds DIM has introduced "COMPUTING FUNDAMENTALS" as a core course for 1st year students to give them a knowledge of working in a IT environment. On completion of this course, the student should be able to,

- Describe the evolution of the computer
- Define basic computer architecture and operations of a computer
- Explain the concepts of data representation, computer arithmetic and Boolean algebra
- Describe the basic components of a CPU, its operations, and how it is used to execute programs
- Describe instruction set architecture and its role in program execution
- Explain how the combinational and sequential circuits perform computer operations
- Describe the systems concept
- Demonstrate data transmission between peripherals

1.2.1. Vision

The vision is to develop interactive content, teaching & learning activities and assessment for the above course that will aid students to learn the Fundamentals of Computing and apply them in their day to day operations.

1.2.2. Mission

To achieve the above vision undergraduate should have an interest to learn ICT in an interactive way. The traditional classroom teaching will not be ideal as it is more practical than the other subjects where students will use the knowledge and skill in their academic and professional life. So that sticking them to a classroom will restrict the time of learning.

In order to achieve the vision, the mission would be an interactive e-Learning course. With this online system, students will do a adhoc learning where still the theory classes will go in continues way the students will be able to take a quiz and measure their ICT competency and attend for the online classes. To make the interest the students need to be given the learning in an interactive and a creative environment. Such as, by attending discussion forums, chat sessions and sharing tools to collaborate their ideas with the peers. Movies and videos should be included to interact and understand the concepts clearly. Creative activities with familiar tools for the children such as presentations should be given for them to be constructive on what they are learning. Students will be totally in an online environment, where they follow the Demo videos and facilitator instructions to do the activities. Facilitator contact details and its policy procedures will also be included in the course.

1.3.Need/Purpose

E-Learning provides access to information, training and lifelong learning through the use of multimedia technologies. The recent growing trend of e-Learning uses certain facilities like infrastructure, technology and relevant content.

However, in Sri Lanka majority of educational institutes face challenges when it is to incorporate eLearning in their education. The main challenges are:

- Computer Literacy -Although students are generally tech savvy, and thus able to manage computers well, lack of computer literacy is a major issue among students today .Basic courses in computer literacy enhance students ′knowledge in the field; having a fundamental knowledge of computer hardware /software would help them participate in online classes without interruptions and hindrances .
- Self-Motivation and Mind-Set -Self-motivation is an e-Learning essential requirement . However, many online learners lack it .Learners often have the preconceived notion that traditional classrooms are more effective because they believe they can be more successful in a familiar environment .Only a positive attitude will help them overcome the challenges in eLearning .

When it comes to DIM 1st year students who follow BSc in MIT, the above problems are affecting when the students use the e-Learning environment in the University. From the course it give the knowledge to develop their skills on Computing Fundamentals at the completion of INTE 11512. But since they are from different backgrounds, sometimes this will be the first time they use a VLE. And the motivation to login or working with the system would be less because of the complexity of CAL System, less user friendliness, doesn't contain attractive content etc.

To overcome these problems this project aims is to develop a course that includes a variety of different multimedia elements in interactive, simple, learner friendly way by creating the e-Learning course attention grabbing and unique. Basically this instructional design will help leaners to connect with the curriculum and get more from the education experience. It would definitely help learners to enhance their knowledge and the skill on computing fundamentals.

1.4. Motivation

The main reason behind developing an e learning course is the author's interest in the course delivery methods. Providing an online course will offer the opportunity to support the diverse learner styles at the same time unlike face to face teaching.

At the same time teaching Fundamentals of Computing to the undergraduates following alternative methods can be used.

- Conducting face-to-face theory and practical classes – The time allocation for Theory and Practical classes are 5hrs per week (Theory – 2 hrs. Practical – 3 hrs.). There are more than 120 students attending for a theory class and 2 groups of 60 students for practical classes. Hence three demonstrators are allocating for a practical class, the time allocated for practical is not enough because
    - the competency level of students are different
    - the access for individual student is limited
    - will limited to 3 or 4 exercises related to software tools
- Students can follow online ICT courses available in the Internet – Most of courses recommended are not free. So students have to pay extra money for those courses. If some are free the content of the course is not much covered. Students may have to follow several courses to gain the knowledge. Lack of collaborative learning methods such as chatting and forums and evaluation methods such as tests and assessments which are useful methods in online learning to motivate and share the knowledge with the learners.

To overcome the difficulties mentioned above, the best solution is to develop an e-Learning course on Fundamentals of Computing to students to follow free of charge. It can be accessed from anywhere and at any time by the student to enhance their ICT Skills.

1.5.Project Goals, Objectives and Scope

This project is intended mainly to create awareness among the students about the learning of the ICT with interactive content, teaching & learning activities by increase the effectiveness of lecturer-student interaction and student-student interaction and assessment to enhance the knowledge and skills of ICT.

The final outcome of the solution should be to equip students with life time social value competencies so that they can become secured, respectful and responsible users of Information and Communication Technology.

1.5.1. Goal

Improve the performance of the undergraduate students by enhancing the knowledge and skills on ICT by introducing a virtual learning environment.

1.5.2. Objectives

To achieve the project goals following objectives should be met.

- Study the course INTE 11512: Computing Fundamentals
- Prepare course materials for above course
- Develop activities for each and every module to assess how the students learn
- Increase the engagement of students on working with VLE system
- Improve students' knowledge and skill on Computing Fundamentals

1.5.3. Scope

The course will specifically focus on:

- Electronic Based Learning – on the Moodle virtual learning environment.
- The target group is MIT 1st year students of DIM, UOK
- This will help users to learn via WWW in Blended / Hybrid Learning methodology
- The users will perform related activities online experience interactive e-Learning features.
- The users of the system will be Students, Lecturers and Demonstrators.
- All the Instructional design principles and e-Learning principles will be applied accordingly though out the design.
- The VLE includes a variety of different multimedia elements in interactive, simple, learner friendly ways which attract and engage the learners, interactive activities (quizzes) and the assignments.
- Online assessments, and self-assessment tasks and activities at the end of each lesson
- Rewards will be given after completing each Task, Module or Course

1.6. Assumptions

- The students and the lecturers are able to access Internet from University as well as from their own homes.
- The students will get the instructions on working with VLE before they are accessing to the system
- The department will have allocated practical times from to use this VLE

- The evaluation the system provides reflect exact knowledge user gained through system.
- Both students and other staff will be able to use the VLEs a Learning and Teaching support.

1.7. Feasibility Study

Feasibility study has conducted to objectively and rationally uncover the strengths and weaknesses of a proposed online course, opportunities and threats present in the natural environment, the resources required to carry through, and ultimately the prospects for success. The study inquires how the CAL System is going to be technically, economically, legally and operationally feasible.

1.7.1. Technical Feasibility

This assessment has carried out to determine whether the technology and the expertise to use the technology are available to handle completion of the project.

The system will be developed based on the Principals of Instructional design and e-Learning. And to develop the e-Learning product following Hardware and Software are required.

Table 1.1: Hardware & Software Requirements

Hardware Product	Software Product
• 4th Generation Intel® i3 Core™ processor • 8GB Memory • 500 GB Hard Drive • 17” Monitor • DVD Rom and writer • Printer • UPS • Router/Switch • NIC (Network Interface Card) • UTP cables • Wall sockets • RJ-45 Connectors • Power cables • Network cables • Firewall	• Microsoft Windows 10 • Moodle 3.0 • Adobe Creative Cloud • WampServer Version 3 (64 BITS) ○ Apache : 2.4.17 ○ MySQL : 5.7.9 ○ PHP : 5.6.16 PHP : 7 • Google Chrome • Microsoft Office 2013

When developing the course

To develop the course existing hardware can be used and no additional hardware required. As software Moodle LMS, audio editing, video editing and image editing software which can be easily found will be used. The developer has adequate knowledge on handling such software.

When following the course

All the other online courses currently delivering are hosted in CAL system which based on Moodle of University of Kelaniya. ICT Center of the university are responsible for maintaining and installing the systems therefore configuring server networks can be processed with the available resources.

Department itself has one computer laboratory with 100 machines to do practical classes. Otherwise the ICT Center has 6 Computer Labs equipped around 250 machines with the internet connection and multimedia facility. No additional hardware components are required to follow the course.

1.7.2. Economic Feasibility

The purpose of economic analysis is to determine whether there is an economic case for the investment decision.

Following budget describes what the economic cost of the project is.

Table 1.2: Budget for the eLearning System

Price	
Software Cost	
Adobe Creative Cloud	380,000.00
Microsoft Windows 10	18,000.00
Microsoft Office 2013	59,000.00
Moodle 3.0	-
WampServer Version 3 (64 BITS)	-
Google Chrome	-
Hardware Cost	
Dell Inspiron Desktop	59,000.00

Internet Connection (Annually)	10,000.00
Infrastructure (Electricity & Telephone etc.)	40000.00
Effort for 250 Man Hours	250,000.00
Total	**816,000.00**

To develop the course existing hardware and software such as Moodle LMS, audio, video and image editing software freely downloadable from the internet will be used. Other licensed software are available in the developer's computer. Hosting and other maintenance for servers will be doing by ICT Center so no initial cost required for hosting.

By considering the above we can say that the project is economically feasible.

1.7.3. Legal Feasibility

As the proposed CAL system has got the approval from DIM, This CAL System will follow the rules and regulations of DIM and UOK in order to accept by legally. Even when developing the software it will firmly achieve the rules which are required in developing software and Industrial Design.

1.7.4. Operational Feasibility

Operational feasibility is a measure of how well a specific solution will work in the organization. Since the system is a web based LMS, the teachers can access it from anywhere and at any time.

Stake holders of the system are

- Instructional Designer – to develop the system
- Hardware Technician – to giving support on Hardware
- Lecturers – to update the course materials and deliver the course contents
- Administrator – Handling Users
- Learners – to learn through the system

By considering the above we can say that the eLearning course is operationally feasible.

1.8.Project Deliverables

After developing the eLearning course the following will be delivered.

- Syllabus and teaching and learning materials.
- eLearning portal with the course on Computer Fundamentals will be developed in Moodle with below functionalities
    - User friendly Navigation though out the course flow
    - Curriculum and course management from the scratch
    - Online learning and activities
    - Grading and assessment and feedback mechanism
    - Assign Course and learning materials
    - Online Help support / Forum / Help Menu
    - Ability to Download all the Couse materials and perform activities
    - Integration with the social media
    - User manual.
- Project dissertation

1.9. Outline of the Dissertation

Chapter 1: Introduction - This chapter describes the introduction of the project "Online Course for Computing Fundamentals at Department of Industrial Management University of Kelaniya".

Chapter 2: Background - In chapter two the background information of the project is described, providing others approaches to solve the problem.

Chapter 3: Analysis - This chapter describes the analysis phase of the project with the analysis concepts used.

Chapter 4: Design - The chapter four provides a detailed explanation about the project design.

Chapter 5: Development and Implementation - Project development and implementation of the project describes within this chapter.

Chapter 6: Evaluation - This chapter describes how the course was evaluated including analysis results.

Chapter 7: Conclusion and Future Work - In this chapter conclusion and the future work to be carried out are discussed

References are stated at the end of the dissertation which is followed by the appendix and the list of figures, tables and abbreviations.

2. Chapter Two: Background

2.1. Literature Review

When considering an e-Learning environment the primary challenge is to get an idea about what the approaches, methodologies, techniques and other relevant tools available to develop interactive content, teaching and learning activities and assessment for a teaching Computing Fundamentals. During my literature review I went through number of articles, books on libraries, web sites which have published articles and tutorials relevant to my System that educates me a lot on the subject area. It gave a good knowledge on me to develop my skills and knowledge on programming and developing web sites that I need to be used within my solution.

When incorporating e-Learning in to Sri Lankan education system it faces some challenges and problems. The studies revealed that the lecturers are with positive attitude and supportive mind-set to embark on e-Learning initiative and it also identified a number of factors that could potentially influence the e-Learning implementation in the universities. [1]. The Research work found the critical factors affecting the eLearning in Sri Lankan universities are depending on the life cycle stage of the e-Learning. It is by means of motivation to use eLearning. [2]. And the insufficiency of the engagement of interactivity in the use of eLearning in Sri Lankan academic institutions was identified as a problem.

Organizing the e-Learning content around the core learning goals to foster enduring understandings in the students. To adapt goals according to student feedback and readiness I went through following questions.

- What knowledge do you want students to attain?
- What are the abilities you want students to attain?
- What should students be able to do with their learning after your course?
- How can they apply their new knowledge?

The Blooms Taxonomy (Figure 2.1) is one classification system was specifically designed to help instructors, and instructional designers, clearly define learning objectives and in turn create courses that meet learners′ needs. This will help to develop the instructional design phase in my E- Learning project.

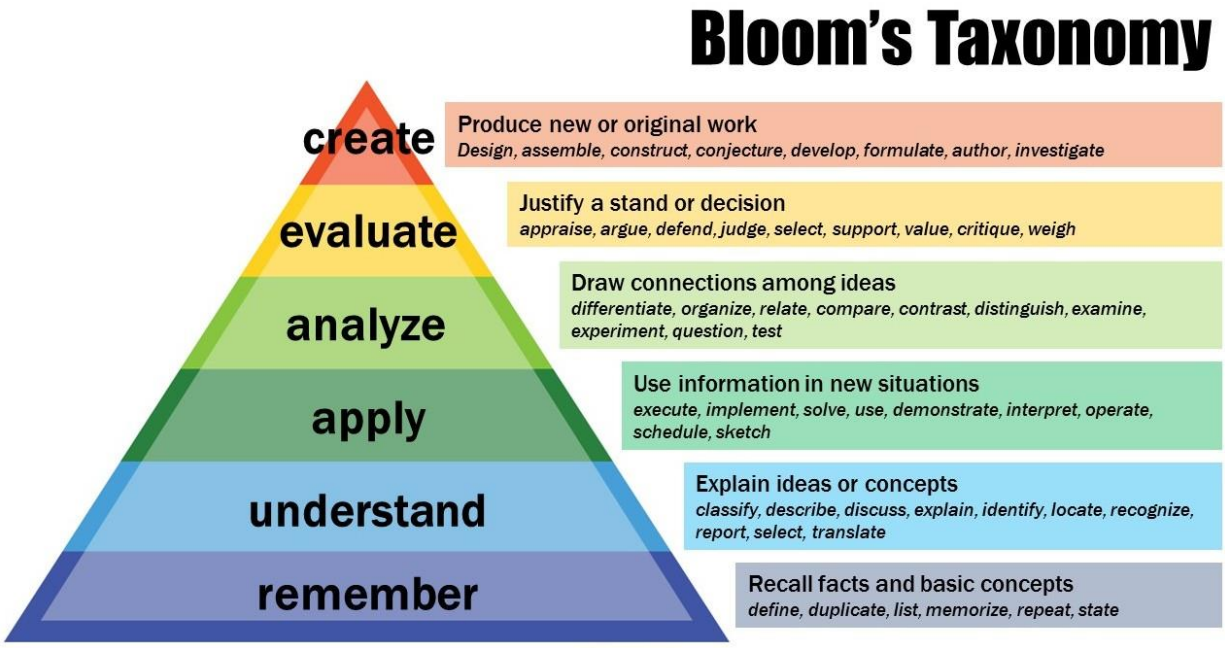


Figure 2.1 Blooms Taxonomy – Source www.cft.vanderbilt.edu

2.2.Review of Similar Systems

E-Learning systems are increasingly popular among academics and students because of their time and location independence, which gives learners a great deal of learning flexibility. Most e-Learning systems are deployed via the Internet. [3]

Numbers of online courses were identified on the Internet related to Fundamentals of Computing where students doesn't wanted to attend face to face classes. All these online courses are designed based on their requirement on creating awareness on Computing in their contexts. All the courses are interactively designed focusing the school children which have expected a positive outcome.

1. Fundamentals of Computing | Coursera [4]

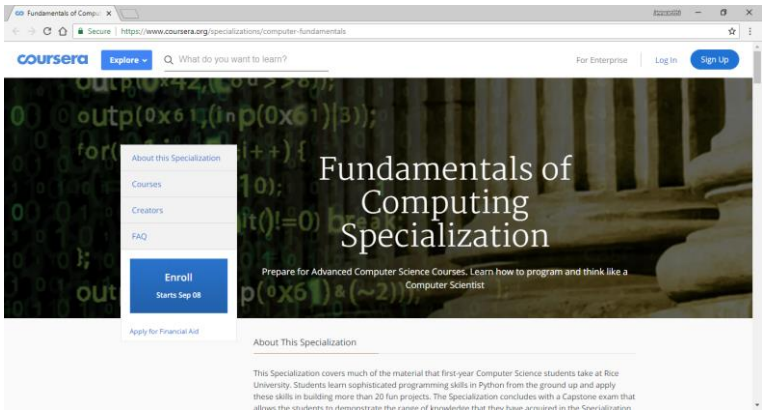


Figure 2. 2: Coursera - Source - https://www.coursera.org

Coursera has partnered with leading universities in the U.S. and around the world to provide online courses covering dozens of different subjects. Recently, they've introduced "specializations"—10 different course pathways that will lead to an official certification from an associated university. This Specialization covers much of the material that first-year Computer Science students take at Rice University.

2. Fundamentals of Computer Science | edX [5]

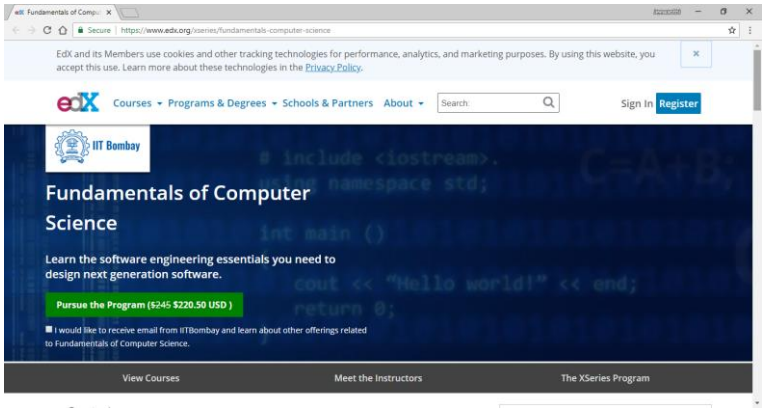


Figure 2.3: Fundamentals of Computer Science - Source - https://www.edx.org

Founded in 2012 by scientists from Harvard University and MIT with a "mission to provide quality education to everyone around the world," edX offers hundreds of rigorous courses spanning dozens of subjects, all of which feature real classes, from real universities, taught by real professors. In addition to these top-tier universities, edX has partnered with 90 other global institutions, such as Berkeley, Arizona State University, and more. In this 5 course XSeries, student will learn the importance of software design, programming skills, data structures, and algorithm principles, which drive every electronic gadget that we see in the market.

3. Free Computer Classes – Online Computer Courses | Alison [6]

ALISON is a free, online platform for individual learners to learn skills at a certified, standards based level. They offer over 300 courses to choose from, ranging from IT to Business Management to English Language Skills to Personal Development courses. The courses they offer are free to all individual learners, while a nominal fee is charged for ALISON Manager, which allows a company to form and monitor a group of learners. An understanding of computer basics is invaluable, and Alison provides free, online courses to help you get started.

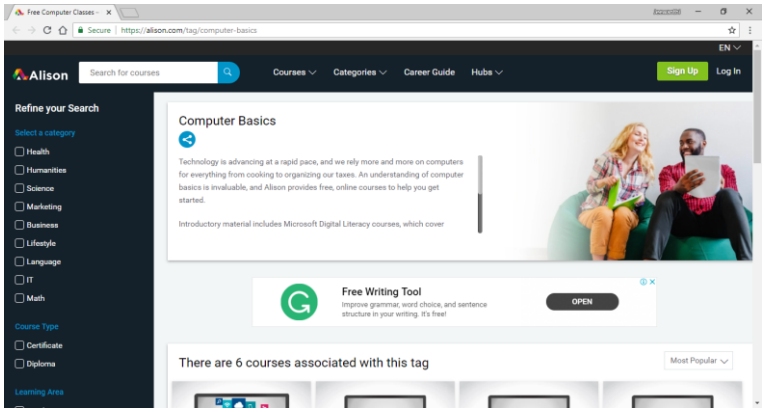


Figure 2.4 - Free computer Classes | Alison Source - https://alison.com

Currently universities also introduced and working with the Learning Management Systems to teach the content as a supporting tool. I also reviewed the CAL system which Department of Industrial Management [7] and the Course Fundamentals of Computing.

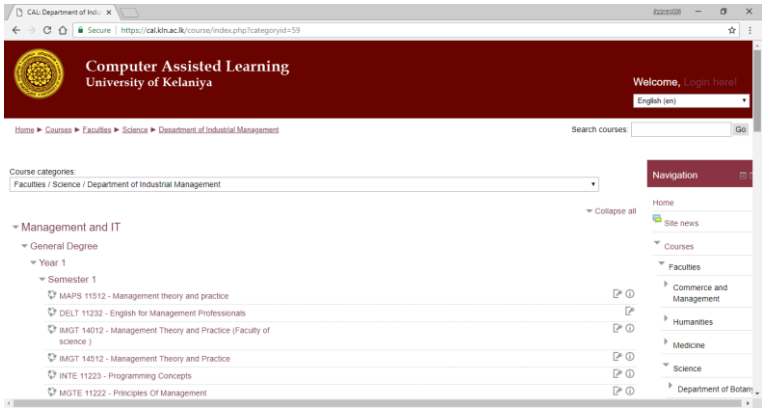


Figure 2.5: CAL System, University of Kelaniya Source - cal.kln.ac.lk/

However, based on the research that I have made several different assumptions can be made in my project such as:

- The learners of the system should have the basic knowledge to use an online system
- Demonstrations on how to use e-Learning system is a compulsory requirement.
- Learners will attract by adding multimedia to the learning content
- The assessments will reflect the knowledge and the awareness that learner possesses from following the course.

2.3.Design Principle and Guidelines

Following design principle and guidelines will be utilizing in the design of e-Learning module.

- Simplicity
- Visual hierarchy
- Legibility
- Consistency
- Familiarity
- Accessibility
- Focal points

Following Mayor's 12 principles of Multimedia [8] have been considered and applied when creating learning content on the system.

1. Coherence Principle – People learn better when extraneous words, pictures and sounds are excluded rather than included.
2. Signaling Principle – People learn better when cues that highlight the organization of the essential material are added.
3. Redundancy Principle – People learn better from graphics and narration than from graphics, narration and on-screen text.
4. Spatial Contiguity Principle – People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.
5. Temporal Contiguity Principle – People learn better when corresponding words and pictures are presented simultaneously rather than successively.
6. Segmenting Principle – People learn better from a multimedia lesson is presented in user-paced segments rather than as a continuous unit.
7. Pre-training Principle – People learn better from a multimedia lesson when they know the names and characteristics of the main concepts.
8. Modality Principle – People learn better from graphics and narrations than from animation and on-screen text.
9. Multimedia Principle – People learn better from words and pictures than from words alone.
10. Personalization Principle – People learn better from multimedia lessons when words are in conversational style rather than formal style.
11. Voice Principle – People learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice.
12. Image Principle – People do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen.

3. Chapter Three: Analysis

3.1. Need Assessment Plan

3.1.1. Objectives

The main objective of this need assessment plan is to identify the current course delivery metho ds and to what extent students have achieved the course learning objectives from the course.

This will also assess:

- Is program goals and student learning outcomes to course syllabus?
- What assessment methods need to be used to measure students′ skills and knowledge?
- How can I use the data to improve materials, instruction, and assessment?
- What are the teacher′s expectations on New Learning Management System?

3.1.2. Target audience

- Performers - 1st year students of DIM, Faculty of Science, University of Kelaniya who has registered for Bachelor of Science in Management and Information Technology (Special) Degree Program
- Decision makers - Subject Specialists, Staff of DIM, Faculty of Science, University of Kelaniya - (Head of the Department, Lecturers, Demonstrators)

3.1.3. Sampling procedures

- Convenience or Judgmental Sampling – This course ″INTE11512 - Computing Fundamentals″ is going to be developed for all the 1st year students who has registered for Bachelor of Science in Management and Informatio n Technology (Special) Degree Program. So I′m planning to take students of the academ ic year 2015/2016, who are currently following the course.

3.1.4. Data collection methods

- Interviews
- Indirect examination of performance or productivity measures
- Questionnaires

3.1.5. Specifications for instruments and protocols

- Interview guides
- Observation guides
- Questionnaires

3.1.6. Methods of data analysis

I′m planning to use descriptive data analysis method in this need assessment study. Descriptive method is always describing situations. It doesn't′t make accurate predictions, and not determine cause and effect. With this method I can use observational methods and survey methods within this assessment.

3.1.7. Descriptions of how decisions will be made based on the data

- Interviews
  - To check what are the lessons learned with previous academic years
  - To identify what are the teacher′s expectations on New Learning Management
- Indirect examination of performance or productivity measures system
  - To track what are the results earlier students has got for the course
  - To observe whether program goals and student learning outcomes to course syllabus
- Questionnaires
  - To learn from which backgrounds the students are coming from
  - To identify what are students′ interests? (whether they like to watch videos, read books, listen to audio clips etc.)
  - To check whether students have achieved the course learning objectives from the course

3.2.Need Analysis

Need Analysis is the process of identifying and evaluating needs in a community or other defined population of people. The identification of needs is a process of describing ″problems″ of a target population and possible solutions to these problems. Needs assessments are conducted to help program planners identify and select the right job/Tasks before doing the job right.

To identify problem is, to find the problem infected audience, analyse them and provide adequate solution this need analysis was conducted according to the created Need Assessment Plan.

The main objective of this need assessment plan was to identify the current course delivery methods of "INTE11512 - COMPUTING FUNDAMENTALS" course and to what extent students have achieved the course learning objectives from the course. This assessed:

- What are the characteristics of my audience?
- Is program goals and student learning outcomes to course syllabus?
- What assessment methods need to be used to measure students′ skills and knowledge?
- How can I use the data to improve materials, instruction, and assessment?
- What are the teacher's expectations on New Learning Management System?

3.2.1. Learner Analysis

The target audience of the course is 1st year students of DIM, Faculty of Science, University of Kelaniya who has registered for Bachelor of Science in Management and Information Technology (Special) Degree Program.

In order to carry out interviews and questionnaires (Appendix A), the sample set of users were selected using Convenience or Judgmental Sampling method. Sampling is the use of a subset of the population to represent the whole population or to inform about processes that are meaningful beyond the particular cases, individuals or sites studied. According to the problem the selected sample groups were students who in;

- Age Groups: 22 - 28
- Gender: Male & Female
- Level: 1st Year

3.2.2. Teacher Analysis

Interviews and questionnaires (Appendix B), conducting with teachers of the department to analyse their views on learning management systems and proposed online course to increase the quality and the user-friendliness of the programme. .

3.2.3. Content Analysis

Content analysis (Appendix C), is conducted to see whether the studying documents and communication artefacts, which can be texts of various formats, pictures, audio or video are prepared according an eLearning environment.

4. Chapter Four: Design

4.1. Introduction

Developing an online course that is engaging, promotes interaction, motivates learners, and above all facilitates learning is easier said than done. It′s even more challenging when trying to modify a face-to-face course for the online format. Instructional Design is the process of designing and developing instructional courses or materials that bring greater efficiency and effectiveness to acquiring knowledge or skills for learners.

This Instructional Design process has done for the online course, "**INTE11512 COMPUTING FUNDAMENTALS**" at DIM, University of Kelaniya. This section is about giving an idea on overall computer system to 1st year undergraduate students. The Design Document contains the Introduction of the document, Course maps for the design, lesson template, overall story boards and detailed storyboards that related to the lesson, "section 1: Introduction to Computers".

The DIM of Faculty of Science, University of Kelaniya maintains high expectations for best practice and professional leaning. Currently the department is conducting two Degree Programmes which are Bachelor of Science in Management and Information Technology and Bachelor of Science in Software Engineering.

4.2. Course Maps

4.2.1. Course Map -Level 1

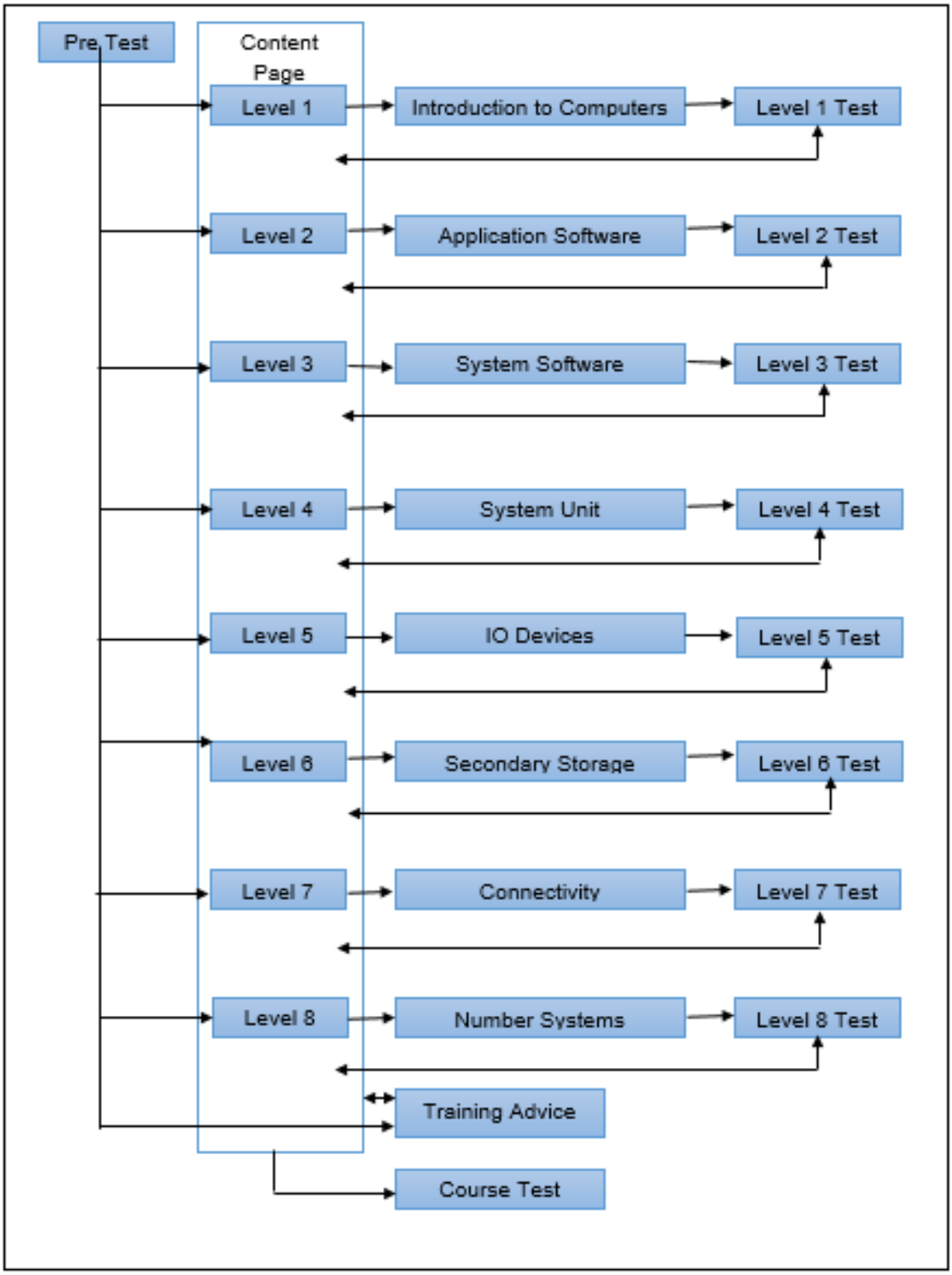


Figure 4.1: Course Map - Level 1

4.2.2. Course Map -Level 2

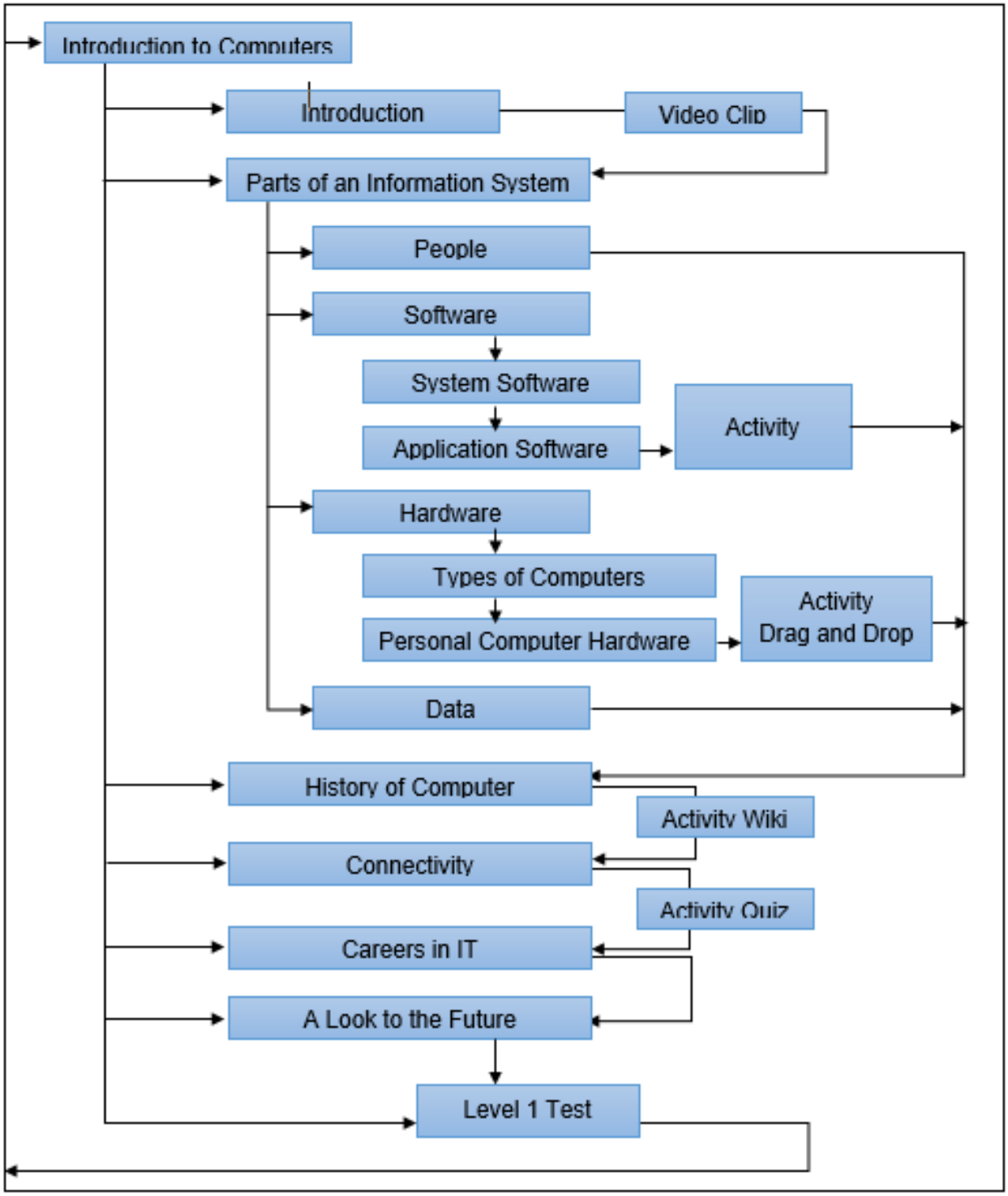
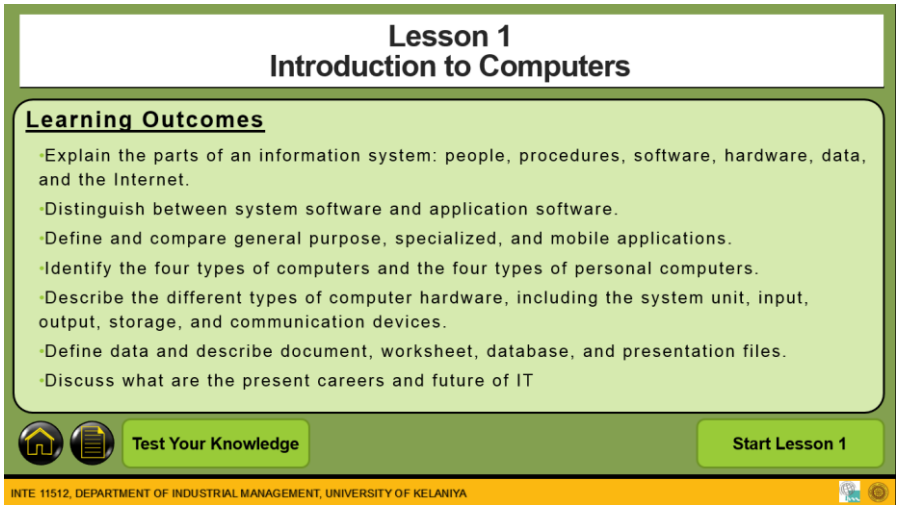


Figure 4.2: Course Map - Level 2

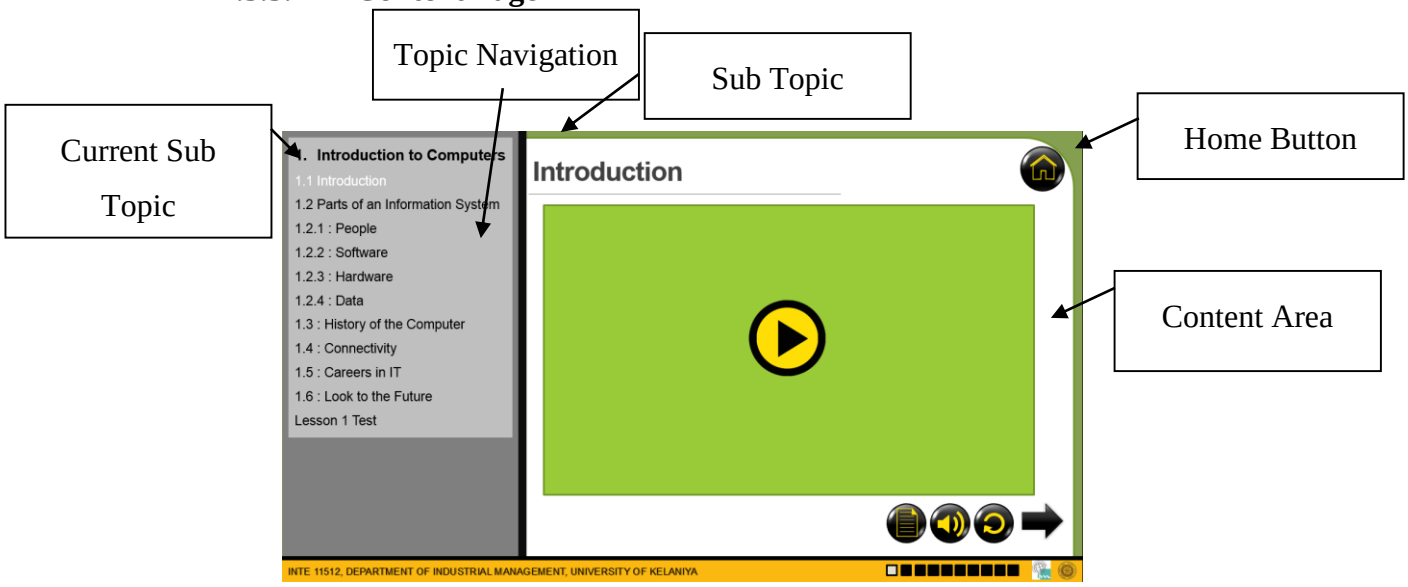
4.3.The Template of the Lesson Page

4.3.1. Lesson Title Page

4.3.2. Leaning Outcomes Page



4.3.3. Content Page



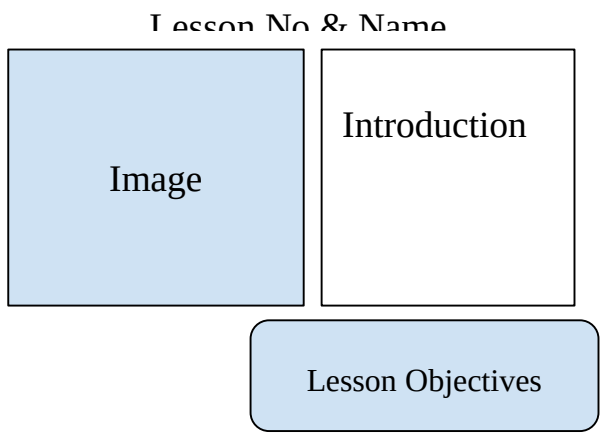
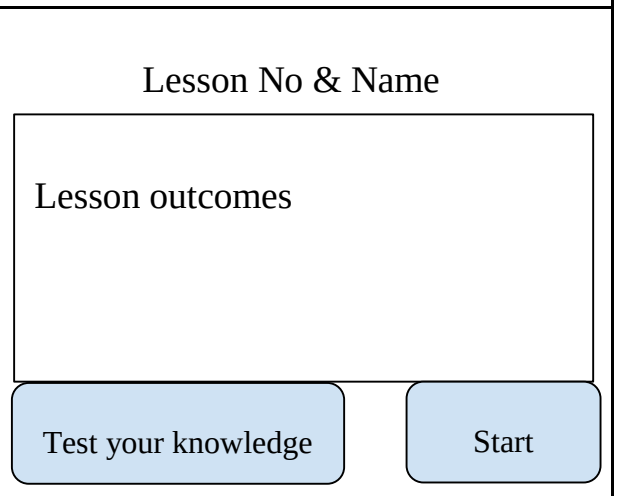
4.3.4. Button Types

	Forward Button		Back Button
	Forward Button Disabled		Back Button Disabled
	Home Button		Home Button Disabled
	View Text Button		Speaker / Mute Button
	Activity Button		Replay Button
	Other Buttons		
		Progress Bar	
1 2 3 4 5 6 7 8 9 10		Question Navigation Bar	

4.4. Overall Story Boards

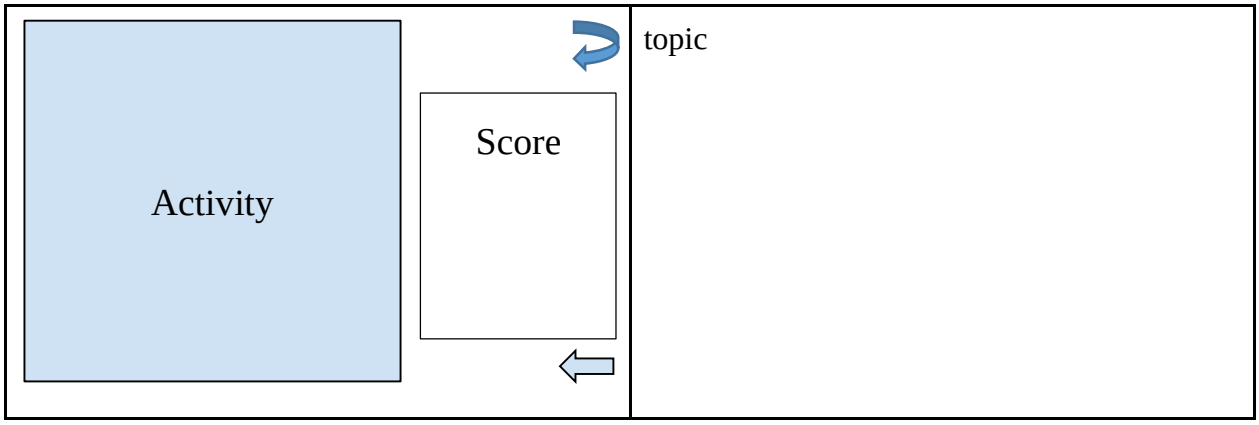
4.4.1. Lesson 1: Introduction to Computers

Table 4.1: Overall Story Board

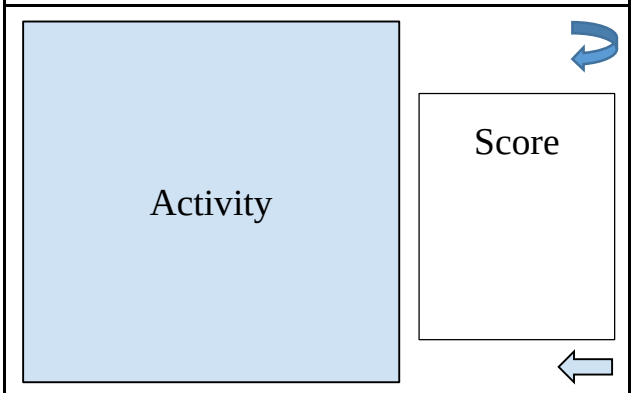
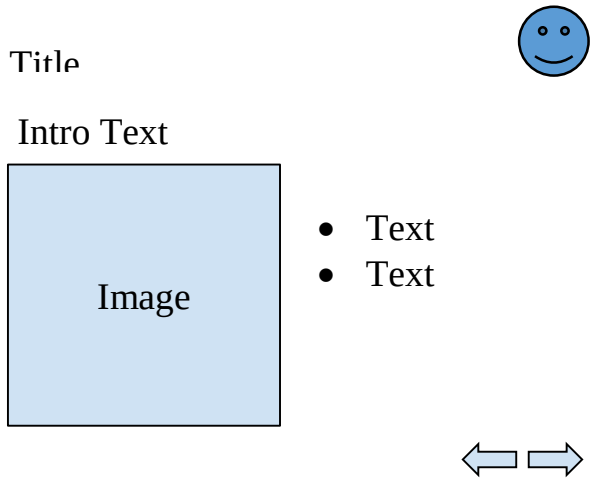
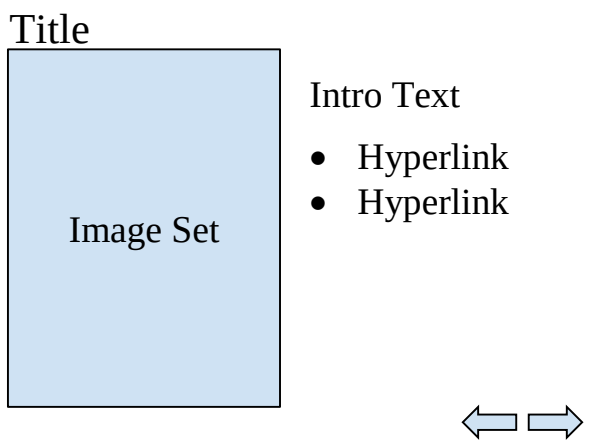
Visual	Explanation
1: Introduction to Computers	This is the Intro slide. This contains the Lesson Number and the Name. The ice breaker to start the lesson also displayed in this slide.
	
1.1.1: Lesson Objectives	This slide contains the learning objectives of the lesson. Student can test the knowledge before starting the lesson witch directs to Lesson test. Else the student can start the lesson.
	
1.1.2 : Introduction	This slide contains the introduction animation

Lesson No & Name Animation	of Introduction to computer. This contains Text, Audio and Video.

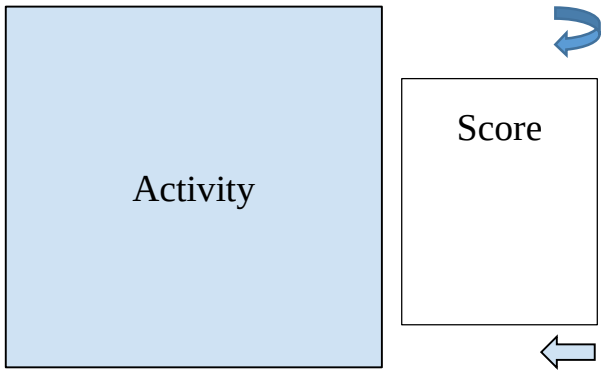
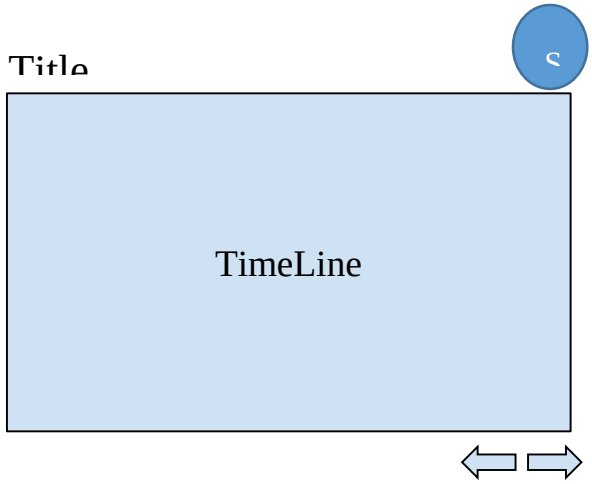
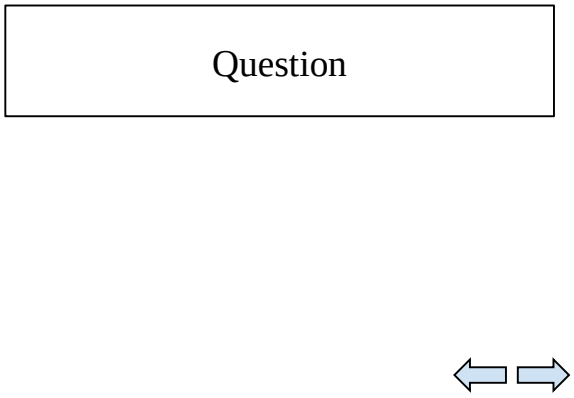
1.2 : Parts of an Information System Title Image Intro Text • List Item • List Item • List Item • …	This is the content slide for Parts of an Information System. This contains the title, Intro image and texts with links.
1.2.1 : People Title Animation	People: Parts of an information system will display in this slide. Animation will be added to this slide. By clicking activity icon, it will link to the activity related to this topic.
1.2.1.1 : Activity 1	Fill in the blanks activity regarding a people

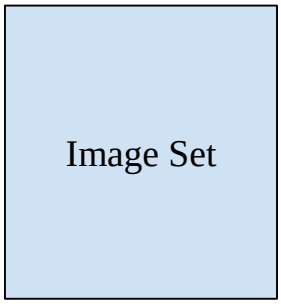
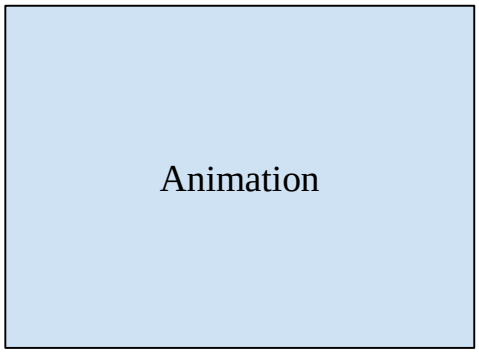

Activity
Score
topic

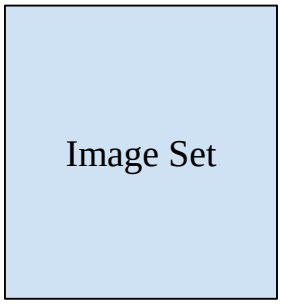
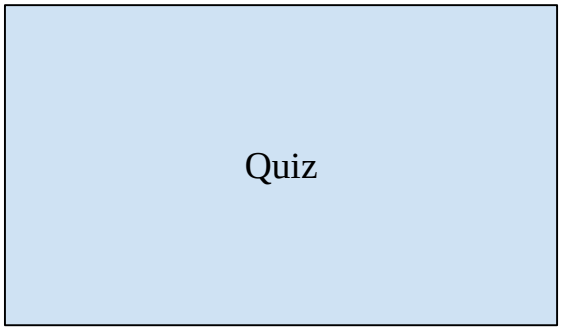
1.2.2 : Software Title Intro Text Image Image	This slide is about Software. The images will link to System Software and Application Software. The student can link to the activity from here.
1.2.2.1 : System Software Title Image Set Intro Text • Hyperlink • Hyperlink	
1.2.2.2 : Application Software Title Image Set Intro Text • Hyperlink • Hyperlink	

1.2.2.3 : Activity 2 	Drag and Drop activity regarding the Software topic
1.2.3 : Hardware 	
1.2.3.1 : Types of Computer 	

<table>
<tr><td>1.2.3.2 : Personal Computer Hardware</td><td rowspan="2"></td></tr>
<tr><td>Title
Image Set
Intro Text
• Hyperlink
• Hyperlink
• ..</td></tr>
<tr><td>1.2.3.3 : Activity</td><td rowspan="2">Drag and Drop activity regarding the Hardware Topic</td></tr>
<tr><td>Activity
Score</td></tr>
<tr><td>1.2.4 : Data</td><td rowspan="2"></td></tr>
<tr><td>Title
Intro Text
Image Set
Intro Text
• Hyperlink
• Hyperlink
• ..</td></tr>
</table>

1.2.4.1 : Activity	
	
1.3 : History of the Computer	
	
1.3.1 : Group Activity	
	A Wiki for students. This will be a group activity where students can get together online and answer the questions.

1.4 : Connectivity	
Title Intro Text  Image Set Intro Text • Hyperlink • Hyperlink • .. 	
1.5 : Careers in IT	
Title   Animation 	
1.5.1 : Discussion forum	
Question 	

1.6 : Look to the Future	
Title Intro Text  Image Set Intro Text • Hyperlink • Hyperlink • .. 	
1.7 : Level 1 Test	
Title  Quiz 	This is about lesson 1 Test. A quiz with MCQs will added in this quiz.

4.5.Detail Story Boards

4.5.1. Title Slide

Table 4.2: Detailed Story Board

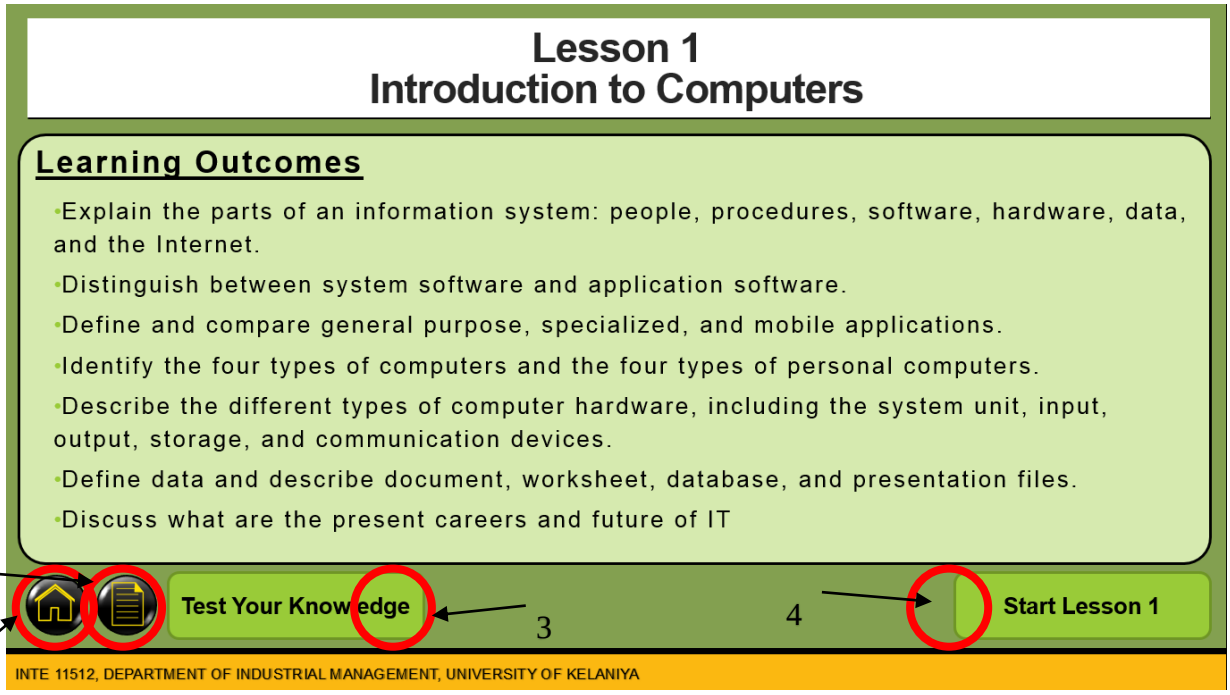
Course Name: INTE11512 COMPUTING FUNDAMENTALS		Storyboard File no. 0x.0y.01.00
Course section: 1.1		
Lesson Name: Introduction to Computers		ID's name:
Objective(s):		SME's name:
Page Title: Introduction to Computers	Page no. 1	CD's name:
Date Designed:	Date SME contributed:	Date verified:
Design		

1

Special Comment(s):
The arrow should link to page no. 2 of section 1.1.

Course Name: INTE11512 COMPUTING FUNDAMENTALS		Storyboard File no. 0x.0y.01.00
Course section: 1.1.1		
Lesson Name: Introduction to Computers		ID's name:
Objective(s):		SME's name:
Page Title: Introduction to Computers	Page no. 2	CD's name:
Date Designed:	Date SME contributed:	Date verified:

Design



2

3

4

1

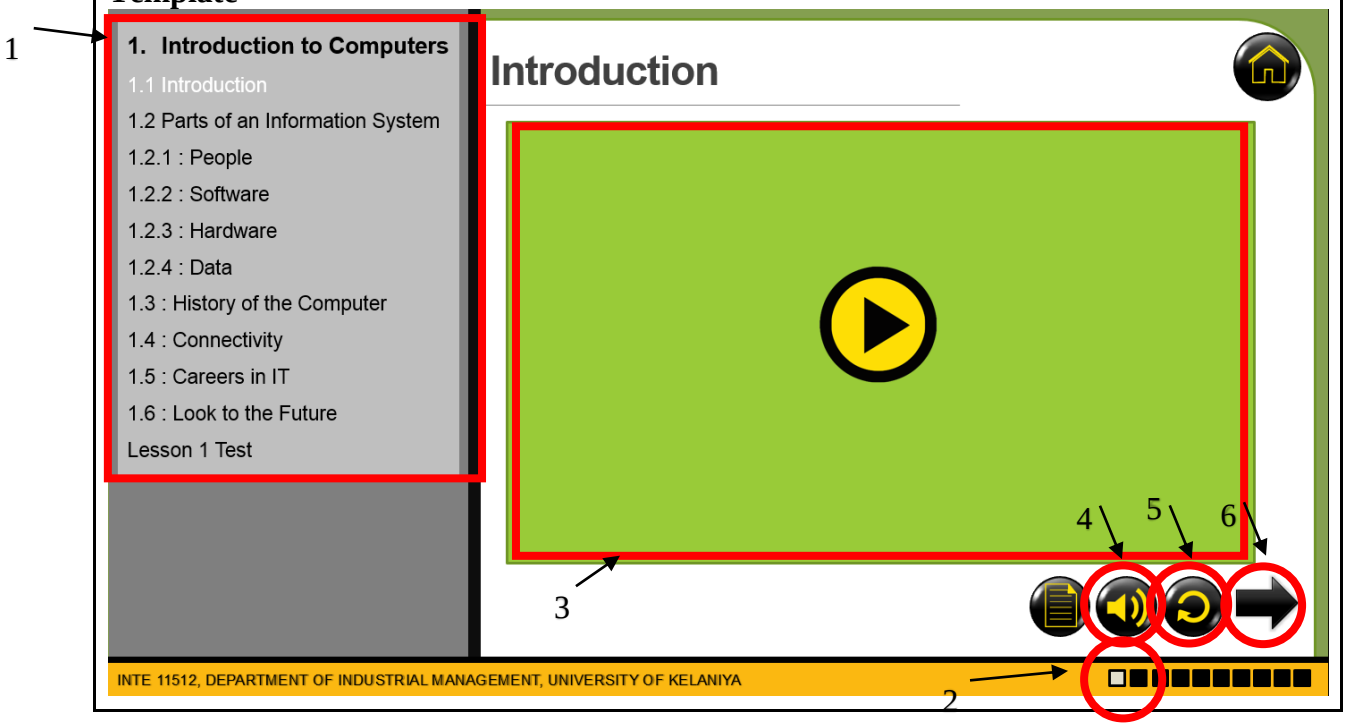
Special Comment(s):

1. This is "Home" button. This should link to "Course Content Page".
2. This is "Print" button. Using this student should be able to read the text version of the slide. And also they can print it.
3. Students should be able to do the quiz of the lesson by clicking "Test your knowledge" link. Link this to page 1 of section 1.7.
4. Link this with page 1 of section 1.2 to start the lesson 1.

4.5.2. Content Slide

Course Name: INTE11512 COMPUTING FUNDAMENTALS		Storyboard File no. 0x.0y.01.00
Course section: 1.1.2		
Lesson Name: Introduction to Computers		ID′s name:
Objective(s): ● Explain the parts of an information system: people, procedures, software, hardware, data, and the Internet		SME′s name:
Page Title: Introduction	Page no. 1	CD′s name:
Date Designed:	Date SME contributed:	Date verified:
Design		

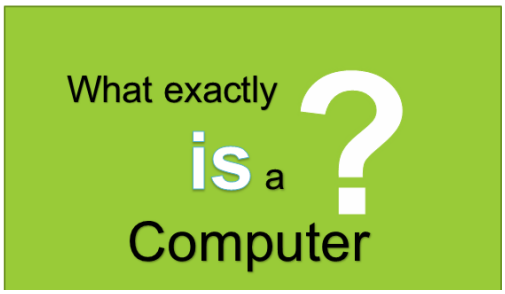
Template



Video Scenes

1. 

2. 

3. 

4. 

5. 

Special Comment(s):

Template

1. This is the content area where student can navigate through the sub topics of the lesson. The current topic should highlighted in white color.
2. This progress bar used to visualize the progression of the lesson. The current slide should emphasize in white color.
3. Content area of any lesson topic. This introduction slide contains a video within this area.
4. Speaker icon should allow students to control the sound of playing video audio or animation.
5. This button allows to replay the video here. But this will also use to replay an audio, animation or an activity
6. Link this with page 1 of section 1.1.2.

Video Scenes

1. Animate the text and image. Background music : futuresoundfx-740.mp3 (Link : https://www.freesound.org/browse/tags/sound-effects/?page=2#sound)
2. This image will be zoomed by starting the boy looking at screen to the rest.

   Audio

   Today, computers are all around.

   From desktop computers to smartphones, they're changing the way we that live our lives.

   They are used in industries, schools, government offices, and shops.

   You can use computers to communicate with your family and friends, create a household budget, book travel and movie tickets, or manage your business.

   Transition : Fade

3. The text should animate.
   Audio
   But have you ever asked, "***What exactly IS a computer?***"
4. ***Audio***
   Computer, is an electronic device that manipulates **data** in to **information**.

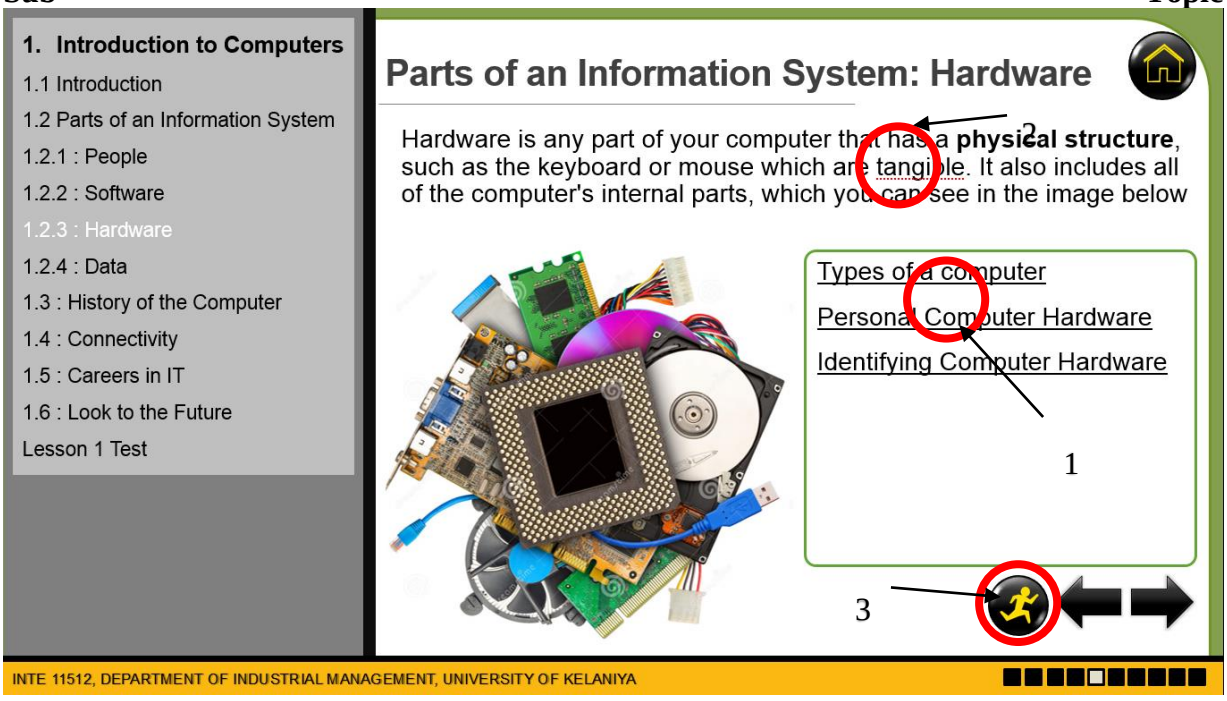
5. The binary.jpg image comes first as the background then, text.jpg, image.jpg, video.mp4, website.jpg, game.jpg files come one by one to the top of the binary image. Use fade animation for text, image, etc files.

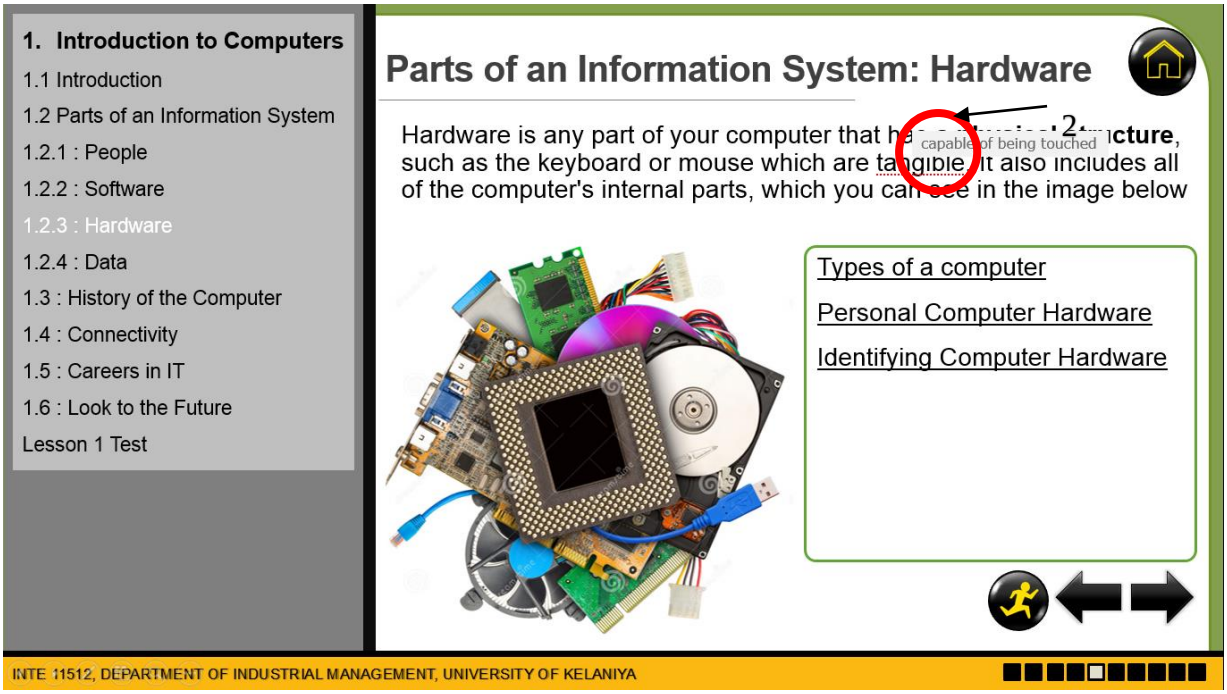
   Audio
   Computer sees data as **1's and 0's**, but it knows how to combine them into more complex things, such as a **text, photograph, a movie, a website, a game** and much more.

4.5.3. Activity :Drag and Drop

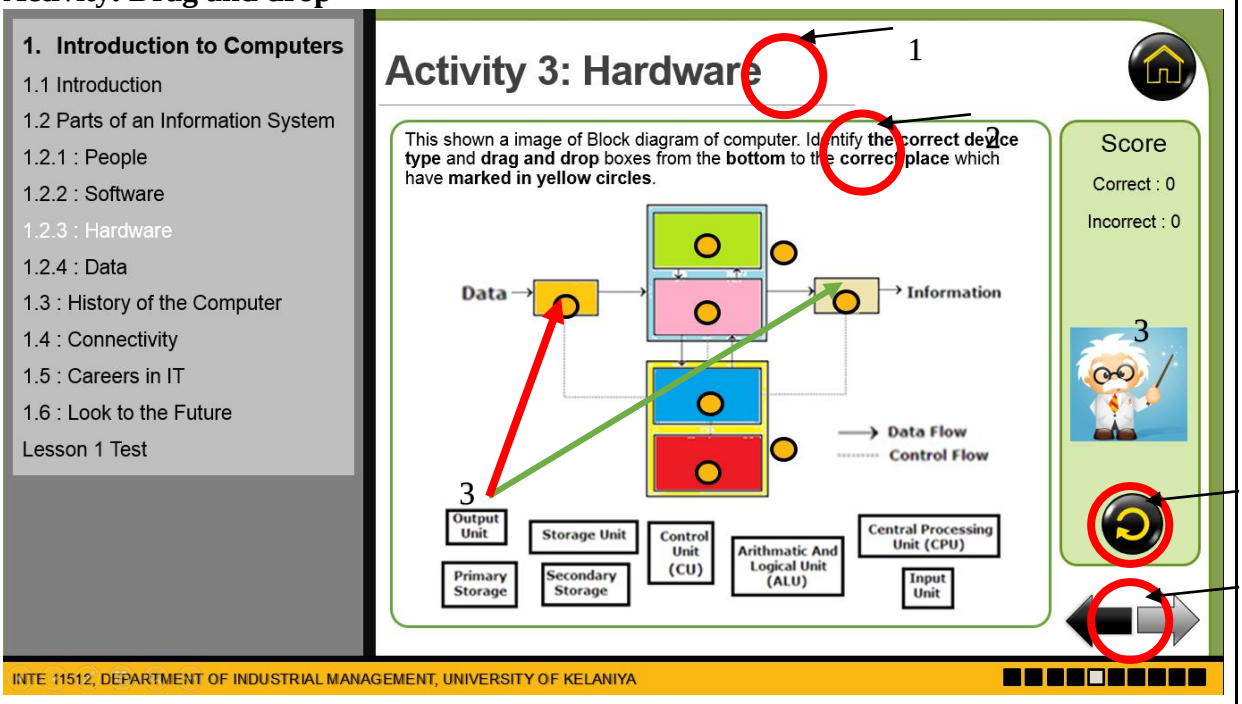
Course Name: INTE11512 COMPUTING FUNDAMENTALS		Storyboard File no. 0x.0y.01.00
Course section: 1.2.1		
Lesson Name: Introduction to Computers		ID′s name:
Objective(s): ● Define and compare general purpose, specialized, and mobile applications. ● Identify the four types of computers and the four types of personal computers. ● Describe the different types of computer hardware, including the system unit, input, output, storage, and communication devices		SME′s name:
Page Title: Hardware	Page no. 1	CD′s name:
Date Designed:	Date SME contributed:	Date verified:
Design		

Sub **Topic**





Activity: Drag and drop



Special Comment(s):

Sub Topic

1. These hyperlinks links to sub topics of the content.
    a. Types of a computer: Link with storyboard 1.1.2.3.1
    b. Personal computer hardware: Link with storyboard 1.1.2.3.2
    c. Identifying computer hardware: Link with storyboard 1.1.2.3.3

2. These are link with tool tip text. Student allow to see the definition of the word when they move mouse to the top of the underline text.
3. This button link students to start an activity.

Activity: Drag and Drop

1. The activity no. and the topic name should be given in this area.
2. Activity instructions should clearly display here. Emphasize the relevant words that student need to pay their attention.
3. If the student drag the answer to the correct place, the system check whether it is correct or not and count the times of correct answers and incorrect answers. The image indicates whether the answer is correct or not.

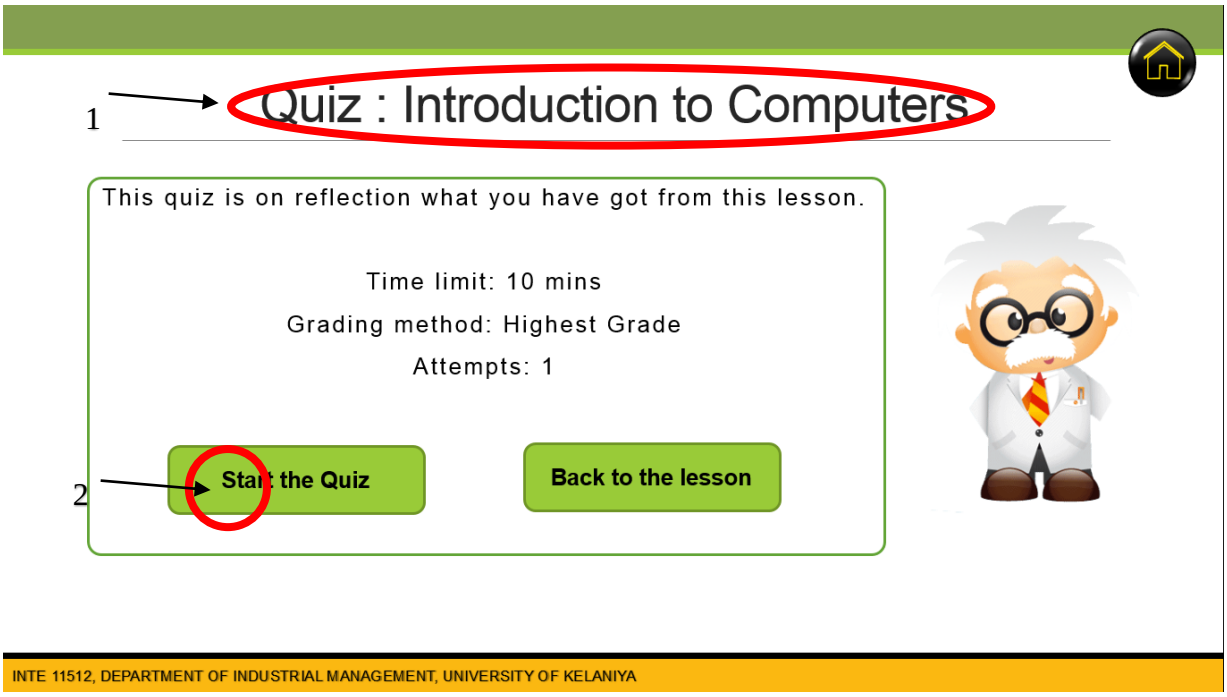
 **>> a. Correct Answer**  **b. Incorrect Answer** 

4. Student can replay the activity from here.
5. The back button used to go to the topic again. But next button should enabled only when students′ made the correct answers and allow them to go to the next topic.

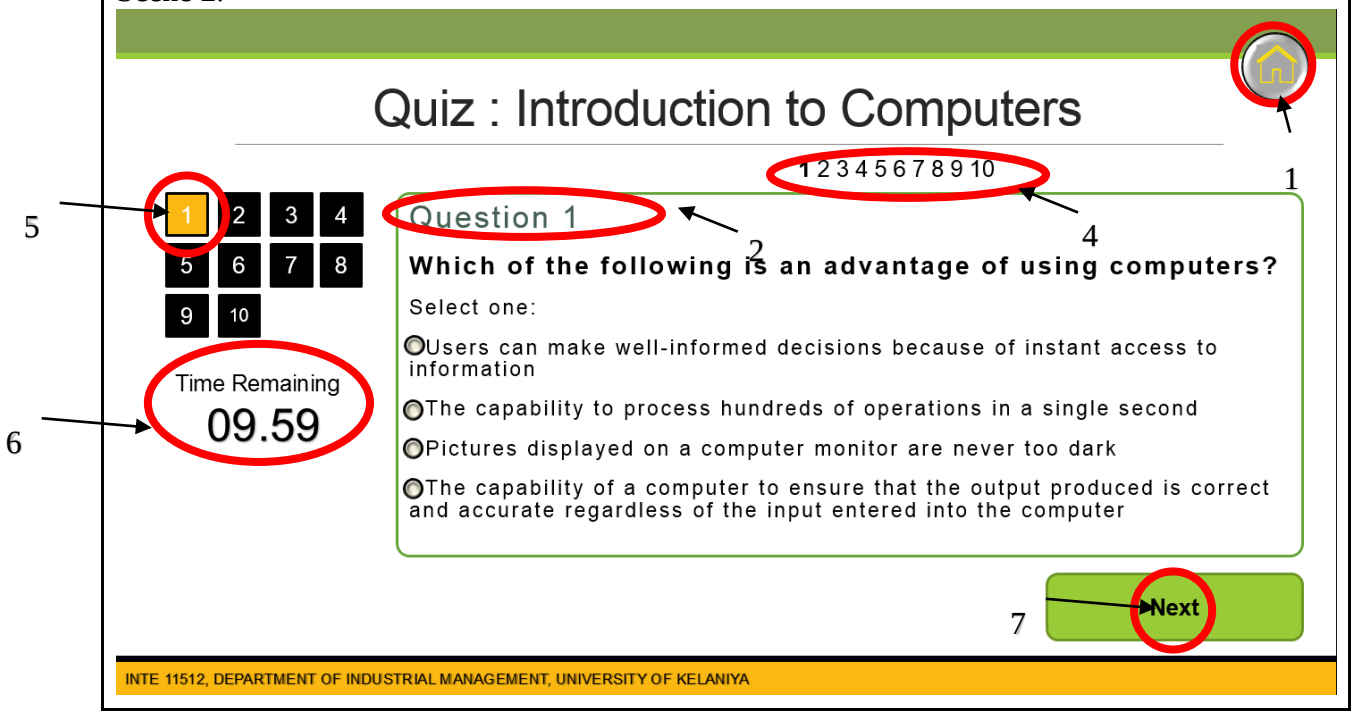
4.5.4. Activity :Quiz

Page Title: ACTIVITY:	Page no. 1.2.1	SME's name:
Date Designed:		Date verified:
Design		

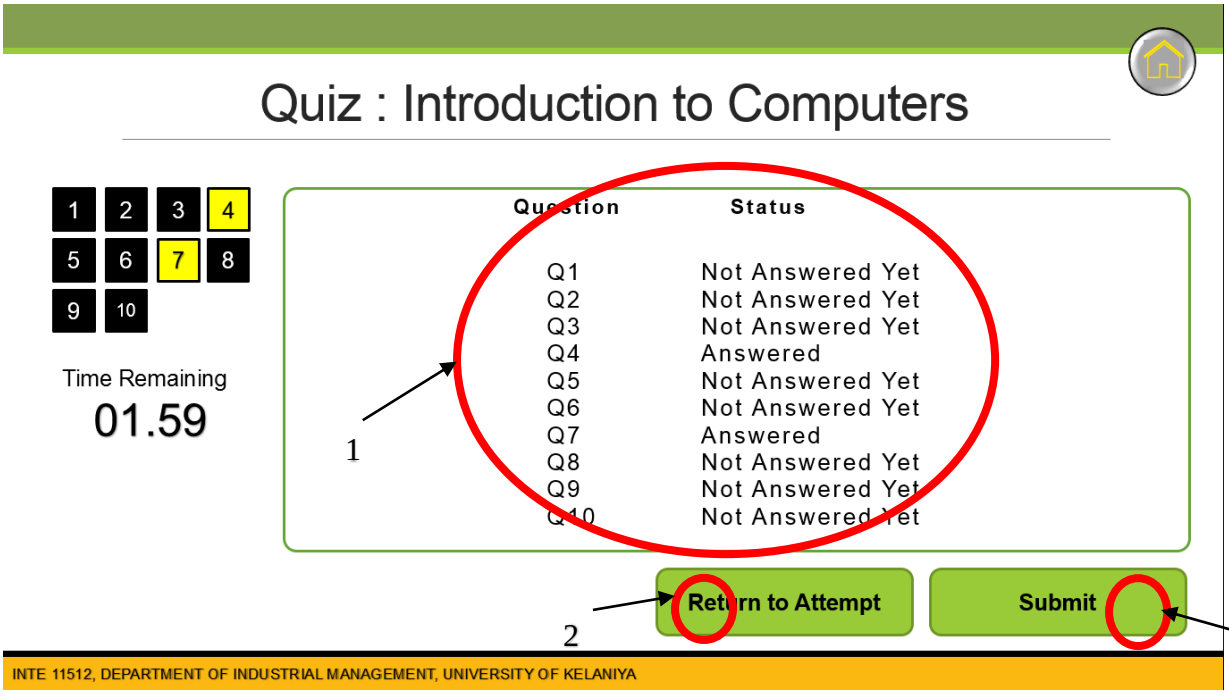
Scene 1.



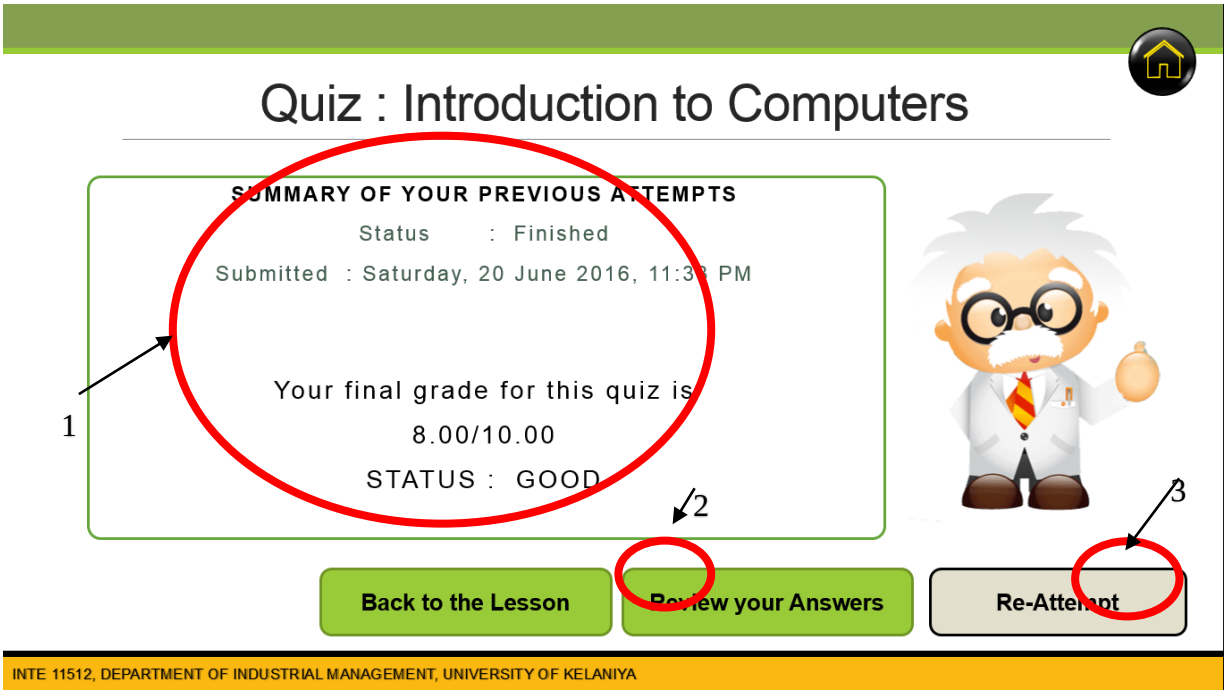
Scene 2.



Scene 3.

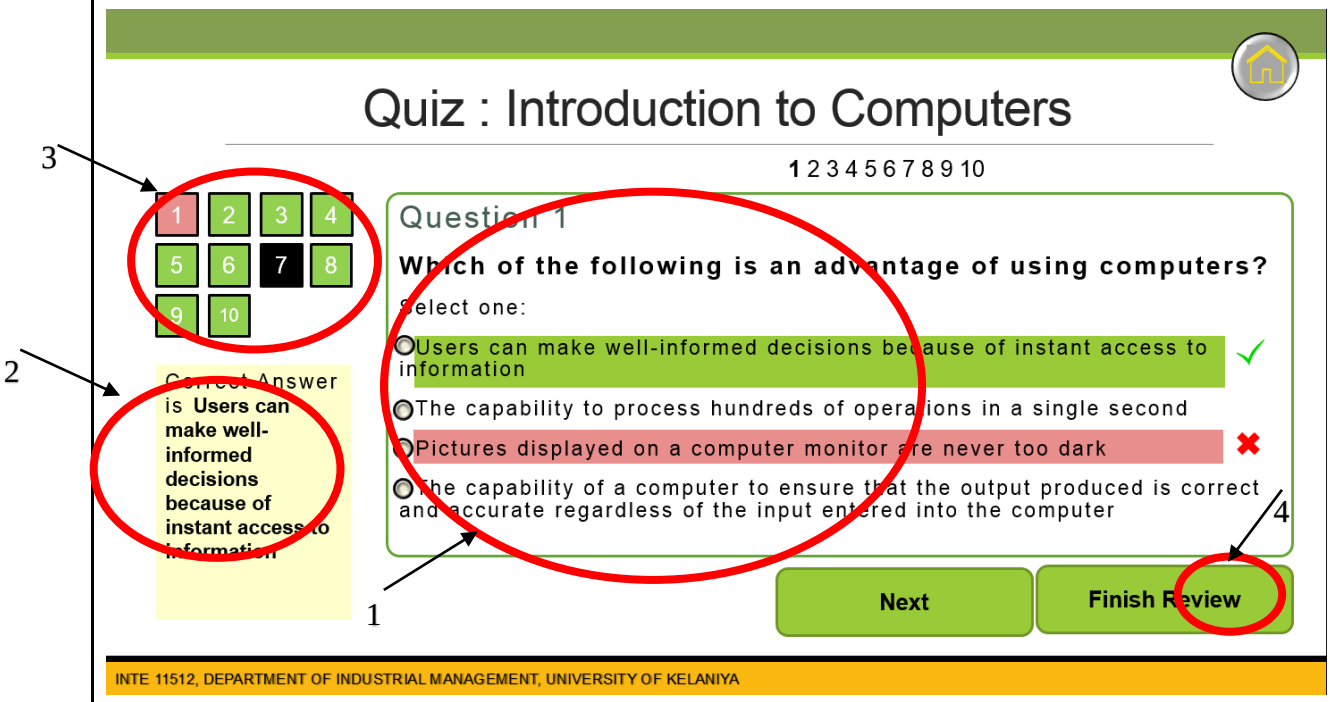


Scene 4.



`

Scene 5.



Special Comment(s):

Scene 1

1. Display the topic of the course and the activity name in each and every question slide.
2. When student click this button the quiz will start.
   This quiz should be randomized.

Scene 2

1. Home button should be disable until the user submit the quiz and check their results.
2. The question number should give here
3. Use relevant question types for each and every question (Here it is a MCQ type question. Use radio buttons)
4. This is a pagination that shows the navigation between questions. Highlight the page that the user is in.
5. This displays what is the current question (Orange), answered questions (Yellow) and the question the user didn't answer (Black). This allows user to jump to questions and recheck whether they have given the correct answer.
6. The time area is indicates the remaining time of the quiz.
7. Students should be able to go to the next question and if it is not first question the "Back button" should be display.

Scene 3

1. This area shows the summary of the questions the student answered or not.
2. If the student not complete with their quiz they can return to the attempt. This will direct to the first question.
3. When the user clicks submit button it will direct to scene4 that the student can view their result of the quiz.

Scene 4

1. This displays the summary of the quiz students have attempt.
2. By clicking this students can review their answers (direct to scene 5.).
3. If students have any attempts remaining they can click this button. But if there are no remaining attempts this button should be disable.

Scene 5

1. If the student given the correct answer the text should highlighted in green color with a right mark on the right side. If the answer is wrong answer the text should highlighted in red color with a cross mark on the right side.
2. If the answer is wrong answer or the student has not answered this area will be displayed with the correct answer.
3. The same navigation area but should marked the correct answers (Green) and wrong answers (Red).
4. Finish review button should direct to scene 4.

5. Chapter Five: Development and Implementation

5.1. Introduction

This chapter describes the developing tools and techniques used in implementing this system and the details of the implementation part of this system. The implementation can be categorized into three two sections as the implementation of the Learning Management System (LMS) and integrating of the SCORM packages to the LMS.

The objective of the project is to provide a user-friendly and interactive environment to learn Computing fundamentals. In order to achieve this purpose a collection of the latest technologies is being used. Following is the list of technologies used in this project.

- Moodle
- XAMPP with MySQL
- iSpring

5.2. Development Process

The ADDIE model was used as the Instructional Design Methodology to proceed with the process of the development life cycle of the project. ADDIE is known as an instructional systems design model and it helps identify requirements and design and develop content in a sequential manner. It consists of five general phases as follows;

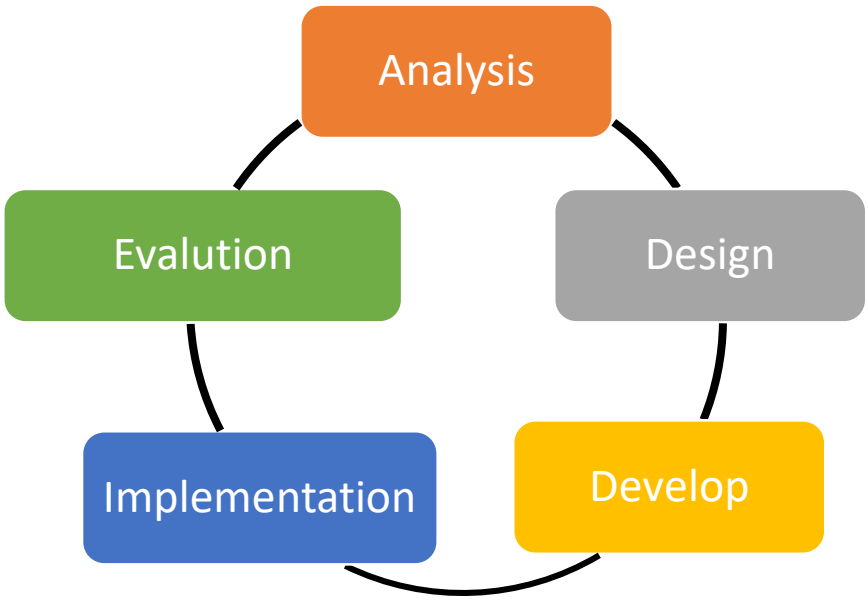


Figure 5.1: ADDIE Model

- A : ANALYSIS of needs , requirements , tasks, participants current capabilities (Deliverables : Chapter 3 - Analysis)
- D : DESIGN learning objectives, delivery format, activities and exercises (Deliverables : Chapter 3 - Design)
- D : DEVELOP create prototype , develop course materials, review, pilot session (Deliverables : Chapter 4 - Design)
- I : Implementation Training Implementation, tools in place, observation (Deliverables : Chapter 5 – Development & Implementation)
- E : Evaluate Awareness, Knowledge, behavior, results (Deliverables : Chapter 6 - Evaluation)

5.3. Technologies Used

When developing the course content was developed with video, slideshow lessons, Assessments including MCQ quizzes, drag and drop activities, etc.

5.3.1. Moodle

Figure 5.2: Moodle

Moodle 3.0 has used as the main platform for eLearning Environment. Moodle (Modular Object-Oriented Dynamic Learning Environment) is a free, open source learning platform or e-Learning platform which is written in PHP and distributed under the GPL (General Public License). This is being used as a popular LMS all around the world. In this project, it is used as the platform for the online course which the users can log and do the browsing and for the content developers to do the course administration.

5.3.2. WampServer

Figure 5.3: WampServer

WampServer refers to a software stack for the Microsoft Windows operating system, created by Romain Bourdon and consisting of the Apache web server, OpenSSL for SSL support, MySQL database and PHP programming language.

5.3.3. iSpring to create SCROM packages

Figure 5.4: iSpring

iSpring is a fully-featured e-Learning development environment for creating rich interactivity. iSpring is aimed at developers of interactive content who will create sophisticated content with some scripting. The iSpring is a plugging to Microsoft PowerPoint tools for content authors. Authors can develop SCROM objects and install into their LMS.

5.3.4. Adobe Photoshop

Figure 5.5: Adobe Photoshop

Adobe Photoshop is a raster graphics editor developed and published by Adobe Systems for macOS and Windows. Adobe Photoshop software is the industry standard in digital imaging and is used worldwide for design, photography, video editing and more.

5.3.5. Adobe Premier

Figure 5.6: Adobe Premier

Adobe Premiere Pro is a timeline-based video editing app developed by Adobe Systems and published as part of the Adobe Creative Cloud licensing program. With Premier Pro it helped to edit videos easily.

5.3.6. Audacity

Figure 5.7: Audacity

Audacity is a free open source digital audio editor and recording computer software application, available for Windows, macOS/OS X, Linux and other operating systems which assisted to make narrations to the videos created in the learning content.

5.3.7. Adobe Acrobat Reader

Adobe Acrobat Reader DC software is the free global standard for reliably viewing, printing, and commenting on PDF documents. This software used to create and upload text based documents to the VLE.

Figure 5.8: Adobe Acrobat Reader

5.3.8. Articulate 360 Storyline

Articulate 360 is one of the best eLearning software where we can add interactive slideshows to the learning content. It includes Storyline and Rise, plus a slew of other authoring apps. Use Storyline 360 to develop custom, interactive courses that work on every device without any manual tweaking. It's powerful enough for experts, but easy for beginners to create virtually any interaction imaginable.

Figure 5.9: Artulate 360

5.3.9. Microsoft Word

Microsoft Word is a word processor developed by Microsoft. This software has used as the word processor for all the learning contents and for the documentation.

Figure 5.10: Microsoft Word

5.4. Human Computer Interface (HCI)

Design Following describes the seven principles of the web page represent the dynamic aspects of the interface and can be mostly regarded as the "feel" of the interface according to the University of Cork (2011).

- Suitability for the task- the web page is suitable for a task when it supports the user in the effective and efficient completion of the task.
- Self-descriptiveness- the web page is self-descriptive when each web page step is immediately comprehensible through feedback from the system or is explained to the user on request.

- Controllability- the web page is controllable when the user is able to initiate and control the direction and pace of the interaction until the point at which the goal has been met.
- Conformity with user expectations- the web page conforms with user expectations when it is consistent and corresponds to the user characteristics, such as task knowledge, education, experience, and to commonly accepted conventions.
- Error tolerance- the web page is error tolerant if despite evident errors in input, the intended result may be achieved with either no or minimal action by the user.
- Suitability for individualization- the web page is capable of individualization when the interface software can be modified to suit the task needs, individual preferences, and skills of the user.
- Suitability for learning- the web page is suitable for learning when it supports and guides the user in learning to use the system.

5.5. The Developed Content

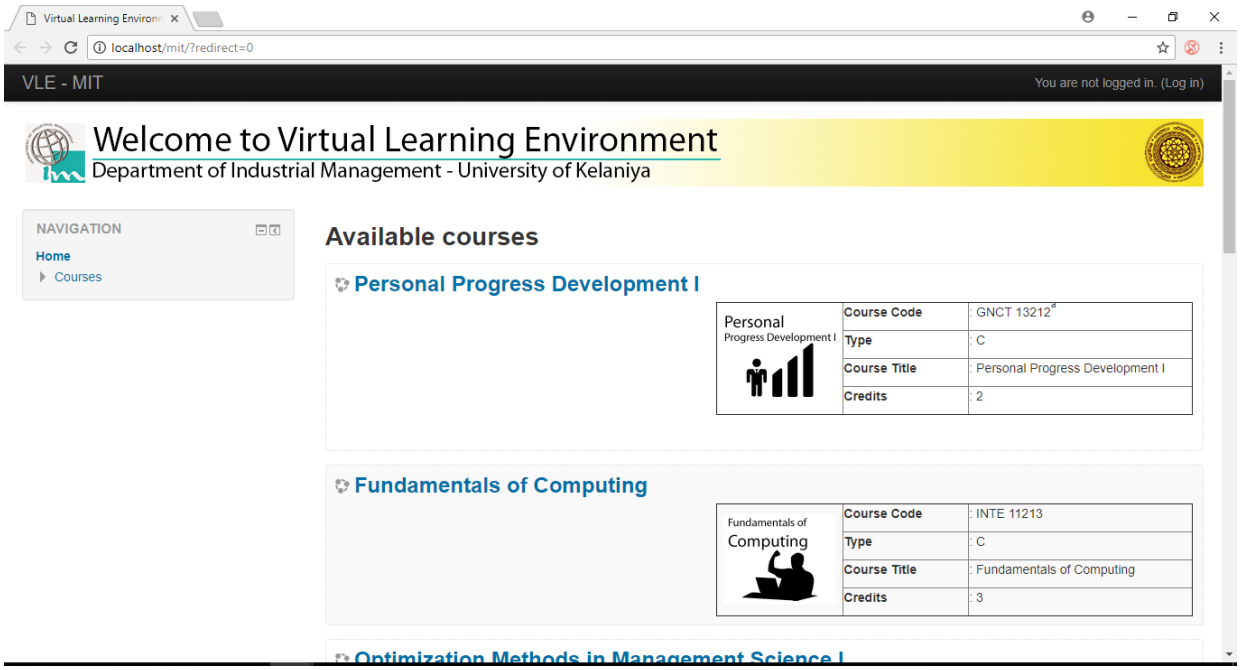


Figure 5.11: VLE - DIM, UoK

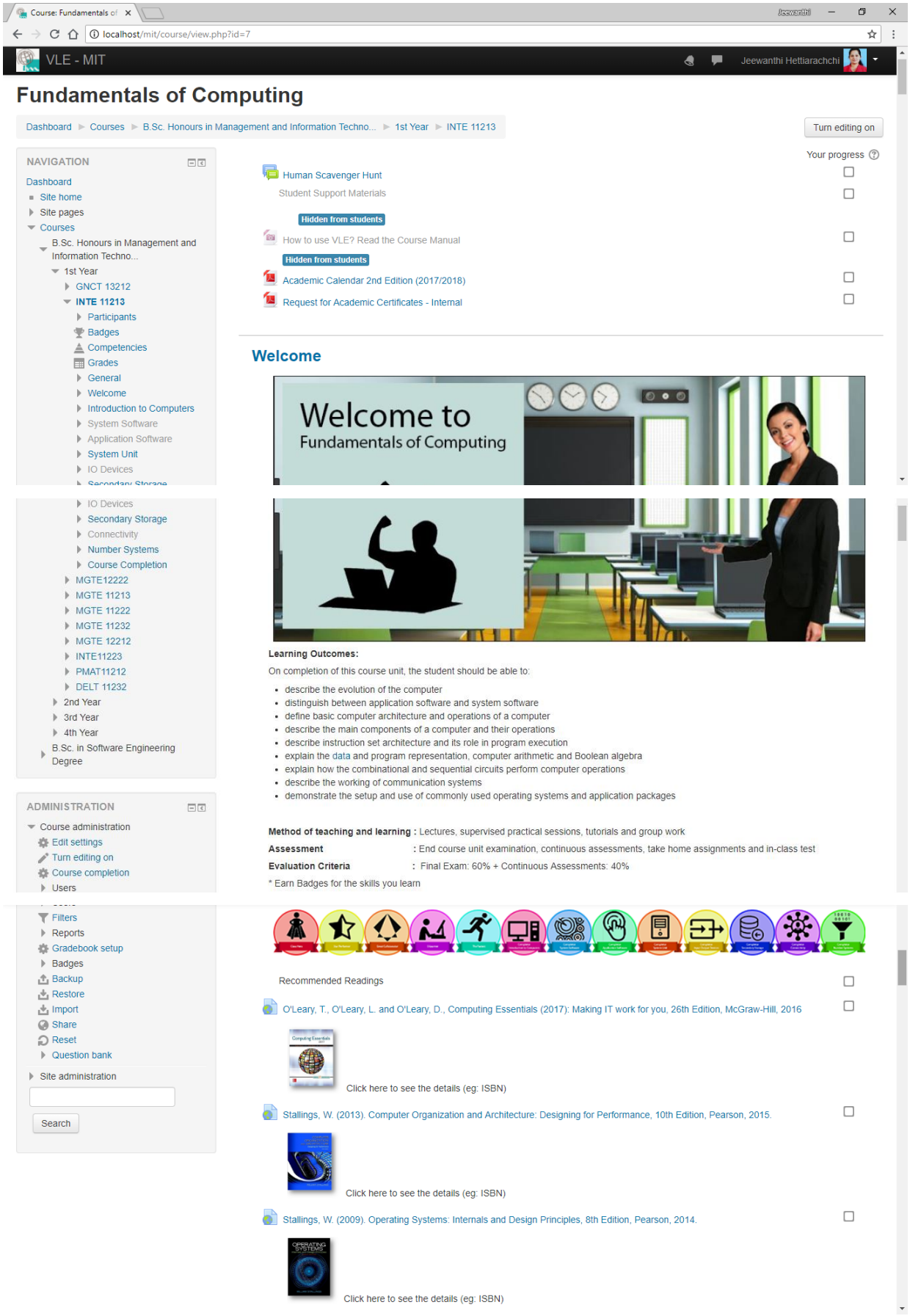


Figure 5.12: INTE 11213 - Fundamentals of Computing - Course view

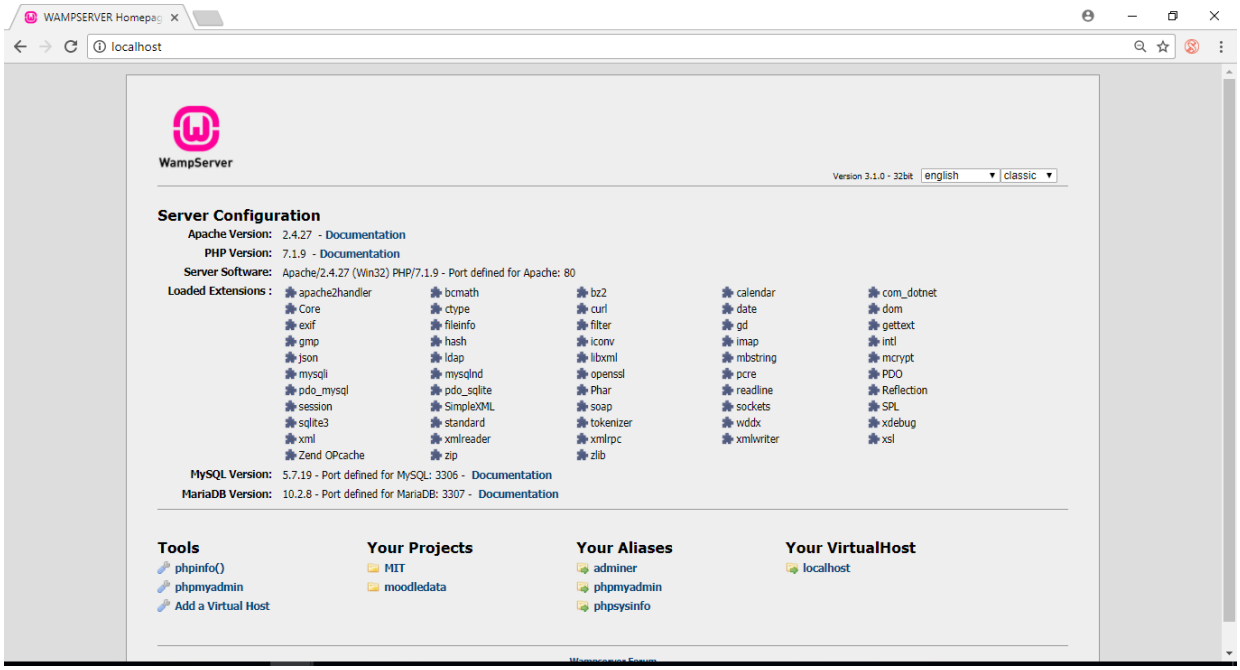


Figure 5.13: Localhost – WampServer 3.0

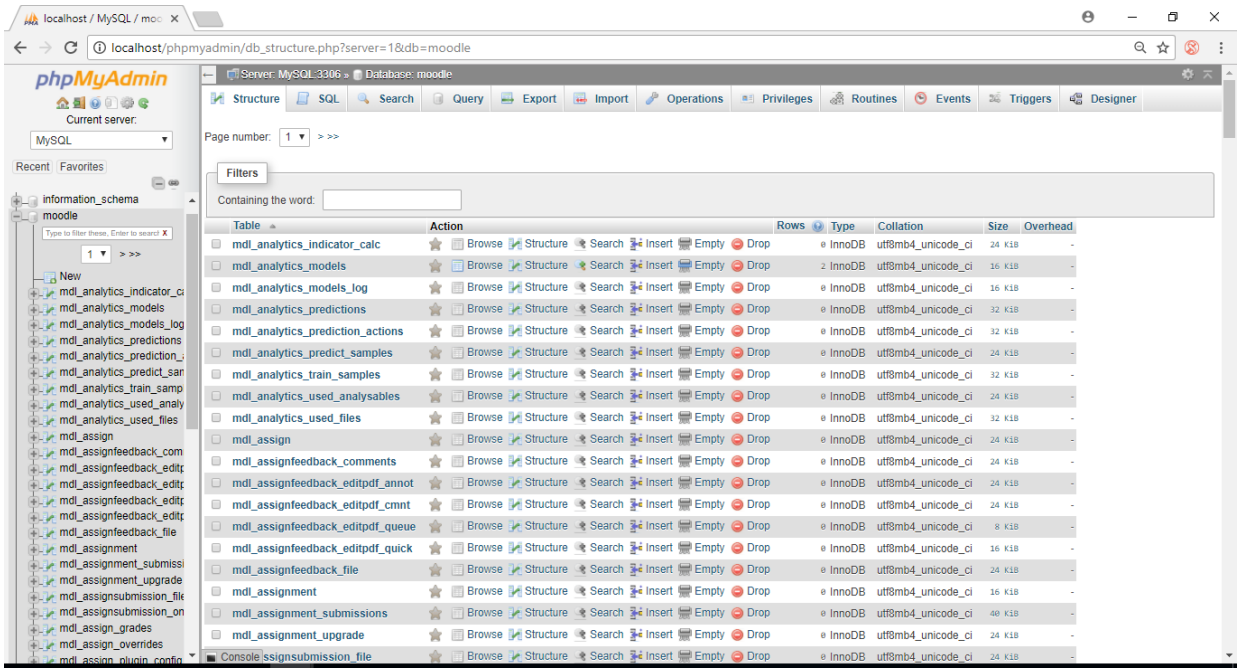


Figure 5.14: phpMyAdmin - WampServer

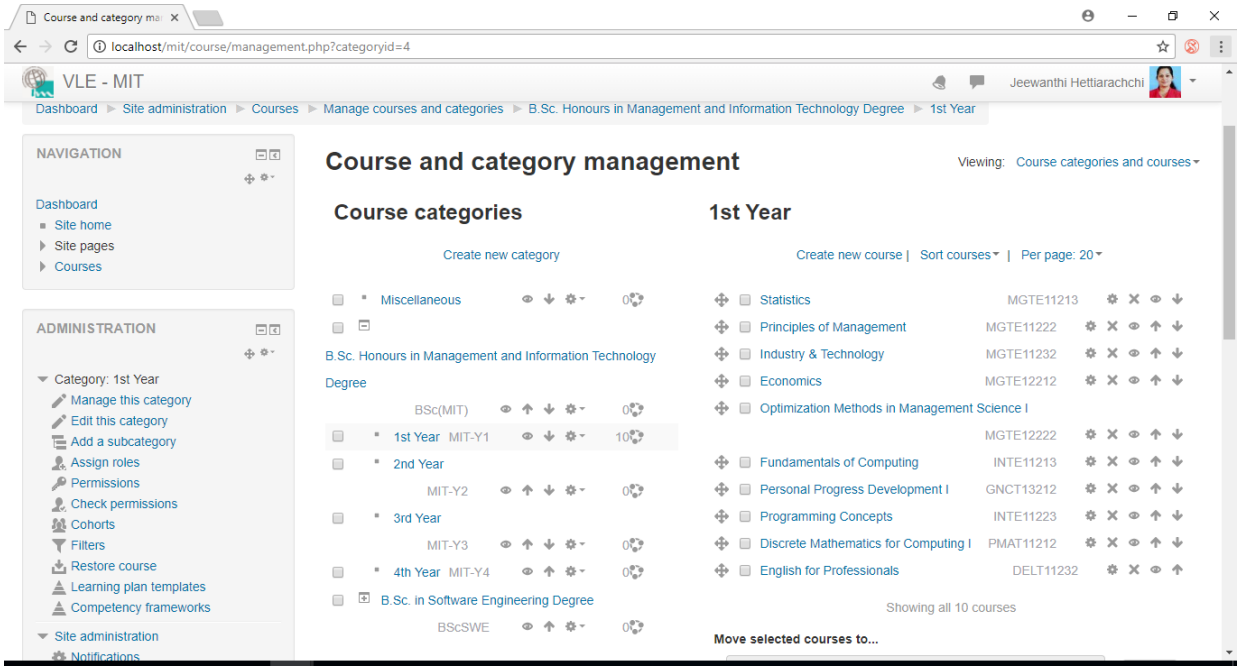


Figure 5.15: Course and Category Management - Moodle

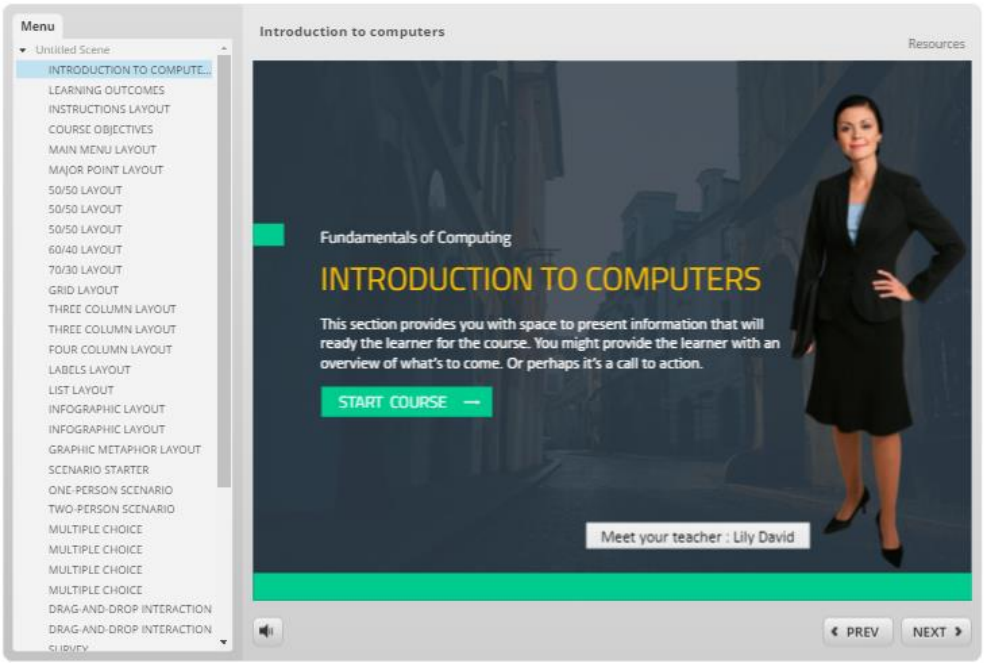


Figure 5.16 : Lesson Content Interfaces (Desktop Layout)

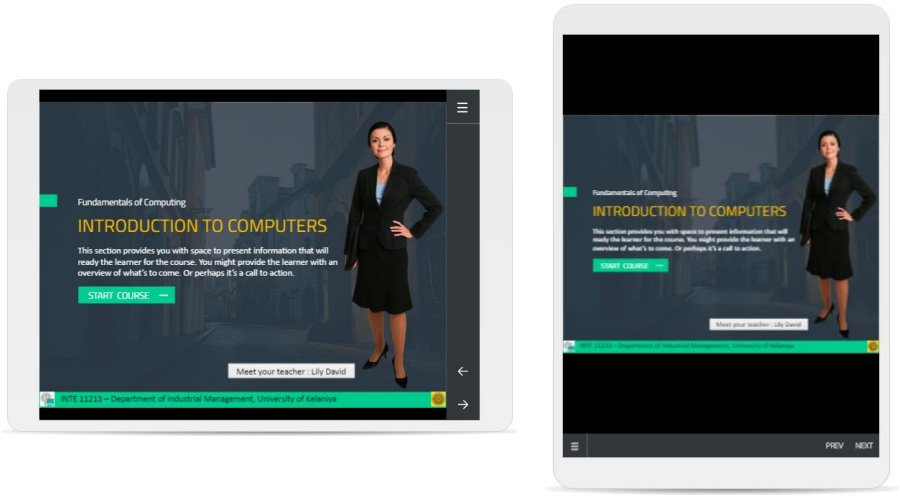


Figure 5.17: Lesson Content Interfaces (Tab Layout)

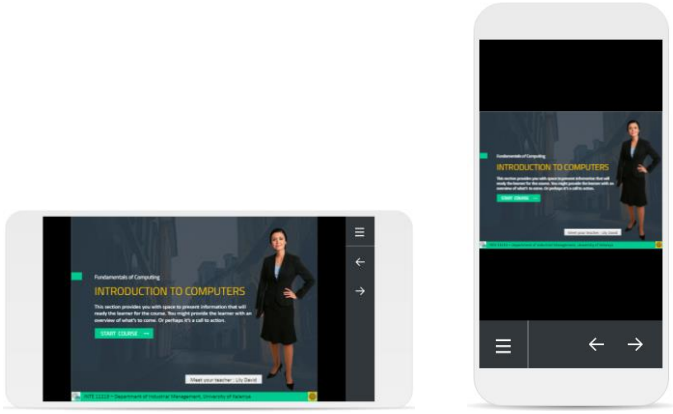


Figure 5.18: Figure 5.17: Lesson Content Interfaces (Mobile Layout)

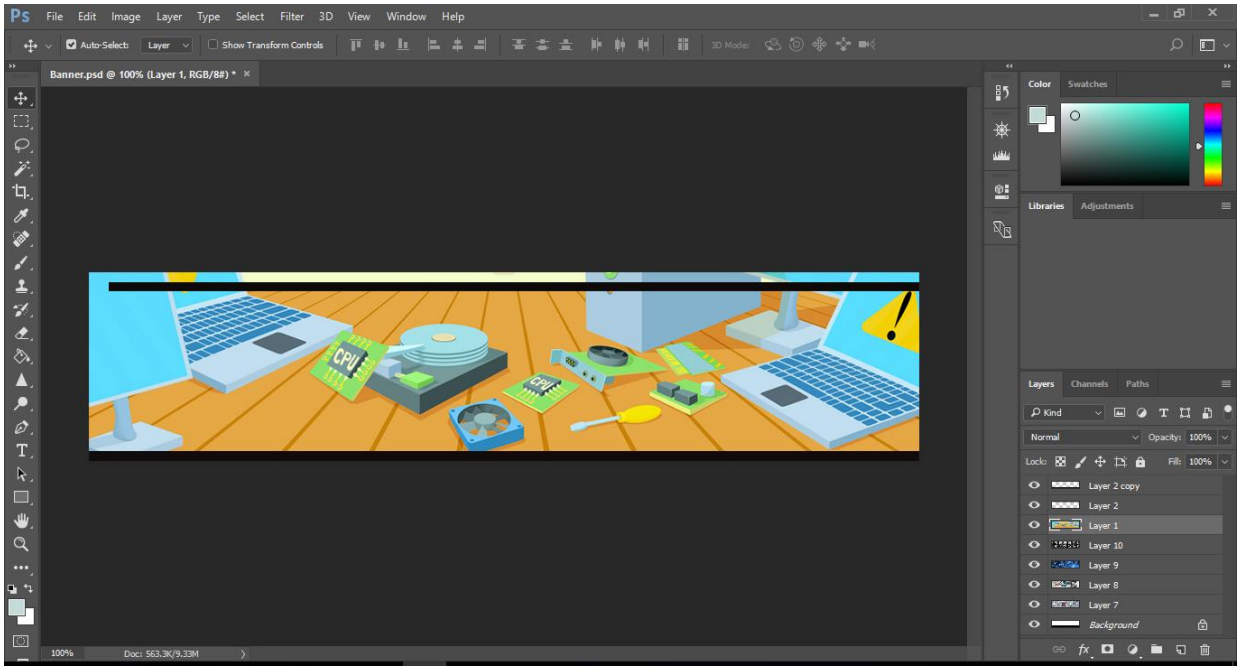


Figure 5.19: Working with Adobe Photoshop

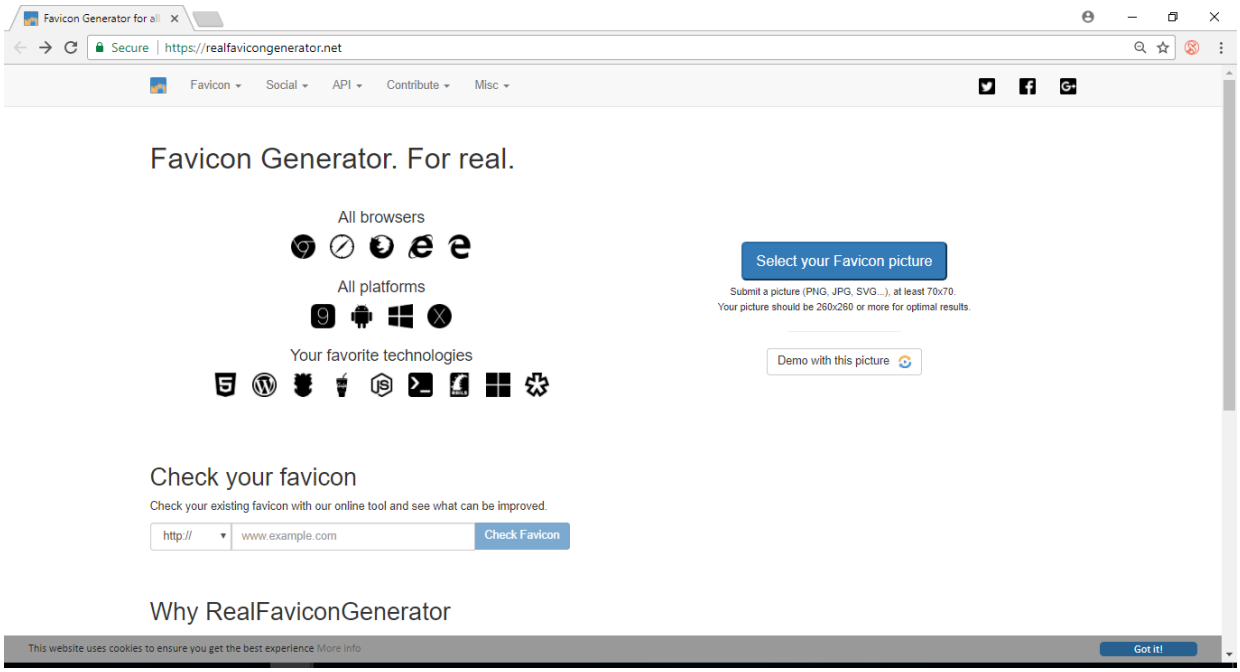


Figure 5.20: Favicon Generator - realfavicongenerator.net

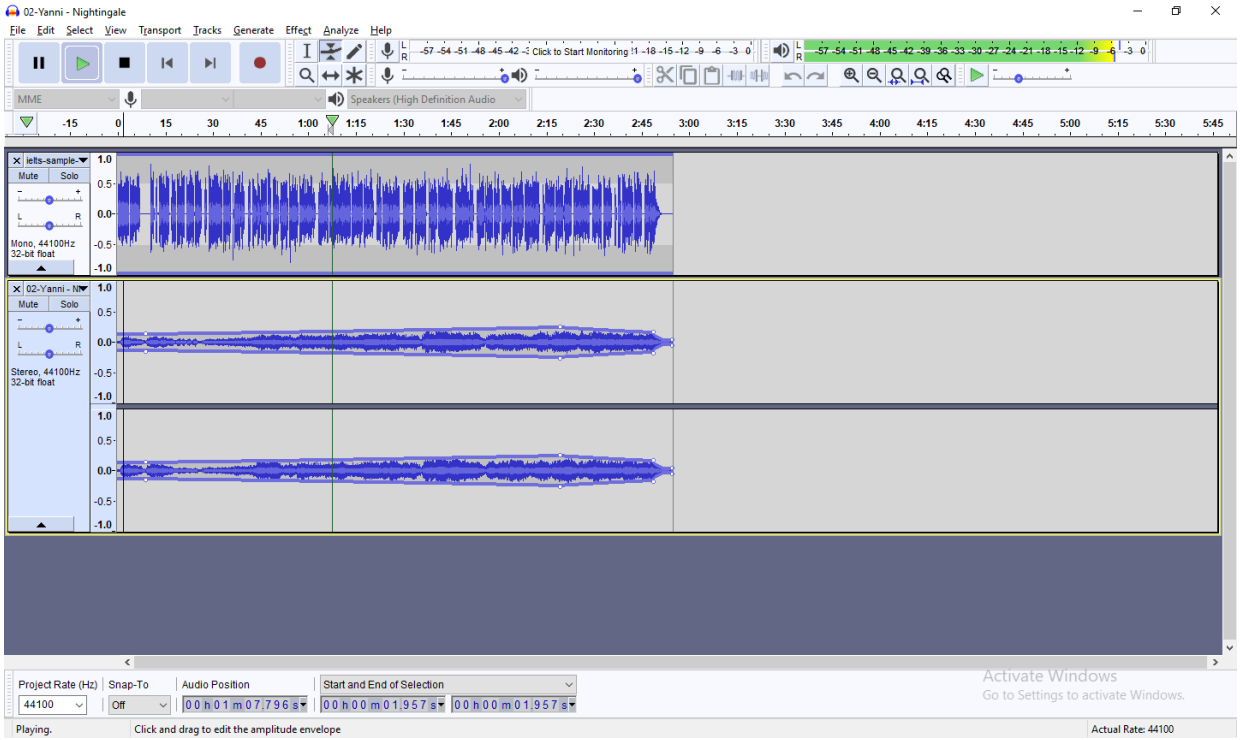


Figure 5.21: Editing Sounds with Audacity

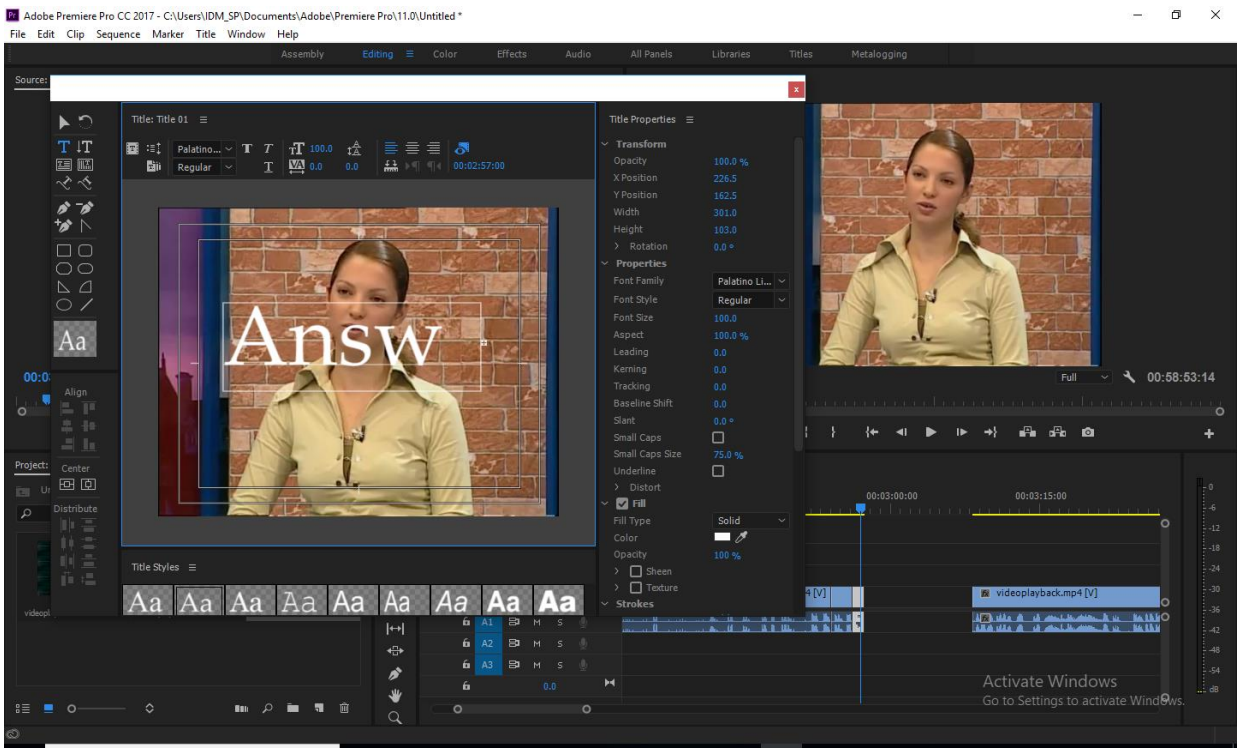


Figure 5.22: Using Adobe Premiere to edit video files

6. Chapter Six: Evaluation

6.1.Introduction

The evaluation of the course gives you an idea of the interaction of the learner in seeing the course. This chapter reveals the learner's participation and responses to the learning content and the extent to which they understand or learn from the content. A mixed method where qualitative and quantitative data collection was used in the questionnaire. Evaluation was done by a sample group of students and an evaluation questionnaire was used. Comments were made about the quality of the course, the effectiveness and relevance of course content, activities and assessments. The questionnaire used in the evaluation is contained in the appendix.

6.2. User Feedbacks on eLearning System

Students' & teacher observations were taken under different categories. Following categories are designed to evaluate different aspects of the course.

1. Visibility & HCI
2. Course content
3. Course impressions

The objective of evaluating the overall experience is to see whether the course met the user's Goal and objectives, whether the course was in line with the expectation of the user and whether the constructive alignment was found in the course.

6.3. Evaluation Process

The evaluation was done in two steps. First a questionnaire was distributed for the students who took part in the evaluation. Based on the results of the questionnaire the analysis indicated variety of results as discussed in the evaluation chapter.

Second step was on site observations, where the students were given to use the course in the school lab and observed whether the students have used the course content as expected and whether it achieved the aligned objectives of the course.

7. Chapter Seven: Conclusion and Future Work

I take pleasure in making a comment at the conclusion of this project and the report. I have a great satisfaction as I achieved the ultimate goals covering all pre-defined objectives as per the guide lines given. The project of designing and developing an eLearning system for "DIM, UOK" has come to the end and it was a challenging experience in almost all aspects. Further I was able to complete the task within the specified period. I learnt a lot and shared a lot of experience during this project such as covering of milestones on specific dates and identifying ways of gathering user requirements etc.

With the development of the project I obtained practical experience on how to carry out the development with the Rational Unified Process. During the project period I got experience not only as a content developer but also as an Analyst, Instructional Designer, Creative Writer, Editor, Story Teller and a Proof Reader. To successfully develop the eLearning system I have to follow some requirement elicitation techniques. For elicitation techniques I have conduct interviews, observations, review of past data, manual system analysis and questioner. I have also learned requirement analysis and proper testing when developing this system.

I assume that decisions I arrived during the project, methodologies I used to make this project a success and techniques and strategies applied will bring me benefits and be useful in my future career.

Despite of the successes stories, when reviewing and assessing the system independently, it has its ups and downs and pros and cons. However after a great commitment, hard and devoted work, I am very happy to see the newly designed eLearning system up and running demonstrating successful outcomes for the betterment of future graduates as per the project plan.

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Appendixes

Descriptive Analysis

- Appendix A - Learner Analysis
    - Questionnaire and Answers
- Appendix B – Teacher Analysis
    - Questionnaire and Answers
- Appendix C – Content Analysis
- Appendix D – Detail Syllabus
- Appendix E – Level 1 Course Maps
- Appendix F – level 2 – Course Maps

Appendix A - Learner Analysis

Student Learning Perceptions of Online Courses and Learning Management System Usability

You are invited to kindly support by attending the following questionnaire to best understand the perceptions of yours on learning experience in online courses as part of the Instructional Design of "INTE 11512 - Computing Fundamentals" of the Department of Industrial Management, Faculty of Science, University of Kelaniya. The findings of this survey will greatly assist strengthening the study programme.

The survey remains anonymous to be more productive on answers and criticisms. Please be informed that all data collected during this survey will be treated with strict confidentiality. We greatly appreciate your participation and cooperation.

Thank you for taking time!

* Required

About You

In this section we would like to obtain some information about you to understand the demography of the participants.

1. **I am from:** * *Mark only one oval.*
   - First Year
   - Second Year
   - Third Year
   - Final Year
2. **I am doing** * *Mark only one oval.*
   - B.Sc. in Management and Information Technology (Special) Degree
   - B.Sc. in Software Engineering Degree
   - B.Sc.in Management and Information Technology (Interim) Degree
   - Computer Studies Degree
   - Industrial Management Degree
   - Management & Computer Studies Degree
3. **What is your Gender?** *Mark only one oval.*
   - Female
   - Male

4. **District** *Mark only one oval.*
   - Ampara
   - Anuradhapura
   - Badulla
   - Batticaloa
   - Colombo
   - Galle
   - Gampaha
   - Hambantota
   - Jaffna
   - Kalutara
   - Kandy
   - Kegalle
   - Kilinochchi
   - Kurunegala
   - Mannar
   - Matale
   - Matara
   - Moneragala
   - Mullaitivu
   - Nuwara Eliya
   - Polonnaruwa
   - Puttalam
   - Ratnapura
   - Trincomalee
   - Vavuniya
5. **What is your residence status?** *Mark only one oval.*
   - University Hostel
   - External Boarding House
   - Residence
6. **Do you have e-mail address?** If yes Write your email address.

Your Learning Style

This section is on how do you learn and understand something.

7. **A website has a video showing how to make a special graph. There is a person speaking, some lists and words describing what to do and some diagrams. You would learn most from:** *Mark only one oval.*
   - seeing the diagrams.
   - listening.
   - watching the actions.
   - reading the words.
8. **You have a problem with your heart. You would prefer that the doctor:** *Mark only one oval.*
   - gave you something to read to explain what was wrong.
   - used a plastic model to show what was wrong.
   - showed you a diagram of what was wrong.
   - described what was wrong.
9. **You are using a book, CD or website to learn how to take photos with your new digital camera. You would like to have:** *Mark only one oval.*
   - many examples of good and poor photos and how to improve them.
   - clear written instructions with lists and bullet points about what to do.
   - diagrams showing the camera and what each part does.
   - a chance to ask questions and talk about the camera and its features.
10. **You are going to cook something as a special treat. You would:** *Mark only one oval.*
    - look on the Internet or in some cookbooks for ideas from the pictures.
    - use a cookbook where you know there is a good recipe.
    - ask friends for suggestions.
    - cook something you know without the need for instructions.
11. **You are going to choose food at a restaurant or cafe. You would:** *Mark only one oval.*
    - choose from the descriptions in the menu.
    - choose something that you have had there before.
    - look at what others are eating or look at pictures of each dish.
    - listen to the waiter or ask friends to recommend choices.

12. **You are planning a vacation for a group. You want some feedback from them about the plan. You would:***Mark only one oval.*

- describe some of the highlights they will experience.
- use a map to show them the places.
- phone, text or email them.
- give them a copy of the printed itinerary.

13. **I like websites that have:** *Mark only one oval.*

- audio channels where I can hear music, radio programs or interviews.
- things I can click on, shift or try.
- interesting written descriptions, lists and explanations.
- interesting design and visual features.

14. **Do you prefer a teacher or a presenter who uses:** *Mark only one oval.*

- diagrams, charts or graphs.
- handouts, books, or readings.
- demonstrations, models or practical sessions.
- question and answer, talk, group discussion, or guest speakers.

ICT Literacy

The following statements relate to the technology ICT skills you have on Learning Management System (LMS)

15. **In a typical day, please indicate the % time you spend using any of the following operating systems.** * *Mark only one oval per row.*

	0%	1-20 %	21-40 %	41-60 %	61-80 %	81-100 %
Windows XP (PC)						
Windows Vista (PC)						
Windows 7 (PC)						
OSX Tiger (MAC)						
OSX Snow Leopard (MAC)						
OSX Lion (MAC)						
iOS (Mobile)						
Android (Mobile)						
Other						

16. **Which of the following technologies do you frequently use?** * *Check all that apply.*

- [ ] Email
- [ ] Skype
- [ ] Blogs/Vlogs
- [ ] Facebook
- [ ] LinkedIn
- [ ] Google+
- [ ] Mailing Lists
- [ ] RSS subscription
- [ ] Slideshare
- [ ] Moodle
- [ ] Flickr or other photograph sharing tool
- [ ] YouTube or other video sharing tool
- [ ] Wikis
- [ ] Dropbox
- [ ] Twitter
- [ ] Mobile APPs iTunes
- [ ] Podcast/Vodcast
- [ ] Blogs/Vlogs
- [ ] Other:

17. **How do you find out about new digital technologies?** * *Check all that apply.*

- [ ] Friends/Family
- [ ] Work Colleagues
- [ ] Online/Digital source
- [ ] Recommended by students
- [ ] Traditional media (TV/Radio/Newspaper)
- [ ] Librarians
- [ ] Lecturers
- [ ] Professional networks
- [ ] Other:

18. **When completing an assignment or studying for a course, how important to you are the following?** * *Mark only one oval per row.*

	Extreamly important	Very Important	Some what Important	Not too Important	Not at all Important
Subject material					
Digital material including multimedia					
Mobile material including multimedia					
Peer-communication (Facebook etc)					
Support material to engage with the electronic resources					
Subject material from an eBook					
Research papers					
Mobile APPs					

Learnability on Leaning Management System

Select all applicable and add other if required.

19. Do you use LMS for your university activities? * *Mark only one oval.*

- Yes
- No

20. **What type of LMS you use?** * *Mark only one oval.*

- Moodle
- Blackboard
- Custom Developed by University
- Not known
- Other:

21. **How often do you use this LMS?** *Mark only one oval.*

- Everyday
- Once or Twice in a week
- Once or Twice in a month
- Few times a year
- Never

22. **What type of study materials are available in your Course**? *Check all that apply.*

- ☐ Interactive Learning Materials
- ☐ Reading Materials
- ☐ Audio and Podcasts
- ☐ Video and Webcasts
- ☐ Assignments (Upload and Download)
- ☐ Mock tests / Practice tests
- ☐ Discussion Forums
- ☐ Subject related chat sessions
- ☐ Academic Wiki and FAQ
- ☐ Other:

23. **What modifications to current LMS will support you optimize your learnability?** *Check all that apply.*

- ☐ Subject contents
- ☐ Subject related literature
- ☐ Online forum for discussions
- ☐ Orientation course
- ☐ Practice Tests
- ☐ Forums and Discussions
- ☐ Scheduled subject chats
- ☐ Other:

24. **What new LMS features will motivate you to use LMS more** *Check all that apply.*

- ☐ Communication tools (Such as SMS alerts)
- ☐ Mobile ready LMS
- ☐ Multimedia contents
- ☐ Videos of class sessions
- ☐ Audios of class sessions
- ☐ Interactive media for subject contents
- ☐ Discussion Forums
- ☐ Integration of Social Media
- ☐ Digital Archives
- ☐ Assignments Plagiarism check
- ☐ Online Teacher support
- Other:

25. **What changes will make you satisfy with LMS ?** *Check all that apply.*

- [ ] Better interface
- [ ] More contents
- [ ] Quality of the contents
- [ ] Responsive LMS (support to all PC, tablet and mobile),
- [ ] LMS app for Smartphones
- [ ] Integration of social media
- [ ] Accessibility
- [ ] 24 x 7 LMS support
- [ ] Other:

Answers

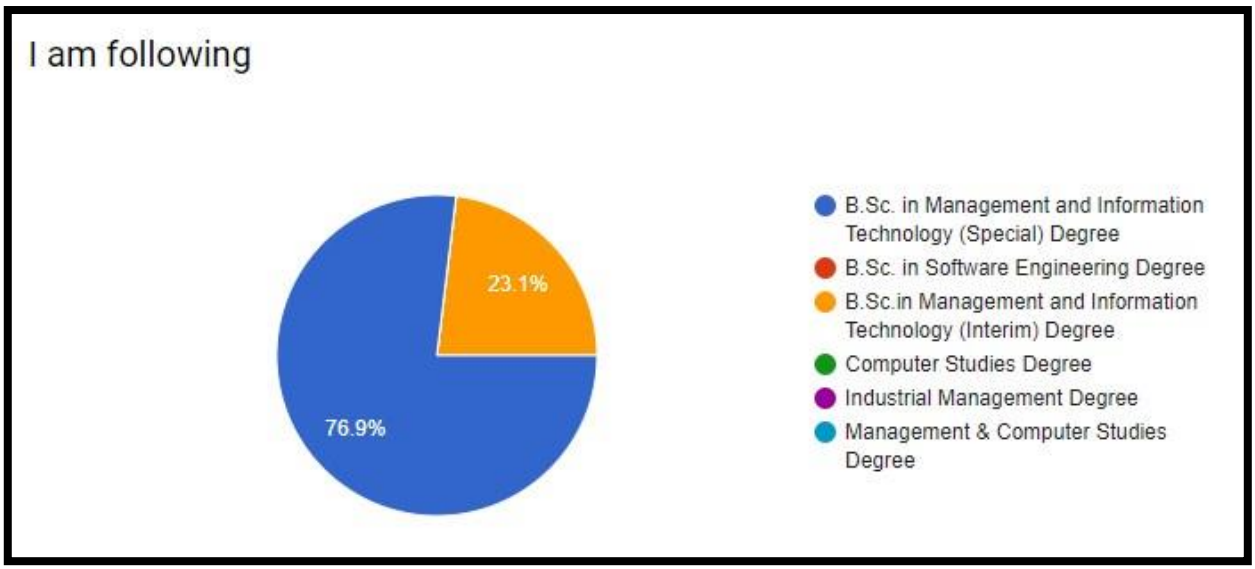

Figure 0.1: About You – I'm following

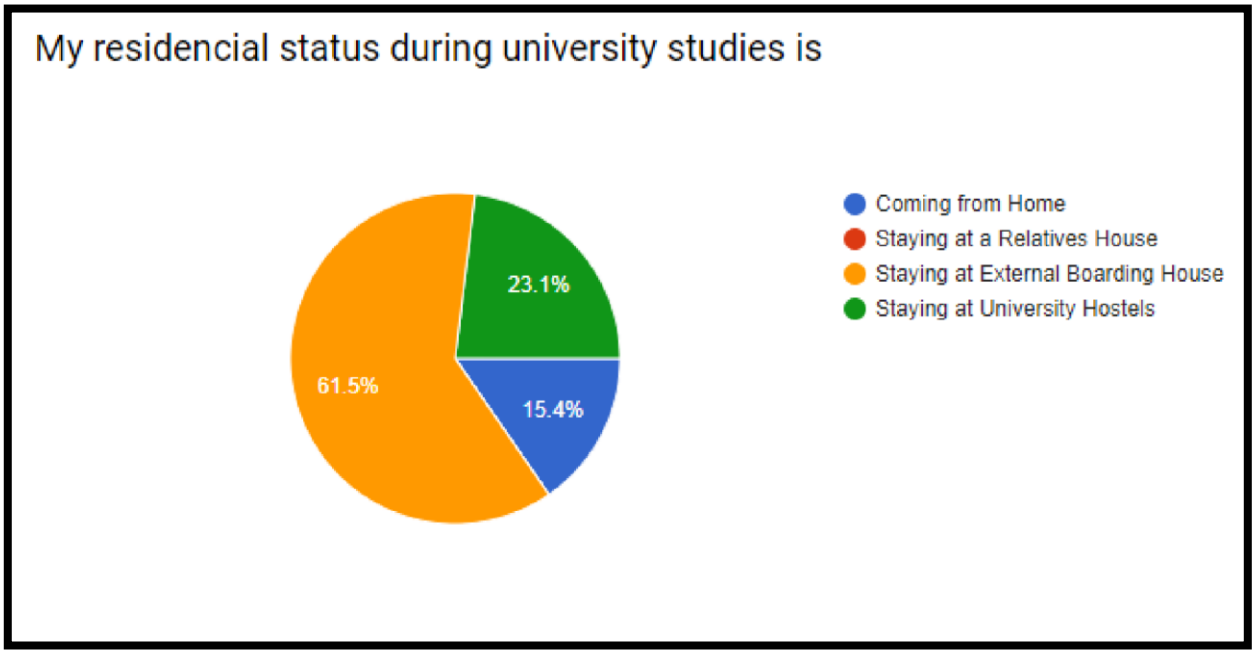

Figure 0.2: About You - My Residential status during university studies is

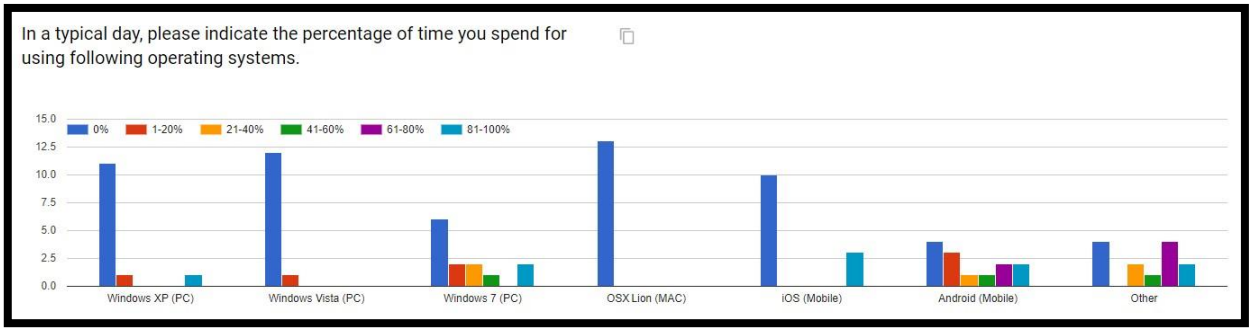

Figure 0.3: ICT Literacy - In a typical day, please indicate the percentage of time you spend for using following operating systems

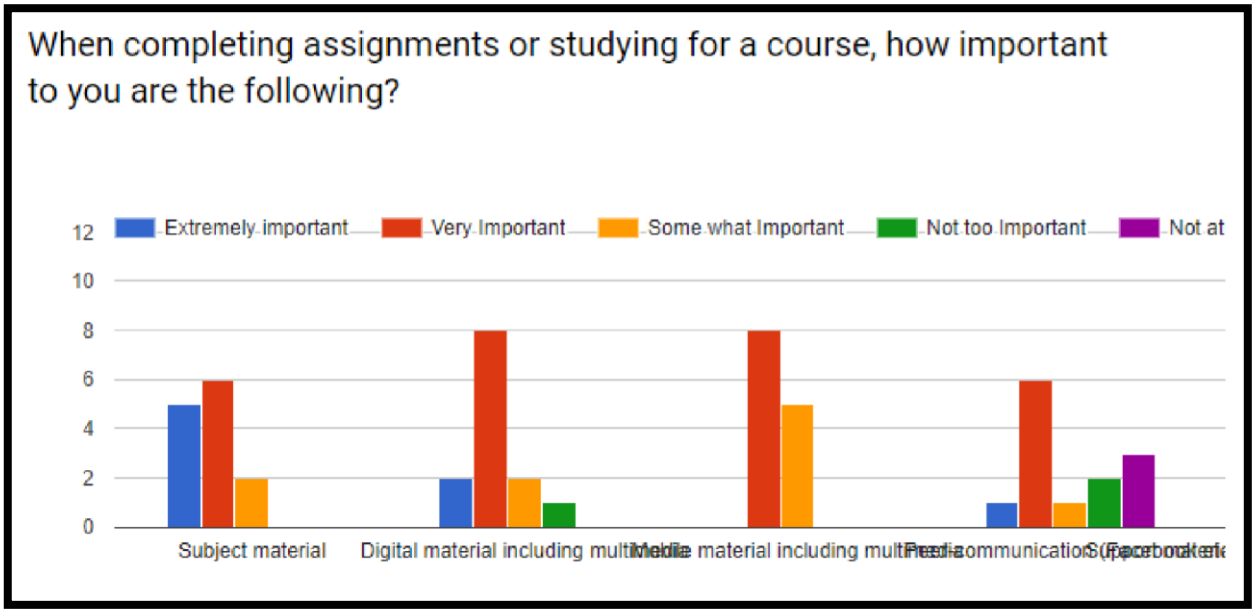

Figure 0.4: ICT Literacy When completing assignments or studying for a course, how important to you are the following?

Appendix B - Teacher Analysis

Need Assessment Survey

This questionnaire is a survey evaluating your ideas on Online courses as part of the Instructional Design of "INTE 11512 - Computing Fundamentals" of the Department of Industrial Management, Faculty of Science, University of Kelaniya. The findings of this survey will greatly assist strengthening the study programme.

Please be informed that all data collected during this survey will be treated with strict confidentiality. We greatly appreciate your participation and cooperation.

Thank you for taking time!

* Required

About You

The following statements ask you to describe yourself and the course you are teaching as part of this study.

1. **I am :** * *Mark only one oval.*
   - ◯ Lecturer
   - ◯ Demonstrator
   - ◯ Other:
2. **I teach** * *Check all that apply.*
   - ☐ Management
   - ☐ Software Development
   - ☐ Information Technology
   - ☐ Multimedia
   - ☐ Data stuctures and Algorithems
   - ☐ Web Technologies

Technological Skills on Leaning Management Systems

The following statements relate to the technology skills you have on Learning Management System (LMS)

3. **Have you participated in Leaning Management System training courses or workshops?** * *Mark only one oval.*
   - ◯ Yes
   - ◯ No
4. **Indicate in which year the latest took place** (eg: 2010) *

   _____

5. **How many courses have you taught along with a Learning Management System?** * *Mark only one oval.*
   - ◯ None
   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ◯ 5 or more
6. **Have you used Moodle for any of your courses?** * *Mark only one oval.*
   - ◯ Yes
   - ◯ No
7. **If NO (you have not used moodle), why have you not used Moodle as an instructional tool?** * *Check all that apply.*
   - ☐ I dont have time
   - ☐ It is difficult to use
   - ☐ I am not interested in using moodle
   - ☐ It wouldnt help meet outcomes
   - ☐ I use other tools instead
   - ☐ Other:

8. **Is technical support provided for Students and Lecturers/ Demonstrators at your department?** * *Mark only one oval.*

- ◯ No, not provided at all
- ◯ Yes, but very limited
- ◯ Yes, during office hours
- ◯ Yes, provided for all students 24x7
- ◯ Other:

Learnability of your course

Select all applicable and add other if required.

9. **What type of study materials are available in your Course?** ***Check*** *all that apply.*

- ☐ Interactive Learning Materials
- ☐ Reading Materials
- ☐ Audio and Podcasts
- ☐ Video and Webcasts
- ☐ Assignments (Upload and Download)
- ☐ Mock tests / Practice tests
- ☐ Discussion Forums
- ☐ Subject related chat sessions
- ☐ Academic Wiki and FAQ
- ☐ Other:

10. **What modifications to current LMS will support you optimize your students learnability** *Check all that apply.*

- ☐ Subject contents
- ☐ Subject related literature
- ☐ Online forum for discussions
- ☐ Orientation course
- ☐ Practice Tests
- ☐ Forums and Discussions
- ☐ Scheduled subject chats
- ☐ Other:

11. **What new LMS features will motivate your students to use LMS more** *Check all that apply.*

- [ ] Communication tools (Such as SMS alerts)
- [ ] Mobile ready LMS
- [ ] Multimedia contents
- [ ] Videos of class sessions
- [ ] Audios of class sessions
- [ ] Interactive media for subject contents
- [ ] Discussion Forums
- [ ] Integration of Social Media
- [ ] Digital Archives
- [ ] Assignments Plagiarism check
- [ ] Online Teacher support
- [ ] Other:

12. **What changes will make your students satisfy with LMS ?** *Check all that apply.*

- [ ] Better interface
- [ ] More contents
- [ ] Quality of the contents
- [ ] Responsive LMS (support to all PC, tablet and mobile),
- [ ] LMS app for Smartphones
- [ ] Integration of social media
- [ ] Accessibility
- [ ] 24 x 7 LMS support
- [ ] Other:

What are the expected outcomes of an Online Course according to yourself?

The following statements helps to develop a good tailor made the online course as per your suggestions on "teaching presence".

The course should * *Mark only one oval per row.*

	Disagree				Agree
clearly communicate important course topics.					
clearly communicate important course goals.					
provide clear instructions on how to participate in course learning activities.					
clearly communicate important due dates/time frames for learning activities.					
identify areas of agreement and disagreement on course topics that helped my students to learn					
guide the class towards understanding course topics in a way that helped students clarify their thinking					
keep course participants engaged and participating in productive dialogue					
keep the course participants on task in a way that helped the students to learn.					
encourage course participants to explore new concepts in this course.					
my actions to reinforce the development of a sense of community among course participants					
focus discussion on relevant issues in a way that helped students to learn.					
provide feedback that helped students understand their strengths and weaknesses relative to the course's goals and objectives.					
provide feedback in a timely fashion					

The following statements helps to develop a good tailor made the online course as per your suggestions on "Social presence".

The course should enabled me to *Mark only one oval per row.*

	Disagree				Agree
get to know my students					
form distinct impressions of some course participants					
Online or web-based communication is an excellent medium for social interaction					
feel comfortable conversing through the online medium					
feel comfortable participating in the course discussions					
feel comfortable interacting with other course participants					
feel comfortable disagreeing while still maintaining a sense of trust					
feel that their points of view were acknowledged by other course participants					
online discussions that helped students to have a sense of collaboration					

The following statements helps to develop a good tailor made the online course as per your suggestions on "Cognitive presence".

The course should enabled *Mark only one oval per row.*

	Disagree				Agree
problems to be posed that increased students' interest in course issues.					
course activities that piqued students' curiosity.					
students to be motivated to explore content related questions.					
a variety of information sources to enable my students explore problems					
me to facilitate brainstorming and finding relevant information to help students resolve content related questions.					
online discussions that were valuable in helping students appreciate different perspectives.					
students to combine new information to help them answer questions raised in course activities.					
learning activities that helped students construct explanations/solutions.					
students to reflect on course content and discussions in order to understand fundamental concepts in this class.					
students to describe ways to test and apply the knowledge created in this course.					
students to develop solutions to course problems that can be applied in practice.					
students to apply the knowledge created in this course to their work or other non-class related activities.					

Answers

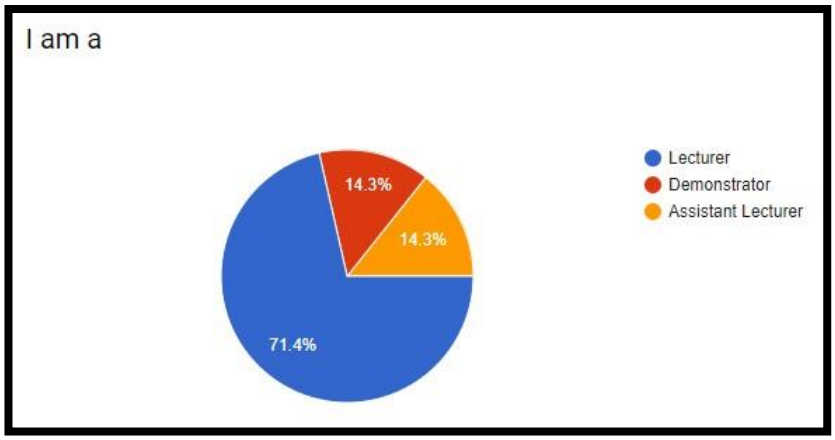

Figure 0.5: About You – I am a

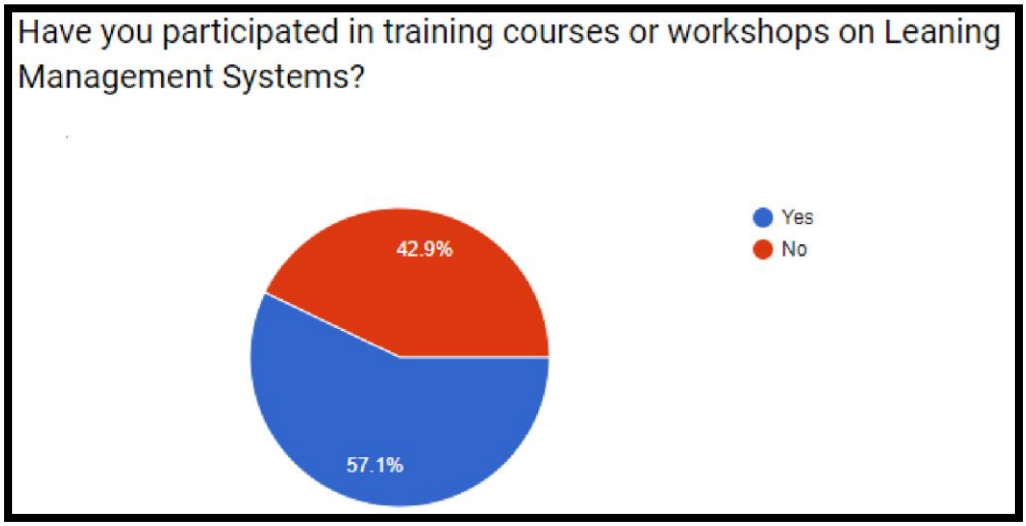

Figure 0.6: Technological Skills on Leaning Management Systems– Have you participated in training courses or workshops on Leaning Management Systems?

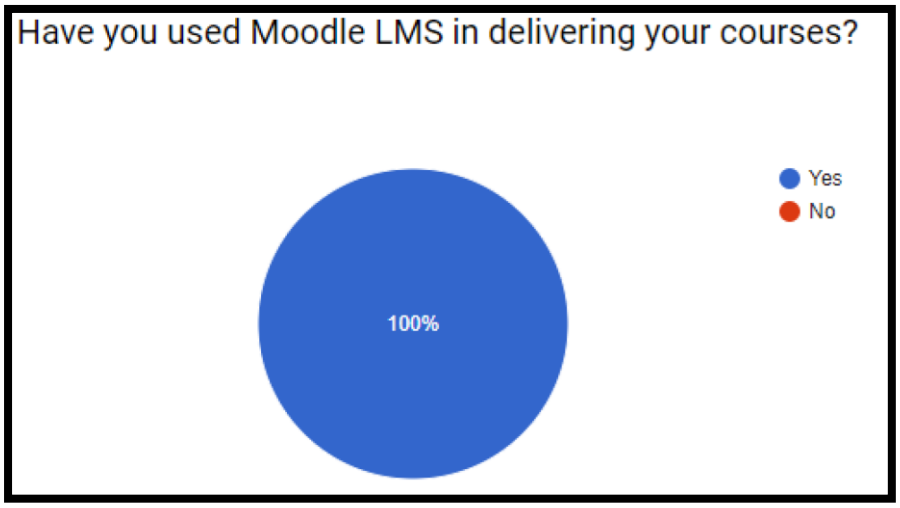

Figure 0.7: Technological Skills on Leaning Management Systems– Have you used Moodle LMS in delivering your courses?

Appendix C - Content Analysis

The Syllabus

Credits : 2	INTE 11512 : COMPUTING FUNDAMENTALS	
Status : Core	Prerequisite : None	Co-requisite : None

INTRODUCTION

This course will help you understand how computers work and how to use them. We'll talk about how to set up a computer, the difference between hardware and software, and the types of computers you can use. We'll also explore operating systems, applications, the cloud, and a whole lot more.

LEARNING OUTCOMES

On completion of this course, the student should be able to:

- Describe the evolution of the computer
- Define basic computer architecture and operations of a computer
- Explain the concepts of data representation, computer arithmetic and Boolean algebra
- Describe the basic components of a CPU, its operations, and how it is used to execute programs
- Describe instruction set architecture and its role in program execution
- Explain how the combinational and sequential circuits perform computer operations
- Describe the systems concept
- Demonstrate data transmission between peripherals.

OUTLINE OF SYLLABUS

Topic	Hours
1- Introduction to Computers	02
2- Application Software	10
3- System Software	02
4- System Unit	02
5- IO Devices	02
6- Secondary Storage	02
7- Connectivity	02

8- Number Systems	04
Lectures	26
Practical and Tutorials	04
Total for the subject	30

PEDAGOGICAL FRAMEWORK

The main pedagogical framework of the course focuses on activity based learning. Students are supposed to do all the learning activities to cover the learning content**.**

EXPECTATIONS/EXAMINATIONS/REQUIREMENTS

Whether student getting started with the first computer or are just looking to learn more about how they work, student will find all of the information s/he need in these written lessons, videos, and interactive. There will be activities and quizzes that are compulsory for the students but the marks of these activities as well as quizzes are not counted for the Final Exam.

RECOMMENDED READINGS

1. O'Leary, T., O'Leary, L. and O'Leary, D. (2015). Computing Essentials 2015: Making IT work for you, McGraw-Hill.
2. Stallings, W. (2013). Computer Organization and Architecture: Designing for Performance, Prentice Hall.
3. Stallings, W. (2009). Operating Systems: Internals and Design Principles, Prentice Hall.
4. Englander, I. (2009). The Architecture of Computer Hardware and System Software: An Information Technology Approach, John Wiley & Sons Inc.
5. Null, L. and Lobur, J. (2014). The Essentials of Computer Organization and Architecture, Jones & Bartlett LLC.

ACTIVITIES

Please refer to the activities on the e-Learning material in your VLE.

Appendix D - The Detail Syllabus

Section 1- Introduction to Computers (02 Hours)

Instructional Objectives

- Explain the parts of an information system: people, procedures, software, hardware, data, and the Internet.
- Distinguish between system software and application software.
- Define and compare general purpose, specialized, and mobile applications.
- Identify the four types of computers and the four types of personal computers.
- Describe the different types of computer hardware, including the system unit, input, output, storage, and communication devices.
- Define data and describe document, worksheet, database, and presentation files.
- Explain computer connectivity, the wireless revolution, the Internet, and cloud computing.

Material / Subtopics

- Introduction
- Parts of an Information System
- People
- Software
- Brief History of Computers
- Hardware
    - Types of Computers
    - Personal Computer Hardware
- Data
- Connectivity and the Mobile Internet
- A Look to the Future

Section 2- Application Software (10 Hours)

Instructional Objectives

- Identify general-purpose applications
- Describe word processors, spreadsheets, presentation programs, and database management systems.
- Identify specialized applications.
- Describe graphics programs, web authoring programs, and other specialized professional applications.
- Describe browsers
- Describe mobile apps and app stores.

- Identify software suites.
- Describe office suites, cloud suites, specialized suites, and utility suites.

Material / Subtopics

- Introduction
- User Interface
- General Purpose Applications
    - Word Processing
    - Spreadsheets
    - Presentation Graphics
    - Database management systems
- Specialized Applications
    - Graphics
    - Web Authoring Programs
- A Look to the Future

Section 3- System Software (02 Hours)

Instructional Objectives

- Describe the differences between system software and application software.
- Identify the four types of system software.
- Explain the basic functions, features, and categories of operating systems.
- Compare mobile operating systems including Windows, MacOS, UNIX, Linux, and Virtualization.
- Explain the purpose of utilities and utility suites.
- Describe need for device drivers.
- Describe the concepts of bit, byte and character encoding
- Explain the difference between low-level and high-level programing languages
- Explain how compilers and interpreters function

Material / Subtopics

- Introduction
- Operating Systems
    - Functions of an Operating System
    - Features of an Operating System
    - Categories of Operating Systems
    - Mobile Operating Systems
    - Desktop Operating Systems
- Virtualization

- Utilities
    - Making IT Work for You
- Computers & Programs
    - Bits & Bytes
    - Programming in Machine Language
    - Programming in Assembly Language
    - Programming in High Level Language
    - Compiler
    - Interpreter

Section 4- System Unit (02 Hours)

Instructional Objectives

- Differentiate the four basic types of system units.
- Describe system boards, including sockets, slots, and bus lines.
- Recognize different microprocessors, including microprocessor chips and specialty processors.
- Compare different types of computer memory including RAM, ROM, and flash memory.
- Explain expansion slots and cards.
- Describe ports, including standard and specialized ports.
- Identify power supplies for desktop, laptop, tablet, and mobile devices

Material / Subtopics

- Introduction
- System Unit Types
- Components
    - System Board
    - Microprocessor
    - Memory
    - Expansion Slots and Cards
    - Bus Lines
    - Ports
    - Power Supply
- Electronic Data and Instructions
- A Look to the Future

Section 5- IO Devices (02 Hours)

Instructional Objectives

- Identify different input devices and their features
- Identify different output devices and their features

- Define printing features and types including inkjet and cloud printers
- Define combination input and output devices including multifunctional devices, Internet telephones, and VR headgear and gloves
- Explain ergonomics and ways to minimize physical damage

Material / Subtopics

- Introduction
- What is Input?
- What is Output?
- Combination Input and Output Devices
- Virtual Reality
- Ergonomics

Section 6- Secondary Storage (02 Hours)

Instructional Objectives

- Identify important characteristics of computer storage
- Distinguish between primary and secondary storage
- Describe platters. tracks, sectors, clusters, cylinders and head crashes of hard disks
- Compare internal and external HDD, SDD, and RAID
- Describe reflective layer, pits and lands of optical discs
- Compare read only, recordable and rewritable CD, DVD and BD
- Explain storage hierarchy

Material / Subtopics

- Computer Storage
    - Hard Disk
    - Optical Disc
- Storage Hierarchy

Section 7- Connectivity (02 Hours)

Instructional Objectives

- Explain connectivity and communication systems
- Describe wired and wireless communication channels
- Differentiate between connection devices and services
- Describe network components
- Classify networks based on their geographic range
- Explain internet technologies
- Explain Internet , web, e-mail and instant messaging

- Describe cloud computing

Material / Subtopics

- Connectivity
- Communication System
- Communication Channel
- Connection Device & Services
- Network
- Internet Technologies
- Internet & Web
- Cloud Computing

Section 8- Number Systems (04 Hours)

Instructional Objectives

- Understand the need and use of different number systems
- Convert the number from one number system to another
- Represent signed integers in binary
- Preform binary arithmetic
- Represent fractional numbers in binary
- Represent floating point numbers in IEEE 754 representation

Material / Subtopics

- Number Systems
- Notations
- Signed Integers
- Binary Arithmetic
- Fractional Values
- Floating point representation

Appendix E – Level 1 - Course Maps

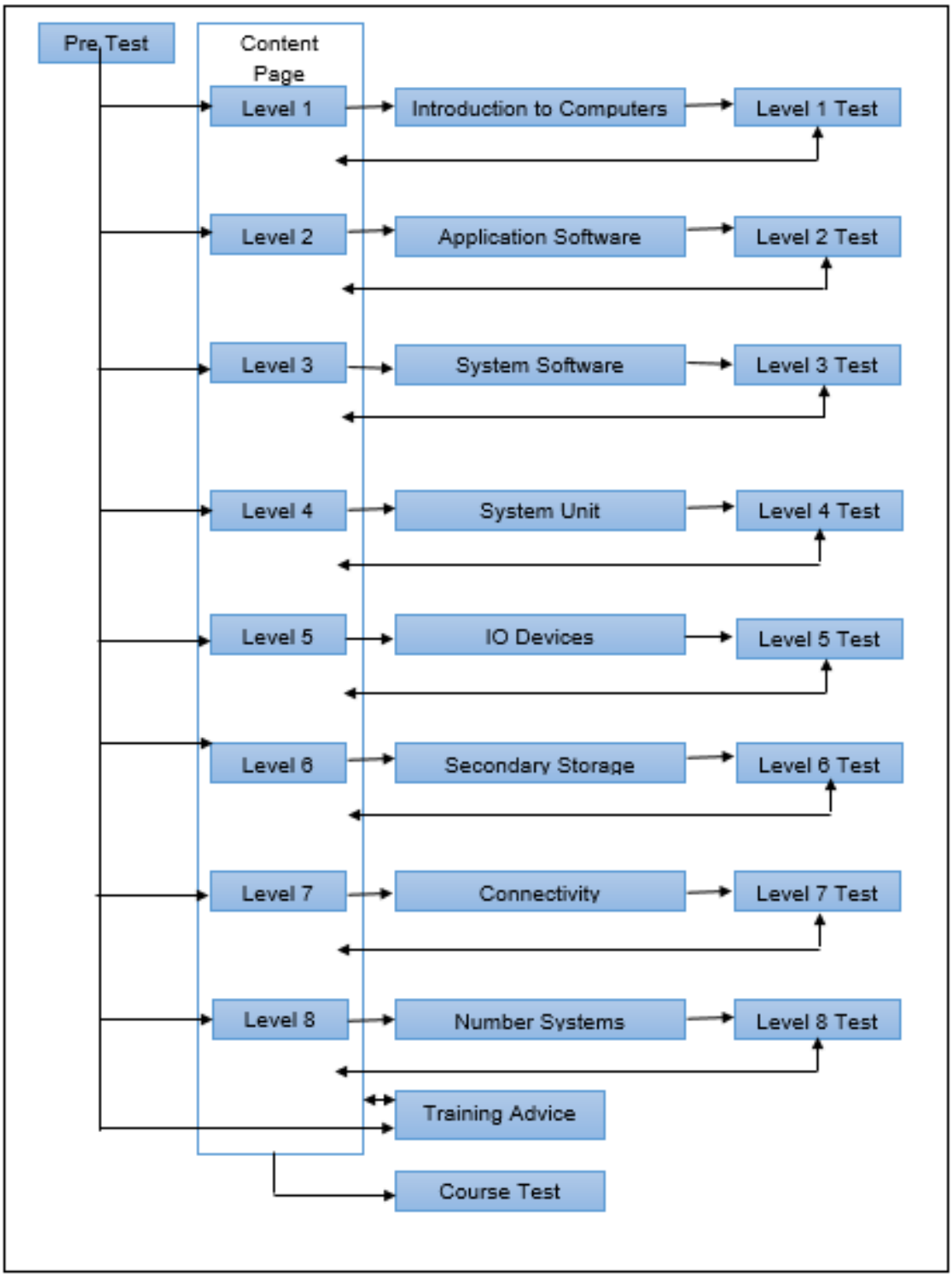

Figure 0.8: Level 1 Course Map

Appendix F - Level 2 - Course Map

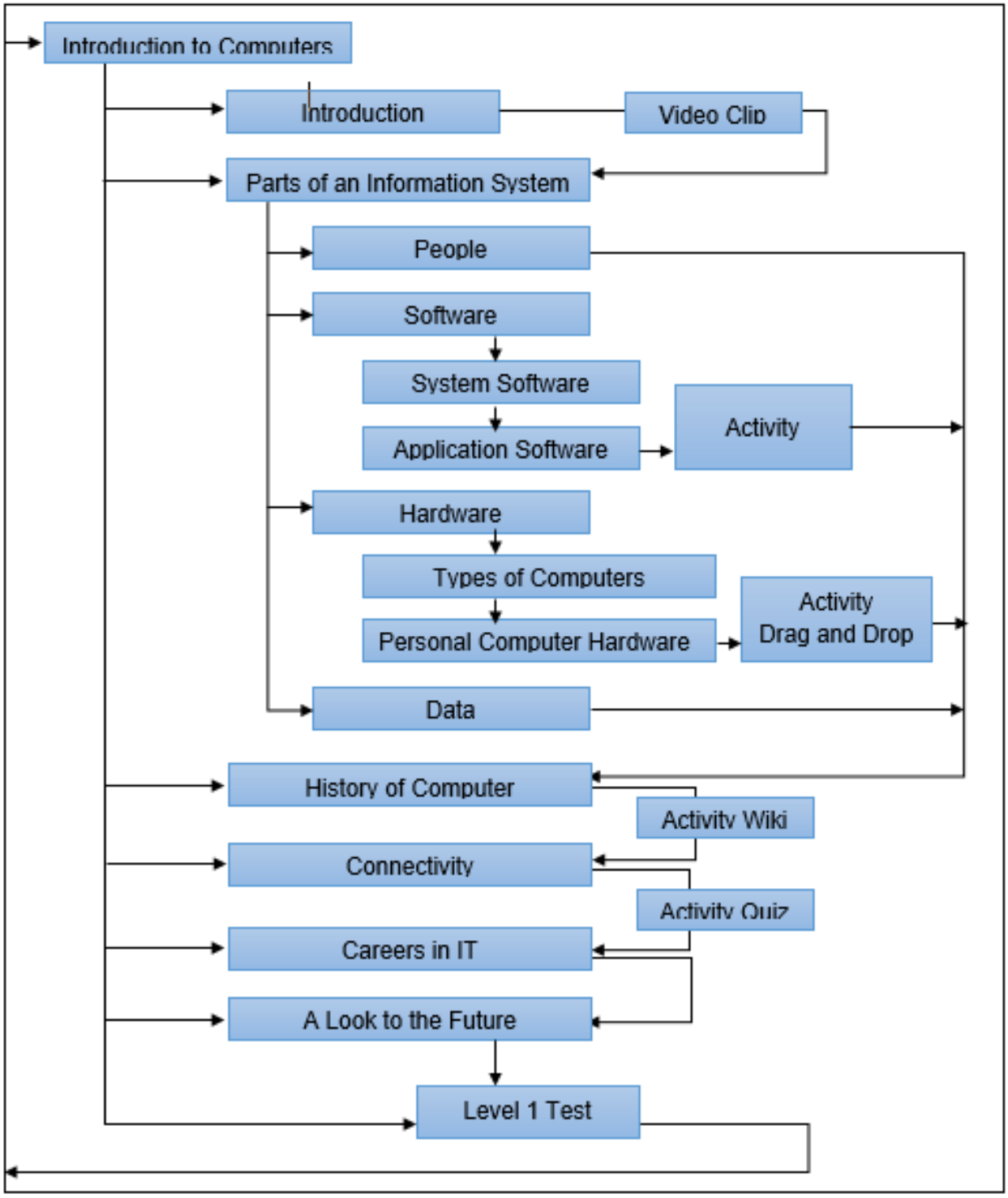

Figure 0.9: Level 2 Course Map