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Design an E-learning Platform for Electronic Laboratory in The Electromechanical Engineering Department at University of Technology Baghdad, Iraq

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Abstract— **E-learning Platform represents a helpful pattern for self-learning of experiments, it is one of the modernized patterns that enable the learners to reach an educational material to extend their knowledge. In this paper, a new platform for electronics laboratory has been designed for Iraqi academic universities and institution; specifically, for the learners of the electronic laboratory in the University of Technology, where it has been designed by using the instructional design model (ADDIE). This platform includes many pages that contain learning materials in form of documents, videos, exams, and applications with their guidance tutorial. According to the results obtained from using this platform is that this platform provided an effective method for the learner of the electronic laboratory to increase their understanding of the complex theories and experiments.**

Index Terms— **E-learning Platform, ADDIE, Electronic laboratory, Website Management.**

I. Introduction

E-learning is an educational system which is considered as an alternative to traditional learning where it is cheaper, faster, and probably better. E-learning does not present any barriers to self-learning where it allows the person to get courses and training to educate themselves at anytime and anywhere via using laptops, smartphones, etc… [1]. It acts as a bridge between the two basic components in the classrooms the learner and the teacher, for this reason it is considered a very popular way for those who want to learn through the Educational technology, and nowadays it is deemed as an important part of the community [2]. In the E-learning there is a part which is indispensable, this part is called the E-learning platform, which is the software applications that present a technological infrastructure to enable performing the E-learning activities [3]. The E-learning platform has characteristics such as authentication, generating and viewing content, reporting the activities that the pupil performs, providing different media to the teachers, and the evaluation tools [4]. The E-Learning platform provides many learning, teaching, and research resources accessible to the society which the learners can obtain such as E-books, video lectures, exams, computer applications prepared by authorized universities and institutions, as well as it enables the communications with instructors and other learners, via message, forums, chats, video-conference [5]. Laboratories are considered means for acquiring knowledge, where they are being utilized for research and for understanding the difficult concepts and to verify the designs before executing them [6]. The electronics laboratory deals with electronic circuits that include electrical components such as resistors, transistors, diode, sensors etc... These electronic circuits are used widely to amplify the weak signals, signal and information processing, telecommunication, and digital information processing, etc... [7].

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II. Research Motivation

The laboratory experimentations and the theories of the electronics field are very complicated to the learners if there is not any practical side in their study. In the past, the electronics laboratory was contained electronics components and equipment that are physically located in the laboratory, but in the recent years, the trend has been changed toward simulation applications, such as Multisim because there were few components and equipment and are not available to all learners [8]. Hence this platform is considered an opportunity for the students to improve their knowledge and experience in the electronic field simply via understanding the theories by watching and listening to the videos and interacting with the experiments rather than only doing the basics exercises, and the learners will be able to access the platform even out the classroom hours.

III. Related Work

Some research on the subject of E-learning platforms is as follows:

- Omer Deperlioglu, Utku Kose, Ramazan Yildirim. [9] In 2012 designed and developed a web-based E-learning system that is used in the course of Electrical Circuit Analysis. This system involves multiple lesson pages that contain texts and interactive simulations, also uses assessment tools and online communication for teachers and students. According to the achieved results, this system develops students' performances in the Electrical Circuit Analysis course and gives an efficient way in engineering learning.
- Mohammed A. Amasha, Salem Alkhalaf. [10] In 2013 designed an online E-learning website that contains the name of the course as Object-Oriented Programming, this course should be taught through online and then designed a program to assess the students' achievement electronically. where a

modern technology is used in the education to achieve a notable improvement in the educational process and in students' attitudes and thoughts. The time of the examinees and examiner is saved by using the E-test results.

• Ivan Kastelan, Jorge R. Lopez Benito, Enara Artetxe Gonzalez, Jan Piwinski, Moshe Barak, Miodrag Temerinac. [11] In 2014 produced an embedded computer engineering learning platform that tends to be utilized in the curriculum to decrease the cost of engineering learning. This platform will guarantee the capability of producing complicated systems and keeping the leadership in the embedded systems field, thereby assuring that the industrial automation, communications, medical systems are able to evolve. The result of this platform is to enable involving the students in the projects and problem-solving rather than only executing the basic exercises.

IV. Research Objectives

The objectives of this research are:

1. Designing an E-learning platform for the electronic laboratory for improving the student skills to understand the complex theories and experiments and to support the development of E-Learning in Iraq because the traditional approach has become useless.
2. Implementing the E-Learning Platform to present the simulation that has been incorporated with material to increase the learners' attention and increase the engineers' motivation towards their lessons and fostering teamwork.
3. Testing the E-Learning Platform to be evaluated by the students and teachers of the electronic laboratory.

V. Website Management

In the Website Management, as shown in figure (1) the pages of the website that serves the administrator, student, teacher, and the visitor is being designed. It depends on the five phases of the ADDIE model which are the (analysis, design, development, implementation, and evaluation). These essential phases are illustrated as follow:

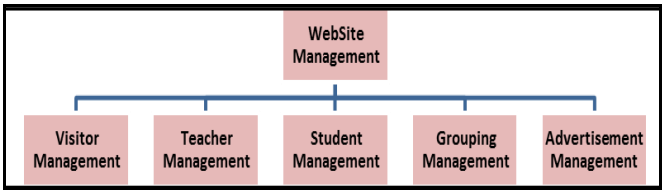

FIG. 1. The Website Management

A. Analysis Phase

It is the first and most important step toward building any system, where it must be given the most interest and time because the outcomes of this phase will be given to the next phases. The analysis phase will be divided into the following steps: In the first step, the students and academics needs are determined by making interviews with the teaching staff to collect more information about the problems that face the education process, and what are their goals to determine the proper solutions, and define the limitations that will probably face the system build. And the teaching materials are collected and arranged to be inserted into the proposed platform. In the second step, the most common E-Learning Platforms have been analyzed and making comparisons among them so as to obtain useful information that helps to prepare the Iraqi higher education needs, to analyze the platform environment, and what are the positive and negative aspects to be able to deal with.

B. Design Phase

It is considered a systematic phase that uses the outcomes that have been obtained from the analysis phase to create a simple and modern design. In this phase, the E-Learning platform for the electronic laboratory is being designing, which consists of multiple web pages. There are types of diagrams that are used to show and explain the design of the platform, and these diagrams are sitemap and wireframe as shown below:

The sitemap diagram: is the first step in the design phase, where it is used to present the entire structure of the proposed E-learning Platform and shows how the pages are linked to each other. In the sitemap diagram, the pages are organized in a hierarchical style, where the home page will be at the top, and the child pages will be added to the bottom horizontally. This Platform is consisting of three levels, the homepage is considered the first level of the site, and the second level pages have a different color as well as the third level, this will make it easy to recognize the hierarchical structure of the platform.

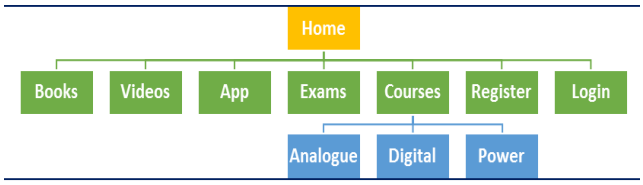

FIG. 2. Sitemap of the platform for Visitors

In this platform there are three subpages which are the analogue, digital and power belong to courses, also it provides different pages for each of the visitor, teachers, and the students of the platform according to the authorities dedicated to every user as illustrated below with figures.

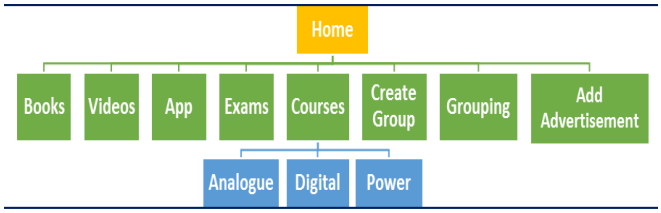

FIG. 3. Sitemap of the platform for Teachers

Where the figure (2) shows the pages that are displayed to the visitor (which is any user does not have an account or the teacher and student before login), the figure (3) shows the pages that are displayed to the teachers, and the figure (4) shows the pages that are displayed to the students.

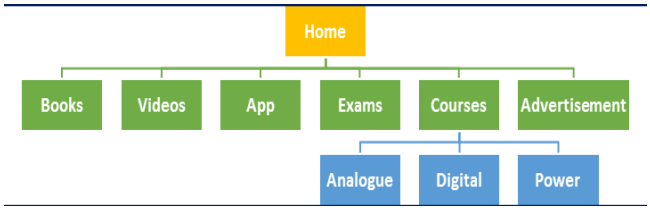

FIG. 4. Sitemap of the platform for Students

The wireframe diagram: is considered the second step in the design phase, where it is used to determine the shape and appearance of the proposed platform. This diagram gives an overview before the coding process, which makes modifying the appearance easy and done in a short time. The software that is used to sketch the wireframe for this platform is the IPLOTZ application. In this platform, a wireframe diagram for the visitor Home page has been drawn as shown in figure (5) which are similar to the Home page for teacher and student in many aspects. The other pages that serve the visitor are designed in a way to only enable the visitor to see the information about the platform. The basic structure and content of the Home page for the teacher is similar to the home page of the visitor but it has some extra features, such as create groups, add students to groups, and add advertisement. The other pages that serve the teacher are designed in a way to enable him to edit, upload, or download the content on the platform such as PDF, videos, text, images, and links. And the basic structure and content of the Home page for the student is also similar to the home page of the visitor but it has one extra feature, which is the advertisement. The other pages that serve the student are designed in a way to enable him to view, read and download the content from the platform such as PDF, videos, text, and images. In grouping management, the teacher can manage the operation that related to creating groups and adding students to the groups that have been created. The aim of this operation is organizing dealing with students by teachers, where the creating group operation can be done by entering the name of the group by the teacher that he wants to create it. Then, the teacher can search for any group that has been created to edit the group name or deletes the group itself. While the operation of adding students to the groups is done by entering the name of the group by the teacher to search for it, then select the group name that has been searched for from the table result. After the group has been selected, the teacher can search for the student name from the table result and click on (Add to this group) button to add it. In the advertisement management, the teacher can manage the operation of adding advertisements to the groups through sending information to the selected group. This information is in form of attachments such as messages, video, PDF, image.

C. Development Phase

The sitemap and wireframe diagrams which are the outcomes of the design phase are used in this phase to convert the design into a real platform through the use of programming works. Where in this phase, there is a need to find out the proper plan for the proposed platform, choose the programs, correct tools, and the suitable languages for the developer. All these needs must be matched to the requirements of the proposed platform. The development phase is divided into three sections which are:

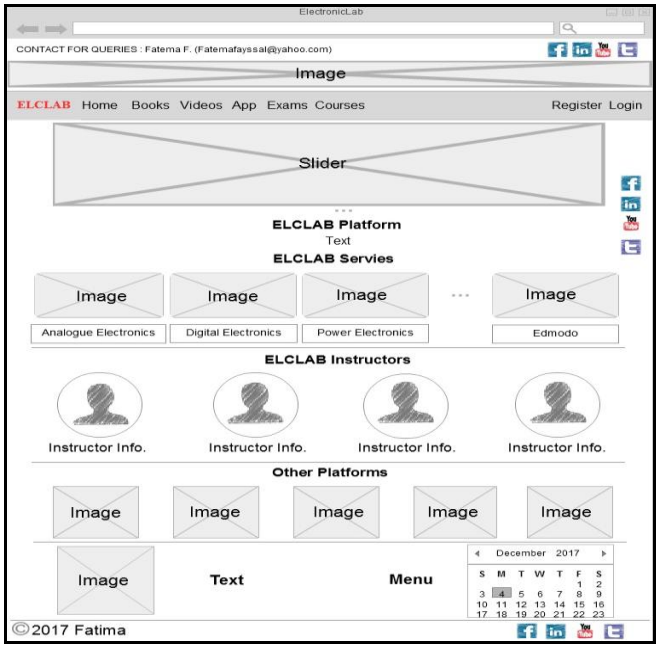

FIG. 5. Wireframe Diagram for Visitor Management

The Development Architecture: where in the development architecture, the basic development architecture components of the proposed platform will be classified into client side, server side, and database as shown in figure (6).

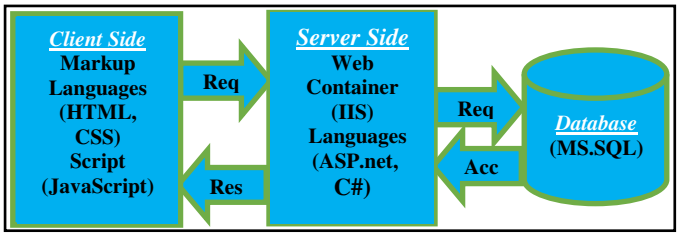

FIG. 6. Development Architecture of the Proposed Platform

The Audience Functionality: In this section, the functionality of the audience will be illustrated to classify the processes they do, where it divided into visitor's processes, teacher's processes and student's Processes. The visitor's processes as shown in figure (7) explain how the visitor can use the proposed platform, where the visitor can see only the information about the platform contents and if he wants to have more information or download the platform contents, then he should register and fill all the necessary information that will be investigated by the admin to confirm the registration, then the visitor can log in to the platform as a student or as a teacher. While in the teacher's processes, the teacher is considered a visitor before he logs in to the platform and has the same visitor properties, but after using his account he can log in to the teacher's pages to be able to edit or delete the information and can upload the attached files. And in the student's processes, the student is considered a visitor before he logs in to the platform and has the same visitor properties, but after using his account he can log in to the student's pages to be able to view the information and read and download the attached files.

D. Implementation Phase

In this phase, the files are moved from a local server to a web hosting server. In order to determine the best web hosting company which should offer the following aspects: Speed

and reliability, Customer support, E-mail, Control panel, Bandwidth and Storage, Database support, FTP service, Statistics software, Domain name, Backups. The web hosting company that is chosen is the IQ HOSTING which is offering suitable prices with many advantages to serve the proposed platform.

E. Evaluation Phase

The evaluation must be done during the phases, between phases, and after the implementation phase, and it could be formative or summative: The formative evaluations are proceeding during and between phases, this kind of evaluation is to improve all phases before the implementation. And the summative evaluation is done usually after implementation to measure the entire platform.

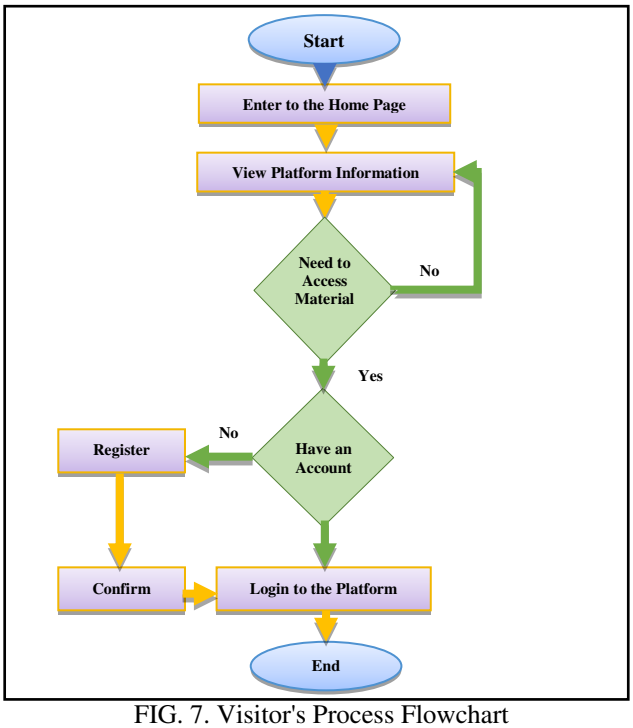

FIG. 7. Visitor's Process Flowchart

VI. CONCLUSION

This paper shows the design of an E-learning platform that is designed for the Electronic Laboratories in the University of Technology in Iraq. Where this study focuses on the designing the platform, preparing its contents, and the usability of it which should not be complicated. The results of using this platform show that the platform provided an effective method for learning the complex electronic theories and experiments in a better way and from anywhere and in any time, also the attached simulations application played a major role in allowing them to learn easily.

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