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INTERACTIVE EDUCATION WEB-BASED PLATFORM FOR THEORETICAL ELECTRICAL ENGINEERING RELATED TOPICS

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Abstract: *The paper represents web-based educational platform, which delivers resources and theoretical electrical engineering related topics. The platform allows easily access by everyone because of its web-based nature. The system is based on top of the free open source software which makes its development efficient and time reduced significantly. The purpose of this interactive educational web-based platform is to provide a variety of significant, quality, and understandable content. Architecture of the platform is scalable and extendable. The article describes theoretical underpinnings, features, architecture, implementation of particular platform, and the application results.*

Keywords: *Education platform, Learning platform, Interactive platform, Electrical engineering platform, web-based education*

1. INTRODUCTION

In recent years, Information and Communication Technology (ICT) and multimedia technology have increasingly altered the landscape of the educational field particularly in higher education. The revolution in the ICT arena has produced a new age of digitalism, which uses digital media as a way to learn and communicate with each other through a method known as online learning.

Nowadays, several tools can promote knowledge and learning, many practices were improved, such as audiovisual resources that were once closely tied to the television and video.

Among the main features of e-learning platforms we can refer to the flexibility, accessibility, focusing on the student, the economy or rationalization of resources, interactivity and enhancement of the student [1].

With the rapid advancement of information and communication technology, almost all of the higher education institutions and schools have equipped themselves with new technological tools.

The use of multimedia or multiple digital media elements in online education is becoming an emerging trend in the communication of educational information. Multimedia "provides a means to supplement a presenter's efforts to garner attention, increase retention, improve comprehension, and to bring an audience into agreement".

The advancement of information media and the convenience of the Internet have fostered the growth of web- based instruction, interactive functions, and resources avail-

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able for learners to engage in interaction, learning, discussion, and access without time and geographic constraints. In design practice, the integration of
computer technology has allowed designers to practice with consistency and innovation design approaches that were long believed to be possible only through the use of traditional tools or simulated hand-made physical objects, and ways in which humans communicate have been improved. Hence, web-based instruction is essential for design education [2].

It is important to acknowledge the fact that students have become more sophisticated in terms of the IT and internet "consumption" and as such can process learning differently through constant exchange of information and discussion.

Students are growing up immersed in digital media which they use for entertainment, communication, learning, and even shopping. Since web logs are a new form of technology and users are doubtful about its successful adaptation, the attitudes and intentions of writing web logs are shaped before initiating efforts begin. In order to make good use of the latest technological advances associated with ICTs, these technologies need to be integrated into teaching practice. This would facilitate the development of innovative modalities that would enable educational institutions to better cater to the needs of the diverse types of students in today's university environment.

Online learning materials, from a student's viewpoint, can be treated as a sequence of webpages. A webpage, of course can contains multimedia elements, hyperlinks and animation. In our methodology, we address three issues that we consider central to producing a flexible and easy to use multimedia content management system:

1. Remote Access - It must provide an effective collaboration interface.
2. Easy to Use - It should be relatively straightforward to produce interactive and personalized educational online notes from the digital archive of educational materials.
3. Maintenance and cost – Maintenance of the software should be without much effort and resources. Expenses should be reduced as much as possible.

Web logs provide opportunities for people to publish their thoughts, opinions and feelings in an online environment. There is no need for special technological skills to develop, update and publish entries while using web logs. Web logs generally share the following features: individual ownership, posted updates displayed in reverse chronological order and the archival of old articles.

Web logs have some features that distinguish it from a web page It allows for easy creation of a page, easy filtering of content for presentation by date or category, and it allows the web log creator to invite and add other authors to the web log. The technological and functional features of web logs allow them to be used for different purposes (reflective thinking, collaboration, interactivity, etc.) as an educational tool [3].

Web-based education has become the cheaper and superior printed book of the modern era.

For the purpose of this paper a web log has been developed and set up, which named "TEE", accessible on the following URL https://tee.ayanev.eu

2. FEATURES

The application uses lightweight markup language - markdown for the con-tent creation.

Different features are integrate, that fulfill the need of the platform, such as math syntax support, drawing charts, diagrams, code snippets, and inserting images.

Markdown itself support syntax for creating – Headings, Bolded text, Italic text, Links, Ordered Lists, Unordered lists, Blockquote, Tables and Footnotes.

The content of the web-based platform can be browse by categories and keywords.

On the bottom of each article, the platform suggest relevat article to be read.

The math support is done by the help of the Mathjax JS and LaTeX which supports latex style syntax, an example is shown below.

LaTeX style math typsetting with KaTeX

```
{{< raw >}}
\[u(t) = K_p e(t) + K_i \int_{0}^{t} e(\tau) d\tau + K_d \frac{de(t)}{dt} \]
{{< /raw >}}
```

$$u(t) = K_p e(t) + K_i \int_0^t e(\tau)d\tau + K_d \frac{de(t)}{dt}$$

Fig. 1 Example of math syntax

Digaram support is done by Mermaid JS, an example of Basic flowchart is shown below.

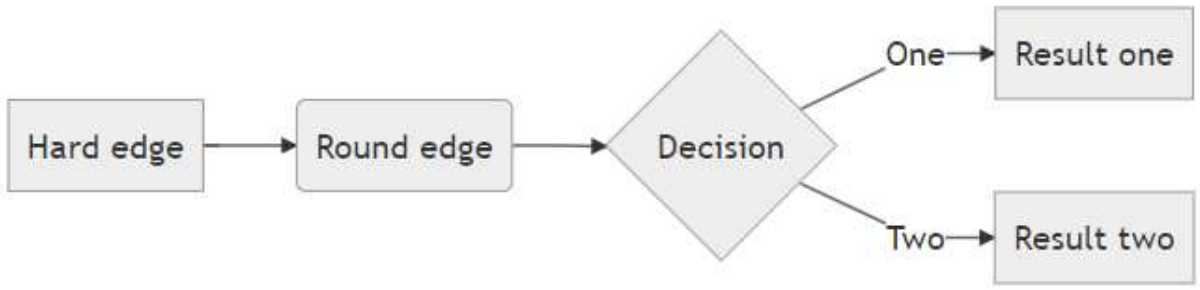

Fig. 2 Diagram support with Mermaid JS

Code syntax is supported by the highlight js, the figure below show a code snippet written in markdown and its render from the applications.

````
```javascript
var s = "JavaScript syntax highlighting";
alert(s);
```
````

```javascript
var s = "JavaScript syntax highlighting";
alert(s);
```

Fig. 3 Code syntax support with highlight js

3. ARCHITECTURE

Designers of online learning systems have an enormous variety of software tools and learning resources at their disposal.

Unfortunately, the wide variety of software tools available from many different vendors are not able to share learning resources and interoperate with each other.

Nowadays, Web-based education research efforts are focused into the standardization of learning metadata schemas, course structures and software interfaces to provide interoperability between applications and learning resources.

This would allow both instructors to reuse learning resources and developers to reuse educational software.

Software reuse is one of the most outstanding research topics in Software Engineering. One of the current trends in this field is the component-based approach. Software reuse allows programmers to focus their efforts in their specific business logic.

The application is build on top of the Hugo [4]. Hugo is one of the most popular open-source static site generators (SSG), with its amazing speed and flexibility.

Improved performance, security and ease of use are just a few of the reasons static site generators are so appealing. The purpose of website generators is to render content into HTML files. Most are “dynamic site generators.”, which means it is possible to review the files locally before copying them to the computer hosting the HTTP server.

A large pool of different open source themes are written for hugo. The application uses a modified version of theme called aether.

The content of the topics is written by markdown markup language.

There are many third party solutions with user interface for content creating, such as forestry.io, instead of writing markdown.

The application uses a GitHub repository for the source code files and GitHub Pages for deployment [5].

A custom shell script is used for deployment, but this process can be optimized further more with continuous integration and continuous delivery (CI CD).

4. APPLICATION

The application design is responsive.

That make its look nice eather desktop and mobile version. Next figures describes how the web platform looks.

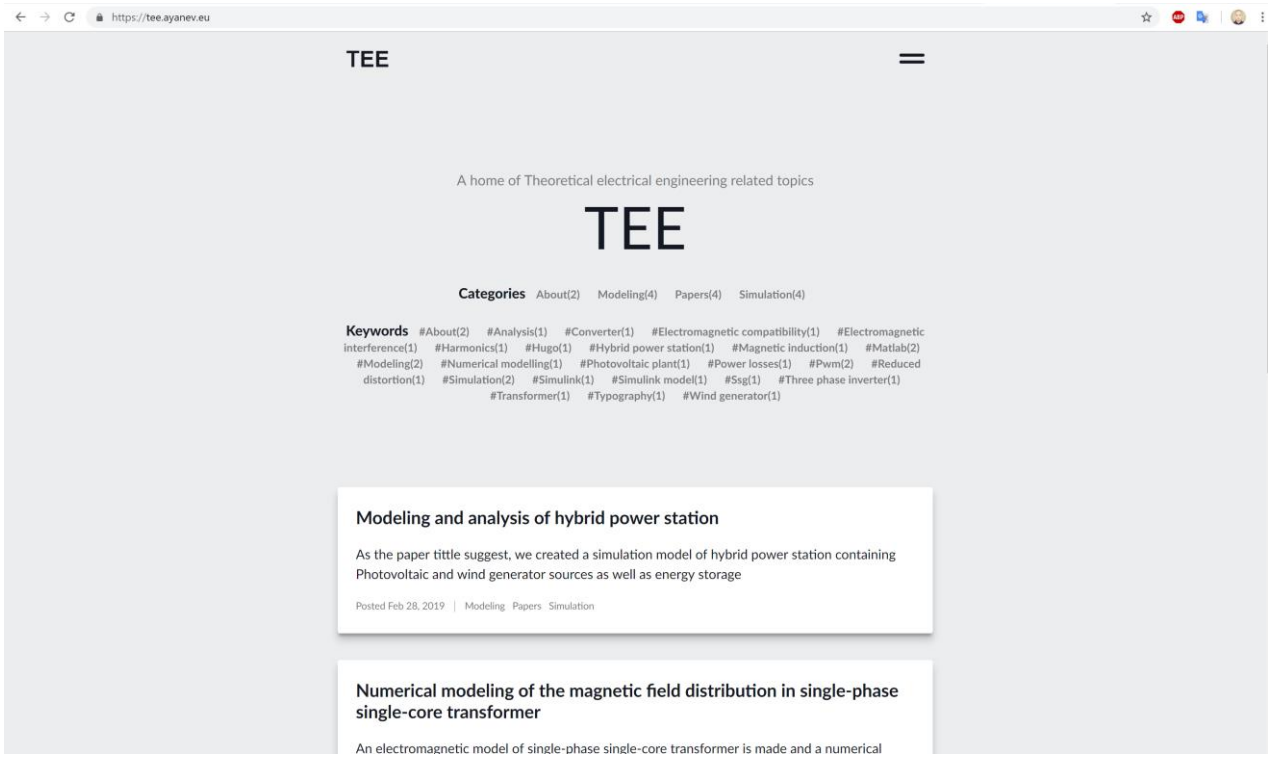

Fig. 4 Home page of the application

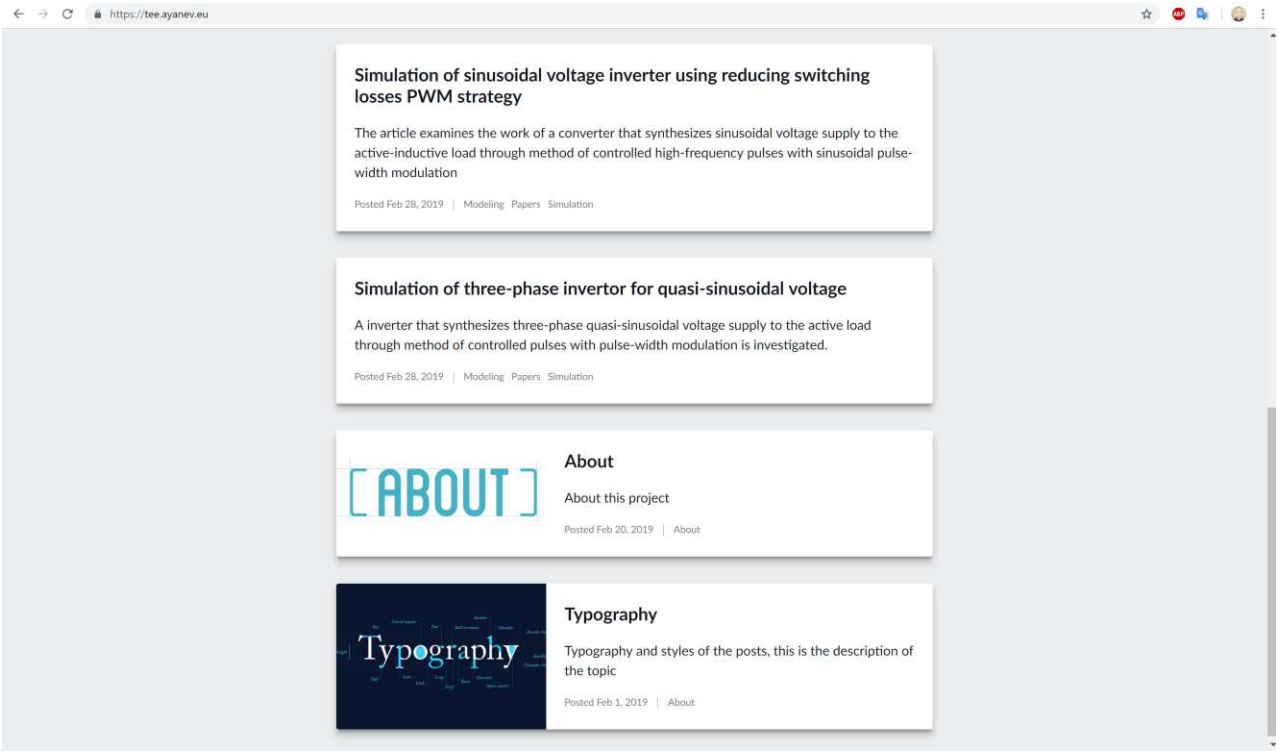

Fig. 5 Application list of the articles

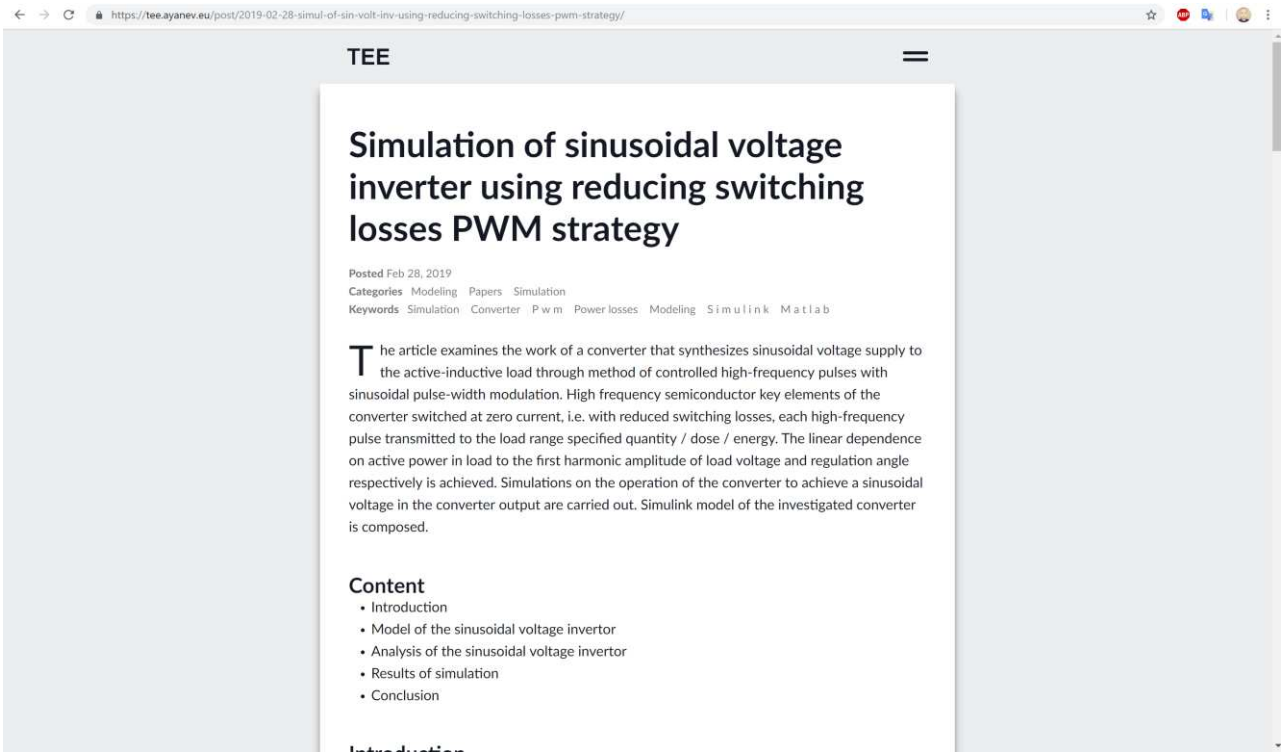

Fig. 6 Example of article content.

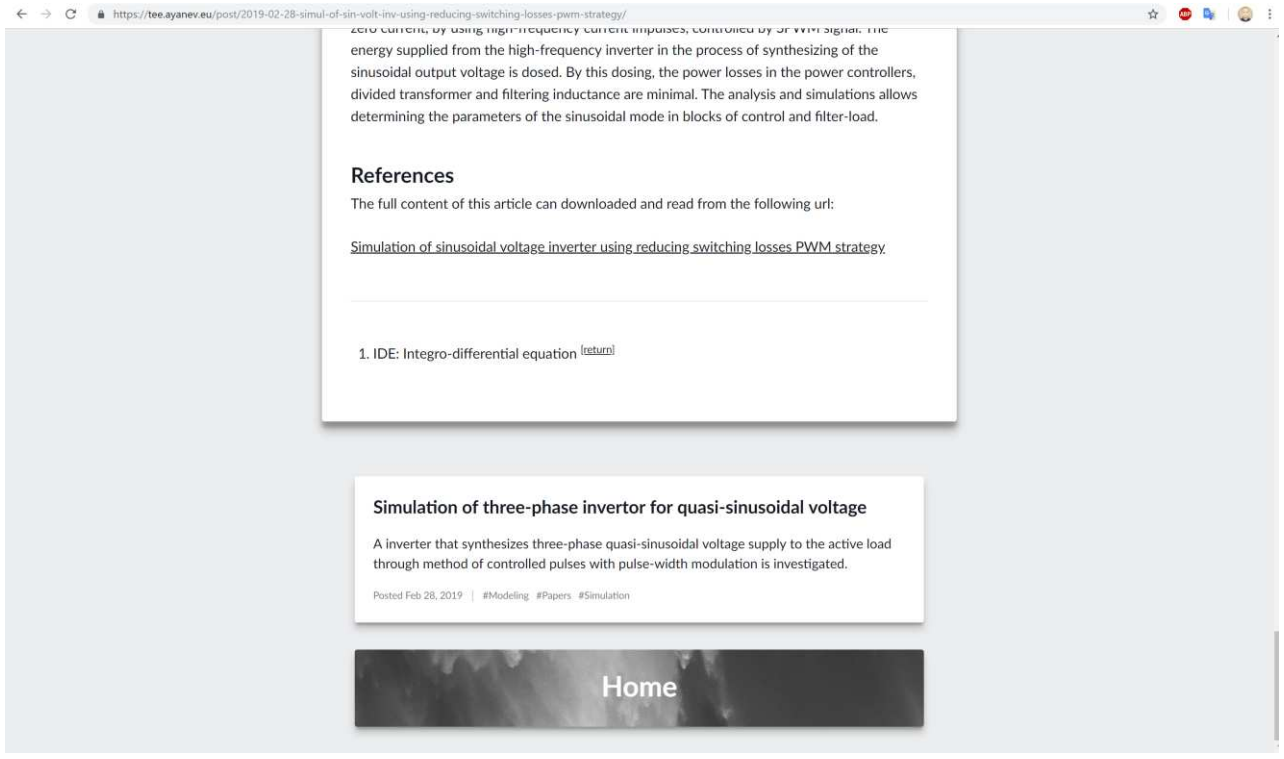

Fig. 7 Example content, botton of the article.

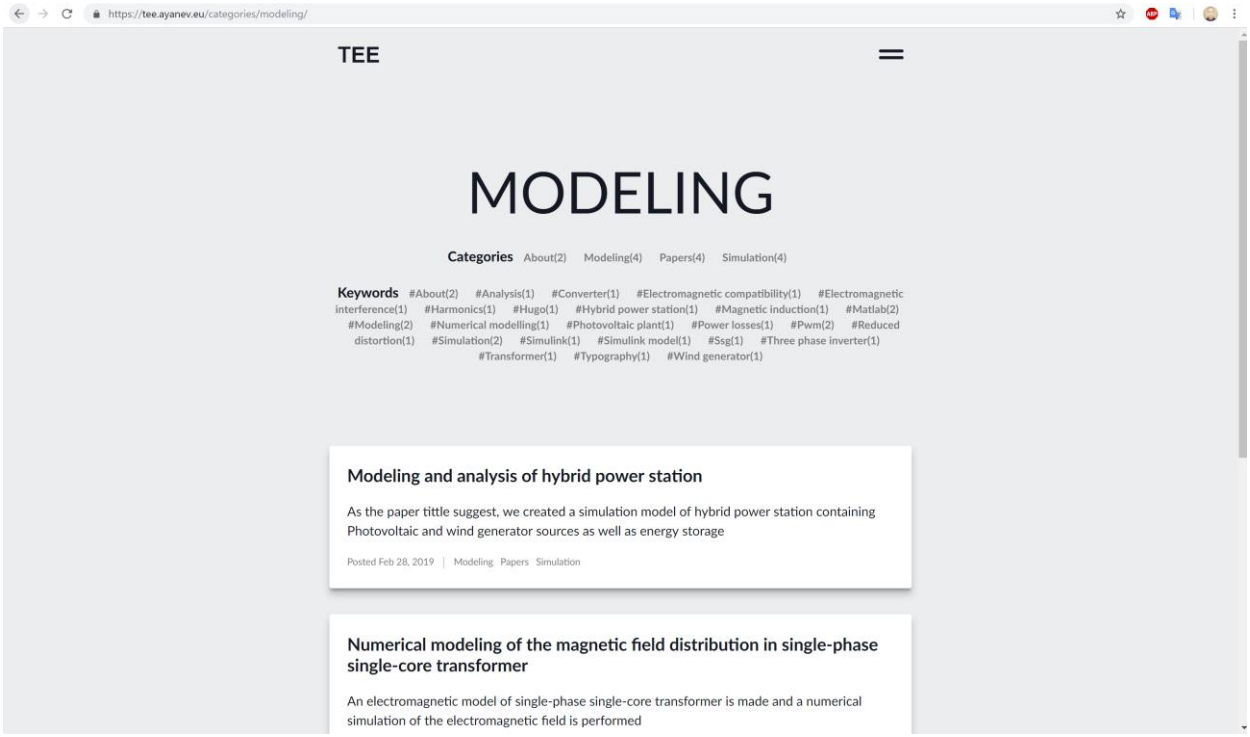

Fig. 8 List of articles associated with "MODELING" category

The fallowing figurates show the application used from mobile device

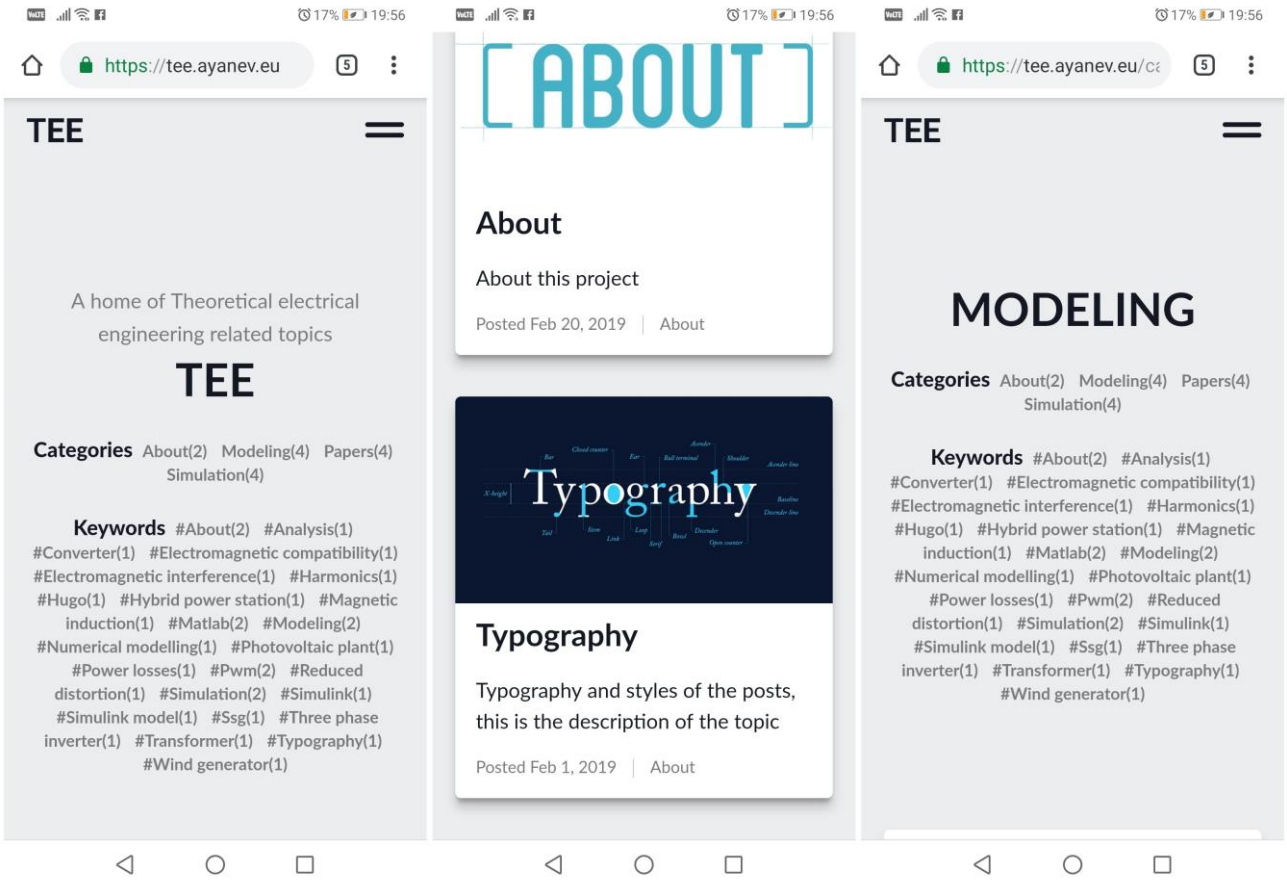

Fig. 9 Responsive mobile design. Home pages and selected cagerogy page

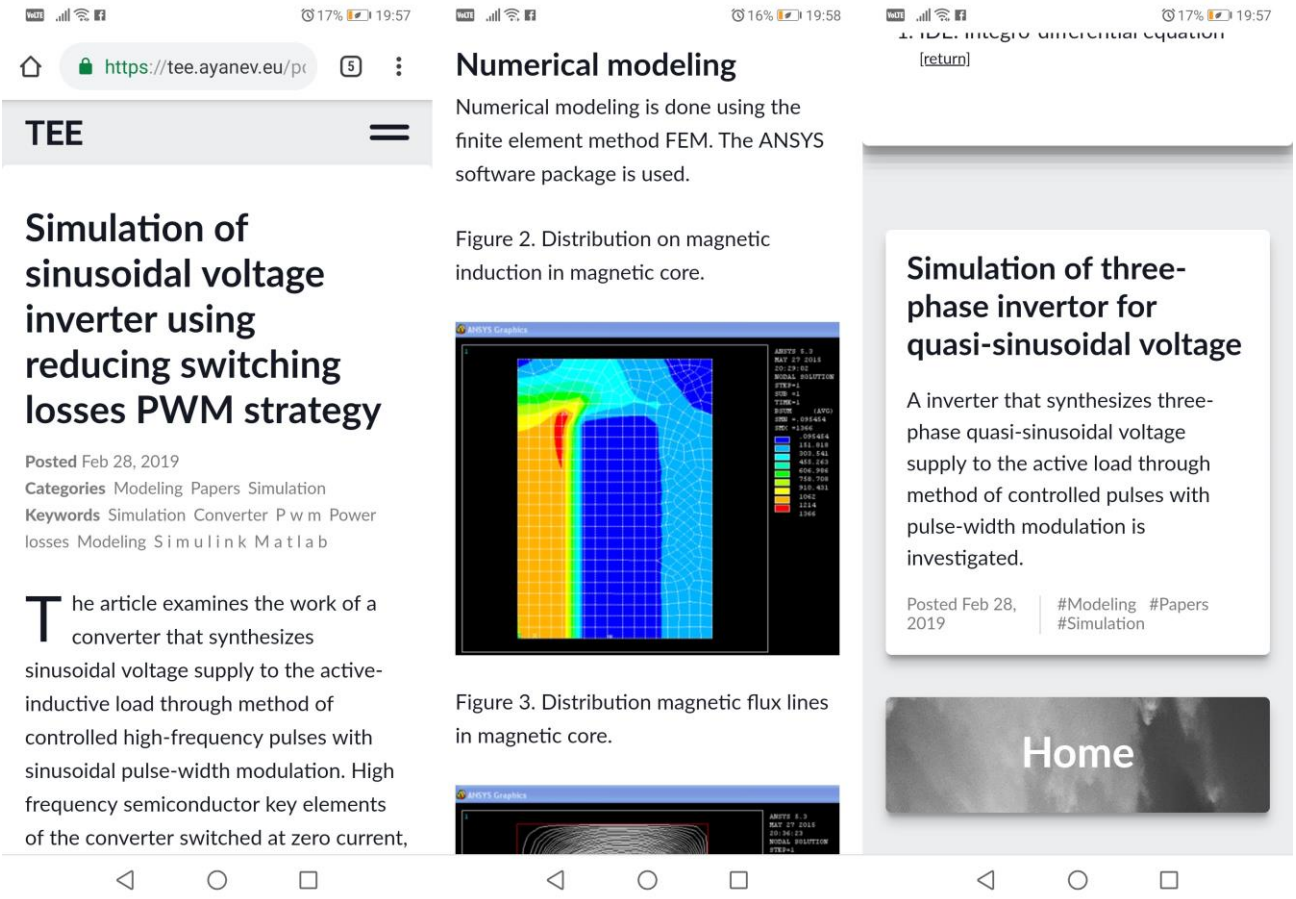

Fig. 10 Responsive mobile design. An example of article content

5. CONCLUSION

The Interactive education web-based platform for theoretical electrical engineering related topics and resources is created.

The platform provides easily use by the end clients and the contributors (authors) of the content.

The required recourses for deploying, hosting and keeping live the system are free.

The system is responsive and accessible by most used devices on the following URL *https://tee.ayanev.eu*

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