Abstract
Web courseware (CW) *The History of Physics* was designed as an outcome of a collaborative work of students and teachers. Its content, graphical and instructional design was prepared to suit pupils, students and Physics teachers. Lessons follows the development of Physics through time and its fields. CW includes a time axis, a dictionary, a help function, a clickable application map, references and links, communication via Web forms, multimedia elements and a quiz. CW as an example of good practice and project teaching is available in Croatian language at http://ahyco.ffri.hr/povijestfizike/

1. Introduction
In the context of a course „Hypermedia supported education“ at the Physics and Information Science undergraduate program at the University of Rijeka, a hypermedia e-learning WWW application or courseware *The History of Physics* was developed. The educational content is the result of teamwork achieved by four students, guided by two teachers of information science and physics. The students, as a part of their tasks, developed an extensive web courseware on the topic of history of physics, and during the development the students have applied the acquired knowledge of good Web and instructional design, as well as included various multimedia elements, online quizzes and communication tools. An excellent project result motivated the authors to further improve the web courseware and turn it into an educational content which could be used not only by students of *The History of Physics* for learning, but also by other physics teachers to facilitate teaching at the primary and secondary level, as well as their pupils. To meet that goal, the courseware is enriched with various content, adjusted texts, quotations, additional materials, and images; with addition of improved design and navigation system. The text in Croatian language is methodologically edited. The courseware is available to users in Croatian language at http://ahyco.ffri.hr/povijestfizike/.

2. Content and the elements of the Courseware
The aim of developing this courseware is to familiarize the user with the development of physics through history, to facilitate the process of learning physics, and to represent physics in a different, more interesting and dynamic way than the classic sources of knowledge do. Historical content is organized chronologically into chapters covering the most important historical periods in the development of physics: Antiquity, Middle Ages, Renaissance, Modern Age, 19\textsuperscript{th}/20\textsuperscript{th} century and 21\textsuperscript{st} century. Each chapter, i.e. period, begins with an introduction which provides basic information about the period from general history view, the length of the period and main ideas born at that time. What follows are the subchapters which describe physics development by fields of physics: the Philosophy of Nature, Mechanics and Astronomy, Optics and Waves, Electricity and Magnetism, Heat and Structure of Matter.

In chapter 19\textsuperscript{th} century Heat is extended by Statistical physics, and chapter 20\textsuperscript{th} century has the following subchapters: the theory of relativity, quantum physics, atomic and nuclear physics, quantum field theory and the physics of elementary particles. Even though the primary organization is chronological, the user can follow the development of the entire physics through each historical period separately or the development of a particular field of physics through all periods.

The historical development of periods of physics is described through an overview of relevant events, discoveries and thinkers. The first occurrence of a physicists’ name is marked in bold, with reference to their birth and death date. The titles of the most prominent works in the history of physics are listed throughout the entire courseware, translated to Croatian language and with the original title in brackets. The pages are visually enhanced by myriad images, and the graphical outlook is improved by quotes of famous physicists or anecdotes, which are framed or marked in cursive. These are implemented into the content as a directly authentic or witty testimony of the time and people, with the purpose to illustrate a specific period, discovery or inventor, and to make the content more interesting and dynamic.
The History of Physics has standard elements characteristic to every courseware: attractive design of the front page as the entry point into the courseware, content, i.e. list of links to all lessons, interactive graphic map, a glossary, instructions for use, list of references and links, tools for communication between users and authors/teachers and elements for knowledge assessment. At the end of each period, i.e. chapter, one can find an interactive quiz with ten multiple choice questions for assessing the user knowledge. After taking the quiz, the user is provided with feedback in the form of a percentage, and the information about correct answers.

The alphabetically organized glossary shortly defines physics terms which are named after physicists, e.g. Doppler effect, Faraday’s law of electromagnetic induction etc. The courseware content is formed as a list of links to all chapters and subchapters. The interactive clickable map also contributes to easier navigation. It graphically represents the hierarchy of the courseware, i.e. chapters, lessons and other elements. The courseware also contains a timeline with marked years of the most important historical events and years of great historic discoveries in physics.

The main menu also offers a page with references and numerous links intended for further expansion of knowledge. The instructions for use consist of basic information about the courseware with an emphasis on element description and navigation rules through the contents. The page “Supplementary material” is organized as a sort of courseware repository; it contains students’ presentations from previous academic years in which the course “The History of Physics” was held, in PDF format.

Communication with authors or teachers is enabled in three ways: via e-mail (the address is: povijest.fizike@gmail.com), via guestbook, where visitors leave their comments using a web form, and a pool, where the aim is to examine the user’s satisfaction with the courseware.

3. Courseware design
Web courseware The History of Physics was created in the context of the course “Hypermedia Supported Education”, and in its development student-authors used knowledge acquired through courses “Computer networks”, “Internet Programming”, “Multimedia Systems” and the “Methodology of Teaching Information Science”. It was developed using the Macromedia Dreamweaver 8 which is used as a web design tool. For developing interactive elements of the courseware, like the pool and guestbook, dynamic programming in php language was used. Quizzes were developed in javascript. Tables are used for the design of the page interface, and the graphical design is based on a background created by scanning a notebook, which is a metaphor for learning and studying. Other graphical elements like letters, colours, arrows and images are adjusted to the historical theme; these are in brown and dark hues which create a resemblance to parchment paper.

The front page of the courseware contains an introductory clip on the development of physics from Antiquity to the present time. The clip is created in Windows Movie Maker and touched up and finished in Macromedia Flash. This tool was also used for the timeline and page map. The creation of title, logo, background image and image processing were performed using Gimp 2.6.1. and Macromedia Fireworks.

To facilitate the process of navigation in the courseware, a few kinds of navigation are used, as an extremely important element of the courseware. Below the title is the primary navigation bar for main elements: content, map, glossary, timeline, instructions, repository of additional content and contact information. On the left side of each page is a secondary vertical navigation with the list of all time periods. By clicking on these periods, a submenu is opened with a list of physics fields described in this period. For easier linear navigation through the content, every page contains an arrow at the bottom which navigates through the same historical period. The right side of the page holds a panel with links to other historical periods in which accomplishments from the same field are mentioned. Another way of navigating through the courseware is enabled by the popular breadcrumb navigation, which is set below the primary navigation.

4. Conclusion
Courseware The History of Physics is developed as an educational material with the intention to support e-learning of the course “The History of Physics” at the University of Rijeka. By content, methodological and design interventions, the courseware is transformed into an educational material intended for a wide group of users, students, and teachers at the primary and secondary
levels of education. It can serve as an e-textbook for students and a sort of e-manual for teachers, as well as an additional source of knowledge on the historical development of physics.
Due to its online form and the usage of multimedia, the courseware enables a more dynamic approach to contents, to which young people can easily relate to, and even manage it better than classic printed sources of knowledge. In this way, the courseware is also intended for general public, for all those interested passing through the virtual space, which maybe don’t strive towards understanding physics itself, but are rather interested in finding out more about discoveries and their historical surroundings. With this in mind, the authors believe that the courseware attributes to the popularisation of physics.

References