

## **GIS EDUCATION IN TURKEY:**

### **GIS Education under The Institute of Natural and Applied Sciences of Anadolu University and Online Education Proposal for International World Campus**

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#### **INTRODUCTION**

Today, developed countries' wealth depends on the information they have. However, it is not adequate only to own this information. It is also important to manage it correctly and orderly. Most of the information contains spatial data and this feature can be used while making analysis. Consequently, the information can be analytically analysed. Analytical analysis provides faster and more accurate interpretations (Cabuk et. al. 2004). Converting the data to information, evaluating the information and making analysis using this information, which is the basis of the scientific and engineering studies, are made in different environments depending on the today's rapidly developing technologies. For the purposeful evaluation of the information, which is obtained as a result of the data evaluation after the necessary scientific processes, it is important to save the information in a form and an environment where authorised users can access and use it collectively. Besides, when required, the necessary information must be rapidly accessible and interpretable to the users. Considering the opportunities that technological developments provide us, it appears to be an inevitable requirement to digitally store the obtained information. Most of the data applied today also contains geographical coordinates. As a result, the location of the data on earth is known. The information coming out in various formats such as text, drawing, picture, photograph, audio, animation and video records, is ready to serve the users with the help of a designed database. Knowing the information with its location as well, will help interpreting the other related elements and the interaction between them by evaluating according to their features.

Remote Sensing (RS) and Geographical Information Systems (GIS), together, introduce a method supported with technological developments capable of planning the studies carried out by related scientific and engineering branches, coordinating the data, using and evaluating the produced information properly. Digitally storing the produced information in a database and relating it with the element in its accurate coordinates are the basis of GIS. Thus, it is possible to evaluate the spatial interaction of the data with each other and access the geographical information such as coordinate, area and length. All feature and location information of each element of data can be evaluated at the same time, so visual interpretations and analysis can be made. When necessary, it is possible to produce intelligent digital maps capable of making modelling works.

When RS and GIS techniques are dealt with by means of urban planning, it is possible to evaluate each feature of the elements making up the city, such as buildings, streets, parks, government buildings, military areas etc., and coordinated and scaled graphical information at the same time. Thus, current status of the city can be examined in a digital environment and future plans can be made properly. Moreover, the results can be seen before the projects are applied, so probable problems are eliminated by changing the project flow process. This provides both time and money saving. It is also important for municipalities to make the planning processes digitally. RS and GIS are also important for the emergency planning and applications in case of a natural disaster. Determining areas proper for pitching tents, organizing the hospitals and fire brigades according to their capacities, determining the most appropriate ways to key places and etc. are the parts of Disaster Information Systems developed by using coordinate and feature information of the mentioned digital data. Disaster Information Systems intend to minimize the probable problems during an emergency case. RS and GIS techniques are highly applied during the works of earth sciences. They are also widely used for geology, environmental engineering, architecture, city and regional planning, surveying, aviation and military applications. It is possible to produce erosion risk maps, earthquake risk maps, biodiversity assessments, landslide hazard assessments, sanitary landfill site selections, route selections, mineral exploration and resource estimation by using the 3-dimensional GIS techniques supported by Satellite imagery. Many successful applications in Turkey have been implemented in these fields.

The main factor of the RS and GIS techniques is the man for he manages both software and hardware. In Turkey, it has been reported that most of the hardware and software become useless because of the lacking users. As a result, existence of users with adequate know-how, experience and knowledge has become the most important factor for using RS and GIS techniques. 5 or 10 years later from now, the use of RS and GIS techniques will be inevitable for all governmental sectors as well as municipalities. Unfortunately, the lack of proper users would only end up with improper and unproductive results and misuse of these technologies. Consequently, the most important start to stop this is training users.

## GIS AND RS EDUCATION IN TURKEY AND AT ANADOLU UNIVERSITY

These days, GIS courses begin to be developed in undergraduate, graduate programs especially in geodesy, cartography, computer sciences, geology, photogrammetry departments of the universities in Turkey. Also GIS based graduate programs have been developed by the graduate schools of natural and applied science of the universities. But these education programs are not enough to reduce lack of GIS experts of Turkey. For these reasons, online education opportunities should be developed by the universities. There are two graduate programs in Turkey on GIS and Remote Sensing Technologies. One of these programs was developed by Middle East Technical University. The name of the program is Geodetic and Geographic Information Technologies. This program caters for the qualified manpower and research needs in these fields. There are three streams of the Graduate Program. These are Space Geodesy, Remote Sensing, Geographic Information Systems. Contributing Departments of this program are City and Regional Planning, Civil Engineering, Computer Engineering, Electrical Engineering, Environmental Engineering and Geological Engineering.

The other graduate program was developed by Anadolu University and will start in this academic year. The main objective of the program is to train GIS and RS experts who can serve in a large range of disciplines for private sector, industrial, commercial, municipal, military and governmental applications to meet various needs. The main goal of the programme is to teach these techniques with the support of current technologies and applications. For this purpose, graduate programme and projects for students from various disciplines have been suggested to take place in the RS and GIS laboratories of Anadolu University.

Anadolu University is the biggest university of Turkey and one of the biggest universities of the world as to the number of students. University is offering distance education programs and has approximately 700000 students. Anadolu University, established more than forty years ago, has become one of the pre-eminent institutions of higher education in Turkey. Anadolu University accepts the responsibility to excel in service to the community and is willing to follow the scientific, academic and technological innovations and meet the universal standards. Anadolu University committed to excellence in research continuously seeks the universal standards and is

well prepared to carry on the responsibilities of a mega university. The University has accomplished 'firsts' in the Turkish Higher Education system and produced solutions to 'problems to education'. Anadolu University today has combined all the essential components of a great and engaging university that is worthy of the young Turkish Republic. Anadolu University aims to prepare students for lives of leadership and service in a constantly changing world. Students who attend Anadolu University find it a place where challenging courses, strong academic majors help develop the tools they need for success. University has 12 faculties and three of these faculties are offering distance education, seven schools offering degree programs and four schools offering associate degrees. Additionally, Anadolu University has 9 Institutes and 20 research centers. (for more information refer [http://www.anadolu.edu.tr/index\\_eng.html](http://www.anadolu.edu.tr/index_eng.html)).

**GIS and RS Graduate program was developed by the lead of Research Institute of Satellite and Space Sciences and will be executed under the supervision of Graduate School of Sciences.** Two groups have been foreseen as a target mass of the program. First group is the science and engineering departments graduates who are likely to continue their studies in the universities. For this group, postgraduate programme with thesis is suggested. The second group includes the people working for private companies and government sectors in the fields applying RS and GIS techniques. For this group graduate programme without thesis is suggested. Contributing departments of the programme are Research Institute of Satellite and Space Sciences, Faculty of Engineering and Architecture, Department of Architecture, Faculty of Engineering and Architecture, Department of Material Science and Engineering, Faculty of Engineering and Architecture, Department of Environmental Engineering, School of Civil Aviation, School of Industrial Arts, Faculty of Natural and Applied Sciences, Department of Statistics, Faculty of Natural and Applied Sciences, Department of Mathematics.

The courses which will be taught within the program is listed below:

**Remote Sensing**

**Geographical Information Systems**

**Computer Based Design Applications and Automatic Mapping/ Facility Management (AM/FM) Systems**

**Database Management Systems and General Concepts (geodatabase)**

**Integration of Global Positioning Systems (GPS) and Geographical Information Systems (GIS)**

**Digital Analysis Methods**

**Fundamentals of Cartography**

**Interpretation and Analysis Techniques in GIS**

**Statistics/Geostatistics**

**Computer Programming**

**Remote Sensing and Geographical Information Systems in Disaster Management**

**GIS For Disaster Management**

**Urban Information Systems**

**Environmental Management and Geographical Information Systems Integration**

**Electromagnetic Wave Theory in Remote Sensing**

**Material Science for Remote Sensing**

**Thesis**

**Seminary**

Students are obliged to take and succeed in at least three lectures besides the seminary.

#### **ONLINE GIS AND RS MASTER DEGREE PROGRAM PROPOSAL**

New computer aided - web based training methods are more effective than traditional training methods especially for graduate courses. The main reason is students can join the courses without going the classroom and this prevents time lost for their professions. On the other hand online courses are also more useful for academicians. Academicians can teach the students without going to classroom, the training materials will be easy to access and supported by animations and illustrations. There are very successful examples web based GIS training and education, such as ESRI's Virtual World Campus and Penn State's GIS Online Master Degree Course. According to new innovations on information and education technology, GIS and RS master program of Anadolu University will be executed online as well using some asynchronous

and synchronized training techniques using internet capabilities. Courses for this program will be fully independent of place and time and totally performed through internet. However, some session of the training will be fully independent of place and independent on time. Lecturers and students will never be in same location and students will be trained using internet relay chat in some hours. In the first stage, the online program will be in Turkish. In the second stage, the program will be in English and will be open to foreign students as well. The target will be Middle Eastern Countries. The existing spatial data is outdated or incomplete, is not integrated as file format and geographically in Middle Eastern Countries (Cabuk, A., 2003). For this reason, there is a lack of expert in Middle Eastern Countries. Many departments depend on consulting companies to establish their GIS. Although there is in-house training, it is not enough to handle/maintain a GIS project. Non-availability of staff involved in the GIS project from the beginning is another factor that may result in failure of GIS. It is also noticed that there is a migration among the trained staff to other branches of the governmental departments or to the private sector. The reason beneath choosing the Middle Eastern Countries as a target is to try to provide educated expert on Geomatics without going to Campus. For more information for GIS and GIS Education in Middle East refer [http://www.angelfire.com/mo/yagoub/images/GIS\\_UAE.htm](http://www.angelfire.com/mo/yagoub/images/GIS_UAE.htm).

As mentioned before, although the usage of GIS technologies is extremely important in Turkey it can't be widely used because of the lack of the staff to work in this field. Anadolu University has too much experience on distance education and, using this experience, wants to develop an online course on GIS and RS depending on foreign GIS training models and the strategic tendency towards the GIS requirements in Turkey. Moreover, with this internet based online training program, the infrastructure of the cooperation among the private sector, the government departments and the universities and information sharing infrastructure between these organizations can be provided.

The user interface for this online program has partially been developed by Research Institute of Space and Satellite Sciences, Anadolu University. The program will have 3 main users: Student, teacher, and administrator. These users have different user interface and applications using internet capabilities. Some examples for the user interface and courses are given in Figure 1 and Figure 4).

**Figure 1.The lectures are supported with some online-interactive tests, pictures, illustrations and animations (Ayday et al 2004)**

keskin gölgे olayına, yeteri kadar kısa dalga uzunluklarında ışık hem düz gidebilir hem de keskin gölgé yapabilir diyerek açıklık getirdi, girişim yasalarının açıkladı ve ışığın dalga uzunuşunu öptü. Bu arada Fresnel adında bir Fransız bilim adamı kininm olayını başan ile açıkladı ve dalga teorisi güvendi.

İşik Deneyleri "Optics" kitabının yazarı aşağıda verilen bilim adamlarından hangisidir?

Hooke  
 Huygens  
 Newton  
 Römer

Pratikte biz ışık diye elektromanyetik tayfin görünen ışık kırınım bölümünün algılanması göz sayesinde kolayca başanılır. Bunlar birebirinerek algılanır.

"İşik nedir?" sorusunun cevabı etrafındaki kavga arbik son zaman particle (parçaok) kimi zaman wave (dalga).

Cekim, Elektromanyetik Zayıf Etkileşim ve Güçlü Etkileşim olarak tanımlandığına göre Elektromanyetik etkileşimle bağlantılı olan gluon'a ne ad verilir?  
Aşağıdaki alanına yazarak tamam butonuna basınız.

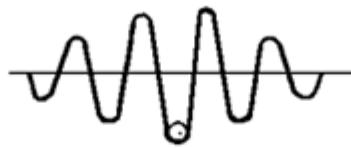
**Microsoft Internet Explorer**

Yanlış. Doğru cevap FOTON olmalıdır.

Tamam

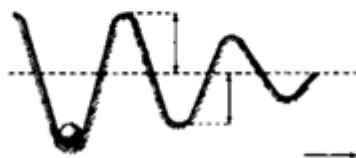
parçacaktır yanı kimilerinin deyişi ile "wave" dir. Yani kim

Taş çevresinde iki adet tepecik oluşmasına neden olmuştur (Şekil 4). Belli bir süre geçmişten sonra yarataban tepe ve çukurları sayı artacaktır (Şekil 5).



Şekil 5: Dalga yayılıyor

Taşın sağında tepe ve çukur görülmektedir. İki tepe veya iki çukurun arası DALGA BOYU olarak tanımlanır (Şekil 6).



Şekil 6: Dalga boyu

Bir tepenin su yüzeyine göre yüksekliği ya da çukurun su yüzeyine göre alçaklışı GENLİK olarak adlandırılır. Genlik kaynaktan uzaklaşıkça azalmaktadır (Şekil 7).

**Figure 2. User enrollment for the program (Ayday et al 2004)**

The screenshot shows a Microsoft Internet Explorer window with the title 'User Enrollment'. The page is titled 'User Enrollment' and displays an 'Online Application Form'. On the left, there is a 'Login' section with fields for 'Kullanıcı Adı' (Username) and 'Şifre' (Password), followed by an 'OK' button. To the right of this is a larger form titled 'ÖĞRENCİ FORMU' (Student Form) containing fields for 'Ad' (Name), 'Soyad' (Surname), 'Ovren' (Address), 'Telefon' (Phone), 'Mail' (Email), 'Şehir' (City), and 'Adresi' (Address). To the right of the student form are fields for 'E-mail', 'Düzen Telefon' (Mobile Phone), 'Önaylı' (Approved), 'Kullanıcı Adı' (Username), 'Şifre' (Password), and 'Şifre' (Password) again. At the bottom right of the form is a 'Kayıt' (Registration) button. The browser's address bar shows the URL 'http://129.144.12.107/PLMS/online\_register'. The taskbar at the bottom of the screen shows various open applications including Microsoft Word, Microsoft Excel, and Microsoft PowerPoint.

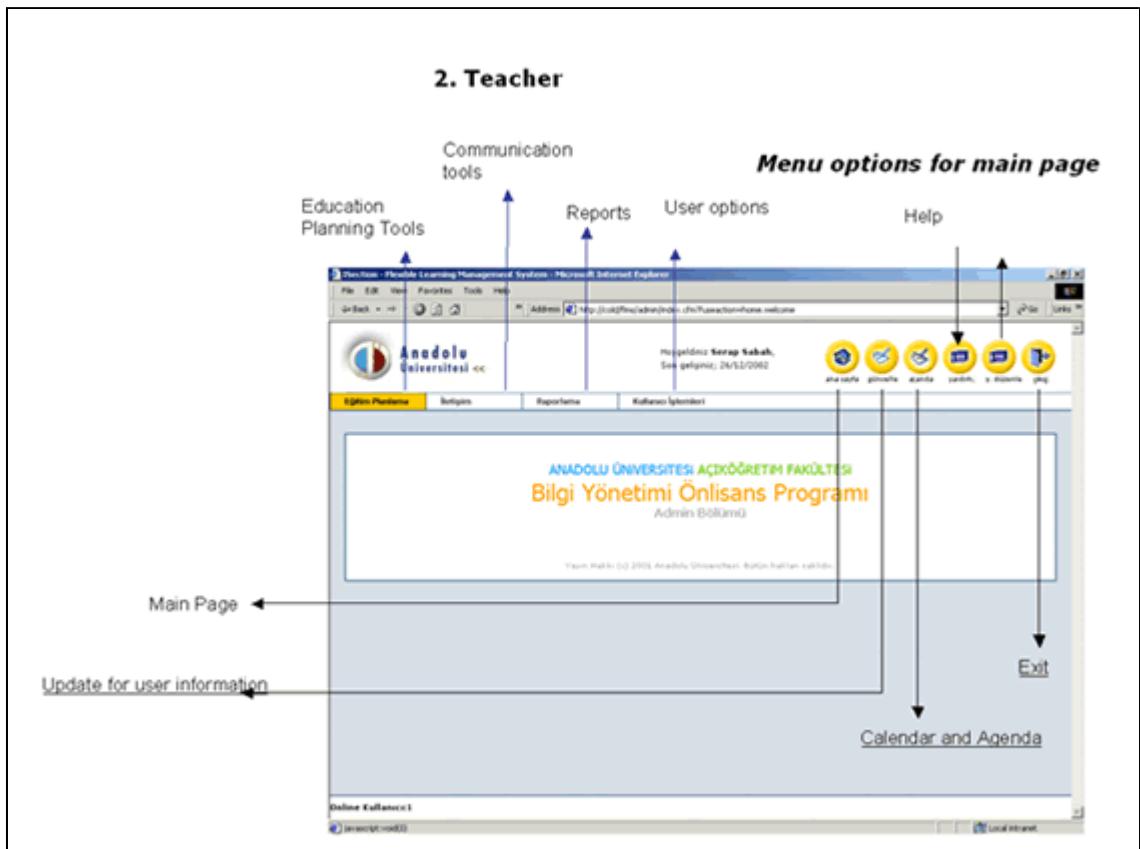
**Figure 3. User interface and some tools for students (Ayday et al 2004)**

### 1. Student User Interface

The student user interface consists of a main page and several tool windows:

- Main page:** Displays course links (Courses, Transcript, Forum, FAQ, Add message, Chat Room, Settings), announcements, messages, and a note book.
- Updating tool for user information:** Shows a calendar for the week, with days labeled "Öğretim Günü" (Teaching Day) and "Öğrenci Günü" (Student Day).
- Agenda:** A list of scheduled events.
- Exit:** A button to exit the application.
- Tool windows:**
  - Transcript:** Shows a table with columns: Date, Name, Grade, and Grade Points.
  - Forum:** Shows a list of topics and posts.
  - Messages:** Shows a list of messages.
  - Notes:** Shows a list of notes.

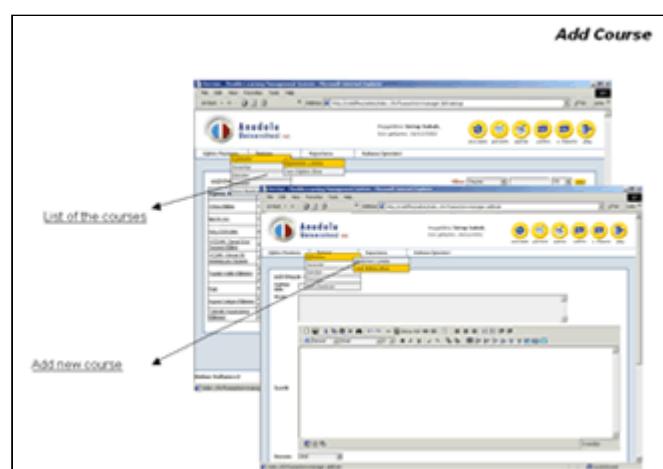
Figure 4. User interface and some tools for teachers (Ayday, et al 2004)

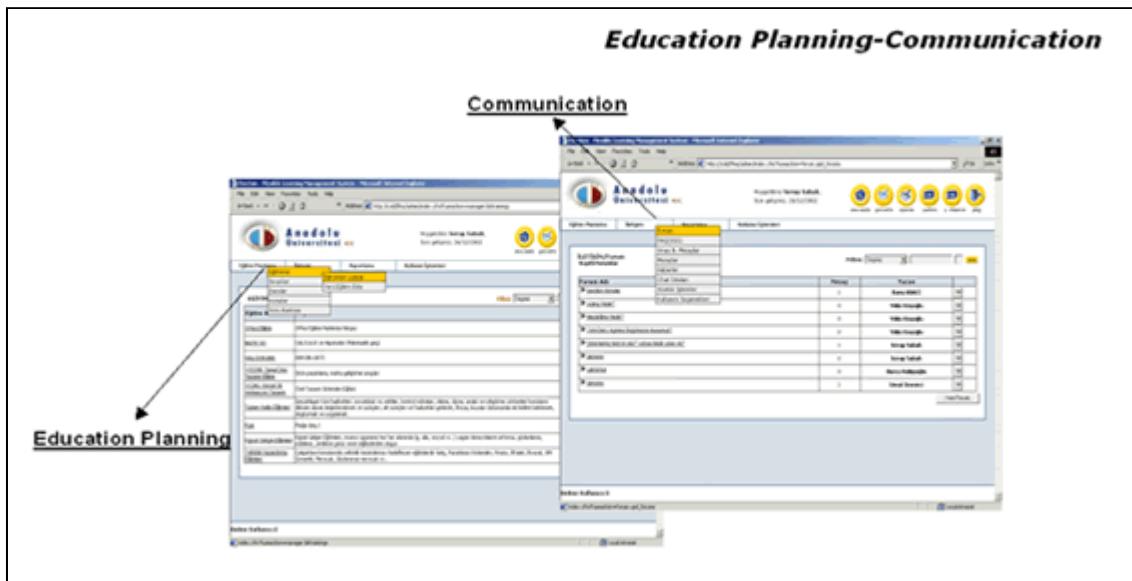
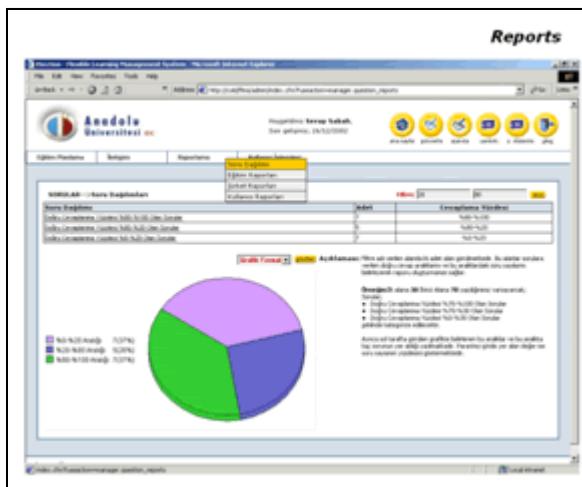


**Exams**

**Question Bank**

**Figure 4. cont. User interface and some tools for teachers (Ayday, et al. 2004)**





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