LATVIA UNIVERSITY OF LIFE SCIENCES AND TECHNOLOGIES
FACULTY OF ENVIRONMENT AND CIVIL ENGINEERING

APPROVED
by the academic staff meeting of
Department of Land Management and Geodesy
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CARTOGRAPHY

Jelgava
Programme

Code of the study course at LLU IS Register**: BūvZ4083**
2.5 CP (10 h): Lectures – 10 h, Laboratory works – 15 h Course Project 15 h.
Type of assessment: Formal Test with a grade, following the presentation of laboratory works and the course project.
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Compulsory course of the 2nd level professional higher education study programme "Surveying", 7th semester

Abstract

The study course provides theoretical and practical insight into the cartography industry. Students are introduced to the history and development of cartography until today, mathematical justification of maps, mapping principles, methods and usage. In the laboratory students acquaint with initial practical skills to draw up a variety of maps and related digital GIS data sets as well as use its results.

The aim of the study course:
The aim of the study course is to provide students with knowledge about technologies and conditions for the production of various cartographic materials (analogue and electronic) and their use and application. Students acquire skills of drawing up different types and scales of cartographic materials (new maps) and their corresponding digital GIS data sets in laboratory works;

Learning outcomes (knowledge, skills and competence):
After completing the study course students will have:

- **knowledge** of the mapping methods and their practical application;
- **skills** to read and use analogue and digital maps; skills to make various maps and to perform different kind of work for production of different kind of maps;
- **Competence** to evaluate rationally the selection of mapping methodology according to objectives of the designed map and implement creation of maps in practice including GIS software.

Relation of the study course with other subjects:
"Higher Mathematics", "Geodesy", "Land Cadastral and Topographic Surveying" , "Geographic Information Systems", "Computer Graphics", "Photogrammetry".

Requirements for individual work:

1. Individual studies of the theoretical literature as well as other resources (including online) about mapping and map applications. Creation of maps using given materials and other available materials online using internet resources and professional cartography software as well as ArcGIS software.

***Assessment of knowledge*:**

- Students should successfully pass tests, complete and submit all laboratory works. Students should complete the course project. The type of assessment is a formal test with the grade (following the presentation of the course project and laboratory works).

***Procedure and requirements for settling missed lectures*:**
The missed or failed tests and missed laboratory works should be settled at the time scheduled by a lecturer.

Extended content of the programme

Introduction
History of cartography in the world and Latvia.
Theoretical overview of cartography.
Cartography and its relation with other sectors and GIS software.
Mathematics of cartography.
The Earth's ellipsoids and coordinate systems. Cartographic projections. Map scale. Coordinate networks. Division of maps in pages, nomenclature of maps.
Methods of designing maps.
Designing maps. Sources of map content. The map content, background, legend and design. Cartographic means of expression: symbols of points, lines and squares. Cartographic means of expression: vectors, diagrams, graphs, colouring, fill-ins. Types of writing names of objects. Visualization techniques of the relief. Generalization of maps.
Topographic maps.
The structure and content of a topographic map. Usage of a topographic map.
Geographic maps.
The structure and content of geographic maps, principles of design and application.
Thematic and special maps.
The structure of a thematic map. Themes of thematic maps, the process of creation of thematic maps.
Analysis of the map content.
Analysis methods of the map content and their technical features.
Digital cartographic data.
The meaning, structure and use of digital cartographic data. Terms and standards for creating and using digital data. Data forming processes and regularities. Data and GIS requirements.
Content and quality analysis of cartographic data.

Methods of analyzing and evaluating the quality of the digital map content, the technical features of their use. GIS requirements, performance evaluation and provision.

Laboratory works and the course project:

1. Creation of the sketch of a native place from memory and later comparison of the sketch with other cartographic materials (scanning the sketch in ArcMap, attaching coordinates and matching with other maps).
2. Design of a topographic plan M1:500 of the chosen place (according to the surveying requirements) in a digital format using orthophoto maps available in the website of Latvian Geospatial Information Agency (students can choose either ArcMap or MicroStation software) and creation of printouts (A3 format, Pdf file).
3. Transformation of a topographic plan M1:500 to M1:5000, generalization of data and image, zooming of the territory on the map until 1x1 km and creation of printout (using ArcMap or MicroStation programme);
4. Design of the created M1: 5000 plan in accordance with the cartographic design requirements (coordinate network, the layout behind the frame, change of levels, object resymbolizing, text and symbols on the map); preparation of the printout in the ArcMap software.
5. Transformation of the created topographic plan M1:5000 to a map of scale M1:10000, generalization of data and the image, extension of mapping territory until 15x15 km, design of a relevant map layout, creation of the printout in ArcMap programme.
6. Transformation of the created map M1:10 000 to a topographic map scale M1:50 000, generalization of data and the image, extension of mapping territory until 2.5x2.5 km, design of a relevant map layout, creation of the printout in ArcMap programme.
7. Arrangement of the created cartographic digital data sets according to the usage requirements in GIS data bases – in SXP files (ArcGIS) (sorting data in layers, mutual matching, adding, adding metadata, and other related activities).
8. Searching different maps or their data in the internet and performing different tasks using maps available in the internet and their possibilities (ArcCatalog and ArcGlobe).
9. Drawing of the location of the native place or any other place using the open world map "OpenStreetMap"; modelling of 3D buildings using Google SketchUp or ArcScene.
10. Adding or combining various cartographic materials (available on the Internet) in the ArcMap programme, their coordination or transformation of coordinates; creating a printout of cartographic products with independently projected mapping data and the newly prepared combination.
11. Work on the course project: the layout (using designed maps and data sets prepared during the laboratory works) and presentation during the defence.

Bibliography

1. Štrauhmanis J. Kartogrāfija: Mācību līdzeklis. Rīga: RTU, 2004., 109 lpp.
2. Mūsdienu Latvijas topogrāfiskās kartes. Rīga: VZD, 2001. - 2001., 203 lpp.
3. Vanags V. Mūsdienu Latvijas topogrāfiskās kartes: Fotogrammetrija. Rīga: VZD,

2003., 275 lpp.
4. Stūrmanis E. Ģeoinformācijas sistēmas. Jelgava: LLU, 2006., 90 lpp.

Further reading:

1. Helfriča B., Bīmane I., Kronbergs M., Zuments U. Ģeodēzija. Rīga: LĢIA, 2007., 262 lpp.
2. Štrauhmanis J. Teorētiskā kartogrāfija. Mācību līdzeklis. Rīga: RTU, 2005., 44 lpp.
3. Štrauhmanis J. Kartogrāfijas praktikums. Mācību palīglīdzeklis. Rīga: RTU, 2004., 34 lpp.

Periodicals, sources of information and cartographic resources:

1. Latvijas Ģeotelpiskās informācijas aģentūra. [tiešsaiste]. [Skatīts 14.06.2011.]. Pieejams: http://www.lgia.gov.lv/
2. Mernieks.lv. [tiešsaiste]. [Skatīts 14.06.2011.]. Pieejams: http://mernieks.lv/
3. Karšu izdevniecība "Jāņa sēta". [tiešsaiste]. [Skatīts 14.06.2011.]. Pieejams: http://www.kartes.lv/
4. Геоинформационный портал ГИС-Ассоциации. [tiešsaiste]. [Skatīts 14.06.2011.]. Pieejams: http://www.gisa.ru/
5. Latvijas Nacionālā bibliotēka. [tiešsaiste] Pieejams: http://kartes.lnb.lv/
6. Atvērtā pasaules karte „OpenStreetMap" [tiešsaiste] Pieejams: http://www.openstreetmap.org/
7. Google Earth [tiešsaiste] Pieejams: http://www.google.com/intl/lv/earth/learn/
8. 3D Ēku modeļu veidošana [tiešsaiste] Pieejams: http://www.google.com/intl/lv/earth/learn/3dbuildings.html#tab=create-3d-models-with-sketchup
9. Google Maps [tiešsaiste] Pieejams: http://maps.google.com/