# KLAIPĖDA STATE UNIVERSITY OF APPLIED SCIENCES

## Faculty of Technologies

STUDY PROGRAMME:      **GEODESY**
NAME OF THE SUBJECT:      **CREATION OF GEOGRAPHIC INFORMATION SYSTEMS**
CODE OF THE SUBJECT:

| Group of the subject* | Type of the subject** | Form of studies | Structure*** | | | | Total number of hours | Number of credits |
|---|---|---|---|---|---|---|---|---|
| | | | T | P | C | I | | |
| SF | P | Full-time studies (FT) | 12 | 72 | 6 | 70 | 160 | 6 |
| | | Part-time studies (PT) | 10 | 26 | 54 | 70 | | |

\*Group of the subject: GS ─ general study subjects; SF ─ subjects of the study field.

\*\*Type of the subject: C ─ compulsory subject; A ─ optional subject (alternative), FE ─ freely elective subject.

\*\*\*Structure: T ─ theory; P ─ seminars, workshops, laboratory works; C ─ consultations; I ─ individual work.

**Annotation**

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| The subject forms student competence in the fields of collection and import of spatial data to the computer. It explores "GIS" data structure and models, analyses "GIS" spatial data sets; analyses determination methods of geographical location of an object; analyses "GIS" software and data visualisation. |

**The connection of results of the study programme with results of the study subject and study methods, as well as evaluation methods of the learning achievements**

| Results of the study programme | Results of the study subject | Study methods | Evaluation methods of the learning achievements |
|---|---|---|---|
| A2. A student will demonstrate knowledge and understanding about the measuring, design and construction methods and ways, technical measures used to take such actions, as well as their management methods and principles of quality assurance | A2.1. A student will be able to analyse collection schemes of primary and secondary spatial data, as well as methods for their import to the software. | A lecture An individual work Collection and entry of the spatial data | Presentation of an individual work |
| B1. A student is able to apply the acquired knowledge to implement the latest technologies and to solve the tasks, related to geodesy, cartography and cadastre and register of real estate, as well as territorial planning; a student is also able to select measurement methods to obtain the necessary data | B1.1. A student will be able to analyse opportunities for use of "GIS" software, to assess advantages and disadvantages of object display in "GIS" environment, as well as to select proper and unified coordinate systems and cartographic projections. | A lecture A practical work An individual work | Presentation of practical work |
| B2. A student is able to use modern measurement devices, organise and analyse measurement results optimally, as well as applies methods of administration, formation and assessment of real estate, which comply with standards and regulations of Lithuania and the | B2.1. A student will be able to analyse contents of the primary and thematic spatial data sets, as well as a unified coding system of the spatial objects. B2.2. A student will be able to enter spatial data into the thematic spatial data sets and to encode them according to the | A lecture Analysis Collection of the spatial data Encoding of the spatial data | Verbal interview Defence of practical work |

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|---|---|---|---|
| European Union | geographic data of the integrated geographic information system ("InGIS") | | |
| C2. A student is able to apply measurement information for scientific research and to solve other applicable tasks, to design various types of maps, measurement databases of information systems, and to apply legislation in the professional activities | C2.1. A student will be able to create, edit and update spatial data sets by using "ArcGIS 9.3" software. C2.2. A student will be able to solve tasks, related to determination of location accuracy of the objects, as well as generalisation and analysis of objects. | A lecture A practical work Creation of a set of spatial data | Defence of practical work |
| C4. A student is able to use information technologies, basic software, to apply and use numerical computed methods, used to solve specific engineering problems, to use computers to obtain and process problem solving data, to manage processes, automated design and computer graphics | C4.1. A student will be able to process and analyse primary and secondary spatial data in the created spatial data set. C4.2. A student will be able to distinguish spatial measurement data and to perform their analysis in the spatial data sets. | A lecture Analysis of the spatial data Analysis of the measurement data | Presentation of practical work A test Interview in writing |
| D2. A student has learning skills that are necessary for studies and constant professional development, as well as is able to convey information, ideas, problems and solutions, to justify them or to defend them in from of auditorium full of engineering specialists and non-specialists | D2.1. A student will be able to collect and use information that is necessary for the creation of thematic spatial data sets independently. | Collection of information Analysis of information | Verbal interview |

**Contents and scope of the subject**

| Topic name and content description | Number of the contact hours, FT form | | | Number of the contact hours, PT form | | | I | Total number of hours |
|---|---|---|---|---|---|---|---|---|
| | T | P | C | T | P | C | | |
| **1. Introduction to GIS. Concept and history of GIS.** | 2 | - | - | 2 | - | - | - | 2 |
| **2. Display of "GIS" spatial data and descriptive information. "GIS" software: components, functions and application.** | 2 | - | - | 2 | - | - | - | 2 |
| **3. Introduction to "ArcGIS PRO". "ArcGIS PRO" graphic interface.** Task of the course work No 1. Creation of a personal database of geographic data by using "ArcGIS PRO" software. Objective: to create personal database of geographic data by using "ArcGIS PRO" software, to transform spatial data and export them by using queries. | - | 10 | - | - | 4 | 6 | 6 | 16 |
| **4. Collection and export of spatial data to "ArcGIS PRO" software: primary data; secondary data; collection scheme of spatial data.** | - | 4 | - | - | 2 | 2 | 8 | 12 |
| **5. Display of raster spatial data in the spatial data set of "ArcGIS PRO" environment.** | 2 | 10 | - | 2 | 2 | 8 | 8 | 20 |

| Topic | | | | | | | |
|---|---|---|---|---|---|---|---|
| Task of the course work No 2. Display of raster data in the spatial data set of "*ArcGIS PRO*" environment.<br>Objective: to analyse collection methods of the primary data. To display raster data in the spatial data set of "*ArcGIS PRO*" environment. | | | | | | | |
| **6. Display of vectorial data in the spatial data set of "*ArcGIS PRO*" environment.**<br>Task of the course work No 3. Display of vectorial data in the spatial data set of "*ArcGIS PRO*" software.<br>Objective: to analyse collection methods of the secondary data. To display vectorial data in the spatial data set of "*ArcGIS PRO*" environment. | 2 | 10 | - | 2 | 2 | 8 | 8 | 20 |
| **7. Creation of new elements of spatial data set and editing of the existing ones in "*ArcGIS PRO*" environment.**<br>Task of the course work No 4. Entry of new "GIS" elements and editing of attribute information. Editing tools of the existing elements, as well as change and splitting of their shape.<br>Objective: to enter new elements of spatial data set in "*ArcGIS PRO*" environment, as well as to change and split the existing elements in the created spatial data set | - | 12 | - | - | 4 | 8 | 8 | 20 |
| **9. Determination of geographic location of an object by applying geodetic method, 3D scanning and remote measurement technologies (drone with THERMAL and LIDAR sensors).** | 2 | 2 | - | - | - | 4 | 8 | 12 |
| **8. Visualisation of 3D data in "*ArcGIS PRO*" environment.**<br>Task of the course work No 5. Visualisation of 3D data<br>Objective: to review, display and analyse spatial data in three-dimensional environment. To create digital 3D models of the surface by using "*ArcGIS PRO*" tools of the surface and 3D analysis, as well as *LIDAR, TIN* and raster data. | 2 | 12 | - | 2 | 6 | 6 | 8 | 22 |
| **10. "GIS" software and data visualisation: description of "GIS" software; provision of "GIS" data to the user; metadata and data transmission.**<br>Task of the course work No 6. "GIS" software and data visualisation.<br>Objective: to analyse opportunities to use "GIS" software and to assess advantages and disadvantages of object display in "ArcGIS PRO" environment. | - | 12 | 2 | - | 6 | 8 | 10 | 24 |
| **Preparation for the examination** | - | - | 4 | - | - | 4 | 6 | 10 |
| **Total number of hours** | **12** | **72** | **6** | **10** | **26** | **54** | **70** | **160** |

**Assessment system of results of the subject studies**

| Result number of the study subject | Assessment criteria of results of the study subject |
|---|---|
| A2.1. | Selection of methods to import spatial data to the software |
| B1.1 | Assessment of opportunities to use "GIS" software |
| B2.1 | Understanding of a unified coding system of the spatial data |
| B2.2 | Selection of method to enter spatial data and information about it by "ArcGIS" software |
| C2.1 | Quality assessment of updated content of the spatial data set |
| C2.2 | Assessment of location accuracy of the spatial object by selecting methods of generalisation and analysis |
| C4.1 | Assessment of opportunities to use the primary and secondary spatial data |
| C4.2 | Use of measurement data in the analysis of spatial data sets |
| D2.1 | Quality assessment of independently collected spatial data for the creation of the spatial data sets |

**Procedure of evaluation**

A ten-point criterial grading scale and system of an individual cumulated grading are applied.

$$IKV = X_1 \cdot 0.5 + X_2 \cdot 0.5$$

$X_1$ − average of interim evaluations: average of evaluation of individual works (evaluation of individual work − 20%, evaluation of practical works − 80%).

$X_2$ − evaluation of examination.

Examination can be taken by students, whose average of interim evaluations is at least 5 points.

**Recommended literature and other information sources**

| No | Literature and information sources | At the library of the Faculty of Technologies | At other libraries of Klaipeda State University of Applied Sciences |
|---|---|---|---|
| | **Primary literature and information sources** | | |
| | | **Number of copies** | |
| 1 | Gurklys V. (2008). *Aplinkos geografinės informacinės sistemos: mokomoji knyga*. LŽŪU Leidybos centras. | 10 | - |
| 2 | Mineikyte A. (2008). *Geografinės informacinės sistemos: mokymo(si) priemonė*. K: Kauno kolegijos leidybos centras. | 20 | - |
| 3 | Mozgeris G. (2008). *Geoinformacinių sistemų pagrindai: mokomoji knyga*. K: Ardiva. | 9 | - |
| 4 | Paršeliūnas E. (2001). *Geoinformacinės sistemos: technologija*. V.: Technika. | 3 | - |
| 5 | Tumas R. (2006). *Aplinkos geoinformacinės sistemos: vadovėlis aukštųjų mokyklų studentams*. V: Enciklopedija. | 16 | - |

| No | Additional literature and information sources |
|---|---|
| | **Literature and information sources** |
| 1 | Bekonytė G. (2004). *Duomenys ir duomenų bazės kartografijoje*. V.: VU. |
| 2 | Kennedy M. (2009). *Introducing Geographic information systems with ArcGIS: a workbook approach to learning GIS*. Hoboken (N.J.): John Wiley & Sons. |
| 3 | Longley, Paul A. (2006). *Geographical information systems and science*. Chichester: John Wiley & Sons, Ltd. |
| 4 | Neteler M. (2010). *Open source GIS: a grass GIS approach*. New York, NY: Springer. |
| 5 | Rekus D. Urbanavičius V. Pekrosnienė I. (2008). *Georeferencinės duomenų bazės*. K.: UAB „Vaistų žinios". |

**Description of the subject was prepared by:**

| Lecturer | | Indrius Kuklys |
|---|---|---|
| *(Position)* | *(Signature)* | *(Academic degree, name and surname)* |