| NAME OF THE COURSE | Introduction to Geo Information systems | | | | | |
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| Code | PMIH15 | Year of study | | | | |
| Course teacher | prof.dr. sc. Vlado Dadić | Credits (ECTS) | 5,0 | | | |
| Associate teachers | | Type of instruction (number of hours) | L | S | E | F |
| | | | 30 | | 30 | |
| Status of the course | | Percentage of application of e-learning | | | | |

| COURSE DESCRIPTION | |
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| Course objectives | Acquisition of basic knowledge of geographic information systems (GIS), their usage in the handling of geospatial data and thematic layers, including the collection, quality control, storage, processing, analysis and presentation of results in the standalone and network environment |
| Course enrolment requirements and entry competences required for the course | Knowledge of HTML and work in a networked environment and general knowledge of relational and object databases |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | • Introduction to GIS systems and their particularities<br>• Introducing spatial models used in GIS<br>• Introduction to the geoid Earth and how it is displayed in two-dimensional space (X, Y plane)<br>• Introduction to used geodetic datums and projections (local and global datums)<br>• Introduction to methods and techniques of collecting geospatial and associated attribute data (primary and secondary)<br>• Introduction to methods of generating spatial layers from measurements in a limited number of geospatial points<br>• Practical exercises on several independent and network GIS tools<br>• Development of GIS projects with a focus on overlapping thematic GIS layers and the usage of Boolean algebra and other methods in geospatial analysis<br>• Solving practical projects related to analytics of geospatial data in order to prepare the basement for optimal decisions in the management of geospatial areas. |
| Course content broken down in detail by weekly class schedule (syllabus) | Lectures:<br>• Basic concepts in GIS. Areas of application of GIS. Components of GIS. The development of GIS. GIS and environment (stand-alone, network, wireless) (2).<br>• Basic models in GIS (point, line and area). Object-relational data models. The overlap of different thematic layers via Boolean operands as the basis of analysis of geospatial data (2)<br>• The digitization and reconstruction of the real world and display in GIS. The collection of spatial and related attribute data and their integration into the GIS. Optimizing costs by using existing data collection with regard to its quality and specific needs. (2).<br>• "Gap" analysis and the minimum number of input data for the development of thematic geospatial layers. Generating spatial fields from data measured in statistical randomly distributed positions - making thematic layers. (2)<br>• Kriging (BLUE) local objective method and its usage in geospatial problems. The variance and covariance in the assessment of the |

interdependence of spatially distributed data. Other commonly used methods of objective analysis in GIS (standard, fuzzy, neural networks). (2)
• GIS system in a standalone environment, the local network, web network and wireless environments. Particularities of hardware and software in the GIS. Software tools for handling spatial data. (2)
• Methods for collecting and entering data in the GIS database. Primary and secondary data collection methods. Specific feature (advantages and disadvantages) of existing thematic layers. The assessment of their usability due to the current situation. Techniques of survey. Geodetic survey. Measurement techniques and systems for remote data collection (2).
• Geospatial positioning. Cartographic information. Cartographic scales and categories. The scales in GIS. Georeferenced spatial systems. (2)
• Earth as geoid. Model of Earth: ellipsoid. Reference ellipsoid - global datum. Local ellipsoids and local datums. Taking into account the flattening of the Earth at the datum. Improving the datum of the 19th and 20th centuries as a result of increasing the accuracy of measurements. (2)
• Types of projection of the Earth in two-dimensional space - x, y plane. Cylindrical, azimuthal and conical projections. Conformal, equivalent and equidistant projections and their properties. Distortion in the projection. (2)
• Datums and projections in Croatia throughout history. Croatia in two zones (5 and 6). Croatia as one zone (legal obligation to use for official purposes from januqary 1st, 2010). Datum GRS80 and HTRS96 projections. The central meridian 16.5 degrees. (2)
• Converting GIS layers created in previous official datums and projections with new ones. Mistakes during the transformation. Software packages specialized for the needs of GIS. Licensed GIS software (ArcInfo/ArcView, ArcGIS, AutoCAD Map, CARIS). Free software QGIS and GRASS (2)
• WEB GIS. Basic standards. Open GIS consortium and GML standard. Sensor GML. Marine GML. Mobile GIS. (2)
• The principles of making GIS project. Organizational and technological changes. Expected benefits. Required computer and human resources. Cost-benefit analysis. Multicriteria analysis in evaluating geographic space. (2)
• INSPIRE - European infrastructure for spatial information, architecture, standards, implementation, impact analysis, environmental data. (2)
Exercises:
• The digitization and reconstruction of the real world and display in GIS. The collection of spatial and related attribute data and their integration into the GIS. Optimizing costs by using existing data collection with regard to its quality and specific needs. The issue of conversion of measured data into spatial layers (2).
• Determination of the required number and spatial distribution of the input data. Generating spatial layers from data measured in statistical randomly distributed positions - making thematic layers. (2)
• Training with practical examples in the generation and analysis of spatial layers by  Surfer 8 software tool (2D space, time ..., fisheries, environment) (2)
• Digitization and scanning of existing graphics - charts, graphs, drawings. Examples from the cadastre. Advantages and disadvantages. Formats and data conversion. The exchange of geospatial data and standards.
• Remote sensing. Photogrammetry. Framing. Passive and active remote sensors. Multispectra and hiperspectra in the capturing of thematic layers. Radar sensors. The response of terrestrial substrates at different frequency spectrum. (2)

| | • Checking the homogeneity and isotropy field. The problem of different scales along x and y axes. Practical resolving of isotropic and nonistropic fields problems. Generating output fields. The used GIS formats at presentation and their compatibility. "Shp" format as the standard format for the spatial layers exchange in GIS. (2) • Testing various methods for generating spatial fields of statistical randomly distributed data. The appearance of "ox-eye" in the spatial field and methods for their reduction. (2) • Introduction with portable software tools Q-GIS. The conversion datums and projections. Additional tools for various spatially analysis. (4) • Creating layers and adding attribute tables in ArcView program. Adding data for discrete monitoring stations and convert to the "shp" formats. Creating a line and polygon structures. Updating of existing layers. (3) • The use of Boolean algebra in the processing of thematic layers in the ArcView program. Overlapping of more layers. The impact of the projections of handling layers on the output results. (2) • Practical work on converting and equalizing layers generated in different datums and projections. GRS 80 and WGS 84. Errors within digitization and their elimination. Generalization and "streaming" in order to increase the efficiency of GIS presentation. (2) • Creating web pages with GIS components. WMS and WFS services in a network environment and compatibility of created layers with the INSPIRE directive. Linking web GIS server with databases. Adapting GIS network applications for mobile devices. GIS in the cloud. (3) • Usage of GIS tools in a network environment for the purpose of efficient management of Croatian coastal zone. Example of fishery regulations, intended use of the space, determining creditworthiness of the different geospatial areas, showcase coverage of Natura 2000 and land cover in Croatia. (2) |
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| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ homework assignments |
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| Student responsibilities | Attendance at the lectures and exercises, making seminar related GIS applications and colloquia and final examine | |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Name | Ects | Name | Ects | Name | Ects |
|---|---|---|---|---|---|---|
| | Class attendance | 1,5 | Research | | Experimental work | |
| | Oral exam | 2,5 | Report | | Homework assignments | |
| | Seminar essay | 1 | Essay | | | |
| | Tests | | Practical training | | | |
| | Written exam | | Project | | | |

| Grading and evaluating student work in class and at the final exam | The evaluation of students is done through the recording of regular attendance and active participation in class, regular attendance and the successful development of set tasks during exercises on the computer, the assessment created seminar work in the field of GIS, through solving two tests during the semester, and the success in solving the task the writing and general knowledge of the subject matter at the oral examination. | | |
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| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | George B. Korte, 2001. The GIS book, 5th edition. Onword press-Thompson learning, 387 pp. | 0 | |
| | Zdravko Galić, 2006. Geoprostorne baze podataka. Golden Marketing Tehnička knjiga, 368 pp. | 0 | |
| | David E. Davis, 2003. GIS for everyone with CD room, 33rd edition. ESRI, 164pp. | 0 | |
| | Dawn J. Wright, ed., 2015. Ocean solutions – Earth solutions. ESRI Press | 0 | |
| Optional literature (at the time of submission of study programme proposal) | Deutch C.V. and A.G. Journel, 1998. GSLIB – Geostatistical software; library and user's guide. Oxford University Press. 369 pp.<br>Vasilis D. Valavanis, 2002. Geographic information systems in oceanography and fisheries. Taylor and Francis Press, 209 pp.<br>Clayton V. Deutch and Andre G. Journel,, GISLIB-Geostatistcal software ,library and users guide. Oxford university press, 369 pp.<br>Gary Amdabl, 2001. GIS for public safety. ESRI Press, 108pp.<br>http://www.esri.com/mapmuseum<br>http://www.qgistutorials.com/en/<br>http://www.kartografija.hr/old_hkd/<br>http://www.dgu.hr/<br>Http://jadran.izor.hr/geo/msfd_mon.htm | | |
| Quality assurance methods that ensure the acquisition of exit competences | Records of attendance and active participation in lectures, exercises and seminars<br>Evaluation of the seminar work in the field of GIS<br>Evaluation of making up to two tests<br>Assessment made the written exam with practical work in the GIS tool<br>Evaluation of oral examination | | |
| Other (as the proposer wishes to add) | | | |