

## COURSE OUTLINE

### 1. Study programme information

|                                     |                                                          |
|-------------------------------------|----------------------------------------------------------|
| 1.1 Higher education institution    | Universitatea de Vest din Timișoara                      |
| 1.2 Faculty / Department            | Chimie, Biologie, Geografie / Departamentul de Geografie |
| 1.3 Sub-department                  | Geografie                                                |
| 1.4 Field of study                  | Geography                                                |
| 1.5 Level of study                  | Master's degree                                          |
| 1.6 Study programme / Qualification | Geographic Information Systems                           |

### 2. Course information

|                               |                                |              |   |                        |   |                 |       |
|-------------------------------|--------------------------------|--------------|---|------------------------|---|-----------------|-------|
| 2.1 Course title              | <b>Location Based Services</b> |              |   |                        |   |                 |       |
| 2.2 Course Convenor/ Lecturer | Dr. Octavian Iercan            |              |   |                        |   |                 |       |
| 2.3 Teaching assistant        | Dr. Octavian Iercan            |              |   |                        |   |                 |       |
| 2.4 Year of study             | II                             | 2.5 Semester | 1 | 2.6 Type of assessment | E | 2.7 Course type | DS/DA |

### 3. Total estimated time (hours of didactic activities per semester)

|                                                                                    |            |                       |    |                        |              |
|------------------------------------------------------------------------------------|------------|-----------------------|----|------------------------|--------------|
| 3.1 Number of hours per week                                                       | 4          | of which: 3.2 lecture | 2  | 3.3 seminar/laboratory | 2            |
| 3.4 Total hours in the curriculum                                                  | 42         | of which: 3.5 lecture | 14 | 3.6 seminar/laboratory | 28           |
| <b>Time distribution:</b>                                                          |            |                       |    |                        | <b>hours</b> |
| Studying textbooks, course materials, bibliography and notes                       |            |                       |    |                        | 25           |
| Further research in libraries, on electronic platforms and in the field            |            |                       |    |                        | 20           |
| Preparing seminars/ laboratories, homework, research papers, portfolios and essays |            |                       |    |                        | 20           |
| Tutoring                                                                           |            |                       |    |                        | 12           |
| Examinations                                                                       |            |                       |    |                        | 6            |
| Other activities .....                                                             |            |                       |    |                        |              |
| <b>3.7 Total hours of individual study</b>                                         | <b>83</b>  |                       |    |                        |              |
| <b>3.8 Total hours per semester</b>                                                | <b>125</b> |                       |    |                        |              |
| <b>3.9 Number of credits</b>                                                       | <b>5</b>   |                       |    |                        |              |

### 4. Prerequisites (if applicable)

|                           |                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 4.1 based on curriculum   | Basics knowledge in Geographic Information Systems; Geoinformatics, Remote sensing                                             |
| 4.2 based on competencies | Basic programming with python, data processing techniques, relational databases, basis understanding of programming algorithms |

### 5. Conditions (if applicable)

|                                |                                                                                                                                                                                                                                                                                  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.1 for the course             | <ul style="list-style-type: none"> <li>Computer / laptop with audio-video system for the teacher and students</li> <li>internet access; access to the E-learning UVT platform;</li> <li>video projector</li> <li>the course will be taught modular over 1 week onsite</li> </ul> |
| 5.2 for the seminar/laboratory | <ul style="list-style-type: none"> <li>complete fulfilment of tasks of laboratory work and projects</li> <li>Computer / laptop with audio-video system for the teacher and students;</li> <li>internet access; access to the Elearning UVT platform;</li> </ul>                  |

|  |                                                                                                                                           |
|--|-------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>• video projector</li> <li>• the applications will be taught modular over 1 week onsite</li> </ul> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------|

## 6. Objectives of the discipline - expected learning outcomes to the formation of which contribute to the completion and promotion of the discipline

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knowledges                  | <ul style="list-style-type: none"> <li>• Understanding the importance of Location Based Services (LBS)</li> <li>• Knowledge of the methodologies for obtaining a location using diverse hardware components;</li> <li>• Knowledge of the algorithms used and analytical methodologies for determining locations in LBS;</li> <li>• Grasping the methodologies involved in using LBS;</li> <li>• Understanding the specifics of POI collection needed in LBS;</li> <li>• Critical analysis of determining correct positioning using LBS</li> <li>• Parallel analysis between algorithms and sensors used for localization</li> </ul>                                                                                                                                          |
| Skills                      | <ul style="list-style-type: none"> <li>• Using hardware such as smartphones, GPS receivers, PNG, etc.</li> <li>• Using ESRI ArcGIS for data transfer and processing including Python processing</li> <li>• Using Open Source GIS such as Quantum GIS and FOOS4G products</li> <li>• Using high-end GPS receivers for precise location determination and understanding the relativeness of the mitigated GPS collection techniques</li> <li>• Utilizing various connectivity bridges (WLAN, Bluetooth, GSM, UMTS) in LBS context</li> <li>• Data processing and data integration in GIS projects for navigation and LBS</li> <li>• Obtaining Smart Analytics with Big Data methodologies for generating results from collected and sourced data in the LBS context</li> </ul> |
| Responsibility and autonomy | <ul style="list-style-type: none"> <li>• Apply working strategies for efficiency and responsibility based on principles, norms, and values according to the ethical code of conduct</li> <li>• Apply efficient and collaborative working techniques in a multiskill set and multidisciplinary environment, respect for multiculturalism and diversity as well as acceptance for differences of opinion</li> <li>• Self-assessment of the need for professional development aiming to increase the labor market adaptability</li> </ul>                                                                                                                                                                                                                                       |

## 7. Content

| 7.1 Lecture                                                                                                                                                                                                                                              | Teaching methods                                                                                    | Observations |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------|
| Introduction to Location-Based Services                                                                                                                                                                                                                  | Lecture, Interactive presentations, heuristic conversation, problematization, and hands-on examples | 1 hour       |
| GPS, Galileo, and satellite navigation                                                                                                                                                                                                                   |                                                                                                     | 1 hour       |
| Determining location with WLAN and Bluetooth                                                                                                                                                                                                             |                                                                                                     | 1 hour       |
| Controlled determination of location with WLAN                                                                                                                                                                                                           |                                                                                                     | 1 hour       |
| Determining location with WLAN and no calibration                                                                                                                                                                                                        |                                                                                                     | 1 hour       |
| Determining location with Time-of-arrival method for WLAN                                                                                                                                                                                                |                                                                                                     | 1 hour       |
| Determining location using GSM and UMTS networks                                                                                                                                                                                                         |                                                                                                     | 1 hour       |
| Security and privacy in LBS context                                                                                                                                                                                                                      |                                                                                                     | 1 hour       |
| Multisensor determination of location for results correction and improvement                                                                                                                                                                             |                                                                                                     | 1 hour       |
| Algorithms for trajectory prediction                                                                                                                                                                                                                     |                                                                                                     | 1 hour       |
| LBS and data processing                                                                                                                                                                                                                                  |                                                                                                     | 2 hours      |
| Smart analytics and data extraction                                                                                                                                                                                                                      |                                                                                                     | 2 hours      |
| <b>Bibliography</b><br>Schiller, Jochen, and Agnès Voisard, eds. Location-based services. Elsevier, 2004.<br>Assessing the business impact of location-based services, 2004. Proceedings of the 37th Hawaii International Conference on System Sciences. |                                                                                                     |              |

L. S. A.-M. Nivala, An approach to intelligent maps: Context awareness, The 2nd Workshop on 'HCI in Mobile Guides', (2003).  
R. S. Ajay Magon, Lbs, the ingredients and the alternatives.  
<http://www.gisdevelopment.net/technology/lbs/techlbs006pf.htm>.  
M. G. B. Schilit, J. Hong, Wireless location privacy protection, IEEE JNL, Volume 36 (2003), pp. 135–137.  
A. Brimicombe, Gis - where are the frontiers now?, Proceedings GIS 2002, (2002), pp. 33–45.  
F. P. Carmine Ciavarella, The design of a handheld, location-aware guide for indoor environments, Springer-Verlag London, (2004).  
G. George Liu, Jr. Maguire, A class of mobile motion prediction algorithms for wireless mobile computing and communications, Mobile Networks and Applications, (1996), pp. 113–121.  
T. Helmreich, Hier geht's lang mit den location based services, 2002.  
[http://www.contentmanager.de/magazin/news\\_h3153-print\\_hier\\_gehts\\_lang\\_mit\\_den\\_location-based.html](http://www.contentmanager.de/magazin/news_h3153-print_hier_gehts_lang_mit_den_location-based.html).

| 7.2 Seminar / laboratory                                                                                                                                     | Teaching methods                                                                                                                                         | Observations |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Display data used in LBS projects using web based applications such as Google Maps/Open Streetmap and local installation such as ESRI ArcGIS or Google Earth | Scientific explanation, case studies, demonstration, problem-solving applications, Teamwork, results marketing and presentation, application development | 2 hours      |
| Basic data processing and project preparation                                                                                                                |                                                                                                                                                          | 4 hours      |
| Learning LBS importance and utilization using preinstalled applications on mobile devices                                                                    |                                                                                                                                                          | 4 hours      |
| Fieldwork: test various hardware with LBS applicability and multi sensor technologies                                                                        |                                                                                                                                                          | 4 hours      |
| Use of GIS data in corroboration with mobile device data collected in the field for better understanding of LBS.                                             |                                                                                                                                                          | 2 hours      |
| Contribute to a data gathering exercise for future generations and create a database for LBS of Timisoara and the region.                                    |                                                                                                                                                          | 2 hours      |
| Extract smart analytics with Python and other programming tools using Big Data methodologies                                                                 |                                                                                                                                                          | 4 hours      |
| Team Project                                                                                                                                                 |                                                                                                                                                          | 6 hours      |

### Bibliography

Schiller, Jochen, and Agnès Voisard, eds. Location-based services. Elsevier, 2004.  
Assessing the business impact of location-based services, 2004. Proceedings of the 37th Hawaii International Conference on System Sciences.  
L. S. A.-M. Nivala, An approach to intelligent maps: Context awareness, The 2nd Workshop on 'HCI in Mobile Guides', (2003).  
R. S. Ajay Magon, Lbs, the ingredients and the alternatives.  
<http://www.gisdevelopment.net/technology/lbs/techlbs006pf.htm>.  
M. G. B. Schilit, J. Hong, Wireless location privacy protection, IEEE JNL, Volume 36 (2003), pp. 135–137.  
A. Brimicombe, Gis - where are the frontiers now?, Proceedings GIS 2002, (2002), pp. 33–45.  
F. P. Carmine Ciavarella, The design of a handheld, location-aware guide for indoor environments, Springer-Verlag London, (2004).  
G. George Liu, Jr. Maguire, A class of mobile motion prediction algorithms for wireless mobile computing and communications, Mobile Networks and Applications, (1996), pp. 113–121.  
T. Helmreich, Hier geht's lang mit den location based services, 2002.  
[http://www.contentmanager.de/magazin/news\\_h3153-print\\_hier\\_gehts\\_lang\\_mit\\_den\\_location-based.html](http://www.contentmanager.de/magazin/news_h3153-print_hier_gehts_lang_mit_den_location-based.html).

### 8. Corroborating course content with the expectations held by the representatives of the epistemic community, professional associations and typical employers in the field of the study programme

Course content is conforming to the standard and state of the art research in the field as well with the technological state of the art for LBS in the industry. The course stimulates the students to work as a team to a common goal to find and solve spatial and temporal problems a LBS user experiences in real life. Utilization of GIS and relational databases knowledge as well as better understanding of data manipulation using software scripting languages allows the student to interact in the future with the GIS industry as well as with the data analytics organizations. The Software used in the course is high-end GIS software used by the majority of the

businesses and institutions dealing with GIS.

### 9. Assessment

| Type of activity                                                                                                                                                            | 9.1 Assessment criteria                         | 9.2 Assessment methods  | 9.3 Weight in the final mark |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------|------------------------------|
| 9.4 Lecture                                                                                                                                                                 | Understanding and assimilation of LBS knowledge | Test                    | 50%                          |
| 9.5 Seminar / laboratory                                                                                                                                                    | Presentation and project report content quality | Presentation of results | 50%                          |
| 9.6 Minimum performance standard                                                                                                                                            |                                                 |                         |                              |
| <ul style="list-style-type: none"> <li>Minimum mark 5 at course evaluation.</li> <li>Minimum mark 5 at practical project.</li> </ul>                                        |                                                 |                         |                              |
| Final remarks: <ul style="list-style-type: none"> <li>All lectures and seminars will be kept in a modular approach established at the beginning of the semester.</li> </ul> |                                                 |                         |                              |

Date

12.09.2025

Course convenor's signature

Dr. Octavian Iercan

Date of approval in the department

Head of department's signature