

# ***Land Governance Master program***

Discipline ***“SURVEYING SYSTEMS  
FOR LAND GOVERNANCE”***

Responsible university

Donetsk National Technical University

Course is developed by

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# ***SURVEYING SYSTEMS FOR LAND GOVERNANCE***

**Integrative module**

**Total ECTS – 4**

**Is studied in**

**1st year**

**2 term**

**for Technical and Agrarian**

**Universities**



## ***Basis for learning***

- ***Geodesy,***
- ***Geodetic Instruments,***
- ***Automation of Geodetic Measurements,***
- ***Bases of Photogrammetry and Remote Sensing.***



# ***Aim and objectives of the course***

- **To provide deeper theoretical studies in the domain of advanced surveying systems, their development and classification.**
- **The course is also concentrated on the comparative analyses of particular surveying systems and their economic aspects.**



# ***SURVEYING SYSTEMS FOR LAND GOVERNANCE***

<b>Total hours</b>	<b>Class room total/ hours</b>	<b>lectur es</b>	<b>practi ce</b>	<b>Exam / hours</b>	<b>indivi dual student's work</b>	<b>% of class room s</b>
<b>144</b>	<b>48</b>	<b>24</b>	<b>24</b>	<b>36</b>	<b>60</b>	<b>0,4</b>



# Course syllabus

N	Topic name	Number of hours		
		Total	Lectures	Pract./ exercises
1.	Development and establishment of surveying systems	2	2	-
2.	Classification of modern surveying systems	2	2	-
3.	Semi-automatic measuring complexes on the base of digital reflectorless Total Stations	6	2	4
4.	Automatic measuring complexes on the base of digital robotized reflectorless Total Stations	6	2	4
5.	Geodetic instruments of terrestrial laser scanning	6	2	4
6.	Global positioning systems	8	4	4
7.	Digital cameras for terrestrial stereophoto surveying.	10	4	6
8.	Application of Remote Sensing data	4	2	2
9.	Comparative analysis of certain surveying systems in terms of accuracy and sphere of application	2	2	-
10.	Comparative analysis of certain surveying systems in terms of economic aspects	2	2	-
<b>Total:</b>		<b>48</b>	<b>24</b>	<b>24</b>



# Structure of the lectures

## Lecture № 1. Development and establishment of surveying systems – 2 h.

- History of surveying systems development:
  - optic –mechanic geodetic instruments;
  - analog surveying equipment;
  - analog surveying equipment in photogrammetry;
  - first remote sensing data;
  - first GPS receivers.
  
- Initial assignment of equipment concerned.
  
- Prerequisites of their appearance and development.



# Structure of the lectures

## Lecture № 2. Classification of modern surveying systems – 2 h.

- General description of each surveying (measurement) systems:
  - total station;
  - terrestrial laser scanning;
  - digital photo camera;
  - GPS receiver.
  
- The principles of classification, description of the application sphere of each measurement system.
  
- Aspects of economic practicability of its application at industry.





# Structure of the lectures

## Lecture № 3. Semi-automatic measuring complexes on the base of digital reflectorless Total Stations – 2 h.

- Classification in terms of accuracy and packing list (available equipment).
- The principles of operation, physic principles of measurement devise's operation in total station.
- Classification in terms of accuracy, producers, sphere of application and price.
- The order of work with complex.
- The procedure of measurement's treatment.



# ***Structure of the lectures***

## **Lecture № 4. Automatic measuring complexes on the base of digital robotized reflectorless Total Stations– 2 h.**

- The principles of operation.
- Classification in terms of accuracy, producers, sphere of application and price.
- The order of work with complex.
- The procedure of measurement's processing.



# Structure of the lectures

## Lecture № 5. Geodetic instruments of terrestrial laser scanning – 2 h.

- General performance concerning geodetic instrument of terrestrial laser scanning.
- The principles of operation, structure, classification in terms of accuracy, producers, sphere of application and price.
- The procedure of work and measurement's processing.
- Technique of laser scanning system's application.
- Schemes of application.



# Structure of the lectures

## Lectures № 6-7. Global positioning systems – 4 h.

- General performance concerning GPS, principles of operation.
- Classification in terms of accuracy, producers, sphere of application and price.
- The procedure of work and measurement's processing.
- Engineering and technical tasks could be solved with GPS.



# Structure of the lectures

## Lectures № 8-9. Digital cameras for terrestrial stereo-photo surveying – 4 h.

- General performance concerning digital cameras for terrestrial stereo-photo surveying.
- Structure of digital cameras, the principles of operation.
- Classification in terms of accuracy, producers, sphere of application and price.
- The procedure of work and measurement's processing.



# Structure of the lectures

## Lecture № 10. Application of Remote Sensing data – 2 h.

- General performance concerning remote sensing technique.
- The principles of operation, initial data format.
- Classification in terms of accuracy, producers, sphere of application and price.
- The procedure of work and measurement's processing.



# ***Structure of the lectures***

## **Lecture № 11. Comparative analysis of certain surveying systems in terms of accuracy and sphere of application – 2 h.**

- The criteria for comparison.
- Requirements to accuracy in terms of application sphere.
- Advantages and disadvantages of particular surveying systems in terms of accuracy provision and land governance tasks to be solved.



# ***Structure of the lectures***

## **Lecture № 12. Comparative analysis of certain surveying systems in terms of economic aspects – 2 h.**

- The criteria for comparison.
- Advantages and disadvantages of particular surveying systems in terms of expended recourses (labor recourses, capital, time).





# Structure of the practical works

№	Topic of laboratory, content of assignment	Geodetic instruments and devices, software to be used	hours
1	<b>Semi-automatic measuring complexes on the base of digital reflectorless Total Stations:</b> –Design and execution of tacheometry surveying of certain object. –Measurement result's processing	Total Station Leica	4
2	<b>Automatic measuring complexes on the base of digital robotized reflectorless Total Stations:</b> –Design and execution of tacheometry surveying of certain object . –Measurement result's processing	– Total Station Leica – Software 3D VizIR	4



# Structure of the practice work

№	Topic of laboratory, content of assignment	Geodetic instruments and devices, software to be used	hours
3	<b>Geodetic instruments of terrestrial laser scanning:</b> –Processing of laser scanning results of architectural object –Development of Digital Elevation Model (DEM) of object to be surveyed.	Software: Digitals / AutoCad	4
4	<b>Global positioning systems:</b> –Design and execution of GPS surveying of certain object . –Measurement result's processing	– GPS-receivers, Leica, – Corresponded software	4
5	<b>Digital cameras for terrestrial stereo-photo surveying:</b> –Design and execution of terrestrial stereo-photo surveying of certain object –Processing of images and obtaining of DEM for object to be surveyed.	– Digital camera , – Software: Erdas/ Dalta / Digitals	6



# Structure of the practice work

№	Topic of laboratory, content of assignment	Geodetic instruments and devices, software to be used	hours
6	<b>Application of Remote Sensing data:</b> Processing of remote sensing data (space images)	Software: Erdas/ Dalta / Digitals	2
<b>Total:</b>			<b>24</b>



# *List of literature*

1. Карсунская М.М. **Геодезические приборы (Geodetic Instruments)**. – Москва: Институт оценки природных ресурсов, 2002. – 186 с.
2. **Серапинас Б.Б. Глобальные системы позиционирования (Global Positioning Systems)**. – Москва: ИКФ «Каталог», 2002. – 106 с.
3. **Наземное лазерное сканирование (Terrestrial Laser Scanning): монография./ Середович В.А., Комиссаров А.В., Комиссаров Д.В., Широкова Т.А.** - Новосибирск: СГГА, 2009. – 261 с.



# *List of literature*

4. Дорожинський О.Л., Тукай Р. Фотограмметрія (Photogrammetry). - Львів: Вид-во НУ «Львівська політехніка», 2008. – 332с.
5. У. Рис. Основи дистанційного зондирования (Physical Principles of Remote Sensing). – Москва: Техносфера, 2006.. – 346 с.
6. Шевченко Т.Г., Мороз О.І., Тревого І.С. Геодезичні прилади (Geodetic Devises): практикум. - Л.: Вид-во Нац. ун-ту "Львів. політехніка", 2007. - 195 с.

