



**SURVEYING SYSTEMS**  
**Code: CVEG3015**

**1. Number of credits:** 3 [ 3.0.0 ]

**2. Class hours:** 45; in which Theory: 45; Assignments: 0; Field trip: 0

**3. Education program for:**

- **Compulsory:** Civil Engineering specialized in Structural Engineering, Transportation Engineering, Geotechnical Engineering, Hydraulic Engineering, Construction Management, Environmental Engineering, Water Resources Engineering

**4. Assessment method:**

Form	No. of times	Description	Time	Weighted
Homework	1 time	Every chapter	Last week of the course	10%
Quiz	5 times	- 10÷15 mins - Multiple choice/ written	Every 2 weeks	10%
Examination	4 times	- 30÷45 mins - Written	- Week 3 - Week 7 - Week 10 - Week 13	40%
Attendance	All times	Call name in lists	All time	10%
<b>Summation progressive assessment</b>				70%

Final examination	1	- 90 mins - Multiple choice /written	1-2 weeks after courses finished	30%
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## 5. Prerequisite conditions:

- *Prerequisite class:* Math 2554

- *Prior class:* None

- *Parallel class:* None

- *Others:* None

## 6. Brief content:

The aim of this course is:

- Understand and apply the knowledge of some subjects such as: Math, Physical, etc. in calculating, analyzing, synthetizing the special technical problems.

- This course and associated lab is designed to introduce undergraduate civil engineering students to surveying calculations, procedures and equipment. The objective of the course is to provide the students with a basic understanding of surveying systems and their use in civil engineering and surveying application.

## 7. Teaching Staff:

No	Name	Academic degree	Phone	Email	Job title
1	Lã Phú Hiền	Dr.	096513858 9	laphuhien@tlu.edu.vn	Lecturer, Head of division
2	Đặng Tuyết Minh	Dr..	098318029 7	dtminh@tlu.edu.vn	Main lecturer
3	Nguyễn Cẩm Vân	MSc.	098242798 6	nguyencamvan@tlu.edu.vn	Lecturer

## 8. Text books & Reference books

### *Text books:*

[1] Wolf and Ghilani, Elementary Surveying, An Introduction to Geomatics, Eleventh Edition, Prentice Hall

**Reference books:**

[1] Trắc địa cơ sở : Lưu hành nội bộ //Paul R. Wolf, Charles D. Ghilani; Hoàng Xuân Thành,.. [ và những người khác] dịch. - Hà Nội ::Khoa học tự nhiên và Công nghệ,,2010. (#000004346)

[2] Trắc địa đại cương //Hoàng Xuân Thành chủ biên, Đào Duy Liêm, Trần Lê Đang. Tài nguyên điện tử - Hà Nội ::Xây dựng ,2005. (#000001010)

**9. Detailed content:**

Chapter	Content <sup>(1)</sup>	Teaching & learning activities <sup>(2)</sup>	Hours		
			Theory	Exercise	Field trip
1	<b>Introduction</b> <ul style="list-style-type: none"> <li>- Definition</li> <li>- Brief History</li> <li>- Classification</li> <li>- Importance of Surveying</li> </ul>	<ul style="list-style-type: none"> <li>* <u>Lecturer:</u> <ul style="list-style-type: none"> <li>- Self introduction for further communication</li> <li>- Introduction of syllabus, assessment method, course content.</li> <li>- Conveying experiences and study methodology.</li> <li>- Introducing surveying and its applications</li> </ul> </li> <li>* <u>Student:</u> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> </ul> </li> </ul>	1	0	0
2	<b>Units, significant figures</b> <ul style="list-style-type: none"> <li>2.1 Units of measurement</li> <li>2.2 Significant figures</li> <li>2.3 Rounding off numbers</li> </ul>	<ul style="list-style-type: none"> <li>* <u>Lecturer:</u> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Explaining units used in surveying and significant figures</li> </ul> </li> <li>* <u>Student:</u> <ul style="list-style-type: none"> <li>- Answer queries</li> </ul> </li> </ul>	1	0	0

		<ul style="list-style-type: none"> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> </ul>			
3	<p><b>Theory of errors in observations</b></p> <p>3.1. Classification</p> <p>3.2. Sources of errors in making observation</p> <p>3.3. Type of errors</p> <p>3.4. Precision and accuracy</p> <p>3.5. Probability</p> <p>3.6. Most probable value</p> <p>3.7. Residuals</p> <p>3.8. Measures of precision</p> <p>3.9. Occurrence of Random Errors</p> <p>3.10. General Laws of Probability</p> <p>3.11. Error propagation</p> <p>5.1. Correct exercises + Quiz</p>	<ul style="list-style-type: none"> <li>* <u>Lecturer:</u> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> </li> <li>* <u>Student:</u> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul> </li> </ul>	3	0	0
4	<p><b>Leveling- Theory, Methods and Equipment</b></p> <p>4.1. Introductions</p> <p>4.2. Definitions</p> <p>4.3. Curvature and refraction</p>	<ul style="list-style-type: none"> <li>* <u>Lecturer:</u> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> </li> <li>* <u>Student:</u> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> </ul> </li> </ul>	1	0	0

	<p>4.4. Methods for determining differences in elevation</p> <p>4.5. Categories of level</p> <p>4.6. Parts of automatic level</p>	<ul style="list-style-type: none"> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>			
5	<p><b>Leveling – Field procedures and Computations</b></p> <p>5.2. Operations using the level</p> <p>5.3. Differential leveling</p> <p>5.4. Precision</p> <p>5.5. Adjustments of simple level circuits</p> <p>5.6. Correct exercises + Quiz</p> <p>5.7. Examination #1</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>	4	0	0
6	<p><b>Distance measurement</b></p> <p>6.1. Introduction</p> <p>6.2. Distance measurement by stadia</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>	1	0	0
7	<p><b>Angles, Azimuths, and Bearings</b></p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> </ul>	3	0	0

	<p>7.1. Introduction</p> <p>7.2. Horizontal angle</p> <p>7.3. Direction of the line</p> <p>7.4. Azimuth</p> <p>7.5. Bearing</p> <p>7.6. Comparison azimuth and bearing</p> <p>7.7. Computing azimuth</p> <p>7.8. Magnetic declination</p> <p>5.8. Correct Exercise + Quiz</p>	<ul style="list-style-type: none"> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> </ul> <p>- Implement of the work</p>			
8	<p><b>Total station</b></p> <p><b>instrument-Theodolite</b></p> <p><b>instrument-Angle observations</b></p> <p>8.1. Introduction</p> <p>8.2. Observation horizontal angles with theodolite</p> <p>8.3. Observation vertical angles</p> <p>8.4. Correct Exercise</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> </ul> <p>- Implement of the work</p>	2	0	0
9	<p><b>Traversing</b></p> <p>9.1. Introduction</p> <p>9.2. Traverse type</p> <p>9.3. Observation of traverse angles or directions</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p>	4	0	0

	<p>9.4. Observation of traverse lengths</p> <p>9.5. Angle misclosure</p>	<ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>			
10	<p><b>Traverse computation</b></p> <p>10.1. Rectangular coordinates</p> <p>10.2. Inversing</p> <p>10.3. Balancing angles</p> <p>10.4. Computation of preliminary azimuths or bearings</p> <p>10.5. Departures and latitudes</p> <p>10.6. Departure and latitude closure conditions</p> <p>10.7. Traverse linear misclosure and relative precision</p> <p>10.8. Traverse adjustment (compass rule)</p> <p>10.9. Correct Exercise</p> <p>10.9. Examination #2</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>	4	0	0
11	<p><b>Coordinate geometry in Surveying</b></p> <p>11.1. Introduction</p> <p>11.2. Intersection of two lines , both having known directions</p> <p>11.3. Intersection of a line with a circle</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> </ul>	4	0	0

	11.4. Intersection of two circles  5.10. Correct Exercise + Quiz	- Question the course (if necessary)  - Implement of the work			
12	<b>Area</b>  12.1. Introduction  12.2. Method of measuring area  12.3. Area by division into simple figures  12.4. Area by offset from straight lines  12.5. Area by coordinates  12.6. Correct Exercise	* <u>Lecturer</u> :  - Lecturing  - Query  - Use practical images and problems  - Work assignment.  * <u>Student</u> :  - Answer queries  - Problem solving  - Question the course (if necessary)  - Implement of the work	2	0	0
13	<b>Mapping surveys</b>  13.1. Introduction  13.2. Basic methods for performing mapping surveys  13.3. Map scale  13.4. Control for mapping surveys  13.5. Contours  13.6. Characteristics of contour	* <u>Lecturer</u> :  - Lecturing  - Query  - Use practical images and problems  - Work assignment.  * <u>Student</u> :  - Answer queries  - Problem solving  - Question the course (if necessary)  - Implement of the work	2	0	0
14	<b>Mapping</b>  14.1. Map design  14.2. Using the map in the office	* <u>Lecturer</u> :  - Lecturing  - Query	3	0	0

	<p>14.3. Correct Exercise</p> <p>14.4. Examination #3</p>	<ul style="list-style-type: none"> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>			
15	<p><b>Horizontal curves</b></p> <p>15.1. Introduction</p> <p>15.2. Degree of circular curve</p> <p>15.3. Definitions and derivation of circular curve formulas</p> <p>15.4. Circular curve stationing</p> <p>15.5. General procedure of circular curve layout by deflection angles</p> <p>15.6. Circular curve layout by offsets</p> <p>5.11. Correct Exercise + Quiz</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>	4	0	0
16	<p><b>Vertical curves</b></p> <p>16.1. Introduction</p> <p>16.2. Grade</p> <p>16.3. General equation of a vertical parabolic curve</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> </ul>	4	0	0

	<p>16.4. Equation of an equal tangent vertical parabolic curve</p> <p>16.5. High or low point on a vertical curve</p> <p>16.6. Vertical curve computations using the tangent offset equation</p> <p>16.7. Correct Exercise</p>	<ul style="list-style-type: none"> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>			
17	<p><b>Volumes</b></p> <p>17.1. Introduction</p> <p>17.2. Methods of volume measurement</p> <p>17.3. The cross-section method</p> <p>17.4. Determining end areas</p> <p>17.5. Average-end-area formula</p> <p>17.6. Prismoidal formula</p> <p>17.7. Examination #4</p>	<p>* <u>Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Lecturing</li> <li>- Query</li> <li>- Use practical images and problems</li> <li>- Work assignment.</li> </ul> <p>* <u>Student:</u></p> <ul style="list-style-type: none"> <li>- Answer queries</li> <li>- Problem solving</li> <li>- Question the course (if necessary)</li> <li>- Implement of the work</li> </ul>	2	0	0
	<b>Total</b>	<b>45</b>	<b>45</b>	<b>0</b>	<b>0</b>

#### 10. Learning outcomes:

No .	Learning outcomes of the course	Learning outcomes of corresponding education program <sup>(3)</sup>
1	<p>Knowledge:</p> <ul style="list-style-type: none"> <li>- Understanding the definition, the important role of surveying.</li> <li>- Master the fundamentals to calculate: angles, distances, height as well as horizontal position and elevation of a point on earth surface.</li> </ul>	2,3,4

2	Skills:  - Capability to use a map for specific purpose  - Capability to allocate a designed point, line or curve on earth surface	10,12,14
3	Independent and responsible capability (if any):	14,16
4	Individual ethics for profession, society (if any):  - Be moral, be conscience, be disciplinary, be responsible for works  - Having acquisitiveness, striving to study and upgrade the degree, creativeness in specialisation.	14,15,16

<sup>(3)</sup> *Learning outcomes of Corresponding Education Program was proposed by Head of specialisation.*

## 11. Contacts

A. Address: Room 317 – Building A1, Thuy loi University

B. Head of division: (*responsible for answering the queries from students and related partners*)

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*Hà Nội, Dated August, 04th 2021*

**DEAN**

*(In charge of specialisation)*

**DEAN**

*(In charge of course)*

**HEAD OF DIVISION**

**Dr. Lã Phú Hiển**