

**COURSE SYLLABUS**  
**GIS & REMOTE SENSING FUNDAMENTALS**

**GENERAL INFORMATION OF THE SUBJECT**

**1. Code:**

**2. Credit:** 03

- Credit hours (Theory lecture/Practice lecture/Self-learning): 45

- Lecture hours (Theory lecture/Practice lecture/Self-learning): 135

**3. Prerequisite courses:** Mapping, IT, Basic math

**4. Course language:** English/Vietnamese

**5. List of lecturers:**

| No. | Full name             | Title       | Institution | Mobile/ Email                                | Note        |
|-----|-----------------------|-------------|-------------|--|-------------|
| 1   | NGUYEN Thi Nhat Thanh | Assoc.Prof. | VNU         | +84908201880/<br>thanhtn@fimo.edu.vn         | Coordinator |
| 2   | LAFFLY Dominique      | Prof.       | UT2         | +33619204981/<br>dominique.laffly@gmail.com  | Lecturer    |
| 3   | LE Thi Minh Phuong    | Dr.         | HAU         | +84912911368/<br>leminhphuong.dhkt@gmail.com | Lecturer    |
| 4   | BUI Quang Hung        | Dr.         | VNU         | +84904371339/<br>hungbq@fimo.edu.vn          | Lecturer    |

**6. Objectives (Knowledge, Skills, Attitude):**

**6.1. Knowledge**

Introduction to the fundamentals of remote sensing and GIS and privileged tools of integrated analysis in environmental science. Introduction of theoretical concepts, quantitative methods and major domains of application.

**6.2. Skills**

Students should know how to apply the basic knowledge and tools in GIS and remote sensing to develop GIS database and conduct image processing.

**6.3. Attitude**

Student should actively participate in group discussion and have the spirit to gain knowledge about GIS.

## **7. Expected learning outcomes (knowledge, skills, attitudes):**

### ***7.1. Knowledge***

- Being able to understand about fundamentals of Remote sensing and GIS and privileged tools of integrated analysis in environmental science.
- Being able to understand theoretical concepts, quantitative methods and major domains of application.

### ***7.2. Skills***

- Being able to apply the basic knowledge and tools for basic application
- Self learning and teamwork skills

### ***7.3. Attitudes***

- Collaboration with other students in a group
- Curious on gaining knowledge about GIS and remote sensing.

## **8. Examination methods**

### ***8.1. Regular examination (20%)***

- *Purpose:* To check how often students go to class; Examine and evaluate the ability to understand through each lecture
- Examination form: Submit the homework, write report in a group, or have a short presentation.

### ***8.2. Midterm examination (20%)***

- *Purpose:* To evaluate the level of student's academic goals in the mid-or half-final stages.
- Examination form: Test 30 minutes, submit the homework, write group report, or have a short presentation.

### ***8.3. Final examination (60%)***

- Purpose: To evaluate students' learning outcome
- Examination form: Writing or personal/group presentation

## **9. References**

### ***9.1. Required references***

1. Dominique Laffly, 2020, TORUS - Toward an Open Resource Using Services: Cloud computing for Environmental Data - Volume A
2. Dominique Laffly, 2020, TORUS - Toward an Open Resource Using Services: Cloud computing for Environmental Data - Volume B

### ***9.2. Additional references***

1. Dominique Laffly, 2020, TORUS - Toward an Open Resource Using Services: Cloud computing for Environmental Data - Volume C
2. Paul Bolstad, 2016, GIS Fundamentals: A First Text on Geographic Information Systems, Published by XanEdu Publishing Inc
3. Báuden Bhatta, 2011, Remote Sensing and GIS, published by OUP Higher Education Division.
4. Le Thi Minh Phuong, 2019, Mapping and GIS, Construction Publish

## **10. Summary of the course**

This course provides basic knowledge of GIS and remote sensing. The subject is divided into 3 main parts, the first part introduces basic concepts of GIS, the components and functions of GIS. Beside that, the subject also to show how to build up a GIS database (spatial data and attribute data). GIS software also introduce here and typical applications of GIS. The second part introduces the concept of the remote sensing, remote sensing platforms and sensors and how to enhancement, transform, filter and classification image. And the third part is the application of GIS and remote sensing in environmental sustainability

## **11. Content of the course**

### **SECTION 1: Geographic information system**

**Lecture 1.** A Brief History of GIS: the tool of integrated geographical analysis (component and concepts)

**Lecture 2.** Geographical and Map projection coordinate system; georeferencing and geocoding ; GNSS input

**Lecture 3.** Attribute data: data input, relationship, statistics, relation and joint

**Lecture 4.** Vector spatial data analysis: statistical map, graph theory and topology

**Lecture 5.** Raster spatial data analysis

**Lecture 6.** Vectorial multiscale analysis

**Lecture 7.** 3D analysis and data visualization

Lecture 8. Geographical PDF, layout and GIS report

## SECTION 2: Remote sensing

Lecture 9. History of aerial photography and remote sensing: From above we see the Earth better

Lecture 10. Physics of remote sensing

Lecture 11. Image quality

Lecture 12. Sensors and application domain: land, water, atmosphere

Lecture 13. Remote sensing mathematical analysis

Lecture 14. Land use and land cover change (LULCC)

Lecture 15. Atmospheric remote sensing

## 12. Teaching organization

### 12.1. General schedule

| Content      | Teaching organization |          |            |                                 |            | Total      |
|--------------|-----------------------|----------|------------|---------------------------------|------------|------------|
|              | Class                 |          |            | Practice, experiment, fieldwork | Self-study |            |
|              | Theory                | Exercise | Discussion |                                 |            |            |
| Lecture 1    | 3                     |          |            |                                 | 6          | 9          |
| Lecture 2    | 2                     |          | 1          |                                 | 6          | 9          |
| Lecture 3    | 1                     |          | 1          | 1                               | 6          | 9          |
| Lecture 4    | 1                     | 1        | 1          |                                 | 6          | 9          |
| Lecture 5    | 1                     | 1        | 1          |                                 | 6          | 9          |
| Lecture 6    | 1                     | 1        | 1          |                                 | 6          | 9          |
| Lecture 7    | 1                     | 1        | 1          |                                 | 6          | 9          |
| Lecture 8    | 1                     | 1        | 1          |                                 | 6          | 9          |
| Lecture 9    | 3                     |          |            |                                 | 6          | 9          |
| Lecture 10   | 2                     |          | 1          |                                 | 6          | 9          |
| Lecture 11   | 1                     | 1        | 1          |                                 | 6          | 9          |
| Lecture 12   | 2                     |          | 1          |                                 | 6          | 9          |
| Lecture 13   | 1                     | 1        | 1          |                                 | 6          | 9          |
| Lecture 14   | 2                     |          | 1          |                                 | 6          | 9          |
| Lecture 15   | 2                     |          | 1          |                                 | 6          | 9          |
| <b>Total</b> | <b>24</b>             | <b>7</b> | <b>13</b>  | <b>1</b>                        | <b>90</b>  | <b>135</b> |

### 12.2. Detail teaching schedule

| Week | Main content | Student need to do before going to the class | Teaching method | Note |
|------|--------------|--|-----------------|------|
|      |              |  |                 |      |

|   |  |   |  |  |
|---|--|---|--|--|
| 1 | <b>Lecture 1:</b><br>A Brief History of GIS:<br>the tool of integrated<br>geographical analysis<br>(component and<br>concepts) | - Read: Ref. 1,<br>Chapter 1 & Ref.<br>2, Chapter 2         | - Self-study (6)<br>- Theory (3)                                       |  |
| 2 | <b>Lecture 2:</b> Geographical<br>and Map projection<br>coordinate system;<br>georeferencing and<br>geocoding ; GNSS input.    | - Read: Ref. 2,<br>Chapter 2                                | - Self-study (6)<br>- Theory (2)<br>- Discussion (1)                   |  |
| 3 | <b>Lecture 3:</b><br>Attribute data: data input,<br>relationship, statistics,<br>relation and joint                            | - Read: Ref. 2,<br>Chapter 2, 3<br>- Submit the<br>homework | - Self-study (6)<br>- Theory (1)<br>- Discussion (1)<br>- Practice (1) |  |
| 4 | <b>Lecture 4:</b><br>Vector spatial data<br>analysis: statistical map,<br>graph theory and<br>topology                         | - Read: Ref. 2,<br>Chapter 2, 3<br>- Submit the<br>homework | - Self-study (6)<br>- Theory (1)<br>- Exercise (1)<br>- Discussion (1) |  |
| 5 | <b>Lecture 5:</b><br>Raster spatial data<br>analysis   | - Read: Ref. 2,<br>Chapter 2, 3<br>- Submit the<br>homework | - Self-study (6)<br>- Theory (1)<br>- Exercise (1)<br>- Discussion (1) |  |
| 6 | <b>Lecture 6:</b><br>Vectorial multiscale<br>analysis  | - Read: Ref. 2,<br>Chapter 2, 3<br>- Submit the<br>homework | - Self-study (6)<br>- Theory (1)<br>- Exercise (1)<br>- Discussion (1) |  |
| 7 | <b>Lecture 7:</b><br>3D analysis and data<br>visualization   | - Read: Ref. 2,<br>Chapter 2, 3<br>- Submit the<br>homework | - Self-study (6)<br>- Theory (1)<br>- Exercise (1)<br>- Discussion (1) |  |
| 8 | <b>Lecture 8:</b> Geographical<br>PDF, layout and GIS<br>report  | - Read: Ref. 2,<br>Chapter 2, 3<br>- Submit the<br>homework | - Self-study (6)<br>- Theory (1)<br>- Exercise (1)<br>- Discussion (1) |  |
| 9 | <b>Lecture 9:</b><br>History of aerial<br>photography and remote<br>sensing: From above we<br>see the Earth better             | - Read: Ref.1,<br>Chapter 1 & Ref.<br>2, Chapter 1          | - Self-study (6)<br>- Theory (3)                                       |  |

|    |  |  |  |  |
|----|--|--|--|--|
| 10 | <b>Lecture 10:</b> Physics of remote sensing                               | - Read: Ref. 2, Chapter 1                          | - Self-study (6)<br>- Theory (2)<br>- Discussion (1)                   |  |
| 11 | <b>Lecture 11:</b> Image quality   | - Read: Ref. 2, Chapter 1<br>- Submit the homework | - Self-study (6)<br>- Theory (1)<br>- Exercise (1)<br>- Discussion (1) |  |
| 12 | <b>Lecture 12:</b> Sensors and application domain: land, water, atmosphere | - Read: Ref. 2, Chapter 1                          | - Self-study (6)<br>- Theory (2)<br>- Discussion (1)                   |  |
| 13 | <b>Lecture 13:</b> Remote sensing mathematical analysis                    | - Read: Ref. 2, Chapter 1                          | - Self-study (6)<br>- Theory (1)<br>- Exercise (1)<br>- Discussion (1) |  |
| 14 | <b>Lecture 14:</b> Land use and land cover change (LULCC)                  | - Read: Ref. 2, Chapter 1                          | - Self-study (6)<br>- Theory (2)<br>- Discussion (1)                   |  |
| 15 | <b>Lecture 15:</b> Atmospheric remote sensing                              | - Read: Ref. 2, Chapter 1                          | - Self-study (6)<br>- Theory (2)<br>- Discussion (1)                   |  |

### 13. Prerequisites:

- Classroom with projector and board;
- Students must bring all textbooks;
- Students must do homework and participate in learning activities under the teacher's instructions
- Students must accumulate enough component points as prescribed;
- Students must participate fully and submit homework required.

**14. Contact:** Nguyen Thi Nhat Thanh, VNU-UET, FIMO, Mobile: +84908201880, Email: [thanhntn@fimo.edu.vn](mailto:thanhntn@fimo.edu.vn).

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