CALCULUS 2

Course Syllabus

1. General Information

Course name: **Calculus** 2

Course code: BAS1203

Number of credits: 3

2. Objectives of the subject

- Knowledge:
    - Equip students with basic knowledge of the differential and integral calculus of functions of several variables as a basis for further learning Calculus 2, Physics, Probability and Statistics, Engineering math and other subjects.
    - Including the main contents as follows:

- Differential calculus of functions of several variables.

- Integral calculus of functions of several variables: Integrals depend on parameters, double integrals, multiple integrals, line integrals, surface integrals.

- Differential equations and systems of differential equations.

- Skills:
    - Critical thinking and analytical thinking.
    - Skills of the differential and integral calculus of functions of several variables:

- Finding the differential and integral calculus of functions of several variables.

- Applying derivatives and integrals

- Computing line integral, surface integral,

- Solving first-order and second-order differential and systems of differential equations.

- Attitude:
    - Prepare lessons seriously before going to class, listen to lectures actively in class, practice above skills consciously.
    - Complete exercises, midterm tests, and assignments.

3. Abstract

Provide students with basic knowledge about differential and integral calculus of functions of several variables, integral depends on parameters, double integrals, multiple integrals, line integrals, surface integrals, differential equations and systems of differential equations 4. **Teaching and learning methods**

Lectures: 34h

Classroom guidance: 8h

Class discussion: 00h

Midterm test: 02h

Group activities: 00h

Self-study: 01h

5. Prerequisites

Elementary mathematics

6. Learning Outcomes

Upon successful completion of the course, students will be able to:

1. Understand the differential and integral calculus of functions of several variables;

2. Use calculus 2 tools to solve problems;

7. Assessment Criteria

Learning outcomes **Upon successful completion of the course, a learner will**	**Assessment criteria for pass**
LO1: Understand the differential and integral calculus of functions	- Differential calculus of functions of several variables. - Integral calculus of functions of several variables: Integrals depend on parameters, double integrals, multiple integrals, line integrals, surface integrals. - Differential equations and systems of differential equations.
LO2: Use calculus 2 tools to solve problems	- Finding the differential and integral calculus of functions of several variables. - Computing line integral, surface integral, - Solving first-order and second-order differential and systems of differential equations. - Applying derivatives and integrals

8. Outlines

Chapter 1 Differential calculus of functions of several variables

1.1 Space R^n, concept of distance, neighborhood, domain

1.2 Limits and continuity of functions of several variables

1.2.1 Concept of functions of several variables, domain of a fuction, graphs of function of two variables.

1.2.2 The Limits of functions of several variables

1.2.3 The continuity of functions of several variables

1.3 Partial derivatives and total differentials of functions of several variables

1.3.1. Partial derivatives and total differentials

1.3.2. Total differentials and higher-order differentials

1.3.3. Partial derivatives and differential of function composition

1.3.4 Partial derivatives of the implicit function

1.3.5. Directional derivatives and the Gradient vector

1.4 Extremum, maximum and minimum values of functions of several variables

1.4.1 Taylor's formula of functions of several variables

1.4.2 Unconstrained extrema of functions of several variables

1.4.3 Constrained extrema of functions of several variables

1.4.4 Maximum and minimum values of functions of several variables

1.5 Scalar fields, vector fields, Rôta, Dive

Chapter 2: Multiple integrals

2.1 Integrals depend on parameters

2.1.1 Definite integrals depend on parameters

2.1.2 Improper integrals depend on parameters

2.2 Double integrals

2.2.1 Definition of double integrals

2.2.2 Properties of double integrals

2.2.3 Methods for calculating double integrals

2.2.4 Change of variables in double integrals**,** double integral**s** in polar coordinates

2.3 Triple integrals

2.2.1 Definition of triple integrals

2.2.2 Properties of triple integrals

2.2.3 Methods for calculating triple integrals

2.2.4 Change of variables in triple integrals, triple integrals in cylindrical and spherical coordinates

2.4 Applications of multiple integrals

Chapter 3: Line integrals and surface integrals

3.1 Line integral of a scalar field

3.1.1 Definition of line integral of a scalar field

3.1.2 Methods for calculating of line integral of a scalar field

3.2 Line Integral of a vector field

3.2.1 Definition of line integral of a vector field

3.2.2 Methods for calculating of line integral of a vector field

3.3 Green's Formula and equivalent conditions

3.4 Surface integral of a scalar field

3.4.1 Definition of surface integral of a scalar field

3.4.2 Methods for calculating of surface integral of a scalar field

3.5 Surface integral type 2

3.5.1 Oriented surface

3.5.2 Definition of surface integral of a scalar field

3.5.3 Methods for calculating of surface integral of a scalar field

3.6 Stokes's formula, Ostrogradsky's formula

Chapter 4: **Differential equations and systems of differential equations**

4.1 Concept of differential equations

4.1.1 Definition of differential equations

4.1.2. Solution of differential equations

4.2 First-order differential equations

4.2.1 Definition of first-order differential equations and Cauchy-Peano existence theorem

4.2.2 Separable differential equations

4.2.3 Linear differential equations

4.2.4 Bernoulli's equation

4.2.5 Total differential equations

4.3 Second-order differential equations

4.3.1 Definition of second-order differential equations

4.3.2 Linear differential equations

4.3.3 Linear equation with constant coefficients

4.4 Systems of differential equations

4.4.1 Definition of systems of differential equations

4.4.2 Methods for solving systems of differential equations

4.4.3 Systems of differential equations with constant coefficients

9. Required Textbooks

[1] Pham Ngoc Anh, *Lectures on Analysis 2*; Posts and Telecommunications institute of Technology, 2009.

10. Suggested Textbooks

[1] N.D. Tri et al., *Advanced mathematics 3*, Vietnam Education Publishing House, 1996.

[2] N.D. Tri et al., *Exercises in advanced mathematics 3,* Vietnam Education Publishing House, 1997.

[3] D. Trim, *Calculus for engineers*, Springer, 2001.

[4] J. Stewart, *Mathematical analysis*, (2006b) Cambridge: Cambridge University Press.

11. Grading policy:

- Attendance: 10%
- Exercise: 10%
- Mid-term test: 10%

- Final examination: 70%

Lecturer	**Head of Department of Mathematics**
Assoc. Prof. Dr. Pham Ngoc Anh	**Assoc. Prof. Dr. Pham Ngoc Anh**