COURSE SYLLABUS  
**<Course ID> – <Course Name>**

# GENERAL INFORMATION

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| Course name: Calculus II |  |
| Course name (in Vietnamese): | VI TÍCH PHÂN II |
| Course ID: MTH 252 |  |
| Knowledge block: Compulsory Math |  |
| Number of credits: | 4 |
| Credit hours for theory: | 40 |
| Credit hours for practice: | 20 |
| Credit hours for self-study: | 90 |
| Prerequisite: **Mth 251, Calculus I** |  |
| Prior-course: **Mth 251, Calculus I** |  |
| Instructors: Prof. Nguyen Huu Anh |  |

# COURSE DESCRIPTION

The course is designed to provide students with the fundamental ideas of Improper Integrals & Applications, Differential Equations and Infinite Sequences and Series.

# COURSE GOALS

At the end of the course, students are able to master

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| **ID** | **Description** | **Program LOs** |
| G1 | Applications of Integration | LO1, LO2 |
| G2 | Polar Coordinates. Integrals in Polar Coordinates | LO1, LO2 |
| G3 | Concept and Techniques of Improper Integrals | LO1, LO2 |
| G4 | Introduction to Differential Equations | LO1, LO2 |
| G5 | The Theory of Infinite Series, in particular Power Series | LO1, LO2 |

# COURSE OUTCOMES

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| **CO** | **Description** | **I/T/U** |
| G1.1 | interpret a volume of revolution of a graph around a given axis as a (Riemann) sum of areas of disks or cylindrical shells, convert to definite integral form and compute its value | I, T |
| G1.2 | express the length of a curve as a (Riemann) sum of lengths of line segments, convert to definite integral form and compute its value | I, T |
| G1.3 | Applications to Physics and Engineering: works, center of mass  Applications to Economics and Biology. The Law of Laminar flow | U |
| G2.1 | Polar Coordinates. Graph a curve in Polar Coordinates | I |
| G2.2 | Areas and Length in Polar Coordinates | T, U |
| G3 | Improper Integrals, convergence of improper integrals with discontinuities in their domain or infinite limits of integration A Comparison Test | I, T |
| G4.1 | Modeling with Differential Equations  Direction Fields and Euler’s Method | I, T |
| G4.2 | Separable Differential Equations  The Logistic Differential Equation | T, U  I, T |
| G5.1 | Limit Laws for Sequences. Monotonic Sequence Theorem | I, T |
| G5.2 | Series. The Sum of a Series as Limit of Partial Sums. Geometric series.  The Integral and Comparison Tests | I, T  I, T  T, U |
| G5.3 | The Convergence of alternating series. Absolute Convergence | I, T |
| G5.4 | Power Series, Representations of Functions as Power Series | I, T |
| G5.5 | Taylor and Maclaurin Series.  Taylor Inequality and Application to Estimate the Errors of an Approximation by Taylor Series | T, U  T, U |
| G5.6 | Applications of Taylor Polynomials in Approximations and Physics | T, U |

# TEACHING PLAN

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| **ID** | **Topic** | **Course outcomes** | **Teaching/Learning Activities (samples)** |
| 1 | **0. Review of Integration**  **1. Applications of Integration**  1.1 More about Areas  1.2 Volumes | I. T  I, T  I,T | Lecturing |

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| 2 | 1.3 Arc Length  1.4 Average value of a Function  1.5 Applications to Physics and Engineering  1.6 Applications to Economics and Biology | I  I  U  U | Lecturing |
| 3 | **2. Polar Coordinates**  2.1 Polar Coordinates System  2.2 Curves in Polar Coordinates  2.3 Areas and Lengths in Polar Coordinates | I  I  I | Lecturing |
| 4 | 2.4 Conic Sections in Polar Coordinates.  **3. Improper Integrals**  3.1 Improper Integrals of Type 1: Infinite Intervals  3.2 Improper Integrals of Type 2: Discontinuous Integrands | I  I, T  I,T | Lecturing |
| 5 | 3.3 A Comparison Test  **4. Differential Equations**  4.1 Modeling with Differential Equations  4.2 Direction Fields and Euler’s Method | T  I  I, T | Lecturing |
| 6 | 4.3 Separable Equations  4.4 Exponential Growth and Decay  **Midterm Exam** | I, T  T. U | Lecturing |
| 7 | 4.5 The Logistic Equation4.6 Predator-Prey Systems5. Infinite Sequences and Series 5.1 Sequences: Limit Laws for Sequences. Monotonic Sequence Theorem | I  I  I | Lecturing |
| 8 | 5.2 Series: Geometric series. Properties of Convergent Series  5.3 The Integral and Comparison Tests  5.4 Other Convergent Tests | I, T  T, U | Lecturing |

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| 9 | 5.5 Power Series.  5.6 Representations of Functions as Power Series  5.7 Taylor and Maclaurin Series  5.8 The Binomial Series | I, T  T, T  I  I | Lecturing |
| 10 | 5.9 Applications of Taylor Polynomials in Approximations and Physics  5.10 Fourier Series and integrals  **Review** | U  I | Lecturing  Q&A, Discussion |

# TEACHING ASSISTANTS PLAN

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| **ID** | **Topic** | **Course outcomes** | **Teaching/Learning Activities (samples)** |
| 1 | **1. Applications of Integration**  - Areas, Volumes and Arc Length  - Applications to Physics and Engineering  - Applications to Economics and Biology | G1.1, G1.2, G1.3 | - Explain key ideas. Discussion,  - Demo.  - Ask students to do their lab exercises either on computer in the lab or at home. |

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| 2 | **2. Polar Coordinates**  - Areas and Lengths in Polar Coordinates  - Conic Sections in Polar Coordinates | G2.2 | - Explain key ideas. Discussion,  - Demo.  - Ask students to do their lab exercises either on computer in the lab or at home. |  |  | Lecturing |
| 3 | **3. Improper Integrals**  - Improper Integrals of Type 1, Type 2  - Comparison Test | G3 | - Explain key ideas. Discussion,  - Demo.  - Ask students to do their lab exercises either on computer in the lab or at home. |
| 4 | **4. Differential Equations**  - Euler’s Method  - Separable Equations, Exponential Growth  - The Logistic Equation | G4.1, G4.2 | - Explain key ideas. Discussion,  - Demo.  - Ask students to do their lab exercises either on computer in the lab or at home. |
| 5 | 5. Infinite Sequences and Series - Sequence, Geometric series  - The Integral and Comparison Tests  - Other Convergent Tests  - Taylor and Maclaurin Series  - Applications of Taylor Polynomials in Approximations and Physics | G5.1, G5.2, G5.3, G5.4, G5.5 | - Explain key ideas. Discussion,  - Demo.  - Ask students to do their lab exercises either on computer in the lab or at home. |
| 6 | Review |  | Q&A, Discussion |

For the practical laboratory work, there are 10 weeks which cover similar topics as it goes in the theory class. Each week, teaching assistants will explain and demonstrate key ideas on the corresponding topic and ask students to do their lab exercises either on computer in the lab or at home. All the lab work submitted will be graded. There would be a final exam for lab work.

# ASSESSMENTS

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| **ID** | **Topic** | **Description** | **Course outcomes** | **Ratio (%)** |
| **A1** | **Attendance & Discussion** |  |  | **30%** |
| A11 | Attendance in TA hours |  |  | 10% |
| A12 | Discussion | Each students must present the solution of at least one problem given in advance by the TA |  | 20% |
| A13 | Comment on the solutions presented by other students |  |  | bonus |
| **A3** | **Exams** |  |  | **70%** |
| A31 | Midterm exam | Closed book exam.  The questions cover Chapters 1, 2, 3 and  Chapter 4 up to section 4.4 |  | 30% |
| A33 | Final exam | Closed book exam.  The questions cover the whole course.  However the main emphasize is on Chapters 4 and 5 |  | 40% |

# RESOURCES

# Textbooks

* Calculus, Concepts and Contexts, James Stewart, Thomson Brooks/Cole, 2016, 8th Edition
* Presentations Slides in Power Point

## **Softwares**

* Computer Algebra System MAPLE

# GENERAL REGULATIONS & POLICIES

* All students are responsible for reading and following strictly the regulations and policies of the school and university.
* Students who are absent for more than 3 theory sessions are not allowed to take the exams.
* For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.
* Students are encouraged to form study groups to discuss on the topics. However, individual work must be done and submitted on your own.