

(SYLLABUS)

1. (*)

Item with (*) are only for the ABEEK Program.

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|-------------------------------|---|----------------------------|-----------------------------------|-------------------------|---|
| (Year) | 2016 | | (Semester) | 1 | |
| (Instructor) | | | (Course Title) | | |
| (Course No.) | 2150908501 | (Class) | 01 | (Course Classification) | - |
| | 100 | | | | |
| (Open to) | 2 | (Credit) | 3 (0) | (Class hour per week) | 3 |
| (*) (ABEEK Classification) | | (*) (ABEEK Requirement) | | (Department) | |
| (Office) | | (Telephone) | | (e-mail) | |
| (*) (Teaching Assistant) | | (*) (Office Hour) | M & Th: 13:30 - 14:30, Tu 15 - 17 | | |
| (Course Description) | Differential equation is a mathematical model for situations where a relationship between a continuous variable and its rate of changes are available. It has applications in many areas of science such as engineering, physics, and economics. We study simple types of ordinary differential equations and their solutions. Topics of this course include: solutions of first- and second order linear differential equations, non-linear exact and separable equations, integrating factors, homogeneous equations, higher-order linear equations, initial and boundary value problems, solutions as functions of the equations parameters, Laplace transforms. | | | | |
| (Ssq) | (Course Objectives) | | | | |
| 1 | Students learn developed theories in solving linear and nonlinear ODEs. | | | | |
| 2 | Students learn proper use of English: class notes, lectures, homeworks, and exams are all in English. | | | | |
| 3 | Students learn Mathematical truth: by going through proofs and problem solving techniques in detail, students learn how mathematicians would reach a creative solution. | | | | |
| 4 | Students learn how to communicate effectively: by turning in homework each week and getting a feedback for each, students learn to communicate effectively in writing. By group work and presentation of their work, they learn effective oral presentation. | | | | |
| (Lecture Type) | (90 %) | (00 %) | (10 %) | (00 %) | |
| 가 (Course Grading) | 3 Exams (25% each), Attendance (5%), 10 quizzes (20%): There will be 10 min. quiz on Wed. starting from March 16 at the beginning of the class. Appearing more than 20 min. late to the class is considered as an absence. 3 lates = 1 absence. Exam dates: April 6, May 11, and June 17. | | | | |
| (Required Texts) | * /A first course in Differential Equations/Zill/10th/Previous edition of the text is also fine./ | | | | |
| (*) (Bulletin Board) | | | | | |
| (*) (Prerequisite Courses) | Calculus 1, 2 | | | | |

2.

| (Week) | (Keyword) | (Description) | (Texts) | (Note) |
|--------|--|--|---------|--------|
| 1 | Introduction to Differential Equations | - Basic Definitions and Terminology - Initial- Value Problems | 1.1~1.2 | |

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| (Week) | (Keyword) | (Description) | (Texts) | (Note) |
|--------|--|--|--------------|--------------------------------|
| 2 | Introduction to Differential Equations First - Order Differential Equations | - Differential Equations as Mathematical Models - Separable Variables - Linear Equations | 1.3/ 2.2~2.3 | |
| 3 | First - Order Differential Equations | - Exact Equations - Solutions by Substitution | 2.4~2.5 | Quiz #1 on Wednesday, March 16 |
| 4 | Modeling with First - Order Differential Equations | - Linear Models - Nonlinear Models - Modeling with Systems of Differential Equations | 3.1~3.3 | Quiz #2 on Wednesday, March 23 |
| 5 | Higher - Order Differential Equations | - Linear Differential Equations: Basic Theory: Initial - Value and Boundary - Value Problem, Homogeneous Equations, Nonhomogeneous Equations | 4.1 | Quiz #3 on Wednesday, March 30 |
| 6 | Higher - Order Differential Equations | - Reduction of Order - Homogeneous Linear Equations with Constant Coefficients Exam #1: on classes covered in Quiz #1 ~ Quiz #3 | 4.2~4.3 | Exam #1 on Wednesday, April 6 |
| 7 | Higher - Order Differential Equations | - Undetermined Coefficients - Superposition Approach - Undetermined Coefficient - Annihilator Approach | 4.4~4.5 | Quiz #4 on Wednesday, April 13 |
| 8 | Higher - Order Differential Equations | - Variation of Parameters - Cauchy - Euler Equations | 4.6~4.7 | Quiz #5 on Wednesday, April 20 |
| 9 | Higher - Order Differential Equations Series Solutions of Linear Equations | - Green's Function - Solving Systems of Linear Equations by Elimination - Nonlinear Differential Equations | 4.8~4.10 | Quiz #6 on Wednesday, April 27 |
| 10 | Series Solutions of Linear Equations | - Solutions about Ordinary Points: Review of Power Series, Power Series Solution - Solutions about Singular Points - Special Functions: Bessel's Equation, Legendre's Equation | 6.2~6.4 | Quiz #7 on Wednesday, May 4 |
| 11 | The Laplace Transform | - Definition of the Laplace Transform Exam #2: on classes covered in Quiz #4 ~ Quiz #7 | 7.1 | Exam #2 on Wednesday, May 11 |
| 12 | The Laplace Transform | - Inverse Transforms and Transforms of Derivatives : Inverse Transforms, Transforms of Derivatives | 7.1~7.2 | Quiz #8 on Wednesday, May 18 |
| 13 | The Laplace Transform | Operational Properties I: Translation on the s - Axis, Translation on the t - Axis Operational Properties II: Derivatives of a Transform, Transforms of Integrals | 7.3~7.4 | Quiz #9 on Wednesday, May 25 |

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| (Week) | (Keyword) | (Description) | (Texts) | (Note) |
|--------|-----------------------|---|---------|--------------------------------|
| 14 | The Laplace Transform | Operational Properties II: - Transforms of Periodic Function - The Dirac Delta Function | 7.4 | Quiz # 10 on Wednesday, June 1 |
| 15 | The Laplace Transform | - Systems of Linear Differential Equations Wrap up of the course/Group work | 7.5~7.6 | Group work |
| 16 | | Group work Exam#3: on classes covered in Quiz#8 ~ end of classes | | Exam #3 on Friday, June 17 |

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3. 가 (*)

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|--|--|---|--|--------------------------|---------|
| | | 가 | Going theorems and proofs in detail, not just the techniques of how to solve a problem | Exams and Presentations | 1,2,3,4 |
| | | , | Encouraging the students to ask as many questions as they needed. Also by an English presentation of their group works | English presentation | 1,2,3,4 |
| | | | By weekly practice problems and weekly quizzes, they have to learn prototypes and examples that are needed to bulid their own models | Weekly quizzes and exams | 1,2,3,4 |

