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| Tsuyama College                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Year                                  | 2021                                                                                                       | Course Title                                                   | Fundamental Differential Equations                                                                           |
| Course Information                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                              | 0059                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                       | Course Category                                                                                            | General / Compulsory                                           |                                                                                                              |
| Class Format                                                                                                                                                                                                                                                                                                                                                                                                                             | Lecture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       | Credits                                                                                                    | School Credit: 1                                               |                                                                                                              |
| Department                                                                                                                                                                                                                                                                                                                                                                                                                               | Department of Integrated Science and Technology Electrical and Electronic Systems Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       | Student Grade                                                                                              | 3rd                                                            |                                                                                                              |
| Term                                                                                                                                                                                                                                                                                                                                                                                                                                     | First Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       | Classes per Week                                                                                           | 2                                                              |                                                                                                              |
| Textbook and/or Teaching Materials                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
| Instructor                                                                                                                                                                                                                                                                                                                                                                                                                               | MATSUDA Osamu,YAMANAKA Satoshi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       |                                                                                                            |                                                                |                                                                                                              |
| Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
| <p>Learning Purpose : Familiarize students in understanding and solving differential equations.</p> <p>Course Objective: 1. To understand the meaning of differential equations. 2. To be able to solve basic differential equations of variables. 3. To be able to solve basic first-order linear differential equations. 4. To be able to solve second-order homogeneous linear differential equations with constant coefficients.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
| Rubric                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                          | Ideal Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       | Standard Level                                                                                             |                                                                | Unacceptable Level                                                                                           |
| Achievement 1                                                                                                                                                                                                                                                                                                                                                                                                                            | Can solve high-level problems of the same order related to the separation of variables system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       | Can solve standard problems of the same order related to the separation of variables system.               |                                                                | Can't solve standard problems of the same order related to the separation of variables system.               |
| Achievement 2                                                                                                                                                                                                                                                                                                                                                                                                                            | Can solve high-level first-order linear differential equations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       | Can solve standard first-order linear differential equations.                                              |                                                                | Can't solve standard first-order linear differential equations.                                              |
| Achievement 3                                                                                                                                                                                                                                                                                                                                                                                                                            | Can solve high-level second-order constant coefficient differential equations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       | Can solve standard second-order constant coefficient differential equations.                               |                                                                | Can't solve standard second-order constant coefficient differential equations.                               |
| Achievement 4                                                                                                                                                                                                                                                                                                                                                                                                                            | Can solve problems that apply conventional solutions such as simultaneous differential equations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       | Can solve standard problems that apply conventional solutions such as simultaneous differential equations. |                                                                | Can't solve standard problems that apply conventional solutions such as simultaneous differential equations. |
| Assigned Department Objectives                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
| Teaching Method                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
| Outline                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>General or Specialized : General</p> <p>Field of learning : Natural science common / basic</p> <p>Required, Elective: Elective must complete subjects</p> <p>Foundational academic disciplines : Mathematical science / mathematics / analysis basics</p> <p>Relationship with Educational Objectives: This class is equivalent to "(1)"</p> <p>Relationship with JABEE programs : The main goal of learning / education in this subject are (A) , A-1</p> <p>Class outline: Understand the meaning of differential equations and learn how to find the release of various first-order differential equations and simple second-order differential equations. We start with the separation of variables that is solved by finding the primitive function (quadrature) and the homologous form that results in this. Furthermore, for linear differential equations that have a cohesive theoretical system in differential equations and have a wide range of applications, learn the solutions and the properties of solutions in the case of the first and second floors.</p>                                                   |                                       |                                                                                                            |                                                                |                                                                                                              |
| Style                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>Class method: Content is presented primarily at the board, and we will emphasize computer-based calculation experiments in order to deepen understanding.</p> <p>Grade evaluation method: Two regular examinations, equally weighted (60%) and exercises / reports (40%). Depending on the grade, a retest may be conducted. Textbooks, notebooks, etc. are not allowed for the exam.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                                            |                                                                |                                                                                                              |
| Notice                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Course method : In order to complete the 3rd-grade course, students must take this class (no more than one-third of required number of class hours missed).</p> <p>Course advice: Reviewing integrals is especially important.</p> <p>Foundational subjects : Fundamental Mathematics (1st year), Fundamental Mathematics Practice (1st), Differential and Integral I (2nd), Fundamental Linear Algebra (2nd)</p> <p>Related subjects: Mathematics, physics, and other subjects after the 4th year</p> <p>Advice on attendance: It is important to listen carefully to the lectures and read the textbook by yourself, and I would like you to prepare for class diligently. Also, if you take the time to solve the problems with your own power, you will gain benefit. In addition to solving the equations, think about what the obtained solution curve will look like. Feel free to ask questions if you don't understand. If you are late often, it may be treated as absent after a warning.</p> <p>The person in charge of this subject is a part-time lecturer. The faculty member in charge of liaison is Matsuda.</p> |                                       |                                                                                                            |                                                                |                                                                                                              |
| Characteristics of Class / Division in Learning                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
| <input type="checkbox"/> Active Learning                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> Aided by ICT |                                                                                                            | <input type="checkbox"/> Applicable to Remote Class            |                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            | <input type="checkbox"/> Instructor Professionally Experienced |                                                                                                              |
| Course Plan                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                                                            |                                                                |                                                                                                              |
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|              |             |      |                                                                                                                                              |                                                                                                   |
|--------------|-------------|------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1st Semester | 1st Quarter | 1st  | Guidance and review of calculus, meaning of differential equations                                                                           |                                                                                                   |
|              |             | 2nd  | Solution of differential equations                                                                                                           | Understanding the solution of differential equations                                              |
|              |             | 3rd  | Separation of variables 1                                                                                                                    | Understanding of Separation of Variables                                                          |
|              |             | 4th  | Separation of variables 2                                                                                                                    | Understanding of Separation of Variables                                                          |
|              |             | 5th  | Homogeneous form 1                                                                                                                           | Understanding of Homogeneous form                                                                 |
|              |             | 6th  | Homogeneous form 2                                                                                                                           | Understanding of Homogeneous form                                                                 |
|              |             | 7th  | First-order linear differential equation                                                                                                     | Understanding of First-order linear differential equation                                         |
|              |             | 8th  | Mid-term exam                                                                                                                                |                                                                                                   |
|              | 2nd Quarter | 9th  | Return and explanation of the first half test answer, second-order linear differential equation (solution of equation differential equation) | Understanding of second-order linear differential equations                                       |
|              |             | 10th | Second-order linear differential equation (linear differential equation)                                                                     | Understanding of second-order linear differential equations                                       |
|              |             | 11th | Constant coefficient homogeneous second-order linear differential equation                                                                   | Understanding of Constant coefficient homogeneous second-order linear differential equation       |
|              |             | 12th | Constant Coefficient Non-homogeneous Second Order Linear Differential Equation 1                                                             | Understanding of Constant Coefficient Non-homogeneous Second Order Linear Differential Equation 1 |
|              |             | 13th | Constant Coefficient Non-homogeneous Second Order Linear Differential Equation 2                                                             | Understanding of Constant Coefficient Non-homogeneous Second Order Linear Differential Equation 1 |
|              |             | 14th | Various linear differential equations                                                                                                        | Understanding of Various linear differential equations                                            |
|              |             | 15th | Final exam                                                                                                                                   |                                                                                                   |
|              |             | 16th | Return and explanation of final exam answers, non-linear second-order differential equations                                                 |                                                                                                   |

#### Evaluation Method and Weight (%)

|                         | Examination | Presentation | Mutual Evaluations between students | Behavior | Portfolio | Other | Total |
|-------------------------|-------------|--------------|-------------------------------------|----------|-----------|-------|-------|
| Subtotal                | 60          | 0            | 0                                   | 0        | 0         | 40    | 100   |
| Basic Proficiency       | 60          | 0            | 0                                   | 0        | 0         | 40    | 100   |
| Specialized Proficiency | 0           | 0            | 0                                   | 0        | 0         | 0     | 0     |
| Cross Area Proficiency  | 0           | 0            | 0                                   | 0        | 0         | 0     | 0     |