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| <b>COURSE</b> | <b>Course Name</b> : Applied Mathematics |
|               | <b>Course Code</b> : VI231207            |
|               | <b>Credit</b> : 3 SKS                    |
|               | <b>Semester</b> : 2                      |

#### **DESCRIPTION OF COURSE**

Engineering Mathematics is one of the mandatory courses in the Instrumentation Engineering Technology Study Program. In this course, we study vectors, Laplace transformations and solving differential equations using Laplace, Z transformation, discrete Fourier transformation, numerical interpolation, non-linear equations and linear algebraic equations. The learning method used is to use learning with or without the help of software.

#### **LEARNING OUTCOMES**

- Able to study cases of the application of science and technology in the field of expertise according to work competency standards, and able to make appropriate decisions from the results of one's own work or group work in the form of a final assignment report or other form of learning activity whose output is equivalent to the final assignment through logical, critical thinking, innovative, quality and measurable by considering health, safety, security and the environment. (CPL-2)
- Able to communicate, write reports and make presentations effectively. (CPL-4)
- Able to apply knowledge of mathematics, natural sciences, the basics of measurement instrumentation, control and security for procedures, processes, systems and technical methodologies applied in an industrial process. (CPL-5)
- Able to design solutions to instrumentation technology and engineering problems and can contribute to the design of systems, components and processes to meet specific needs by considering security, health and public safety standards. (CPL-7)

### **COURSE LEARNING OUTCOME**

- Able to understand vectors and their application in calculations
- Able to understand and calculate the Laplace transformation
- Able to calculate differential equations using the Laplace transformation
- Able to calculate Z transformation
- Able to calculate the Discrete Fourier transform
- Able to calculate numerical interpolation
- Able to calculate non-linear equations using numerical methods
- Able to calculate solutions to linear algebra equations

### **MAIN SUBJECT**

1. Vectors: vector properties and operations
2. Definition of Laplace Transformation, Properties of Laplace Transformation, Inverse Laplace Transformation (Fractional and Residual Method)
3. Press Completion. Differential, Applications of the Laplace Transform
4. Z Transformation: Definition of Z Transformation, Properties of Z Transformation, Inverse of Z Transformation (Fractional and Residue Method), Solving Different Equations, Applications of Z Transformation
5. Discrete Fourier Transform: Fourier Transform of Discrete Signals, Properties of Discrete Fourier Transform, Magnitude and Phase of Fourier Transform and Parseval Relations, Effects of Phase of 1st and 2nd Order Discrete Time Systems.
6. Numerical interpolation: Linear interpolation; Lagrange Interpolation; Backward and Forward Newton Interpolation; Newton's interpolation for non-uniform
7. Solving non-linear equations using methods: Graphics; Bisection; Regular False; Newton Raphson; Secant
8. Solving linear algebra equations using the iteration method: Gauss Seidel; Jacobians; Obtaining Eigen Values

### **PREREQUISITES**

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## REFERENCE

Books:

1. Kreyzig, Erwin, 1999, "Advanced Engineering Mathematics", -8<sup>th</sup> ed., John Wiley & Sons, Inc, Singapore.
2. Salvadory, Mario G. and Baron, Melvin L., "Numericals Methods in Engineering", - 2<sup>th</sup> ed, Prentice Hall Inc., USA