

## SYLLABUS:

<b>Date / Revision</b>	23 May 2015 / 02 May 2017 / PP
<b>Faculty</b>	Life Sciences (LS)
<b>Study Programs</b>	Biomedical Engineering (BME), Chemical Engineering (CHE), Food Technology (FTE)

## SUBJECT: Applied Mathematics

### 1 Basic Information

<b>1.01</b>	<b>Subject Name</b>	<b>Applied Mathematics</b>
<b>1.02</b>	<b>Semester</b>	3
<b>1.03</b>	<b>Level</b>	1
<b>1.04</b>	<b>SKS</b>	3
<b>1.05</b>	<b>Mandatory / Curriculum</b>	D-02
<b>1.06</b>	<b>Subject Code</b>	MAT3
<b>1.07</b>	<b>Subject Code</b>	BME-FTE-CHE-D-LS-117
<b>1.08</b>	<b>Year</b>	2017 (7)
<b>1.09</b>	<b>Quality Control</b>	Final Test, OFSE, see evaluation
<b>1.10</b>	<b>Limitations</b>	Min 12 and Max 32 students in one class
<b>1.11</b>	<b>Combined with</b>	All Faculty of Life Sciences Students
<b>1.12</b>	<b>Pre-requisite</b>	Engineering Mathematics 1 and 2
<b>1.13</b>	<b>Responsible</b>	Dr. Tutun Nugraha
<b>1.14</b>	<b>Revision</b>	15-05-2017/pp

### 2 Description of Subject

This course is intended for 2nd year university students (3rd semester) who take science and engineering department. The whole chapters are related to differential equations. First, the solution of 1st and 2nd order ordinary differential equations is delivered. The solution can then be generalized for higher order. After dealing with single equation, the student will be taught on how to solve simultaneous ordinary differential equation. Methods to solve differential equation (such as Laplace and Fourier Transform) are then delivered. Finally, the students will learn about how to solve partial differential equation.

### 3 Objectives

This course will be the next part of mathematical courses given to students that was the continuation of Engineering Math 1 and 2. More specifically, some techniques that are required in solving many different types of engineering problems are discussed here. Students will learn the more complex equation in ordinary and partial differential equation (ODE and PDE), as well as the solution to Fourier and Laplace Transform.

#### 4 Competency

After having the course, students are expected to:

- Able to solve 1<sup>st</sup> order ordinary differential equation (ODE)
- Able to solve 2<sup>nd</sup> order ODE
- Able to solve higher order ODE
- Understand to technique to solve simultaneous ODE
- Able to use Laplace transform method to solve differential equation
- Understand the Fourier Transform
- Able to solve partial differential equation

#### 5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers to build the projects;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.
- Writing assignments/presentations

#### 6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	5
5.3	Homework / Classwork/Report	15
5.4	Presentation /Simulation	-
5.5	Daily Quiz	20
5.6	Final Examination	60 Points
	<b>Total</b>	100 Points

#### 7 Text Book and Reference

- Main Text Book:**
  - Advanced Engineering Mathematics - Erwin Kreyszig - 10th Edition - John Wiley & Sons  
Estimated Price of Book: Rp 368,000,-

<b>2</b>	<b>Supplemental Textbooks:</b> <ul style="list-style-type: none"> <li>Advanced Engineering Mathematics - K. A. Stroud - 4th Edition - Palgrave Macmillan Applied Mathematics</li> <li>Modeling for Chemical Engineers - R. G. Rice, D. D. Do - John Wiley &amp; Sons</li> </ul>
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**8 Content / Topics of Lecture**

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	<b>First Order Ordinary Differential Equation (ODE)</b> Introduction to Applied Mathematics, Basic Concept of 1 <sup>st</sup> Order ODE, Linearity, Concept of Solutions, Separation of Variables, Integrating Factors, Bernoulli Equation	Homework, Quiz	1 x 3 x 50 min
2	<b>Second Order ODE</b> Linear and Constant Coefficient 2 <sup>nd</sup> Order ODE, Superposition Principles, Homogeneous 2 <sup>nd</sup> Order ODE, Characteristics Equation, Euler-Cauchy Equation, Wronskian	Homework, Quiz	1 x 3 x 50 min
3	<b>Second Order ODE</b> Non-homogeneous 2 <sup>nd</sup> Order ODE, Method of Undetermined Coefficient, Method of Variation of Parameters	Homework, Quiz	1 x 3 x 50 min
4	<b>Higher Order ODE</b> Linear and Constant Coefficient Higher Order ODE, Superposition Principles, Homogeneous Higher Order ODE, Characteristics Equation, Wronskian.	Homework, Quiz	1 x 3 x 50 min
5	<b>Higher Order ODE</b> Non-homogeneous Higher Order ODE, Method of Undetermined Coefficient, Method of Variation of Parameters	Homework, Quiz	1 x 3 x 50 min
6	<b>Simultaneous ODE</b> Eliminating Independent Variables, Eliminating Dependent Variables, Homogeneous Simultaneous ODE	Homework, Quiz	1 x 3 x 50 min
7	<b>Simultaneous ODE</b> Non-homogeneous Simultaneous ODE, Method of Undetermined Coefficient, Method of Variation of Parameters	Homework, Quiz	1 x 3 x 50 min
8	Midterm Break		
9	<b>Laplace Transform</b> Definition and Properties of Laplace Transform, Table of Laplace Transform	Homework, Quiz	1 x 3 x 50 min
10	<b>Laplace Transform</b> First and Second Shifting Theorem, ODE Solution Via Laplace Transform	Homework, Quiz	1 x 3 x 50
11	<b>Laplace Transform</b> Solution of Laplace Inverse, Convolution Theorem	Homework, Quiz	1 x 3 x 50

12	<b>Fourier Transform</b> Fourier Series, Euler Formula, Generalization of Euler Formula, Simplification : Even and Odd Function, Sum and Scalar Multiple, Half-Range Expansion, Sturm-Liouville Problems	Homework, Quiz	1 x 3 x 50
13	<b>Fourier Transform</b> Orthogonal Functions, Orthogonal Series, Fourier Integral, Fourier Sine and Cosine Integral, Fourier Sine and Cosine Transform, Linearity, Transform of Derivative	Homework, Quiz	1 x 3 x 50
14	<b>Partial Differential Equation (PDE)</b> Basic Concept of PDE, Total PDE, PDE with Changing of Variables, Implicit Functions, Method of Combination of Variables	Homework, Quiz	1 x 3 x 50
15	<b>Partial Differential Equation (PDE)</b> Method of Separation of Variables, Laplace Transform Method	Homework, Quiz	1 x 3 x 50
16, 17	<b>Final Examination</b>		