
SYLLABUS

Date/ Revision	22 August 2016
Faculty	Engineering
Approval	Dean of Engineering Faculty

SUBJECT : APPLIED MATHEMATICS

1. Identification of Subject:

Name of Subject	: Applied Mathematics
Code of Subject	: MATH-2200
SKS	: 3
Semester	: 3
Study Program	: Aviation Engineering, Mechatronics Engineering
Lecturer	: Dr. Ponky Ivo

2. Competency

After having the course, students are expected to:

- develop an awareness of the exciting applications of Mathematics
- develop a willingness to apply Mathematics to relevant problems that are encountered in daily activities
- understand the basics of Ordinary Differential Equations (ODEs) and Partial Differential Equations (PDEs)
- able to model periodic phenomena in engineering and science with Fourier analysis
- develop the skills of defining the limitations of the model and the solution
- acquire complex analysis to solve engineering problems

3. Description of Subject:

The main emphasis of the applied mathematics course is on developing the ability of the students to start with a problem in non-mathematical form and transform it into mathematical language. This will enable them to bring mathematical insights and skills in devising a solution, and then interpreting this solution in real-world terms.

Students accomplish this by exploring problems using symbolic, graphical, numerical, physical and verbal techniques in the context of finite or discrete real-world situations. Furthermore, students engage in mathematical thinking and modelling to examine and solve problems arising from a wide variety of disciplines including, but not limited to, economics, medicine, agriculture, marine science, law, transportation, engineering, banking, natural sciences, social sciences and computing.

4. Learning Approach

Approach	: Combination of Expository - inquiry and collaborative
Method	: Discussion, question answer, sample problem
Student Task	: Home work, presentation
Media	: LCD projector, slides

5. Evaluation

- a) Absence maximum : 25%
- b) Participation in discussion : 5 points
- c) Homework/Classwork : 10 points
- d) Presentation/Group Work : 10 points
- e) Quiz : 15 points
- f) Final Examination : 60 points

Total : 100 points

6. Contents/ Topics of Lecturing:

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	Ordinary Differential Equations (ODEs) Basic concepts, Introduction to modeling, Homogeneous Linear and Nonhomogeneous Linear ODEs, some examples.	Ch1[1]	
2	Ordinary Differential Equations (ODEs) Second-Order ODEs; Homogeneous Linear and Nonhomogeneous Linear ODEs, examples in RLC and free oscillations	Ch2[1]	
3	Laplace Transforms Introduction to First and Second shifting theorem (s - and t -shifting), Table of Laplace transform, examples of RCL circuit and free oscillation	Ch6[1]	Q1(ODEs)
4	Laplace Transforms Dirac's delta function, Convolution	Ch6[1]	
5	Linear Algebra Review matrices and vectors, introduction to Gauss Elimination, Eigenvalues and Eigenvectors	Ch7-8[1]	Q2(Laplace)
6	Vector Differential Calculus Vectors in 2-Space and 3-Space, Grad, Div, Curl, Vector Dot and Cross Products and examples	Ch9 [1]	
7	Vector Integral Calculus Line Integrals, Green's Theorem, Surface Integrals, Gauss and Stokes's theorems	Ch10[1]	
8	MID SEMESTER BREAK		
9	Fourier Analysis Review Fourier series, Sturm–Liouville Problems, Fourier integral, Fourier Cosine and Sine transforms, Fast Fourier transforms, Tables of Transforms.	Ch11[1]	Q3(Linear Algebra & Vector Calculus)
10	Fourier Analysis Fast Fourier transforms, Exercises with Tables of Transforms	Ch11[1]	

11	Partial Differential Equations (PDEs) Introduction to basic concepts of PDEs, and examples of D'Alembert's Solution of the Wave Equation, heat equation, 2D-heat problems, Laplacian in Polar Coordinates	Ch12[1]	
12	Complex Numbers and Functions, Complex Differentiation Introduction to complex numbers and functions, plane and polar form, Cauchy–Riemann equations, Laplace's equation	Ch13[1]	Q4 (Fourier &PDEs)
13	Complex Integration Line integral and complex plane, Cauchy's integral theorem, derivatives of analytic functions	Ch14[1]	
14	Group Work		Task and Presentation
15	Rehearsal and Tutorial: Rehearsal of all subject and students can ask for more detail.		
16	FINAL EXAMINATION		

7. Book Reference:

- a) **Main Text Book:** [1] "Advanced Engineering Mathematics, 10th Edition, 2011", Authors: Erwin Kreyszig, Publisher: John Willey.
- b) **Supplement Textbooks:**