University: Cairo **Faculty:** Engineering **Department:** Aerospace Engineering

Course Specifications

Programme on which the course is given: 1st year in Aero- Engineering Dept.
Major or Minor element of programmes:
Department offering the programme : Aero- Engineering Dept.
Department offering the course : Engineering Mathematics
Academic year/level : 1st year
Date of specification approval : March 2015.

A- Basic Information

Title : Mathematics (2)
Code : MTH116B
Specification is not based on credit hour system.
However, equivalent is computed based on:
credit hour = contact hour for lecture,
credit hour = 2 contact hours for tutorial or practical:
Lecture: 3 **Tutorial: 1** **Practical: 0** **Total: 4**
(contact hours per week: Lecture 3, Tutorial 1, Total 4 hours)

B- Professional information

1- Overall Aims of Course

At the end of this course, the student should be able to:

- Solve the problem of line and surface integrals using different approaches.
- Know the relation between multiple integral and line and surface integrals.
- Solving different types of first order O.D.E.s.
- Solving different types of second and higher order linear O.D.E.s.
- Solving linear O.D.E.s of the second order in series using Taylor or Frobenius methods.
- Studying Laplace transform: its properties, L. T. of different functions, L. T. of derivatives and integrals, Differentiation and integration of transforms. Inverse L. T. Applications of L.T.
- Fitting a suitable curve corresponding to a given data.
- Studying the basic principles of interpolation and extrapolation.

2- Intended Learning Outcomes of Course (ILOs)

At the end of this course, the student should be able to:

a- Knowledge and understanding:

a1- Define and solve the problem of line and surface integrals, understand the relation between multiple, line and surface integrals

a2- Describing and solving different types of first order O.D.E.s.

a3- Solving different types of second and higher order linear O.D.E.s using different approaches. Solving a system of two L.O.D.E.s

a4- Solving linear O.D.E.s of the second order in series using Taylor or Frobenius methods.

a5- Studying Laplace transform: its properties, L. T. of different functions, L. T. of derivatives and integrals, Differentiation and integration of transforms. Inverse L. T. Applications of L.T.

a6- Recall basic principles of curve fitting and interpolation techniques.

b- Intellectual Skills:

b1- Being able to solve the problem of line and surface integrals using different approaches, and to derive the relation between multiple integral and line and surface integrals.

b2- Being able to solve different types of first order O.D.E.

b3- Being able to use different approaches to solve second and higher order L.O.D.E.s, and a system of two L.O.D.E.s

B4- Being able to choose either Frobenius method or Taylor method to solve the second order L.O.D.E.s.

b5- Being able to deal with the Gamma and Beta functions, the Bessel function with its properties, its recurrence relations and its generating function.

b6- Being able to formulate and solve the problems of curve fitting and interpolation

c- Professional and Practical Skills:

c1- Solving the problem of line and surface integrals, deriving the relation between multiple integral and line and surface integrals

c2- Using different methods to solve different types of first order O.D.E.s. Using different approaches to solve second and higher L.O.D.E.s, and a system of two L.O.D.E.s.

C3- Choosing either Frobenius method or Taylor method to solve the second order L.O.D.E.s.

c4- Studying Laplace transform: its properties, L. T. of different functions, L. T. of derivatives and integrals, Differentiation and integration of transforms. Inverse L. T. Applications of L.T.

C5- Formulating and solving the problems of curve fitting and interpolation.

d- General and Transferable Skills:

d1- Computational skills.

d2- Using new methods for solving initial value problems (L.T.) functions.

d3- Using numerical methods to formulate and solve the problems of curve fitting and interpolation.

d4- Working in groups.

3- Contents

Topic	No. of hours	Lecture	Tutorial/Practical
Line and surface integrals	12	8	4
First order O.D.E.s	8	6	2
Second and higher order O.D.E.s	14	10	4
Solution of Linear O. D. E. in series	8	6	2

Laplace Transform	11	9	2
Curve fitting and Interpolation	7	6	1
Total	60	45	15

4- Teaching and Learning Methods

4.1- Lectures.
4.2- Discussion in tutorial.
4.3- Practical examples (electrical and control systems).

5- Student Assessment Methods

5.1- Assignments to assess knowledge and professional skills.
5.2- Quizzes to assess intellectual skills.
5.3- Midterm to assess the different skills in a given time.
5.4- Final to assess the main aims of the course.

Assessment Schedule

Assessment 1 :	Assignments and Quizzes	Week: 5,11
Assessment 2 :	Midterm	Week: 8
Assessment 3 :	Final	Week: 15

Weighting of Assessments

Assignments	5%
Quizzes	5%
Midterm	20%
Final	70%
Other types of assessment	00%
Total	100%

6- List of References

6.1 - Course Notes:

Lecturer notes (in English).

6.2 - Essential Books (Text Books)

"Mathematics, First Year for Engineering Students", Department of Engineering Math. & Physics - Faculty of Engineering – Cairo university, 2006.

6.3 - Recommended Books

7- Facilities Required for Teaching and Learning

White board, data show.

Course Coordinator:- Prof. Dr. Mehra Salama

Head of Department: Prof. Ayman H. Kassem

Date: March, 2015.