University/Academy: Arab Academy for Science and Technology & Maritime Transport
Faculty/Institute: College of Computing and Information Technology
Program: Computer Science / Information Systems / software Engineering

Form No. (12)
Course Specification

1- Course Data

Course Code:	Course Title:	Academic Year/Level:
BA103	Calculus 3	Year 2 / Semester 3
Specialization: Basic Sciences	**No. of Instructional Units:** 2 hrs lecture 2 hrs section	**Lecture:**

2- Course Aim	This course provides the basic definition of Laplace transform and their theorems: First shift theorem, transform of differentiation and integration, unit step function, second shift theorem and convolution theorem. Inverse of Laplace transform. Then application of Laplace transform by solving D.E. and integral equations using Laplace transform. Fourier analysis: Definition of Fourier series, Fourier series of functions of period 2P, Fourier series for even and odd functions, half-Range expansions and Fourier series for harmonic functions. Then the student should also study Fourier integrals, Fourier cosine and sine transforms and Fourier transform. Also this course provides and introduction to linear programming, including its basic concepts, un constrained optimization, linear programming and solving system of linear inequalities using the simplex method.
3- Intended Learning Outcome:	
a- Knowledge and Understanding	**Students will be able to demonstrate knowledge of:** K12. Understand the essential mathematics relevant to computer science. K14. Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics. (Equivalent to K12 in the IS dept & K13 in the SE dept) • Define what is meant by differential equations. (K12, K14) • Describe separable and homogeneous first order ordinary differential equations(K12, K14) • Identify exact and linear first order ordinary differential equations(K12, K14) • Discuss Bernoulli's first order ordinary differential equations(K12, K14) • Explain the fundamental set of solutions of the second order ordinary differential equations with constant coefficients and the linear independence of the solutions. (K12, K14) • Define the Wronskian(K12, K14) • Discuss the general solution of the homogeneous equations(K12, K14) • Discuss the method of undetermined coefficients to solve non-homogeneous second order differential equations with constant coefficients(K12, K14)

	• Explain the method of variation of parameters(K12, K14) • Explain Cauchy -Euler Equation(K12, K14) • Define Laplace transforms (K12, K14) • Know first shifting theorem (s-shifting) (K12, K14) • Recognize derivatives of transforms and transform integration (K12, K14) • Define Unit step function(K12, K14) • Know second shifting theorem (t- shifting) (K12, K14) • Explain the inverse Laplace transforms(K12, K14) • Know the solution of ODEs using Laplace transforms. (K12, K14) • Know the solution of R-L circuit using the Laplace transforms(K12, K14) • Discuss Fourier series(K12, K14) • Know Fourier series for functions of period 2P(K12, K14) • Know Fourier series for even, odd functions(K12, K14) • Know Fourier integrals(K12, K14) • Discuss Linear Programming(K12, K14) • Know the Simplex method(K12, K14)
b- Intellectual Skills	**By the end of the course, the student acquires high skills and an ability to understand:** I2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline. • Solve separable and homogeneous first order ordinary differential equations problems • Solve exact and linear first order ordinary differential equations problems • Solve Bernoulli's first order ordinary differential equation problems • Examine the linear independence of solutions • Compute the Wronskian • Solve the homogeneous second order ordinary differential equations with constant coefficients • Apply the method of undetermined coefficients to the non-homogeneous equations • Apply the method of variation of parameters to the second order ordinary differential equations with constant coefficients • Solve Second order ordinary differential equations with variable coefficients: [Cauchy -Euler Equation] • Apply the first shifting theorem (s-shifting) • Solve problems on derivatives of transforms and transform integration • Apply the second shifting theorem (t- shifting) • Solve Inverse Laplace transforms problems • Solve ODEs and R-L circuit using the Laplace transforms • Analyze the Fourier series for functions of period 2P • Analyze the Fourier series for even and odd functions • Analyze the Fourier integrals • Solve Linear programming problems • Analyze the simplex method

c- Professional Skills	**By the end of the course the student will have the ability to:** P8. Handle a mass of diverse data, assess risk and draw conclusions. • Use calculus to compute, graph, model, and solve problems. • Apply tools and techniques for the design and development of applications. • Evaluate the electric current passing through R-L circuit using the Laplace Transforms

d- General Skills	**Students will be able to:** G1.Demonstrate the ability to make use of a range of learning resources and to manage one's own learning. G3. Show the use of information-retrieval. G5. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension. • Enhance the use numeracy, calculation and statistical methods. • Develop Creativity, imagination skills, and analytic ability.
4- Course Content	<table><tr><th>#</th><th>CLO</th></tr><tr><td>1</td><td>Use the Laplace transform and the theorems (first shift theorem, transform of differentiation and integration theorems, etc….) in solving differential and integral equations.</td></tr><tr><td>2</td><td>Understand the Fourier analysis which includes the Fourier series and Fourier transform.</td></tr><tr><td>3</td><td>Know the concept of linear programming in order to solve system of linear inequalities using the simplex method.</td></tr></table>
5- Teaching and Learning Methods	Lectures, sections, Individual study & self-learning.
6- Teaching and Learning Methods for Students with Special Needs	• Students with special needs are requested to contact the college representative for special needs (currently Dr Hoda Mamdouh in room C504) • Consulting with lecturer during office hours. • Consulting with teaching assistant during office hours. • Private Sessions for redelivering the lecture contents. • For handicapped accessibility, please refer to program specification.
7- Student Assessment:	
a- Procedures used:	Exams and assignments
b- Schedule:	Week 7 exam Week 12 exam assignments Week 16Final exam
c- Weighing of Assessment:	7^{th} week exam 30% 12^{th} week exam 20% assignment 10% Final exam 40%
8- List of References:	

a- Course Notes	From the Moodle on www.aast.edu
b- Required Books (Textbooks)	Erwin Kreyszig, *Advanced Engineering Mathematics*, 8th edition, John Wiley and Sons Inc. 1999
c- Recommended Books	
d- Periodicals, Web Sites, …, etc.	

Course Instructor: **Head of Department: Dr Samah Senbel**

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