

Detailed Course Description - Course Plan Development and Updating Procedures/ Mathematics Department	QF01/0408-3.0E
--	----------------

Faculty	Faculty of Science and Information Technology	Department	Mathematics
Course number	0101374	Course title	رياضيات تطبيقية Applied mathematics
Number of credit hours	3	Pre-requisite/co-requisite	معادلات تفاضلية جزئية Partial Differential Equations (0101374)

Brief course description

Series Solution of differential equations, Boundary value problems, Fourier series of the functions, Solution of the Partial differential equation

Course goals and learning outcomes

Goal 1	Introduce the Power Series solution technique to Ordinary Differential Equations
Learning outcomes	Students will be able to: 1.1 Use power series methods to solve differential equations about ordinary points. 1.2 Use the Method of Frobenius to solve differential equations about regular singular points.
Goal 2	Learn the concept of Fourier series expansion of functions.
Learning outcomes	Students will be able to: 2.1 Determine the Fourier series, sine and cosine series for various functions defined on an interval. 2.2 Understand convergence properties of Fourier series. 2.3 Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function. 2.4 Find the Fourier transform of a function by definition and by use of a table. 2.5 Use the Fourier series to solve partial differential equations. 2.6 Understand Orthogonality of the Eigenfunctions.
Goal 3	Introduce students to the boundary value problems
Learning outcomes	Students will be able to: 3.1 Understand and to solve Eigenvalue and Eigenfunction problem. 3.2 Examine the Sturm-Liouville problem. 3.3 Solve a basic Sturm-Liouville equation. 3.4 Introduce students to the method of Separation of Variables and to the Fourier Series. 3.5 Solve a Boundary Value problem using Fourier Series.

Textbook	1. Elementary Differential Equation and Boundary Value Problems, By William E. Boyce & Richard C. DiPrima, 10 th edition, 2013. 2. Fourier series by Georgi P. Tolstov, By Richard A. Silverman 1976. Dover Publications
Supplementary	1) Fourier series and Orthogonal Functions, Harry F. Davis, 1989/ Allyn and

Detailed Course Description - Course Plan Development and Updating Procedures/ Mathematics Department	QF01/0408-3.0E
--	----------------

references	Bacon.
	2) Fourier analysis and its Applications, Andres Vertblad, 2003 / Springer-Verlage, New Yourk.
	3) Mathematical Methods, Dr. S. Sivaiah, 2013, ISBN: 9789380856476.
	4) A Basic Course in Applied Mathematics, by J. Bystrom, L. Persson, F. Stromberg- Lulea University of Technology, 2010

Course timeline				
Week	Number of hours	Course topics	Pages (textbook)	Notes
01	1	Review of initial value problems, First order I.V.P.	79 – 87 187-194	Text 1
	1	Review of power series.		
	1	Series solution of ordinary differential equation about an ordinary point		
02	1	Classification of ordinary and singular points	79 –84 207 – 215	Text 1
	1	Frobinius method, Solution around regular singular point, part I.,		
	1	Solution around regular singular point, part II.		
03	1	Periodic functions, Harmonic functions.	215 – 219	Text 1
	1	The basic trigonometric system		
	1	The orthogonally of sine's & cosines		
04	1	Normalization of functions	8 – 14	Text 2
	1	Fourier series of function with period 2π .		
	1	Fourier series for functions defined on an interval with length 2π		
05	1	Right-hand and Left-hand limits. Jump discontinuities.	15 – 18	Text 2
	1	Smooth and piecewise smooth functions.		
	1	A criterion for convergence of Fourier series.		
06	1	Even and Odd functions, Sine and Cosine series.	19 – 32	Text 2
	1	Half range of sine & cosine Fourier series		
	1	First Exam. 20%.		
07	1	Change of interval, functions of period $2P$	35 – 40 75 – 77	Text 2
	1	A sufficient condition for convergence of a Fourier series at a continuity point.		
	1	A sufficient condition for convergence of a Fourier series at point of discontinuity.		
08	1	Convergence of a Fourier series of a piecewise smooth function.	75 – 78 79 – 82	Text 2
	1	Uniform convergence		
	1	Integration of Fourier series.		
09	1	Differentiation of Fourier series, the case of continuous function of period 2π .	125 – 137	Text 2
	1	Differentiation of Fourier series, the case of a function defined on the interval $[0, \pi]$.		
	1			

Detailed Course Description - Course Plan Development and Updating Procedures/ Mathematics Department	QF01/0408-3.0E
--	-----------------------

10	1	Parsival's identity.	119-124	Text 2
	1	Finite sine Fourier transforms		
	1	Finite cosine transforms and their properties		
11	1	Generalized sine and cosine transforms	589 – 593	Text 1
	1	Eigenvalue and Eigenfunction problem,		
	1	Sturm-Liouville BVP		
12	1	Solution around regular singular point, part II.	602 – 615	Text 1
	1	Periodic functions, Harmonic functions.		
	1	The basic trigonometric system	250	Text 2
13	1	Orthogonality of the Eigenfunctions.	251-258	Text 2
	1	Fourier series with respect to the Eigenfunction.		
	1	The generalized solution.		
14	1	Equation of a vibrating string.	268 – 273	Text 2
	1	Free vibrations of a string,		
	1	Forced vibrations of a string		
15	1	Equation of a heat flow of a rod	296 – 299	Text 2
	1	Heat flow of a rod with ends held at zero temperature.		
	1			
16	2	Final Exam 50%		

Theoretical course evaluation methods and weight	Participation = 10% First exam 20% Second exam 20% Final exam 50%	Practical (clinical) course evaluation methods	Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50%
---	--	---	---

Approved by head of department		Date of approval	
---------------------------------------	--	-------------------------	--

Extra information (to be updated every semester by corresponding faculty member)

Name of teacher	Amjed Zaiqat	Office Number	9356
Phone number (extension)		Email	amjed@zuj.edu.jo
Office hours	Sun., Tue., Thu. : 9:00 – 10:00 Mon., Wed. : 11:0 – 12:30		