جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Contemporary Topics in Dynamics - ME 394D

Division	Physical Science and Engineering Division
Course Number	ME 394D
Course Title	Contemporary Topics in Dynamics
Academic Semester	Spring
Academic Year	2017/2018
Semester Start Date	01/28/2018
Semester End Date	05/24/2018
Class Schedule (Days & Time)	02:30 PM - 04:00 PM | Sun Wed

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Mohammad Ibrahim Younis	Mohammad.Younis@KAUST.EDU.SA	+966128080597		M, Th from 2-3 PM

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	This course will discuss various topics related to the linear and nonlinear dynamics of lumped-parameter systems and distributed parameter systems. These include beams, plates, membranes, arches, strings, bars, and rods. The course will discuss both linear and nonlinear oscillations including linear egienvalue problems, forced vibrations techniques. Also, it will discuss exact and approximate solution methods including Galerkin, and Ritz methods.
Course Description from Program Guide	
Goals and Objectives	The goals is to master vibration problems related to beams; strings, and other continous systems. Familize yourslef with exact and approximate techniques to solve vibration problems. Introudce you to some perturbation techniques. Expose you to several practical and modern applications of the topic, including MEMS and Nano systems
Required Knowledge	General undergraduate knowledge in vibrations. It is preferred to have ME 222A taken.
Reference Texts	L. Meirovitch, Fundamentals of Vibrations, McGraw Hill, 2001 *MEMS Linear and Nonlinear Statics and Dynamics*, Younis, Mohammad I., Springer, New York, 2011.
Method of evaluation	**60.00**% - Tests **40.00**% - Homework /Assignments
Nature of the assignments	HW problems that require analytical and numerical skills.
Course Policies	Late assignments will be reduced by at least 20 %
Additional Information	

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Sun 01/28/2018	-Introduction to Nonlinear Oscillations
1	Wed 01/31/2018	- Effect of constant forces on systems with quadratic and cubic nonlinearities.
2	Sun 02/04/2018	Primary resonance,
2	Wed 02/07/2018	secondary resonances, sub harmonic and super harmonic resonances
3	Sun 02/11/2018	Parametric resonance.
3	Wed 02/14/2018	Self excited systems
4	Sun 02/18/2018	The method of multiple scales.
4	Wed 02/21/2018	Internal resonance
5	Sun 02/25/2018	Veering
5	Wed 02/28/2018	Lagrangian and Hamiltonian Dynamics
6	Sun 03/04/2018	Continuous Systems - Exact Solutions
6	Wed 03/07/2018	free vibrations (eigenvalue problem);
7	Sun 03/11/2018	String
7	Wed 03/14/2018	Rod
8	Sun 03/18/2018	Bar
8	Wed 03/21/2018	Beam
9	Sun 03/25/2018	Membranes (circular, rectangular)
9	Wed 03/28/2018	Membranes (circular, rectangular)
10	Sun 04/01/2018	Break
10	Wed 04/04/2018	Break
11	Sun 04/08/2018	Exam
11	Wed 04/11/2018	Plates (circular, rectangular)
12	Sun 04/15/2018	Continuous Systems- Approximate Solutions
12	Wed 04/18/2018	Rayleigh quotient
13	Sun 04/22/2018	Rayleigh Ritz
13	Wed 04/25/2018	Galerkin
14	Sun 04/29/2018	Collocation
14	Wed 05/02/2018	Nonlinear beams
15	Sun 05/06/2018	Applications of beams: MEMS, AFM, CNTs
15	Wed 05/09/2018	Buckling of beams
16	Sun 05/13/2018	Shallow arches
16	Wed 05/16/2018	Curved plates
17	Sun 05/20/2018	Review
17	Wed 05/23/2018	Review

Note

The instructor reserves the right to make changes to this syllabus as necessary.