



			Cours	e Specific	ati	ons					
Program(s) on which this course is given:			Aerospace Engineering								
Department offering the program:			Department of Aerospace Engineering								
Department offering the course:			Department of Aerospace Engineering								
Academic Level:			B.Sc.								
Date			March 23 2015								
Semester (based on final exam timing)				🗆 x Fall 🛛 Spring							
A- Basic Infor	mation										
<b>1. Title:</b> Numerical method in str			ructural analysis			Code: AER 640					
2. Units/Credit hours per week:	nits/Credit per week: Lectures 27		Tutori	ial 15	]	Practical		3	Total	45	
<b>B-</b> Professiona	l Infor	nation									
<b>1. Course description:</b> To intra applied applied		To introduce to applied to solve applicability and	To introduce to the a range of numerical techniques based on different theories that can be applied to solve the structure subjected to static and dynamic loads and compare their applicability and compare the strength and weakness in each method.								
2. Intended I Outcomes of (ILOs):	Learning Course	<ul> <li>a) Knowledge a To know the idynamic load ca To understand t structural calcul b) Intellectual S To learn theorie loads and their s To learn theorie loads and their s To learn theorie convergence pro- c) Professional Application of static and dynamic Estimate the nonlinear struct d) General and Gain the ability</li></ul>	ind Und importantises. he wide ation. Skills is for a loads operties. and Pr hand ca nic loads accurace tures. Transf to apply	derstanding nee hand ca e range of ha wide range of convergence a wide range in frequency ractical Skill alculation me s cy of the r <b>Gerable Skills</b> y hand calcul	Ilcu nd of h pro- e of y d s etho num s latic	lation meth calculation and calcula operties. hand calcula omain and od for struct nerical sol	nods in method tion met ulation n in time ures ana ution.	solving st applied to hod for str nethod for e domain. lysis to so Applicati alysis whic	tructural stat static and dy uctures unde structures re and their se lve structures fon to linea	ic and ynamic r static sponse olution s under ur and eck on	
3. Contents		the results obtain			0111						
Торіс				Total hour	S	Lectures	hours	Tutorial	/ Practical 1	nours	
Basic concepts in computational mech Variational methods. Energy methods, equilibrium kinematic methods,. Constitutive equations. Structural conti		nanics. force inuity,			3						
Natural and essential boundary conditions		•			3						
Method in structu	ral statics	s: Minimum tota	al								
potential energy (force method), Minimum			total			6			3		
complementary energy (displacement meth			iod),								

Application to linear and nonlinear structuresMethods in structural dynamics: principle of virtual work, Variational principle, Hamilton principle, Lagrange equations (Holonomic system), Lagrange equations in matrix form, Rayleigh energy method, Rayleigh-Ritz method, Assumed modes method, Lagrange equations formulation and integral formulation, Galerkin method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multiplicate method96	Minimum strain energy, Castiglione theorems.							
Methods in structural dynamics: principle of virtual work, Variational principle, Hamilton principle, Lagrange equations (Holonomic system), Lagrange equations in matrix form, Rayleigh energy method, Rayleigh-Ritz method, Assumed modes method, Lagrange equations formulation and integral formulation, Galerkin method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multipliers method	Application to linear and nonlinear structures							
Virtual work, Variational principle, Hamilton principle, Lagrange equations (Holonomic system), Lagrange equations in matrix form, Rayleigh energy method, Rayleigh-Ritz method, Assumed modes method, Lagrange equations formulation and integral formulation, Galerkin method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multipliars method	Methods in structural dynamics: principle of							
principle, Lagrange equations (Holonomic system), Lagrange equations in matrix form, Rayleigh energy method, Rayleigh-Ritz method, Assumed modes method, Lagrange equations formulation and integral formulation, Galerkin method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multipliars method.	virtual work, variational principle, Hamilton							
System), Lagrange equations in matrix form, Rayleigh energy method, Rayleigh-Ritz method, Assumed modes method, Lagrange equations formulation and integral formulation, Galerkin method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multipliars method96	austam) Lagrange equations (Holonomic							
Assumed modes method, Lagrange equations formulation and integral formulation, Galerkin method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multiplicer method	system), Lagrange equations in matrix form,				6			
formulation and integral formulation, Galerkin method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multiplicar method	Assumed modes method Lagrange equations							
method, Collocation method, integral formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multiplicer method	Assumed modes method, Lagrange equations formulation and integral formulation Galerkin			9				
formulation, Holzer method for torsion vibration Myklestad method for bending vibration, lumped parameter method Lagrange's multiplicer method	method. Collocation method integral							
Myklestad method for bending vibration, lumped parameter method Lagrange's	formulation, Holzer method for torsion vibration							
lumped parameter method Lagrange's	Myklestad method for bending vibration.							
multiplicate mathed	lumped parameter method Lagrange's							
multipliers method	multipliers method							
Application to linear and nonlinear structures 3	Application to linear and nonlinear structures			3	6			
under static and dynamic loads	under static and dynamic loads							
Numerical integration methods. Accuracy of the	Numerical integration methods. Accuracy of the				3			
numerical integration. Application to nonlinear 3 3	numerical integration. Application to nonlinear			3				
Structures. Practical	4. Teaching and Learning Methods			Dractical	Seminar/Workshop (3)			
Lectures Training/ Seminar/Workshop (3)			tures	Training/				
(27) Laboratory (15)			)	Laboratory (15)				
4. Teaching and Learning Methods Class Class Case Study (1) Projects (1)			SS	Case Study (1)	Projects (1)			
Activity (4) Case Study (1) Flogects (1)			ivity (4)	Case Study (1)				
E-learning Assignments (2) /Homework (5) Other:			arning	Assignments /Homework (5)	Other:			
5. Student Assessment Methods	5. Student Assessment Methods							
Assessment Schedule     Week	Assessment Schedule		Week					
-Assessment 1;Class test 4,5,6	-Assessment 1;Class test		4,5,6					
-Assessment 2; Project Assignment 7	-Assessment 2; Project Assignment		7					
-Assessment 3; Presentations 10	-Assessment 3; Presentations		10					
-Assessment 3; Midterm Exam 9	-Assessment 3; Midterm Exam		9					
-Assessment 4; Final Exam 16	-Assessment 4; Final Exam		16					
Weighting of Assessments	Weighting of Assessments		1					
-Mid-Term Examination 20	-Mid-Term Examination	20						
-Final-term Examination 40	-Final-term Examination	40						
-Project 20	-Project		20					
-Class Test 15	-Class Test							
Total 100	Total	100						
6. List of References	6. List of References	1:10 110 11			C7 1FF40			
Analytical methods in vibration, Editor: L. Merlovitch, library of Congress catalog number: 67-15548								
The finite element method, Editor: O.CC. Zienkelwicz, ISBN: 9780080531670								

7. Facilities Required fo	or Teaching and Learning
Computer lab	
Course Coordinator:	Nader M. Abuelfoutouh
Head of Department:	Ayman H. Kassem