2023
TPG-153

Course Specification
(Postgraduate)

Course Title:	**Theory of Elasticity**
Course Code:	**202516-3**
Program:	**Master of Applied Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Taif university**
Version:	1
Last Revision Date:	**20/10/2023**

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A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	☐University	☐College	☐Department	☐Track
B.	☒ Required		☐ Elective	
3. Level/year at which this course is offered: Level 1/First Year				
4. Course general Description:				
This course is an introduction to the main concepts of theory of elasticity. The course is intended to provide basic knowledge of analysis of stress and strain; equilibrium; compatibility; elastic stress-strain relations; material symmetries; Bending of bars.				
5. Pre-requirements for this course (if any)**:**				
None				
6. Pre-requirements for this course (if any)**:**				
None				
7. Course Main Objective(s):				
The student will be taught as follows: 1. **To make students understand the principles of elasticity.** 2. **To familiarize students with basic equations of elasticity.** 3. **To expose students to two dimensional problems in Cartesian and polar coordinates.** 4. **To make students understand the principle of bending of bars.**				

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	NA
3.	**Field**	NA
4.	**Tutorial**	NA
5.	**Others (specify)……**	NA
	Total	**45**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Recognize** the basic concepts in elasticity.	K1	Lectures, group discussion `	Exams, Quizzes, Assignments
1.2	**Describe** stress and strain.	K1	Lectures, group discussion	Exams, Quizzes, Assignments
1.3	**Identify** basic field equations of linear elastic solids.	K1	Lectures, group discussion	Exams, Quizzes, Assignments
2.0	**Skills**			
2.1	**Demonstrate** the governing equations for 2D elastic problems.	S2	Lectures, group discussion	Exams, Quizzes, Assignments, report
2.2	**Explain** problems with various solution methodologies.	S2	Lectures, group discussion	Exams, Quizzes, Assignments, report
2.3	**Use** mathematical techniques to analyze the elasticity problems using software coding.	S3	Lectures, group discussion	Exams, Quizzes, Assignments, report

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	**Accept** critical thinking, communication skills, and the elasticity solutions to structural mechanics problems.	V1	Lectures, group discussion	Exams, Quizzes, Assignments, report
3.2	**Participate** the capability to use programing in elasticity problems.	V2	Lectures, group discussion	Exams, Quizzes, Assignments, report

C. Course Content:

No	List of Topics	Contact Hours
1.	**Fundamentals of Linear Elasticity**: Deformation of elastic body-Compatibility-Motion and Equilibrium-Equations of motion-Constitutive Relations-Isotropic elastic body-The Cauchy Relations-Constitutive relations for Thermoelastic Body-Problems and solutions related to the fundamentals of linear Elasticity.	**9**
2.	**Formulation of Problems of Elasticity**: Boundary value problems of elastostatic-Concept of elastic state-Concept of thermoelastic state-Formulation of boundary value problems-Uniqueness- Problems and solutions related to the formulation of problems of Elasticity.	**9**
3.	**Plane stress and Plane strain**: Plane Stress-Plane strain- Stress at a point-Strain at a point- Measurement of surface strains-Differential equations of equilibrium-Boundary Conditions- Compatibility equations- Stress Function-Problems and solutions related to the plane stress and plane strain.	**9**
4.	**Two dimensional problems in rectangular coordinates:** Solutions by Polynomials-Saint Venant's Principle-Determinations of Displacements-Bending of cantilever loaded at the end-Bending of a beam by uniform load-Problems.	**9**
5.	**Two dimensional problems in Polar coordinates:** General equations in polar coordinates- Stress distribution symmetrical about an axis-Pure bending of curved bars-Strain components in polar coordinates-Problems.	**9**
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes and HomeWorks	Continues	10 %
2.	Midterm exam	8^{th} -9^{th}	20 %
3.	Final exam	16^{th}	70%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Theory of Elasticity, S. P. Timoshenko and J. N. Goodier, 3rd Edition, McGraw Hill Book Company, 1970, 1987. http://parastesh.usc.ac.ir/files/1538886893033.pdf
Supportive References	Elasticity in Engineering Mechanics, A.P. Boresi, and K.P. Chong, John Wiley & Sons, 2000.
Electronic Materials	https://nptel.ac.in/courses/105/105/105105177/
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (Projector, smart board, software)	Data show, Blackboard, Maple, Mathematica, and MATLAB software
Other equipment (Depending on the nature of the specialty)	Wi-Fi internet connections

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students assessment	Students	Indirect
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Peer reviewer	Direct
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Department of Mathematics and Statistics**
REFERENCE NO.	
DATE	**20/10/2023**

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