College:Engineering Department:Civil Engineering

Course Title: ***MATRIX STRUCTURAL ANALYSIS***

Course No: CE 512

Credit Hours: 3

Semester:1

About The Course

Course Title: ***MATRIX STRUCTURAL ANALYSIS*** Class:

Course No: CE 512 Lecture Room: 301

Obligatory/ Optional:
Text Book: Matrix Structural Analysis," PWS-KENT, Boston, 1989. McCormac, J.C., Nelson, J.K., "Structural Analysis—A Classical and Matrix Approach," Second Edition, Addison-Wesley, 1996. Tartaglione, L.C., "Structural Analysis," International Edition, McGraw-Hill, Singapore, 1991.

The Instructor

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Course Description

Introduction to algebra matrix application, Direct stiffness method for linear spring element. The step to develop a finite element model for a linear spring and its application using numerical examples. Matrix Formulation of Stiffness Method for Truss, derivation of stiffness matrix of truss element, Transformation matrix and Numerical application for truss element. Matrix Formulation of Stiffness Method for beam, derivation of stiffness matrix of beam element, Transformation matrix and Numerical application of beam element. Matrix Formulation of Stiffness Method for frame, derivation of stiffness matrix of frame

element, Transformation matrix and Numerical application of frame element. Development of the direct stiffness method and its application to linear analysis of skeletal structures such as springs, trusses, beams and frames.

Course Objectives

T To provide: 1. an understanding of the principles of the Direct Stiffness Method for structural analysis, the basis of most structural and finite element analysis programs. 2. Experience in the application of a commercial structural analysis program (SAP2000) that implements the direct stiffness method, to a range of practical structures. 3. An introduction to the matrix formulation and solution of linear, nonlinear, stability and dynamic problems.

Learning Outcome

Upon completing the course, students should fully understand the important concepts, implementation, and applications of structural analysis using matrix formulation. They should be able to apply the methods to analyze and ultimately develop the skills to understand behaviors of large and complex structures.

Making students aware of how language works to convey meaning as its basic function

Course Outline and Time schedule

CE 402 **MATRIX STRUCTURAL ANALYSIS:** 1. Introduction to algebra matrix application, Direct stiffness method for linear spring element. The step to develop a finite element model for a linear spring and its application

using numerical examples. Matrix Formulation of Stiffness Method for Truss, derivation of stiffness matrix of truss element, Transformation matrix and Numerical application for truss element. Matrix Formulation of Stiffness Method for beam, derivation of stiffness matrix of beam element, Transformation matrix and Numerical application of beam element. Matrix Formulation of Stiffness Method for frame, derivation of stiffness matrix of frame element, Transformation matrix and Numerical application of frame element. Development of the direct stiffness method and its application to linear analysis of skeletal structures such as springs, trusses, beams and frames.

Presentation methods and techniques

Methods of teaching varied according to the type of text, student and situation. The following techniques are usually used:

1- Lecturing with active participations.
2- Problem solving.
3- Cooperative learning.
4- Discussion.
5- Learning by activities.
6- Connecting students with different sources of information

Sources of information and Instructional Aids

For example: … power point , videos lecture .

- Transparencies
- Distance learning
- Library sources

Assessment Strategy and its tools

The assigned syllabus is assessed and evaluated
Through: feed back and the skills that are acquired by the students

The tools:
1- Digonistic tests to identify the students level and areas of weakness
2- Formal (stage) evaluation
   a) Class Participation 20%
   b) Ist Exam 20%

c) 2nd Exam 20%
d) Final Exam 40%

Tool & Evaluation

Tests are permanent tools & assessment, in addition to the activity file which contains curricular and the co-cussiculor activities, research, report papers and the active participation of the student in the lecture.

The following table clarifies the organization of the assessment schedule:

Test	Date	Grade
First Exam	28/3/2019	20
2nd Exam	28/4/2019	20
Activities & Participation	Students should be notified about their marks	20
Final Exam	Not yet	40

Activities and Instructional Assignment

1- Practical assignments to achieve the syllabus objectives.

2- ……..

Regulations to maintain the teaching-Learning Process in the Lecture:

1- Regular attendance.

2- Respect of commencement and ending of the lecture time.

3- Positive relationship between student and teacher.

4- Commitment to present assignments on time.

5- High commitment during the lecture to avoid any kind of disturbance and distortion.

6- High seuse of trust and sincerity when referring to any piece of information and to mention the source.

7- The student who absents himself should submit an accepted excuse.

8- University relevant regulations should be applied in case the studen,s behavior is not accepted.

9- Allowed Absence percentages is (%).

References :

Matrix Structural Analysis," PWS-KENT, Boston, 1989. McCormac, J.C., Nelson, J.K., "Structural Analysis—A Classical and Matrix Approach," Second Edition, Addison-Wesley, 1996. Tartaglione, L.C., "Structural Analysis," International Edition, McGraw-Hill, Singapore, 1991.