Course Unit Descriptor

Study Programme: Civil Engineering

Course Unit Title: Matrix analysis of structures

Course Unit Code: 041

Name of Lecturer(s): Vojnic Purcar Martina

Type and Level of Studies: Undergraduate academic studies

Course Status (compulsory/elective): Compulsory

Semester (winter/summer): winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 5

Prerequisites: Statics construction 1

Course Aims:

Introduction to modern (matrix) calculation methods of engineering constructions, suitable for use on computers.

Learning Outcomes:

The realization of the planned scopes.

Syllabus:

Theory: Opening remarks. Basic assumptions of linear theory. Overview of technical beam bending theory equations. Calculation of the point displacement of the elastic line of the rod. Deformation independent values of rod. Strain indeterminacy of girder in exact deformation method. Deformational determined and statically equivalent system. The concept of stiffness matrix and matrix of flexibility. Matrix analysis of rod. Basic static and kinematic values. Matrix stiffness and vector of equivalent nodal loads and direct method of their formation. Forming stiffness matrix and vector of equivalent nodal loads for rods exposed to axial stress, bending in plane, torsion and complex stress. Base stiffness matrix - part -1. Forming stiffness matrix and vector of equivalent nodal loads for rods exposed to axial stress, bending in plane, torsion and complex stress. Base stiffness matrix - part -2. Forming stiffness matrix and vector of equivalent nodal loads for rods exposed to axial stress, bending in plane, torsion and complex stress. Base stiffness matrix - part -2. Matrix analysis on system of rods. Matrix of transformation of straight girders. System equations. Contour conditions. Determinating joint displacement and the reactions of the supports. Directly forming of system equations – Part 1. Matrix analysis on system of rods. Matrix of transformation of straight girders. System equations. Contour conditions. Determinating joint displacement and the reactions of the supports. Directly forming of system equations – Part 2. Matrix analysis on system of rods. Matrix of transformation of straight girders. System equations. Contour conditions. Determinating joint displacement and the reactions of the supports. Directly forming of system equations – Part 3. Orthogonal frames. Trusses. Continuous girders. Symmetric girders. Spatial girders.

Practice: follows the theory

Required Reading: M. Djuric: Teorija okvirnih konstrukcija, Građevinska knjiga, Beograd, 1972.

M. Sekulovic: Teorija linijskih nosača, Građevinska knjiga, Beograd 2005.

Weekly Contact Hours: 4	**Lectures: 2**	**Practical work: 2**
Teaching Methods: Lectures, exercises, seminars, consultations		

Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation	5	written exam	30
Practical work	5	oral exam	30
Preliminary exam(s)	30	…….	
Seminar(s)			