University POLITEHNICA of Bucharest

Faculty of Industrial Engineering & Robotics

Study programme: Industrial Engineering

Form of study: Bachelor

COURSE SPECIFICATION

Course title	Finite Element Analysis of Solids	Semester	5
Course code	UPB.06.S.05.A.006	ECTS	4

Course structure	Lecture	Seminar	Laboratory	Project	Total hours
No. of hours/ week	2	-	2	-	4
No. of hours/ semester	28		28		56

Lecturer	Lecture	Seminar	Laboratory	Project
Name, academic degree	Ştefan SOROHAN, *Prof. PhD. Eng.*	-	Emil NUŢU, *Lecturer PhD. Eng.*	-
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Course description (max: 200 words)
The objective of the course is introducing finite element method for approximate numerical solutions of engineering problems. The course concentrates on solution of structural problems, but also provides the basis for expanding that focus to other engineering field problems (e.g., thermal, fluid). The displacement method of finite element analysis is developed with emphasis on the isoparametric formulation.
The student should obtain knowledge of theoretical fundamentals of the finite element analysis of mechanical structures, stress, strain and displacement calculations, method approximations and computer implementation.
Teaching courses are done on the blackboard and using the computer and video projector. Students receive electronic documents on e-learning platform.

Seminar description (max: 200 words) -

Laboratory description (max. 200 words)
The objective of the applications is to teach the fundamentals of finite element method with emphasize on the underlying theory, assumption, and modelling issues as well as providing hands on experience using finite element software to model, analyze and design systems of relevance to mechanical engineers. The outline of the labs is as follows: 1. Approximate solution of boundary values problem; 2.Introduction to continuous/discrete problems 3.Linear elasticity (Structural Analysis for 2D models); 4.Specialized elements (Truss and Beam elements); 5.Mesh generation and modelling concerns; 6.Stationary and transient analysis.
Students receive electronic documents on e-learning platform.
One emphasizes some aspects of the content, and the bibliography is used for theoretical completing and applications. The applications (labs) activities pass of on half of groups in the computer laboratory rooms using in-house finite element codes at beginning and commercial codes

(ANSYS) at the end of course. All programs are described in a book and they are available in electronic format for students. Usually the first problem of each chapter is presented by teacher, the next ones are proposed and each student must to solve them. The results are then discussed by the teacher.

Project decsription (max. 200 words) -

Assessment methods	Percentage of the final grade	Minimal requirements for award of credits
Written exam	20	10
Report/ Project	-	-
Homework	30	15
Laboratory	50	25

References
1. Radeş, M, *Finite Element Analysis*, Editura Printech, Bucureşti, 2006.
2. Constantinescu I.N., Sorohan Şt., Pastramă Şt., *The Practice of Finite Element Modeling and Analysis*, Editura Printech, Bucureşti, 2006.
3. Cook R.D., Malkus D.S. and Plesha M.E., *Concepts and Applications of Finite Element Analysis*, Wiley, 1989.
4. Sorohan Şt., Finite Element Analysis of Solids, 2019, electronic format (pdf).

Prerequisites	Co-requisites (courses to be taken in parallel as a condition for enrolment)
Technical Mechanics; Mathematics 1, 2; Computer Programming 1 & 2; Mechanics of Materials 1 & 2; Computer Aided Design 1 & 2; Machine elements; Modelling and simulation	-

Additional relevant information: *Specific competences accumulated*
Identifying basic concepts, theories and basic methods in computer programming and computer science applied in the field of industrial engineering;
Using the basic knowledge associated with software and information technologies to explain and interpret the problems that arise in computer-aided design and design of products, processes and technologies, in theoretical-experimental investigation and computerized processing of data specific to industrial engineering;
Applying basic principles and methods of software and information technologies for programming, database creation, assisted graphics, modeling, computer-aided design of products, processes and technologies, investigation and computerized processing of data specific to industrial engineering;
Appropriate use of standard criteria and assessment methods to assess the quality, benefits and limitations of software programs and information technologies for their use in carrying out tasks specific to industrial engineering;
Elaboration of professional projects specific to industrial engineering based on the selection, combination and use of principles, methods, information technologies, computer systems and software tools established in the field.

Date: 16.05.2022