Course code C.4. **Course item** ……

1. INFORMATION ABOUT THE COURSE

A. Basic information

Course title	Finite Element Method
Field of study	Computer Aided Engineering
Cycle	*Second*
Study profile	*Academic*
Study mode	*Full-time*
Specialisation	*Not relevant*
Unit responsible for the field of study	*Faculty of Mechanical Engineering*
Lecturer	*Dr inż. Artur Cichański*
Introductory courses	*Not relevant*
Prerequisites	*Basic knowledge of numerical methods*

B. Semester/ weekly timetable

Semester	Lectures	Classes	Laboratories	Project classes	Seminars	Field experience	ECTS credits
II	15	-	30	-	-	-	4

LEARNING OUTCOMES (acc. to National Qualifications Framework)

No.	Description of learning outcomes	Reference to learning outcomes for the field of study	Reference to learning outcomes for the area of study
KNOWLEDGE			
K1	is familiar with software for FEM 3D structural simulation of structural members and machines	CAE_W04	T2A_W04, T2A_W05
K2	has extended knowledge within the scope of mathematics and physics useful for describing of stress states in structural members	CAE_W10	T2A_W01
SKILLS			
S1	is able to simulate mechanical behaviour of technical objects with the use of FEM system on the basis of which is able to recommend geometrical shape changes to improve strength state of construction	CAE_U02	T2A_U09, T2A_U16, T2A_U17
S2	is able to plan and implement numerical analysis of structural members, interpret obtained stress map and draw conclusions simulation accuracy	CAE_U12	T2A_U08
SOCIAL COMPETENCES			
SC1	is able to determine priorities accordingly to	CAE_K04	T2A_K04

	implement tasks set by self or others		

2. TEACHING METHODS

multimedia lecture, laboratory classes

2. METHODS OF EXAMINATION

written exam, written reports

3. COURSE CONTENT

Lecture	Introduction to numerical methods. Modelling in machine building. Numerical analyses used in machine building. Characteristics and fundamental properties of Finite Element Method. Shape function role and type. Stiffness matrix for structural analysis. Numerical solution accuracy – discretisation error. Finite elements library. Phases of FEM analysis. Finite mesh generating and modifying. Boundary condition definition method. Control of numerical solution. Analysis results presentation methods.
Laboratories	Methods of discretisation error reduction. Influence of boundary condition definition method on solution results. Structural analysis of 1D objects for truss. Structural analysis of 2D objects for bracket. Modelling of structural members contacts. Structural analysis of 3D objects for hinge. FEM software and CAD environment integration. Fundamental problems of numerical computational methods in machine design and analysis of the most common solutions are illustrated with examples of engineering tasks in the ANSYS Workbench and Autodesk Inventor environment**.**

4. VALIDATION OF LEARNING OUTCOMES

(Each learning outcome from the list requires validation methods to ensure that it was achieved by a student.)

Learning outcome	Form of assessment (for example:)					
	Oral examination	Written examination	Colloquium	Project	Report	……
K1		x				
K2		x				
S1					x	
S2					x	
SC1					x	
…						

5. LITERATURE

Basic literature	Hutton V.D., Fundaments of Finite Element Analysis, McGraw Hill Higher Education, 2003. Müller G., Groth C., FEM für Praktiker, Expert-Verlag, 2002. Renningen
Supplementary literature	Ugural A.C., Mechanics of Materials, John Wiley & Sons, 2007

6. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity	Student workload– number of hours (for example:)
Participation in laboratories indicated in point 2.2	30
Preparation for laboratories	25
Reading assignments	25
Other (preparation for exams, tests, carrying out a project etc)	25
Total student workload	100
Number of ECTS credits allocated by the lecturer	**4**
Final number of **ECTS credits (determined by the Programme Council for the Field of Study)**	???