COURSE INFORMATION SHEET
(Karta informacyjna przedmiotu)

Course title (Nazwa przedmiotu	***Computer Aided Engineering***	***Komputerowe wspomaganie obliczeń inżynierskich***
Course code (Kod przedmiotu)	*WMEMRCSI-CAE*	
Language of instruction (Język wykładowy)	*English (angielski)*	
Study profile (Profil studiów)	*General academic (ogólnoakademicki)*	
Study form (Forma studiów)	*Full time studies (stacjonarne)*	
Study level (Poziom studiów)	*First-cycle studies (studia pierwszego stopnia)*	
Course group (Rodzaj przedmiotu)	*Core/mandatory (podstawowy/obowiązkowy)*	
Effective from recruitment (Obowiązuje od naboru)	*2022/2023*	
Form of classes, no. of hours/evaluation, total no. of hours, ECTS credits (Forma zajęć, liczba godzin/rygor, razem godz., pkt ECTS	*Lecture: 8h (Wykłady: 16h),* *Practical classes: 40h (Laboratoria: 40h),* *Project: 12h (Projekt: 12h)* ***Total: 60 h,** Razem (60h)* ***5,0 pkt ECTS***	
Introductory courses: prerequisites (Przedmioty wprowadzające: wymagania wstępne)	*Engineering Mechanics I & II / Kinematics and Dynamics of a Rigid Body* *Strength of Materials I / Simple and Combined Stress Cases* *Fundamentals of Machine Design / Skills in Designing Machine Elements and Structural Assemblies* *CAE Systems in Engineering Practice / Fundamentals of Operating CAE Systems*	
Programme (Program)	*6th semester / Mechanics and machine construction / Computer Techniques in Mechanical Engineering (Techniki komputerowe w inżynierii mechanicznej)*	
Autor(s) (Autor/autorzy)	*Dr hab. inż. Paweł BARANOWSKI, prof. WAT*	
Organizational unit administering the course (Jednostka organizacyjna odpowiedzialna za przedmiot)	*Institute of Mechanics and Computational Engineering* *Faculty of Mechanical Engineering* *Military University of Technology*	
Short description of the course (Skrócony opis przedmiotu)	*Numerical modeling and simulation of mechanical equipment, components, and machinery with proficiency in Altair HyperMesh and OptiStruct. This includes the preparation of numerical models for structural analysis through advanced geometry simplification and defeaturing techniques to optimize mesh generation. Grounded in Finite Element Analysis (FEA) principles, the expertise covers performing non-linear static analyses to accurately determine stress distribution and displacement within complex mechanical systems.*	

Full description of the course / programme content (Pełny opis przedmiotu / treści programowe)	*<u>Lectures</u> / Audiovisual system using computer-aided instruction* • *Numerical modeling of mechanical equipment, parts, machinery, and mechanical devices / 8 / Training-style lecture covering the creation of discrete models, modeling principles, and geometry simplification within Altair HyperMesh.* *<u>Laboratories</u> / Computer lab (workstations + specialized software + interactive whiteboard), lab manual, and electronic reference materials.* • *Working with discrete modeling environments / 8 / Practical tasks to consolidate knowledge and skills acquired during lectures; modeling principles; finite element mesh selection; CAD geometry modification and defeaturing; file exportation.* • *Modeling of a selected part or structural element / 16 / Construction of a numerical model based on a CAD design of a specific machine part or mechanical component; conducting FEA simulations; definition of initial and boundary conditions; analysis of results.* • *Modeling of a selected device / 16 / Construction of a numerical model based on a CAD design of a specific mechanical device; conducting FEA simulations; definition of initial and boundary conditions; analysis of results.* *<u>Project</u> / Independent student work on an individual task (computer lab – workstations + specialized software):* • *Modeling and simulation of a complex mechanical device / 12 / Independent construction of a discrete model for a complex mechanical assembly; conducting FEA simulations; definition of initial and boundary conditions; analysis of results.*
Literature (Literatura)	*Primary:* 1. *Dacko M. i in., Metoda elementów skończonych w mechanice konstrukcji, Arkady, 1994.* 2. *Rapacki G., Kacprzyk Z., Metoda elementów skończonych w mechanice konstrukcji, OW PW, 2005.* 3. *Kleiber M., Metoda elementów skończonych w nieliniowej mechanice kontinuum, PWN, 1985.* 4. *Materiały własne wykładowcy.* *Complementary:* 1. *Hallquist J. O., LS-DYNA. Theoretical manual, California Livermore Software Technology Corp.,1998.* 2. *Klasztorny M., Wytrzymałość materiałów, DWE, 2013.* 3. *Dyląg Z., Jakubowicz A., Orłoś Z., Wytrzymałość materiałów, t. 1, WNT, 1997..*
Learning outcomes (Efekty uczenia się)	***W1** / possesses structured knowledge in the definition of discrete models, as well as the modeling and numerical simulation of mechanical devices and equipment / K_W06, K_W20.* ***U1** / is able to utilize FEA software to define discrete models and conduct numerical simulations of rehabilitation devices and equipment / K_U07, K_U09, K_U11, K_U13, K_U16.* ***K1** / The student is aware of the responsibility for their own work and is prepared to adhere to teamwork principles and share responsibility for jointly executed tasks / K_K03*
Methods and criteria of evaluation I manners of verification the student's achievement of the assumed learning outcomes (Metody i kryteria oceniania / sposób sprawdzania	*The course is credited based on: **final exam**.* *Laboratory exercises are graded based on: **completed numerical models** and a report containing a problem description, solution methods, results, and conclusions.* *Project exercises are graded based on: **the developed model and a report** containing a problem description, solution methods, results, and conclusions.*

osiągnięcia przez studenta zakładanych efektów uczenia się)	*The final exam is conducted at a computer workstation: the student is required to independently perform the entire modeling and simulation process of a device structure.* *A prerequisite for admission to the exam is receiving passing grades in homeworks laboratories, and the project.* *The achievement of learning outcomes W1 and U1 is verified based on theoretical knowledge and completed laboratory exercises.* *The achievement of learning outcome K1 is assessed based on teamwork and group cooperation aimed at efficiently mastering new software and solving the assigned problem.* *Assessment of the achievement of intended learning outcomes (according to the opinion of the WME Commission for the Quality Assurance of Education):* • ***Very Good (A)*** *is awarded to a student who has achieved the intended learning outcomes at a level of 91–100%.* • ***Good Plus (B)*** *is awarded to a student who has achieved the intended learning outcomes at a level of 81–90%.* • ***Good (C)*** *is awarded to a student who has achieved the intended learning outcomes at a level of 71–80%.* • ***Satisfactory Plus (D)*** *is awarded to a student who has achieved the intended learning outcomes at a level of 61–70%.* • ***Satisfactory (E)*** *is awarded to a student who has achieved the intended learning outcomes at a level of 51–60%.* • ***Unsatisfactory (F)*** *is awarded to a student who has achieved the intended learning outcomes at a level equal to or lower than 50%*
ECTS balance / student workload (Bilans ECTS / nakład pracy studenta)	*Activity / student workload in hrs* *1. Participation in lectures / **8*** *2. Participation in practical classes / **0*** *3. Participation in laboratories / **40*** *4. Participation in seminars / **12*** *5. Independent study of the lectures subject-matter/ **6.4*** *6. Independent preparation for practical classes / **0*** *7. Independent preparation for laboratories / **40*** *8. Independent preparation for seminars / **0*** *9. Project implementation / **12*** *10. Participation in consultations / **9*** *11. Preparation for the exam / **24*** *12. Preparation for the credit / 0* *13. Participation in the exam / **2*** *Total student workload:* ***153.4 hrs / 5.11 ECTS, 5.0 ECTS assumed*** *Classes with academic teacher (1+2+3+4+9+10+13): 71 hrs / 2.5 ECTS* *Classes related to scientific skill development (Σ1+9): 118,4 hrs / 3.5 ECTS*

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