

Field of Study: Mechanical Engineering

Programme of studies: Modelling and simulation in Mechanical Engineering

First year of study:

Subject of study: Ethics and academics integrity

CODE: D23MSIM101

NUMBER OF CREDITS: 4

YEAR/SEMESTER: 1st year , 1st semester

TYPE OF COURSE: mandatory

OBJECTIVES: Learning by the students of concepts, theories, criteria and principles regarding the general and fundamental notions of academic integrity.

CONTENT: Ethics and morality in scientific research and creation. Misconduct in science. Intellectual property and copyright. European and international regulations. The Bern Convention of 1886 and subsequent regulations. EU legislation on intellectual property. Romanian Legislation in the Field of Intellectual Progression. Pecuniary and criminal penalties General Code of Ethics in Scientific Research.

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Pisoschi, A., Vintilă, V., Popescu, Ioana (2002), *Etica în Cercetare. Analiza diagnostic a sistemului CDI*, Bucuresti
 Pisoschi, A., Vintilă, V., Popescu, Ioana (2006), *Etica în Cercetare. Analiza diagnostic a sistemului CDI*, Bucuresti
 Vintilă, D., Vintilă G., *Etica în cercetarea științifică, notițe de curs*
<http://ec.europa.eu/euraxess/index.cfm/rights/whatIsAResearcher>. (Carta si Codul European al cercetatorului)
<http://www.cdi2020.ro/> (Strategia Nationala de Cercetare, Dezvoltare si Inovare 2014-2020)

Subject of study: Finite Element Analysis I

CODE: D23MSIM102

NUMBER OF CREDITS: 8

YEAR/SEMESTER: 1st year , 1st semester

TYPE OF COURSE: mandatory

OBJECTIVES: The main objective is the acquisition by the Master students of the theoretical methods, means and methods of analysis with finite elements of the mechanical structures and of the mobile mechanical systems

CONTENT: Numerical methods in computational mechanics. Computer design elements in AUTOCAD and Mechanical Desktop. General procedures in the finite element method. Polynomial Interpolation. Matrix of stiffness. Modeling with finite elements in static regime of the elastic structures. Theoretical aspects. Modeling with finite elements in dynamic regime of the elastic structures. Theoretical aspects. The finite element in dynamic modal analysis.

Theoretical aspects regarding the use of software for the optimization of mobile mechanical systems (ADAMS, ANSYS). Application study on the optimization of a mobile mechanical system by parametric methods

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Amirouche, F., *Computational methods in multibody dynamics*, Prentice-Hall, 1992.
 Buculei M., Marin, M., *Elemente de mecanică tehnică. Teorie și aplicații*, Ed. Universitaria, Craiova, 1994.
 Brătianu, C., *Metode cu elemente finite în dinamica fluidelor*, București, Ed.Academiei, 1983.
 Corless, R.M., *Essential in Maple*, Springer-Verlag, 1995
 Dumitru, N., *Mecanisme spațiale. Modelare cinematică și dinamică prin metode computerizate*. Editura Universitaria, Craiova, 1999.
 Dumitru N., Margine A., *Bazele modelării în ingineria mecanică*. Editura Universitaria Craiova, 2002.
 Dumitru N., Margine A., *Organe de mașini. Asamblări. Elemente elastice. Proiectare asistată de calculator*. Editura Universitaria Craiova, 2002.
 Dumitru, N., Nanu, Gh. Vintilă Daniela, *Mecanisme și transmisii mecanice*. Editura Didactica si Pedagogica București, 2008. ISBN 978-973-30-1882-7
 Dumitru, N., Margine, A., Catrina, Gh., ș.a *Organe de mașini. Arbori și lagăre. Proiectare asistată de calculator*, Editura Tehnica, București, 2008, ISBN 978-973-31-2332-3
 Gafițeanu, M., *Elemente finite și de frontieră cu aplicații la calculul organelor de mașini*, Ed. Tehnică, 1987.
 Kane, T., Likins, P., Levinson, D., *Spacecraft Dynamics*, Mc. Graw-Hill, 1983.
 ANSYS tutorials, <https://sites.ualberta.ca/~wmoussa/AnsysTutorial/BT/BT.html>
 Maple 18, User's guide.
 ANSYS 12, User's Guide.
 MathCad 2001 –User's Guide, Mathsoft Engineering & Education, Inc. Cambridge, USA, 2007.
 Prezentare
https://www.engr.uvic.ca/~mech410/lectures/FEA_theory.pdf
 Zienkiewicz, O. C., & Taylor, R. L. (2000). *The finite element method: solid mechanics* (Vol. 2). Butterworth-heinemann.
 Zienkiewicz, O. C., & Taylor, R. L. (2005). *The finite element method for solid and structural mechanics*. Elsevier.
 Hughes, T. J. (2012). *The finite element method: linear static and dynamic finite element analysis*. Courier Corporation.
 Babuška, I. (1973). *The finite element method with Lagrangian multipliers*. Numerische Mathematik, 20(3), 179-192.
 Lewis, R. W., & Schrefler, B. A. (1998). *The finite element method in the static and dynamic deformation and consolidation of porous media*. John Wiley.

Bathe, K. J., & Wilson, E. L. (1976). Numerical methods in finite element analysis.
 Johnson, C. (2012). Numerical solution of partial differential equations by the finite element method. Courier Corporation.
 Moaveni, S. (2011). Finite element analysis theory and application with ANSYS, 3/e. Pearson Education India

Subject of study: CAD/CAM Systems. Applications in Mechanical Engineering

CODE: D22CPAM103

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 1st year/1st semester

TYPE OF COURSE: mandatory.

OBJECTIVES: The discipline allows the accumulation of useful knowledge regarding the use of integrated CAD / CAM systems

CONTENT: Introduction. Definitions. Integrating industrial activities with computer in the current context. The life cycle. Linear and simultaneous approach. Computer aided design. Evolution of design systems. CAD / CAPP / CAM concepts. The place and role of computer aided design and manufacturing in the production of goods. Design in the current context The structure and components of a CAD / CAPP / CAM system. Types of decisions. Types of actions. Integration of design and manufacturing. Computer-aided design of the technological processes. Introduction. Stages in applying the CAPP concept. Methods of conception of the machining process. Variants and generative methods. Types of entities in product modeling. Model of the manufacturing process. Representation of the parts based on the form technological elements. Group technology. Coding and classification,

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Ivan. N.V. ș.a., Sisteme integrate CAD-CAM, Algoritmi și programe CAD-T, EDP, București, 2001
 Ivan, V.N., ș.a, Sisteme CAD/CAPP/CAM – Teorie și practică, Ed. Editura Tehnică, București, 2004
 Ungureanu G., Introducere în Computer Aided Design și Computer Aided Manufacturing, Editura Tehnopress, 2005
 De Garmo, Paul Black, J.T., Kohser, Ronald, A., Materials and processes in manufacturing, Eighth Edition, Prentice-Hall, Inc., Upper saddle River, New Jersey, USA, 1997
 Chang, T., C., Wysk, R.A., Wang, H.P., Computer Aided Manufacturing, Prentice Hall, Upper Saddle River, New Jersey, 1998
 Groover, M.P., Timmers, E., W., CAD/CAM Computer-Aided Design and Manufacturing, Prentice Hall, Englewood Cliff, New Jersey, 1984
 Savii George, Milenco Luchin, Modelare și Simulare, Editura Eurostampa, Timișoara, 2000.
 Drăgoi, G., Guran, M., Sisteme integrate de producție asistate de calculator, Ed. Tehnică, București, 1997.
 Drăghici G., Ingineria integrată a produselor, Ed. Eurobit, Timișoara, 1999.

Stoll, H., W., Design for Manufacturing: An Overview. ASTME Applied Mechanics Reviews, 39 (9), pp. 1356-1364 (1986).
 Zapciu, Miron, Fabricația Asistată de Calculator, Editura Politehnica Press, București, 2003.
 Crăciunoiu, N., Fabricația Asistată, Note de curs

Subject of study: Fundamentals of biomedical engineering

CODE: D23MSIM104

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 1st year , 1st semester

TYPE OF COURSE: mandatory

OBJECTIVES: Presentation of the main features of the equipments used in medical bioengineering, assistive equipments and the techniques and processes of adaptive design of assistive equipment based on measured anthropometric and cinematic data

CONTENT: Elements of functional anatomy and articular physiology; Elements of kinematics of human motion; Methods and techniques for measuring the parameters of human motion; Assistive devices. Classification, characteristics. Methods and techniques and equipment for measuring electrical activity in the muscle Modeling human motion using experimentally measured data; Custom design elements for an assistive device

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Kapandji I.A. Physiologie articulaire-schemas commente de mecanique humaine, Librairie Maloine, Paris 1970;
 Lusardi M, Nielsen C., Orthotics and Prosthetics in Rehabilitation, Saunders Elsevier, 2007;
 Nawoczinski D., Epler M., Orthotics in functional Rehabilitation of the Lower Limb, Saunders, 1997;
 Robacki R., Anatomia funcțională a omului, Ed. Scrisul românesc, Craiova 1985;
 ***** Manualele de utilizare a echipamentelor existente în Laboratorul de bioinginerie.

Subject of study: Functioning of thermal systems with sliding parameters

CODE: D23MSIM105

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 1ST year , 1st semester

TYPE OF COURSE: optional

OBJECTIVES: Knowledge by the students of the thermodynamics processes

CONTENT: General methods for thermodynamics analysis of the thermal processes; thermodynamics of the real gas; entropy and exergy; Gas dynamics, flowing through nozzles; steam thermal machines; the vaporization process; the condensation process; vapor thermodynamic diagrams; steam generators; steam machines; thermodynamic cycles; Heat exchangers

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Bejan, A., Termodinamica tehnica avansata, Editura Tehnica, Bucuresti, 1996
 Reynolds, A., I., Curgeri turbulente in tehnica, Editura Tehnica, Bucuresti, 1982

Carafoli, E., Constantinescu, V.N., Dinamica fluidelor compresibile, Editura Academiei, Bucuresti, 1984
 Radcenco, V., Termodinamica gazelor, Editura Tehnica, Bucuresti, 1994
 Brodyansky, V., M., s.a., The efficiency of industrial processes; exergy analysis and optimization, Elsevier Science B.V., 1994
 Bica, M., Filipas, T., Mediul ambient si exergia, Editura Academiei, Bucuresti, 2005
 Bica Marin, Termotehnica si masini termice, Editura Universitara, Craiova, 2000.

Subject of study: Scientific research/Practice

CODE: -

NUMBER OF CREDITS: -

YEAR/SEMESTER: 1ST year , 1st semester

TYPE OF COURSE: -

Subject of study: Finite Element Analysis II

CODE: D23MSIM207

NUMBER OF CREDITS: 7

YEAR/SEMESTER: 1ST year , 2nd semester

type of course: mandatory

OBJECTIVES: The main objective is the acquisition by the Master students of the theoretical methods, means and methods of analysis with finite elements of the mechanical structures and of the mobile mechanical systems

CONTENT: Finite element modeling of mobile mechanical systems; Finite element method in modal - dynamic analysis; Finite element method in thermal transfer analysis; Finite element method in fluid mechanics; Finite element method in structural optimization

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Amirouche, F., Computational methods in multibody dynamics, Prentice-Hall, 1992.
 Buculei M., Marin, M., Elemente de mecanica tehnica. Teorie si aplicatii, Ed. Universitaria, Craiova, 1994.
 Bratianu, C., Metode cu elemente finite in dinamica fluidelor, Bucuresti, Ed. Academiei, 1983.
 Corless, R.M., Essential in Maple, Springer-Verlag, 1995
 Dumitru, N., Mecanisme spatiale. Modelare cinematica si dinamica prin metode computerizate. Editura Universitaria, Craiova, 1999.
 Dumitru N., Margine A., Bazele modelarii in ingineria mecanica. Editura Universitaria Craiova, 2002.
 Dumitru N., Margine A., Organe de masini. Asamblari. Elemente elastice. Proiectare asistata de calculator. Editura Universitaria Craiova, 2002.
 Dumitru, N., Nanu, Gh. Vintila Daniela, Mecanisme si transmisii mecanice. Editura Didactica si Pedagogica Bucuresti, 2008. ISBN 978-973-30-1882-7
 Dumitru, N., Margine, A., Catrina, Gh., s.a Organe de masini. Arbori si lagare. Proiectare asistata de calculator, Editura Tehnica, Bucuresti, 2008, ISBN 978-973-31-2332-3

Gafitanu, M., Elemente finite si de frontiera cu aplicatii la calculul organelor de masini, Ed. Tehnica, 1987.

Kane, T., Likins, P., Levinson, D., Spacecraft Dynamics, Mc. Graw-Hill, 1983.

ANSYS tutorials, <https://sites.ualberta.ca/~wmoussa/AnsysTutorial/BT/BT.html>

Maple 18, User's guide.

ANSYS 12, User's Guide.

MathCad 2001 -User's Guide, Mathsoft Engineering & Education, Inc. Cambridge, USA, 2007.

Prezentare

https://www.engr.uvic.ca/~mech410/lectures/FEA_Theory.pdf

Zienkiewicz, O. C., & Taylor, R. L. (2000). The finite element method: solid mechanics (Vol. 2). Butterworth-heinemann.

Zienkiewicz, O. C., & Taylor, R. L. (2005). The finite element method for solid and structural mechanics. Elsevier.

Hughes, T. J. (2012). The finite element method: linear static and dynamic finite element analysis. Courier Corporation.

Babuska, I. (1973). The finite element method with Lagrangian multipliers. Numerische Mathematik, 20(3), 179-192.

Lewis, R. W., & Schrefler, B. A. (1998). The finite element method in the static and dynamic deformation and consolidation of porous media. John Wiley.

Bathe, K. J., & Wilson, E. L. (1976). Numerical methods in finite element analysis.

Johnson, C. (2012). Numerical solution of partial differential equations by the finite element method. Courier Corporation.

Moaveni, S. (2011). Finite element analysis theory and application with ANSYS, 3/e. Pearson Education India

Subject of study: Computational methods in mechanisms theory

CODE: D23MSIM208

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 1ST year , 2nd semester

TYPE OF COURSE: mandatory

OBJECTIVES: Students will develop an attitude of analysis, interpretation and choice of the possibilities to modeling the mechanical systems, as well as solving the problems arising in the industrial practice, from a holistic perspective

CONTENT: Introduction to computational modeling of mechanical systems; Ways to obtain descriptive mathematical models for different mobile mechanical systems - Newton formalism
 Ways to obtain descriptive mathematical models for various mobile mechanical systems - Lagrange formalism

Numerical algorithms and methods with applicability in solving mathematical models attached to mobile mechanical systems

Using the finite element method in the dynamic modeling of mechanical systems

Special problems of mechanics - computational modeling (collisions, shocks, deformable elements, contact, composite structures, biomechanical structures, etc.)

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Amirouche, F., Computational methods in multibody dynamics, Prentice-Hall, 1992.

Buculei, M., Rinderu, P.L., Mecanică computațională, Editura Universitaria, Craiova, 2005.

Dumitru N., Margine A., Bazele modelării în ingineria mecanică. Editura Universitaria Craiova, 2002.

Huston, R.L., Multibody Dynamics, Butterworth-Heinemann, 1990.

De Jalon, J.G., Bayo, E., Kinematic and Dynamic Simulation of Multibody Systems (The Real-Time Challenge), Springer-Verlag, 1994.

Rinderu, P.L., Gruionu, L., Metode numerice, Editura Universitaria, Craiova, 2004.

Rinderu, P.L., Bagnaru, D., Vibrații mecanice, Reprografia Universității din Craiova, 1997.

Shabana, A.A., Dynamics of Multibody Systems, Wiley, 1989.

Voinea, R., Voiculescu, D., Simion, F.P., Introducere în mecanica solidului cu aplicații în inginerie, Editura Academiei, București, 1989.

*** Maple V – Handbook

*** Mathematica v.x – Handbook

*** ANSYS v.x – Users Manual

Subject of study: Modelling of Special mechanical transmissions

CODE: D23MSIM209

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 1st year , 2nd semester

TYPE OF COURSE: mandatory

OBJECTIVES: Knowledge by the students of aspects specific to numerical computation with applicability to the study of kinematics and dynamics of mechanical transmissions; the use of software packages applicable in the field (numerical analysis programs, finite element programs).

CONTENT: Concepts of structure and topology of mechanical transmissions

Kinematic analysis of mechanical transmissions

Transfer functions; algorithms for kinematic analysis of mechanical transmissions.

Mechanical transmission kinematics optimization:

Mechanical transmission kinematics sources

Algorithms for optimizing kinematic synthesis of mechanical transmissions.

Kinetostatic modeling of mechanical transmissions:

Mechanical transmission yield:

Algorithms to optimize mechanical transmission efficiency.

Experimental analysis of mechanical transmissions:

Using results from the experimental analysis of mechanical transmissions to optimize them.

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Dumitru, N., Organe de masini. Transmisii mecanice. R.Univ. Craiova, Craiova, 1996.

Dumitru, N., Organe de masini. Angrenaje. Elemente de proiectare, R. Univ. Craiova, Craiova, 1996

Dumitru, N., Angrenaje cilindrice. Proiectare asistata de calculator, Editura Universitaria, Craiova, 2000

Dumitru, N., Margine, A., Asamblari. Elemente elastice. Proiectare asistata. Editura Universitaria, Craiova, 2002.

Dumitru, N., Margine, A., Bazele modelarii in ingineria mecanica. Editura Universitaria, Craiova, 2002.

Draghici, I. s.a., Indrumar de proiectare in constructia de masini, vol. 1, Editura Tehnica, Bucuresti, 1981

Jula, E. s.a., Proiectarea angrenajelor evolventice, Editura Scrisul Romanesc, Craiova, 1989

Margine, Al. Contributii la sinteza geometro-cinematica si dinamica a mecanismelor planetare si diferentiale complexe realizate cu roti dintate cilindrice. Universitatea POLITEHNICA, Bucuresti, 1999.

Margine, Al., Catrina, Gh., Calculul functiei de transmitere pentru mecanismele planetare si diferentiale complexe, realizate cu roti dintate cilindrice. In Analele Universitatii din Craiova, Seria Mecanica, nr. 1/1999, pag. 136-145 (ISSN 1223-5296).

Margine, Al., Catrina, Gh., Aspecte privind cinematica mecanismelor planetare simple cu roti dintate cilindrice, cu structura variabila. In Analele Universitatii din Craiova, Seria Mecanica, nr. 1/1999, pag. 146-155 (ISSN 1223-5296).

Margine Al., Catrina Gh., Sinteza expresiilor rapoartelor cinematice interioare ale mecanismelor diferentiale simple din componenta mecanismelor planetare complexe cu structura variabila. In lucrarile Buletinului stiintific, Seria C, Vol.XV, Universitatea de Nord Baia Mare, pag.259-264, ISSN 1224-3264, Baia Mare, 2001.

Margine Al., Catrina Gh., Modelarea cinetostatica a distributiei sarcinilor in mecanismele planetare. In lucrarile Buletinului stiintific, Seria C, Vol.XV, Universitatea de Nord Baia Mare, pag.265-271, ISSN 1224-3264, Baia Mare, 2001.

Margine Al., Antonescu, O., Cercetari experimentale privind dinamica transmisiilor automate. In Constructia de masini nr.7/2001, ISSN 0573-7419, pag. 65-68.

Margine, Al., Catrina, Gh., Particularitati structurale ale mecanismelor planetare cilindrice. In Analele Universitatii din Craiova, Seria Mecanică, Nr.1/2000, pag.181-190 , Craiova, 2000, (I.S.S.N. 1223-5296).

Margine, Al., Catrina, Gh., Scheme structural-topologice ale mecanismelor planetare cilindrice cu structura variabila. In Analele Universitatii din Craiova, Seria Mecanică, Nr.1/2001, pag.143-150 , Craiova, 2001, (I.S.S.N. 1223-5296).

Miloiu, Gh. s.a., Transmisii mecanice moderne, Editura Tehnica, Bucuresti, 1985.

Subject of study: Modeling and simulation of production processes

CODE: D23MSIM210

NUMBER OF CREDITS: 5

YEAR/SEMESTER: 1st year , 2nd semester

TYPE OF COURSE: mandatory

OBJECTIVES: Integrating of the engineering knowledge to develop and implement advanced production strategies, design, model and simulate production systems.

CONTENT: Production systems. Types of production systems
Flexible manufacturing systems
Lean manufacturing
Toyota's just-in-time production system, Kanban
Problems of modeling of production systems.
Conception. Classification
The issue of simulation of production systems.
Characteristics. concepts
Optimization of production systems. Surface response method.

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Abrudan I., Ingineria și Managementul Sistemelor de Producție, Editura Dacia, Cluj Napoca, 2002
Benga, G., Stanimir, A., Tehnologii de Prelucrare și Montaj, vol.1, Editura Universitaria, Craiova, 2007.
Brișan, C., Sisteme Flexibile de Fabricație, Ed. UT Pres, ISBN 973-98380-8-1, Cluj-Napoca, 1998.
Cicala, E.F., Metode de prelucrare a datelor experimentale, Editura Politehnica, Timisoara, 1999
Ciobanu, L., Sisteme Flexibile de Fabricație, Ed. Univ. „Gh. Asachi Iași”, 2003
Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, Prentice Hall Press Upper Saddle River, 2007
Michael Peschl, Norbert Link, Michael Hoffmeister, Gil Gonçalves, Fernando L.F. Almeida, Designing and implementation of an intelligent manufacturing system, Journal of Industrial Engineering and Management, 2011
Montgomery, D.C., Design and analysis of experiments, 5th edition, John Wiley&Sons, 2001
Savu, T., Modelarea si simularea sistemelor si proceselor de productie, Editura Printech, Bucuresti, 1999.

D. Sucală, Management.Aplicații practice. Îndrumător lucrări. Ed. UTPRESS.2016
Mihai Hulea - Managementul proiectelor, Note de curs, UTCN, 2011;
Radu V. Pascu - Managementul Proiectelor;I. Sărăcin, ghidul solicitantului de proiect, Craiova, 2017.I. SĂRĂCIN Realizarea ORIGINAL PAPER ,CRAIOVA, 2017.
Hosu, Managementul lucrărilor în construcții. Ed. DACIA,2001

Subject of study: Scientific research/Practice

CODE: -

Number of credits: -

Year/Semester: 1st year , 1st semester

Type of Course: -

Subject of study: Project management in mechanical engineering

CODE: D23MSIM211

NUMBER OF CREDITS: 5

YEAR/SEMESTER: 1st year , 2nd semester

TYPE OF COURSE: mandatory

OBJECTIVES: To provide specific informations for the preparation by the students a proper management of projects.

CONTENT: Fundamental notions about project.

Project management. Project manager
Triple constraint in project management. Tipology, classification, project particularities
Project management phases Life cycle, project objectives, project entities, organization structure
Initialize the project. Requirement report. Project proposal. The responsibility allocation matrix
Project planning. Risk management. Risk identification. Risk analysis and mitigation
Presentation of the general budget on the chapters of papers

Technical documentation, technical design, execution details

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Mihai Hulea - Managementul proiectelor, Note de curs, UTCN, 2011;

Second year of study:

Subject of study: Modeling and simulation in biomechanics

D23MSIM315

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 2nd year/1st semester

TYPE OF COURSE: mandatory

OBJECTIVES: Presentation of the biological constitutive structures of the human musculoskeletal system, presentation of the analytical, numerical and experimental methods of kinematic and dynamics analysis for the motion of the human body, and for the analysis of structures and biomechanical systems used in the rehabilitation of human motions.

CONTENT: Introduction to biomechanics

Biomechanics of hard tissue and joints of the human musculoskeletal system

Numerical modeling and simulations of the biomechanical behavior of the human joints

Structural and kinematic modeling and simulations of the kinematic chains of the human osteo-articular system

Experimental methods, acquisition and processing systems used for human biomechanical assessments

Modeling and simulations of the prosthetic and orthotic systems used for the rehabilitation of human joints motions

Modeling and simulation of implants used for fracture osteosynthesis

TEACHING LANGUAGE: Romanian

EVALUATION: Written examination

BIBLIOGRAPHY (selective):

Joseph D. Bronzino *The Biomedical Engineering Handbook, Second Edition*. Ed. Joseph D. Bronzino
Donald Peterson, Joseph D. Bronzino, Biomechanics, Principles and Applications, Ed. Taylor and Francis

Gray H., Anatomy, descriptive and surgical., Lippincott Press, N.Y., Boston, 1986

Handra-Luca V., Introducere in teoria mecanismelor, Ed. Dacia, Cluj-Napoca, 1986

Nigg B.M., Herzog W., Biomechanics of the musculo-skeletal system, John Wiley&Sons Ltd., N.Y., 1995

Popescu I., Iordachita I., Dumitru N., Rinderu P.L., Mecanisme biologice, Editura Sitech, Craiova, 1997.

Vera P., Biomecanica. Aparato locomotor, Instituto Biomecanico di Valencia, 1986

Vukobratovic M., Stepanenko J., Mathematical models of general anthropomorphic system, Mathematical Bioscience 17: 191-242.

Winter D.A., Biomechanics and motor control of human movement, John Wiley & Sons, Inc., 1990.

Petre Badea, Laurentiu Camil Bohiltea, Anatomia umana functionala si biomecanica, ISBN: 973-0-00641-5 Editura: [Colectia Medicina Sportiva](#), 2008

Grunoiu Lucian ; Brătianu Constantin ; Rinderu Paul Modelare și simulare numerică în biomecanică, 2005, Editura Universitaria

Tarnita, D., Popa D., Tarnita, D. N., Bizdoaca, N., Properties and Medical Applications of Shape memory Alloys; Romanian Journal of Morphology

and embriology, Vol. 51. No.1, Ed. Academiei Romane. [jurnal ISI, indexat in baza de date Medline, Pubmed] ISSN 1220-0522, 2008 (in curs de aparitie).

Tarnita, D., Popa D., Tarnita, D. N., Grecu, D., The virtual model of the human knee prosthetic components, Romanian Journal of Morphology and embriology, Ed. Academiei Romane, [indexata Medline] ISSN 1220-0522, 2007.

Tarnita, D., Popa, D., Tarnita, D. N., Grecu, D., CAD method for 3D model of the tibia bone and study of torsion and compression stress using the finite element method, Romanian Journal of Morphology and embriology, Vol. 47. No.2, pp.181-186, Ed. Academiei Romane. [Medline] ISSN 1220-0522, 2006.

DANIELA TARNITA, DUMITRU BOLCU, *Elements of mechanics and strength of materials*, Universitaria Publishing House, Craiova, 2012.

DANIELA TARNITA, *Elements of mechanical engineering and strength of materials*, Universitaria Publishing House, Craiova, 2012.

DANIELA TARNIȚĂ - Mechanisms actuated by springs. Methods for dynamic analysis and synthesis, Universitaria Publishing House, Craiova, 1998.

DUMITRU BOLCU, DANIELA TARNITA, *Methods for kinetostatic analysis of plane mechanisms*, EDP, Bucharest, 2009.

DANIELA TARNITA, DUMITRU BOLCU, *Methods for kinematical analysis of planar mechanisms*, Didactic and Pedagogic Publishing House, Bucharest, 2005 ISBN 973-30-1485-0.

Daniela Tarnita, I Geonea, A. Petcu, D.N. Tarnita, Numerical Simulations and Experimental Human Gait Analysis Using Wearable Sensors, New Trends in Medical and Service Robots, Springer Publishing House, DOI:10.1007/978-3-319-59972-4_2, pp.289-304, 2018, Jul.

Tarniță, Daniela, I Geonea, A. Petcu, D.N. Tarnita, Experimental Characterization of Human Walking on Stairs Applied to Humanoid Dynamics, Advances in Robot Design and Intelligent Control, Springer, 293-301, 2016

Daniela Tarnita, Marius Georgescu, Dan Tarnita, Applications of Nonlinear Dynamics to Gait Analysis on Plane & Inclined Treadmill, New Trends in Medical and Service Robots, Springer Publishing House, Vol 39, pp. 59-73, 2016

Daniela Tarnita, M Catana, D.N. Tarnita, Design and Simulation of an Orthotic Device for Patients with Osteoarthritis, pp. 61-77, New Trends in Medical and Service Robots, Springer Publishing House, ISBN 978-3-319-23832-6, pp 61-77, 2016

Daniela Tarnita, D. Popa, C. Boborelu, N. Dumitru, D. Calafeteanu*, D.N. Tarnita, Experimental Bench Used to Test Human Elbow Endoprosthesis, New Trends in Mechanism and Machine Science, Vol 24 (2015), pp. 669-677, Springer International Publishing, Editor: Paulo Flores (https://link.springer.com/chapter/10.1007%2F978-3-319-09411-3_71)..

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[Daniela Tarnita, C. Berceanu](#), Comparison of Human and Artificial Finger Movements, In [New Trends in Medical and Service Robots, Mechanisms and Machine Science](#) Volume 16, 2013, pp 221-235 editors: A.Rodic, Hannes Bleuler, Doina Pislă.

Tarnita, D., D-B MARGHITU, Nonlinear dynamics of normal and osteoarthritic human knee, Proceedings of the Romanian Academy, pp. 353-360, 2017. (IF=1,16).

Geonea, I., Tarnita, D., [Design and evaluation of a new exoskeleton for gait rehabilitation](#), Mechanical Sciences, 8(2), pp 307-322. (IF= 1,2)

Tarnita, D., Calafeteanu, D., Geonea, I., Petcu, A., Tarnita, D.N., [Effects of malalignment angle on the contact stress of knee prosthesis components, using finite element method](#), Rom J Morphol Embryol, 2017, 58(3), pp. (IF=0,67)

Tarnita, Daniela, Wearable sensors used for human gait analysis, *Rom J Morphol Embryol* 2016, 57(2), pp 373-382. IF=0,811

Tarnita, Daniela, Tarnita, D.N., Experimental measurement of flexion-extension movement in normal and corpse prosthetic elbow joint, *Rom J Morphol Embryol* 2016, 57(1):145–151. IF=0,811

DN Tarniță, Daniela Tarniță, D Grecu, D Calafeteanu, B Căpitănescu, New technical procedure involving Achilles tendon rupture treatment through transcuteaneous suture, *Rom J Morphol Embryol* 2016, 57(1):211–214. IF=0,811

[Tarnita, Daniela, Marghitu, D.](#), Analysis of a hand arm system, [Robotics and Computer-Integrated Manufacturing](#), Vol. 29, Issue 6, Pages 493–501, <http://dx.doi.org/10.1016/j.rcim.2013.06.001>, 2013. (IF=2.305)

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Tarnita, D., Tarnita, D.N., Oprea, B., Samide A., Electrochemical study on corrosion resistance in physiological media of nitinol wire used as bioimplant, Digest Journal of Nanomaterials and Biostructures, Vol. 8, No. 1, 2013, p. 35 – 41, <http://www.chalcogen.ro/35> Tarnita.pdf. (IF=0.945)

Tarnita, D., Berceanu, C., Tarnita, C., The three-dimensional printing—a modern technology used for biomedical prototypes, Materiale plastice, no.47, nr.3, pp 328-334, 2010, www.revmaterialeplastice.ro . (IF=0.824)

Subject of study: Design and optimisation in rapid prototyping

CODE: D23MSIM316

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 2nd year/1st semester

TYPE OF COURSE: mandatory

OBJECTIVES : Introduction into the processing by 3D printing technologies of metal or plastic parts and the realization of the specific constructive design

CONTENT: Introduction to Rapid Prototyping of Plastic Parts; Introduction to Rapid Prototyping of Metal Parts; Designing parts for rapid prototyping Topological optimization; Introduction to the use of TOSCA software for topological optimization; Case study: Design and optimization of a plastic piece Case study: Design and optimization of a metallic part.

TEACHING LANGUAGE: Romanian

EVALUATION: Written/oral examination

BIBLIOGRAPHY (selective):

Manual imprimanta 3D Systems ProX DM320

Manual imprimanta Stratasys Fortus 400 mc

Manual Abaqus

Manual Tosca

Note curs/laborator

Subject of study: Numerical modeling of heat trasfer phenomena

CODE: D23MSIM317

NUMBER OF CREDITS: 6

YEAR/SEMESTER: 2nd year/1st semester

TYPE OF COURSE: mandatory

OBJECTIVES: The objective of the discipline is to convey to the students all the necessary knowledges for modeling and simulation of heat transfer phenomena in thermal equipments and installations.

CONTENT: Numerical modeling of thermal constitutive laws. Obtaining and expressing thermal constitutive laws

Numerical approximation methods by interpolation.

Lagrange polynomials, Newton and Newton - Gregory polynomials.

Numerical integration methods. The Newton - Cotes and Gauss - Legendre method

Numerical methods for solving nonlinear and transcendent equations

Numerical Applications - Modeling the variation of water density in a thermal field

Numeric Applications - Numerical integration of the thermal conductivity of a nuclear fuel

Numerical Applications - Determination of friction coefficient when flowing through pipelines

Numerical modeling of thermal radiation processes in outbreaks. Basic elements and working hypotheses in the study of heat transfer by radiation. Modeling with finite volumes of heat transfer through radiation

Numerical and graphical methods for the calculation of transient thermal conduction. Graf-analytical methods. Numerical methods for solving the transient thermal conduction

Finite element method in heat transfer

TEACHING LANGUAGE: Romanian

EVALUATION: Written/oral examination

BIBLIOGRAPHY (selective):

Călbureanu, M., Metode numerice în transferul de căldură, ISBN 973-8043-569-9, 150 exemplare, 264 pag.,Editura Universitaria, Cod CNCIS 130, Craiova 2004.

Călbureanu, M., Introducere în Metoda Elementului Finit, ISBN 978-606-510-378-8, 150 exemplare, 227pag.,Editura Universitaria, Cod CNC SIS 130, Craiova 2008

Călbureanu, M., Cernăianu, C., Bică, M., Îndrumar de laborator de termotehnică, mașini termice și transfer de căldură - Îndrumar de laborator, Ed. Universitaria, 2008, Cod CNC SIS 130, 174 pag. ISBN 978-606-510-028-2

Călbureanu, M., Malciu. R , Termotehnică, mașini și instalații termice – culegere de probleme și aplicații,124 pag., ISBN : 978-606-14-1218-1, Ed. Universitaria, 2017

Unguresan Paula – Transfer de caldura si masa, Notite de curs, 2013

www.termo.utcluj.ro/termoluc.

Cengel, Y., Heat and mass transfer, a practical approach, McGraw-Hill, 2007

Lienhart, J.,A heat transfer textbook,

<http://web.mit.edu/lienhard/www/ahtt.html>

Subject of study: Advanced systems in road vehicles and transport engineering

CODE: D23MSIM 318

NUMBER OF CREDITS: 7

YEAR/SEMESTER: 2nd year/1st semester

TYPE OF COURSE: mandatory

OBJECTIVES Developing scientific and professional skills in the field of Mechanical Engineering from the perspectives of the design and integration of road vehicles in modern transport systems

CONTENT: Advanced systems in the field.

Development, conceptual-functional particularities. Trends of evolution.

Engines for motor vehicles. Highlights of constructive-functional optimizations.

Engines for motor vehicles. Principles of optimization of thermoelectric systems.

Engines for motor vehicles. Modeling techniques based on numerical computing programs.

Simulation of processes in thermo-technical systems.

Investigation techniques for modeling validation.

Requirements and design criteria imposed on propulsion systems of cars derived from functional conditions.

Criteria for optimizing and modeling the behavior of propulsion systems of cars

Simulations associated with optimization criteria defined in propulsion systems.

The virtual model and functional model of the propulsion system.

Research methodology at the level of propulsion systems.

Issues of urban mobility in transport systems.

Modeling at microscopic level in traffic flows.

Vehicle Tracking Models.

Models of vehicle arrival.

Models of intervals between vehicles.

Modeling, Simulation, and Assessment for Road Flows.

Research methods and equipment used in transport engineering and traffic engineering

TEACHING LANGUAGE: Romanian

EVALUATION: Written/oral examination

BIBLIOGRAPHY (selective):

Andreescu, C., ș.a., Diagnosticarea automobilelor, Editura Printech, București, 2002;

Atar R. – A Diffusion Model of Scheduling Control in Queuing System with Many Servers, The Annals of Applied Probability, Vol. 15, 2005;

Beuthe M. – Total logistics cost and quality attributes of freight transportation, Mons, 2004;

Daganzo C.F. –Logistics Systems Analysis, Springer-Verlag, 2010;

Drew, D. R., Traffic flow. Theory and control, New York, Mc Graw-Hill, 1988;

Dumitru, I., Sisteme avansate în ingineria autovehiculelor și transporturi – fise de laborator [uz intern], Craiova, 2018;

Dumitru I. (editor), Automotive and Transportation Engineering. (Applied Mechanics and Materilas vol. 822, in Scientific Net), TransTech Publications, 2015;

Dumitru, I., Motoare pentru automobile și tractoare. Metode moderne de optimizare a parametrilor energetici ai motoarelor Diesel cu injecție directă, Craiova, Editura Universitaria Craiova, Craiova, 2008;

Dumitru, I., Oprica Th., Matei., L. Otat, Oana, Logistica urbana - indrumar de laborator, [format electronic, tiparit in regim propriu], Craiova, 2015;

Dumitru, I., Oprica Th., Matei., L. Otat, Oana, Logistică urbană – note de curs, actualizat, [format electronic, tiparit în regim propriu], Craiova, 2015;

Dumitru, I., Oprica Th., Otat Oana, Matei, L., Proiectarea si modelarea fluxurilor de circulatie - Indrumar de laborator, actualizat [format electronic si tiparit în regim propriu] Craiova, 2015;

Dumitru, I., Oțăt, Tutunea D., Dima Al., Optimizarea constructiv – funcțională a motoarelor pentru autovehicule, Note de curs - actualizate, [format electronic, tiparit în regim propriu], Craiova, 2017;

Dumitru, I., Trafic rutier si siguranta circulatiei. Aspecte aplicative., Craiova, Editura Universitaria Craiova, Craiova, 2006;

Dumitru, I., Tutunea D., Dima Al., Motoare-Indrumar laborator, [format electronic, tiparit în regim propriu], Craiova, 2016;

Dumitru, I., Tutunea D., Dima Al., Motoare–Note de curs, actualizat, [format electronic, tiparit regim propriu], Craiova, 2016;

Florea, Daniela, Aplicații telematice în sistemele avansate de transport rutier, Ed Universității Transilvania, Brașov, 2004;

Frățilă, ș.a., Automobile, Editura Didactică și Pedagogică, București, 1995;

Gaiginschi, R., Filip, I. – expertiza tehnică a accidentelor rutiere – Editura Tehnică, București, 2002;

Gattorna, J. L. – Managementul logisticii si distributiei, Ed. Teora, Bucuresti, 1999;

Ghiold, Ion, Cercetări privind logistica distribuției Intermodale a mărfurilor, Pitesti, 2012;

Ghiulai C., Vasiliu, Gh., Dinamica autovehiculelor, Editura Didactică și Pedagogică, București, 1975;

Huisman, D., – A solution Approach for Dynamic Vehicle and Crew Scheduling, Erasmus Center for Optimization in Public Transport, 2004;

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Otat, V., Dumitru, I., Echipamente si tehnici de diagnosticare a autovehiculelor, Editura Universitaria, Craiova, 2007;
Pisoschi, Al.-Gr., Dumitru, I., Popa, Gh., Remorci și semiremorci auto și agricole, Reprografia Universității din Craiova, Craiova, 2001;
Pisoschi, Al.-Gr., ș.a. Cunoașterea generală a autovehiculelor, Tipografia Universității din Craiova, 2002;
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Poțincu, Gh., ș.a., Automobile, Editura Didactică și Pedagogică, București, 1990;
Raicu S. – Sisteme de transport, Editura AGIR, București, 2007;
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Stratulat, M., ș.a., Diagnosticarea automobilului, Editura Societatea Știință și Tehnică, București, 1998;
Tabacu, I., Transmisii mecanice pentru autoturisme, Editura Tehnică, București, 1999;
Taniguchi, E. - City Logistics - Network modelling and intelligent transport system, Pergamon, Oxford, 2001;
Tutunea D., Dumitru, I., Oțăt, Dima Al., Optimizarea constructiv – funcțională a motoarelor pentru autovehicule. Elemente aplicative - actualizate, [format electronic și tipărit în regim propriu], Craiova, 2017;
Untaru, M, ș.a., Dinamica autovehiculelor pe roți, Editura Didactică și Pedagogică, București, 1975;
Vladut V., Biris, S., Paraschiv, G., Dumitru I., Reglementări naționale și internaționale privind admiterea în circulație pe drumurile publice din România a agregatului tractor – mașină, Editura Universitaria, Craiova, 2011.

Subject of study: Mechanics of composite materials

CODE: D23MSIM 319

NUMBER OF CREDITS: 5

YEAR/SEMESTER: 2nd year/1st semester

TYPE OF COURSE: optional

OBJECTIVES: - to know the main mechanical characteristics of the composite materials;
- to promote the use of these advanced materials in various fields of activity

CONTENT: Composite materials - definitions and types. Mechanical behavior.

Some elastic characteristics of composite bars.

Determination of modulus of elasticity based on modal analysis of composite materials with random distribution of reinforcement.

Using the spectral decomposition of the elastic matrix to calculate the elastic properties of a composite bar.

Theoretical mathematical models for the determination of breaking strength and modulus of elasticity for composite plates with random distribution of the reinforcement.

Nonlinearities in the mechanical behavior of composite materials.

Vibration study for composite bars that are in a flat motion.

TEACHING LANGUAGE: Romanian

EVALUATION: Written/oral examination

BIBLIOGRAPHY (selective):

I. Ciucă, D. Bolcu, M.M. Stănescu, Mecanica și ruperea materialelor compozite. Modele matematice și verificări experimentale, Ed. Universitaria, Craiova, 2010, 227 p.

M.M. Stănescu, D.Gh. Băgnaru, Studiu computațional al unor ecuații diferențiale și integro-diferențiale. Aplicații în mecanică, Ed. Universitaria, Craiova, 2014, 198 p.

I. Ciucă, D. Bolcu, M.M. Stănescu, Elemente de mecanica solidelor deformabile și teoria ruperii, Ed. Didactică și Pedagogică, București, 2008, 468 p.

D.Gh. Băgnaru, M.M. Stănescu, Aplicații ale transformărilor integrale Laplace în abordarea teoriilor moderne în domeniul vibrațiilor unor sisteme mecanice, Ed. Universitaria, Craiova, 2017, 134 p.

M.M. Stănescu, D. Gh. Băgnaru, Probleme extremale și variaționale, Ed. Universitaria, Craiova, 2017, 115 p.

Subject of study: Scientific research/Practice

CODE: -

Number of credits: -

Year/Semester: 1st year , 1st semester

Type of Course: -

Subject of study: Scientific research

CODE: D23MSIM421

Number of credits: 6

Year/Semester: 1st year , 2nd semester

Type of Course: mandatory

Subject of study: Presentation of Dissertation Project

CODE: D23MSIM422

Number of credits: 24

Year/Semester: 2nd year , 2nd semester

Type of Course: mandatory