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SUBJECT:	Solid Mechanics
ECTS CREDITS:	6 ECTS
TEACHERS, UNIVERSITY AND EMAILS:	1. Urazboev Gayrat, (UrSU, gayrat71@mail.ru) 2. Karimov Umid (UrSU, umid.karimov@gmail.com)
RESPONSIBLE TEACHER:	Urazboev Gayrat
LANGUAGE OF INSTRUCTION:	Russian (Urazboev G) English (Karimov Umid)
ACADEMIC COURSE:	2016—17.
NAME OF THE MASTER'S DEGREE:	Master's in Mathematical Engineering.

COURSE AIMS:

- Expanding the knowledge in the field of non-linear mechanics of solids and its application to structural analysis, machine design and material processing
- Understanding the influence of non-linearity on the behaviour of structures
- Equipping student with essential analytical skills which have a particular bearing on professional practice as mechanical engineers
- Enabling students to solve advanced practical problems
- Providing students with the basic skills and knowledge required to analyse displacement field, stress, strain and failure in deformable solids using analytical solutions and the Finite Element Method
- Understanding the mechanics of complex practical situations through the establishment and solution of appropriate boundary value problems
- Overviewing of important structural engineering design philosophies
- Carrying out design tasks, supported by quality assurance and verification strategies associated with risk management as used in industry

LEARNING OUTCOMES:

- Having a good understanding the theory, concepts, principles and governing equations of solid mechanics;
- Being gaining the physical intuition necessary to idealize a complicated practical problem;
- Possessing the contemporary analytical, experimental and computational tools needed to solve the idealized problem;
- Having acquired the independent judgment required to interpret the results of these solutions;
- Being able to use these solutions to guide a corresponding design, manufacture, or failure analysis;

- Developing interpersonal understanding, teamwork and communication skills working on group assignments;
- Being able to learn independently new solutions, principles and methods, read and understand professional articles on the subject.

COURSE SYLLABUS:

1. Linear elastodynamic equations.
2. Stresses and strains.
3. Strain tensor.
4. General methods of resolution in linear elasticity.
5. Plane problems in linear elasticity.
6. Axially and spherically symmetric problems.
7. Bending and torsion of cylindrical beams.
8. One-dimensional beam models.
9. Plate models.
10. Vibrations.
11. Behaviour laws in elasticity.
12. Viscoelasticity, plasticity, viscoplasticity.
13. Nonlinear boundary conditions.
14. An introduction to fracture mechanics.

LITERATURE:

- Basic literature:

[1] Григолюк Э.И., Селезов И.Т. Механика твердых деформируемых тел, том
[2] Работнов Ю.Н. Механика деформируемого твердого тела. М.: Наука, 1988.
[3] Новацкий В. Теория упругости. М.: Мир, 1975.
[4] Качанов Л.М. Основы теории пластичности. М.: Наука, 1969.
[5] Седов Л.И. Механика сплошной среды: В 2-х томах. М.: Наука, 1983, 1984.
[6] Barber, J.R. Elasticity. Solid Mechanics and its applications. Kluwer Academic Publishers. 2002.
[7] S. Timoshenko and J.N. Goodier," Theory of elasticity", 3d ed., New York, McGraw-Hill, 1970.
[8] A.I. Lurie, "Theory of Elasticity", Springer, 1999.
[9] L.B. Freund, "Dynamic Fracture Mechanics", Cambridge University Press, 1990.

[10] R. Hill, "The Mathematical Theory of Plasticity", Oxford University, 1950.
[11] J. Lubliner, "Plasticity Theory", Macmillan Publishing Company, 1990.
[12] D. Bigoni, "Nonlinear Solid Mechanics: Bifurcation Theory and Material Instability," Cambridge University Press, 2012.

- Further reading:

[1] Gurtin, M.E. An Introduction to Continuum Mechanics. Academic Press. New York, 1981.
[2] Carpinteri, A. Structural Mechanics – A unified approach. Chapman & Hall. London, 1997.
[3] Lemaitre J. A A course on damage mechanics. Springer-Verlag, 1996.
[4] Necas, J. y Hlavácek. Mathematical Theory of Elastic and Elasto-Plastic Bodies: An Introduction. Studies in applied mechanics, 3. Elsevier, 1981.
[5] Segel, L.A. Mathematics Applied to Continuum Mechanics. Macmillan Publishing Co., Inc. 1977.
[6] Мусхелишвили Н.И. Некоторые основные задачи математической теории упругости. М.: Наука, 1966.
[7] Клюшников В.Д. Математическая теория пластичности. М.: Изд-во МГУ, 1979.
[8] Кристенсен Р. Введение в теорию вязкоупругости. М.: Мир, 1974.
[9] Лурье А.И. Теория упругости. М.: Наука, 1970.

TEACHING METHOD:

Face-to-face lectures, tutorial and lab classes, online lecture notes, tutorial solutions, peer mentoring, 'help day' by tutors/lecturers and selection of textbooks having interactive solutions of numerical problems. Videoconference to all CA partners.

METHOD OF ASSESSMENT:

70% for **Knowledge and understanding**:

- written examination which includes examination on theory taught in the lectures and practical/seminar/laboratory classes

30% for **Practical issues**:

- includes solved exercises on personal studies,
- attendance to the lab/practical/seminar classes
- Oral and written responses based on individual experience
- Applying fluid mechanics in real-life contexts
- Investigating patterns

Method of REASSESSMENT:
70% for **Knowledge and understanding**:

- written examination which includes examination on theory taught in the lectures and practical/seminar/laboratory classes

30% for **Practical issues**:

- written examination which includes solved exercises during the reassessment examination

STUDENT WORKLOAD:

On-site work at the classroom (attendance to classes and participation on them) = 60 hours.
Lecture hours: 2 hours per week
Practical/Lab hours: 2 hours per week
Mid term exam: 2 academic hours
Final exam: 2 academic hours

Self-study (autonomous study, doing exercises, programming, recommended readings) = 54 hours.

RECOMMENDATIONS:

MDSolids is software for topics taught in the Mechanics of Materials course (also commonly called Strength of Materials or Mechanics of Deformable Solids).
MDSolids is an educational software package devoted to the introductory mechanics of materials course. Web-page: http://www.mdsolids.com/

OTHER COMMENTS: