Federal State Autonomous Educational Institution of Higher Education

PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
RUDN University

ENGINEERING ACADEMY
educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

THEORETICAL MECHANICS, MACHINE DYNAMICS
course title

Recommended by the Didactic Council for the Education Field of:

1.1.7 Theoretical mechanics, machine dynamics
field of studies / speciality code and title

The course instruction is implemented within the professional education programme of higher education:

Theoretical mechanics, machine dynamics

higher education programme profile/specialisation title

1. PURPOSE OF THE DISCIPLINE

The aim of the discipline "Theoretical Mechanics, Dynamics of Machines" is to prepare for the candidate examinations, as well as to master the competences (AK - academic competences, RC - research competences).

2. REQUIREMENTS FOR THE RESULTS OF THE DISCIPLINE

The study of the discipline "Theoretical Mechanics, Dynamics of Machines" is aimed at preparing for the candidate examinations.

3. SCOPE OF THE DISCIPLINE AND TYPES OF STUDY

The total workload of the discipline "Theoretical Mechanics, Dynamics of Machines" is 3 credits.

Table 4.1. Types of academic work by period of study of the postgraduate programme

Type of study		**TOTAL,** ac. h.	**Course**			
			1	**2**	**3**	**4**
Contact work, ac.h.		60			60	
including:						
Lectures (**LC**)		30			30	
Laboratory work (**LW**)						
Practical/seminar classes (**SP**)		30			30	
Independent work of students, ac.h.		48			48	
Control (credit with grading), ac.h.						
Total time commitment of the discipline	ac.h.	**108**			**108**	
	credits	**3**			**3**	

5. CONTENT OF THE DISCIPLINE

Table 5.1. Content of the discipline (module) by type of study work

Name of discipline section	**Section (topic) content**	**Type of study**
Section 1: Basic concepts of mechanics. Fundamentals of Mechanics of Structural Materials.	Mechanical reliability issues in mechanical engineering. Economic aspects of machine dynamics and strength. Basic hypotheses. Real structures and their design diagrams. Sectional method. Internal force factors. Types of core deformation. General assumptions about material properties. Concepts of stresses and strains. Tensor of stresses. Law of pairing of tangential stresses. Principal sites and principal stresses. Particular cases of stress state.	SP, SRS

Name of discipline section	Section (topic) content	Type of study
Section 2: Basic concepts of the theory of reliability of machines and structures. Stability of structural elements	Basic concepts of the theory of structural reliability. Failures, defects, durability, service life of machines and structures. Limit state. Limit and allowable stresses. Safety factor and its statistical justification. Calculation of strength under allowable stresses. Selection of standard safety factor. Kinematic characteristics of oscillating processes.	SP, SRS
Section 3: Bending calculations. Torsion and shear calculations. Shafts and springs. Calculation of shells of rotation.	Geometric characteristics of plane sections: static moments, axial and centrifugal moments of inertia of sections. Calculation of the position of the centre of gravity of a section. Main central axes of a section. Standards for rolled sections. Torsion of an elastic cylindrical rod. Tangential stresses and twisting angle. Torsional stiffness and strength conditions. Potential energy of elastic deformation. Basic concepts of elastic stability theory. Stable and unstable equilibrium states. Stability of rectilinear rods in longitudinal compression. Critical force. Euler's formula and the limits of its application.	SP, SRS

6. LOGISTICS OF THE DISCIPLINE

Table 6.1. Logistical support for the discipline

Type of audience	Classroom equipment	Specialised training/laboratory equipment, software and materials for the discipline (if necessary)
Lecture room	Study rooms №554 for lectures, practical classes, group and individual consultations, current monitoring and interim certification. Set of specialized furniture: technical means: plasma TV Samsung PS-50 A410C1	
Laboratory	Study rooms №554 for lectures, practical classes, group and individual consultations, current monitoring and interim certification. Set of specialized furniture: technical means: plasma TV Samsung PS-50 A410C1	
Seminar room	Study rooms №554 for lectures, practical classes, group and individual consultations, current monitoring and interim certification.	

Type of audience	Classroom equipment	Specialised training/laboratory equipment, software and materials for the discipline (if necessary)
	Set of specialized furniture: technical means: plasma TV Samsung PS-50 A410C1	
Computer lab	Computer room for classes, group and individual consultations, current control and interim certification, equipped with personal computers (____ pcs.), blackboard (screen) and technical means of multimedia presentations.	
For independent work of students	An auditorium for students' independent work (can be used for seminars and consultations), equipped with a set of specialised furniture and computers with access to the EIOS.	

* - the classroom for students' independent work is obligatory!

7. TRAINING, METHODOLOGICAL AND INFORMATION SUPPORT FOR THE DISCIPLINE

Basic literature:

1. Znanium. com. Yatsun S. F. Kinematics, dynamics and strength of machines, devices and equipment: tutorial / S.F. Yatsun, V.Y. Mishchenko, E.N. Politov. - M.: Alfa-M: Infra-M, 2012. - 208 c. - Access mode: http://znanium.com/

Further reading:

1. eLibrary "Znanium. com. Khrunicheva T.V. Machine Parts: Typical Calculations of Strength: Textbook / T.V. Khrunicheva. - M.: FORUM: INFRA-M, 2007. - 224 c. - Access mode: http://znanium.com/.

2. electronic library system "Znanium. com. Matveev, Y.A. Theory of Mechanisms and Machines: Textbook / Y.A. Matveev, L.V. Matveeva. - M.: Alfa-M: INFRA-M, 2009. - 320 c. - Access mode: http://znanium.com/

3. Technology of thin films and coatings: tutorial / L.N. Maskaeva, E.A. Fedorova, V.F. Markov ; under general editors L.N. Maskaeva ; Ministry of Education and Science of the Russian Federation, Ural Federal University named for the first President of Russia B.N. Yeltsin. - Yekaterinburg : Ural University Press, 2019. - 236 c. - ISBN 978-5-7996-2560-3.

Resources of the information and telecommunication network "Internet":

1. the RUDN electronic library system and third-party electronic libraries to which university students have access on the basis of contracts:

- RUDN Electronic Library System - RUDN EBS http://lib.rudn.ru/MegaPro/Web
- The University Library Online electronic library system http://www.biblioclub.ru
- The Yurite electronic library system http://www.biblio-online.ru
- Student Consultant electronic library system www.studentlibrary.ru

- Lan LGS http://e.lanbook.com/
- Trinity Bridge

2. databases and search engines:
- electronic collection of legal and normative-technical documentation http://docs.cntd.ru/
- search engine Yandex https://www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Teaching materials for students' independent work while mastering the discipline/module:*

1. Course of lectures on the discipline "Theoretical Mechanics, Dynamics of Machines".

* - all teaching materials for students' independent work are placed in accordance with the current procedure on the discipline page in TUIS!

8. ASSESSMENT MATERIALS AND SCORING SYSTEM FOR ASSESSING THE LEVEL OF COMPETENCE IN THE DISCIPLINE

The assessment materials and grading system for the discipline are presented in the Appendix to this Work Programme of the discipline.

* - OM and BRS are formed based on the requirements of the relevant local normative act of PFUR.

DEVELOPERS:

Assistant Professor of the Basic Department of Nanotechnology and Microsystem Technology		**M.O. Makeev**
position, educational department	signature	name and surname.

HEAD OF EDUCATIONAL DEPARTMENT:

Head of the Basic Department of Nanotechnology and Microsystem Technology		**S.V. Popov**
educational department	signature	name and surname.

HEAD OF HIGHER EDUCATION PROGRAMME:

Professor of the Basic Department of Nanotechnology and Microsystem Technology		**V.V. Belyaev**
position, educational department	signature	name and surname