Name of subject	Theoretical mechanics (ECTS 4)
Subject/module code	NMEX1404
Teaching Semesters	4th semester
Responsible teacher	Y. Kuvandikov - Associate Professor of the Department of "UTF" of the Jizzakh Polytechnic Institute.
Course language	Uzbek
Course type	Elective Course
Teaching hours (this including independent study)	**Total hours-120.** **Audience Training hours - 48.** Lecture training hours – 24 Laboratory training hours – 12 Practical training hours – 12 **Independent study -72 hours**
ECTS	4
The purpose and tasks of subject / learning outcomes	**I. The content of the subject -** The development of all branches of modern technology, technological processes and the requirements imposed on them, taking into account the need to solve new scientific problems, is extremely relevant. The creation of theoretical foundations of mechanical problems that can meet these requirements, in turn, can serve as a practical tool for justifying the purpose of teaching the subject "Theoretical Mechanics" to students. Since the lesson is the main form of education in mastering the subject, it should be scientific, systematic, understandable, conscious and active, with a solid assimilation of knowledge, and organized taking into account the personal characteristics of the student. The purpose of teaching the subject "Theoretical Mechanics" to bachelors is to ensure that they independently solve various problems and innovations that arise in the process of future scientific and technical development. At the same time, studying the subject "Theoretical Mechanics" should help the future bachelor develop his worldview, thinking skills, and the ability to apply theoretical knowledge to solve practical problems. The subject "Theoretical Mechanics" is studied as one of the universal fundamental sciences, like physics and mathematics, and is the basis of all technical sciences. The purpose of teaching the subject is to form in students the appropriate knowledge, skills, and qualifications in methods for determining stresses and deformations in machines and mechanisms and their elements and structures, as well as methods for calculating these structures for strength, stiffness, and stiffness. **The task of science is -** Students are expected to develop basic skills in design and construction calculations, which are one of the main issues in the design process of machines and mechanisms, to be able to apply the basic methods of analyzing the balance, motion, and interaction of mechanical systems for machine and structure structures in solving technical problems, to be able to build and study mechanical and mathematical models of technical systems, and to develop the skills to study the balance and motion of mechanical systems. **Learning outcomes:** 1. Conditions of equilibrium of a rigid body under the influence of various systems of forces located arbitrarily in a plane and in space, methods for finding the center of gravity of a rigid body;

	2. Forms of motion of a rigid body in mechanical motion, laws of mechanical motion taking into account changes occurring in the environment; basic laws and principles of dynamics, differential equations of motion of mechanical systems, general theorems of rigid body dynamics; internal forces arising in structural elements, stresses and deformations arising in simple types of deformation, calculation scheme of buildings and structures and their kinematic analysis; theory of influence lines, displacements arising in elastic systems, methods for calculating static and uncertain systems; 3. Theoretical foundations of science and application of scientific calculation formulas in solving practical problems; correct selection of calculation models of machine and mechanism elements; determination of internal forces and deformations in machine and mechanism elements; selection of calculation schemes for buildings and structures and their kinematic analysis; 4. Theory of influence lines; have the skills to calculate statically definite and uncertain systems under the influence of fixed and moving loads; 5. Apply and implement the knowledge gained in theoretical mechanics in the process of passing engineering and special disciplines; select computational models of machine and mechanism elements, select machine and mechanism calculation schemes and perform their kinematic analysis; **6.** determine stresses and displacements in machines and mechanisms; must have the skills to calculate statically definite and uncertain systems.
Course content (topics)	**I. Main theoretical part (Lecture)** Module 1. Topic 1. Introduction to theoretical mechanics. Basic concepts and axioms of statics. Topic 2. Projection of a force on an axis. System of intersecting forces at a point. Determination of an equal acting force. Topic 3. Balance of intersecting forces at a point. Topic 4. Moment of a force about a point and an axis. Couple force. Couple moment. Topic 5. Friction force. Friction in sliding and rolling. Module 2. Topic 6. Introduction to kinematics. Methods of transmitting point motion. Point trajectory. Topic 7. Determination of velocity and acceleration when the motion is given by a vector, coordinates and natural method. Topic 8. Forward motion of a rigid body. Rotational motion of a rigid body around a fixed axis. Plane parallel motion of a rigid body. Equations of plane parallel motion. Topic 9. Complex motion of a material point. Module 3. Topic 10. Introduction to dynamics. Basic laws of dynamics. Two main problems of dynamics. Topic 11. Elementary work of force. Force. Oscillatory motion of a material point. Topic 12. The magnitude of the momentum of a material point. Theorem on the change in the magnitude of the momentum of a material point. **II. Instructions and recommendations for organizing laboratory**

exercises.

In laboratory exercises, students develop basic skills in design calculations, which are one of the main issues in the design of machines and mechanisms, as well as practical skills and qualifications in conducting experiments, calculating and drawing tables and graphs. The proposed topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

1. Experimentally determine the equivalent force of a system of forces on a plane intersecting at one point.
2. Experimentally determine the center of gravity of a homogeneous plate.
3. Experimentally determine the laws of friction force.
4. Determine the speed of an object using angular velocity
5. Study the laws of oscillatory motion.
6. Experimentally study the law of conservation of momentum.
7. Study the motion of an object thrown in a horizontal direction.

III. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of a practical training is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

Recommended practical topics:

1. Projection of a force on an axis. Solving problems related to a system of intersecting forces. A system of forces located arbitrarily on a plane. Solving problems related to the equilibrium of intersecting forces at a point.
2. Solving problems related to the moment of a force about a point and an axis. Couple moment. Solving problems related to determining the support reaction forces.
3. Solving problems related to determining the support reaction forces of a rigid body.
4. Solving problems related to determining the friction force.
5. Determining the velocity and acceleration of a point according to the given equations of motion.
6. Problems related to the rotational motion of a rigid body around a fixed axis. Determining the velocity and acceleration of a point in complex motion.
7. Solving problems related to the direct and inverse problems of dynamics.
8. Integrating differential equations of motion of a material point under the influence of constant forces. Problems related to the work of a force and the determination of power. Application of the theorem on the change in the magnitude of momentum to determining the velocity of a material point.

Instructions for organizing computational and graphic work

	The main purpose of performing computational and graphic work: - To develop students' skills in applying the theoretical knowledge they have acquired in practice and to form their independent work. - Each student in the subject performs computational and graphic work on the basis of individual assignments. When performing them, it is recommended to use the methodological instructions developed by the department for performing these computational and graphic works and the questions prepared for independent work. **Topics of the recommended computational and graphical works:** 1.Task-S1. Determination of the support reaction forces of a rigid body. 2.Task-K1. Determination of the velocity and acceleration of a point according to the given equations of motion. 3.Task-D1. Integrating the differential equations of motion of a material point under the influence of constant forces. **IV. IV. Independent study and independent work** 1. Simplification of a system of forces located on a plane. 2. Equilibrium of a system of forces located in space. 3. Kinematics of a point. Special cases of motion. 4. Parallel motion of a rigid body in a plane. 5. Forced oscillatory motion of a material point. Resonance phenomenon. The ability to solve problems in science is of great importance. The main way to study certain topics in depth and solve problems is to be able to work independently with textbooks and manuals. The ability to work independently with a book is not only the basis of training an engineer, but also the basis of all his activities. In addition, it is recommended that students use lecture texts for independent mastery of the topics covered. Students' independent mastery of topics is not assessed separately, they are reflected in the current, intermediate and final assessments. Independent study is a mandatory training course for students and is planned in nature. Independent work topics consist of lecture and practical topics planned for independent study. Independent study strengthens students' theoretical knowledge and helps them to master the topics well. It is recommended that students make notes, prepare presentations, prepare abstracts and present them on topics that are independently studied.
Student assessment	Assessment of student knowledge is based on the mastery of the teaching material during the semester and final control (tests, assignments, written and oral work results). During the course of "Theoretical Mechanics", students are evaluated on a 100-point system. Of these, 50 points are allocated to the current and intermediate results (60% of 50 points are current control, independent study and 40% intermediate control), and 50 points are

	allocated to the final control results. Students whose total score of current and intermediate points is less than 30 points are not admitted to the final control exam. A student who scores 30 or more points in the final control is considered to have mastered the subject.
Requirements for exams	The student must have fully mastered the theoretical and practical concepts of the subject, be able to correctly reflect the results of the analysis. The student must have completed the tasks given in the current and intermediate forms of independent work, assessment. At the same time, he must have received the necessary points from the current, intermediate, independent education and final tests in the relevant subject within the specified time. A student who has not submitted current control, intermediate control and independent education tasks, as well as who has scored less than 30 points on these tasks and types of control, will not be included in the final type of control. Also, a student who has missed 25 or more percent of the classroom hours allocated to the subject without an excuse will be expelled from this subject, will not be allowed to take the final exam and will be considered as not having mastered the relevant credits in this subject. A student who fails the final exam or scores less than 30 points on this type of exam is considered academically indebted.
Recommended Literature	**Main literature:** 1. 1. Sh.A. Shoobidov, X.N. Habibullayeva, F.D. Fayzullayev “Theoretical Mechanics” Tashkent “Yangi Asr Avlod” Publishing House 2008. 2. 2. P. Shohaydarova, Sh. Shoziyotov, J. Zoirov. “Theoretical Mechanics”, “O’qituv” Publishing House. Tashkent-1981. 3. 3. B.A. Fayzullayev “Theoretical Mechanics” Publishing House named after Chulpon Tashkent 2011 4. 4. J. Zoirov, B. Ahmadkhodjayev. “Theoretical Mechanics” Part II, “Fan” Publishing House of the Academy of Sciences of the Republic of Uzbekistan. Tashkent-1998. Pages 157 – 160. 5. 5. V.I. Szolga, "Theoretical mechanics", Berlin, part-1, 2013, - 204 p. 6. 6. V.I. Szolga, "Theoretical mechanics", Berlin, part-2, 2013, - 261 p. 7. 7. F. Smith and W.R. Longley "Theoretical mechanics", New York-London, 2014, 288 p. 8. 8. Meshchersky L.V. A collection of problems from theoretical mechanics. Study guide. - T. Teacher, 1990. - 448 6. 9. 9. Mirsaidov M.M., Boymurodova L.I., Giyasova N.T. Theoretical mechanics. Study guide - T.: Uzbekistan, 2008. - 246 p. 10. Yablonsky A.A. Collection of tasks for coursework and theoretical mechanics Moscow: 2000. – 240 p. **Additional literature** 1. 1. Decree of the President of the Republic of Uzbekistan dated February 7, 2017 No. PF-4947 “On the Strategy of Actions for the Further Development of the Republic of Uzbekistan”. 2. 2. Karimov K.A., Habibullayeva H.N. “Application of the Theorem on the Change of Kinetic Energy of a System in the Study of the Motion of a Mechanical System” Methodological Guide. T.: TDTU, 2013. 3. 3. Karimov K.A., Habibullayeva H.N. “Application of the Theorem on the Change of Kinetic Energy of a System in the Study of the Motion of a Mechanical System” Methodological Guide. T.: TDTU, 2013.

	4. 4. Meshchersky I.V. Collection of Problems in Theoretical Mechanics. 5. Textbook. SPb.: Lan, 2005. —448p. 6. 5. Butenin N.V., Lunts Ya.L., Merkin D.R. Course theoretical mechanics: Uchebnik. Spb.: Lan, 2008. – 736 p 7. T. Bultakov, G. G. Egamnazarov, H. Kh. Igamberdiyev Theoretical mechanics. Practicum. Statics. **Information sources** 1. www.lex.uz – National database of legislative documents of the Republic of Uzbekistan. 2. www.ziyonet.uz – Education portal of the Republic of Uzbekistan. 3. www.ilm.uz. 4. www.zivo.net. 5. http://www.zivo.net 6. http://www.nazmex.ru http://www.books.google.ru