REPUBLIC OF UZBEKISTAN

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS

FERGANA STATE TECHNICAL UNIVERSITY

Material resistance

MODULE HANDBOOK

Field of knowledge:	700 000	Engineering, Manufacturing, and Construction
Field of Education:	730 000	Architecture and construction
Educational Program:	60730300	Civil Engineering

Fergana 2025

Module title	***Material resistance***
Code (if available)	*MatResM46*
Semester(s) of module teaching	*4*
Responsible for the module	*Hamzayev Inomjon-associate professor of Applied Mechanics Department* *Umarov Elmurod Sotvoldiyevich-Senior Teacher of the Department of Applied Mechanics*
Language of instruction	*Uzbek, Russian*
Connection to the curriculum	*compulsory*
Teaching methods	*lecture, practical training, laboratory training, independent study.*
Study load (including classroom and independent study hours)	*Total hours: 180 hours* *Auditorium hours: 72 hours* *lecture – 24 hours, practical training – 22 hours, laboratory training-20 hours, independent training-108 hours.*
Credit units	***6***
Required and recommended prior knowledge for studying the module	*Physics, Higher Mathematics, Descriptive Geometry, Theoretical Mechanics*
Module objectives/intended learning outcomes	***Purpose of the module:*** *To develop basic skills in design and construction calculations, which are considered one of the main issues in the design of building structures. It is only possible to ensure the strength rigidity and usefulness of construction structures and achieve economy only when the engineer is highly qualified and has mastered modern methods of material resistance, it is necessary to have wide knowledge in calculating strength and rigidity from specialists, and it is required to have sufficient training and qualifications in methods of experimental determination of stresses and deformations.* *- Based on these tasks, The Bachelor in the framework of issues carried out in the process of mastering the educational science "material resistance":* *- to gain insight into the results of socio - economic reforms in our republic in the sphere of material resistance science, the achievements of science and technology, regional problems;* *- calculation of construction structures and structural elements by the ability to carry a finite load; methods for determining displacements in the elastic system; mechanical characteristics of structural materials;* *- construction structural elements must have the geometric characteristics of cross-section surfaces; knowledge of the calculation schemes of structures; the construction of equations of Statics and dynamics and the calculation of these equations for real construction using exposure; construction must have the skills to calculate structural and structural elements in strength, rigidity, usefulness and durability.* *The task of material resistance is to determine the deformations and stresses that arise in students from external loads on individual elements of construction structures, buildings and structures, ensuring their strength, rigidity and usefulness.* *The following requirements are imposed on the knowledge, skills and qualifications of students in science.*

	- to have an idea of the theoretical foundations of science, hypotheses and limitations accepted in material Resistance, types of simple deformation, internal forces arising in cross-sections of structural elements, stresses and deformations occurring in structural elements; *- be able to know and use the theoretical foundations of science, hypotheses and limitations accepted in material resistance, simple types of deformation, internal forces arising in cross-sections of structural elements, stresses and deformations occurring in building structure elements, calculation formulas for solving practical issues, sterjen's conditions of strength and bikinishness in types of deformation; when solving practical issues, it is necessary to be able to apply the calculation formulas in practice, to determine the stresses and deformations that occur in the elements of a construction structure, to have the skills to select the cross-section of the elements of a construction structure, using sterjen's strength and bikirlik terms by types of deformation.*
Content	***Lecture sessions.*** ***Module 1. Introduction.*** *Basic concepts about the science of material resistance. Accounting forms of parts of engineering constructions.The main hypotheses and limitations adopted in material resistance. External forces and their types. Deformations and displacements. Internal forces. Cutting method. (KOAM rule). Voltages. Integral connections between internal forces and stresses* ***Module 2. The construction of epics of internal forces in the construction structure.*** *Internal forces in bending and their detection. Differential connections between M,Q and Qs in bending. Build m, and Q images and check them for correctness.* ***Module 3. Stretching and compression of straight rods.*** *Voltages in the transverse section. Longitudinal deformation. Guk's law is the transverse deformation coefficient. The Puasson coefficient is the conditions of strength and biquidity in stretching and compression.* *To test the properties of materials (for independent study). General concepts. Stretch diagram. Stretching and compressioes in the transverse sectility. Specific deformation work. Hardness. Mechanical viscosity.* ***Module 4. Static indeterminate issues in stretching and compression.*** *General concepts. Solving static ambiguous issues in stretching and compression. Voltages produced in the change in temperature. Voltages in Assembly (Assembly).* ***Module 5. Geometric characteristics of flat cross-sectional surfaces****. Static, inertial moments of smooth sectionse 4. Static indeterminate issues in stretching and compression. General concepts. Solving static ambiguous issues in stretching and compression. Voltages produced in the change in temperature. Voltages in Assemotated.* ***Module 6. Shift.*** *Pure displacement and its properties. Head voltages in pure displacement. Guk's law in displacement. Connections between the modulus of elasticity and the modulus of displacement. Practical calculations on displacement.(Note, this topic will be studied further in the science of metal structures, which will be studied in the construction bias).* ***Module 7. Straight Bruce twist.*** *Deflection of rods with circular cross section. Tension and deformation in twisting. Conditions of consistency and indifference in twisting. Potential Enegia in twisting.*

	Static indeterminate issues in twisting. Practical accounts of twisting. ***Module 8. Bending of straight Brus.*** *General concepts. Pure bending. Determination of normal voltages in pure bending. Nov'e formula. Resistance moments of flat sections calculation of beams to strength at normal voltages determination of voltages at transverse bending* ***Module 9. Detection of landslides in bending.*** *Differential equation of the deflection of a beam and its integrability is the universal formula of the deflection elastic line. Determination of balcony migrations using the method of initial parameters.* ***Module 10. Complex deformation.*** *General concepts. Oblique bend. Tension and deformation in oblique bending. Determination of the neutral axis position. Centered tension and compression.* ***Module 11. Strength theories****. General concepts about robustness theories. First, second and third classical robustness theories. The (fourth) energetic Morni of robustness is the theory of robustness. Cross-comparison of strength theories.* ***Module 12. The priming of deformed systems.*** *General concepts. The Euler question for determining critical forces. The effect of the rod tip machining method (Assembly) on the Critical Force Formula. Loss of priming at voltages following the proportionality limit.*
Forms of assessment	*oral, presentation, written work, practical assignments, laboratory work, and final exams.*
Requirements for study and assessment	*In order to successfully complete the module, the student must participate in classes, accumulate the minimum points established from the current, intermediate and final assessments.*
Bibliography	*1. I.H.Hamzayev, E.S.Umarov. Materiallar qarshiligi O‘quv qo‘llanma. 2021 yil 360 bet.* *2. S.M.Xasanov. Mexanika.Materiallar qarshiligi. Darslik. Tashkent. 2022 yil .336 bet.* *3. S.M.Xasanov, I.H.Hamzayev, N.S.Bibutov. Mexanika.Materiallar qarshiligi. Darslik.Tashkent. 2022 yil .350 bet.* *4. I.H.Hamzayev, B.T.Umarov, E.S.Umarov. Qattiq jismlar mexanikasi O‘quv qo‘llanma / “Classic”-2022 yil.* *5. D. K. Singh. Strength of Materials. Fourth Edition. Spiringer. 2021.*
Reviewers	*Sh. Umarov- head of the Department “BIQ”, Fergana State Technical University; I.N.Abdullayev - professor Fergana State Technical University,* *M.N. Nabiyev – Associte professor Fergana State Technical University,*