

REPUBLIC OF UZBEKISTAN
MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS
FERGANA STATE TECHNICAL UNIVERSITY

Dynamics and stability of structures

MODULE HANDBOOK

Field of knowledge: 700000 – Engineering, processing and construction specialities

Educational field: 730000 – Architecture and construction

Education program: 60730300 – Civil engineering

Module name	<i>Dynamics and Stability of Structures</i>
Code (if available)	DPST66
Semester(s) of module teaching	6
Responsible for the module	<i>Dusmatov Abdurakhim, Associate Professor of the Department of Civil Engineering, PhD, Senior Lecturer</i>
Language of instruction	<i>Uzbek, Russian</i>
Connection to the curriculum	<i>elective</i>
Teaching methods	<i>Lectures, practical classes, independent work</i>
Study load (including classroom and independent study hours)	<i>Total number of hours: 180 hours Auditorium hours: 72 hours Lectures — 30 hours, practical classes — 42 hours, independent work — 108 hours</i>
Credit units	6
Required and recommended prior knowledge for studying the module	<i>theoretical mechanics, strength of materials, structural mechanics</i>
Module objectives/intended learning outcomes	Module objective: <i>The objective of the module is to provide students with knowledge, skills and abilities in researching the vibrations of buildings and structures under dynamic loads, as well as in calculating the strength, rigidity and stability of structures, including methods for determining the stresses and deformations that arise.</i> Main task of the discipline: <i>To provide students with basic skills in determining dynamic characteristics that are important in the calculation and design of earthquake-resistant buildings and structures, as well as in the calculation of dynamic loads, including basic design calculations for earthquake resistance.</i>
Content	Module 1. Dynamics and stability of structures <i>Statically determinate and indeterminate systems. Degrees of freedom. Strength, stiffness and stability. Static and dynamic loads. Supports. Oscillatory motion. Oscillations arising under the action of dynamic loads. Oscillations and their types. Free oscillations. Damped oscillations. Forced oscillations. Resonance. The role of oscillations in the technical field. The importance of oscillation suppression. The impact of oscillations. Dampers, silencers, actuators, seismic isolation, shock absorbers.</i> Module 2. Free oscillations of systems with one degree of freedom <i>Degree of freedom. Free oscillations. Frequency of free oscillations. Amplitude and damping coefficient of oscillations. Forced oscillations.</i>

	Harmonic external impact. Resistance of the environment. Differential equation of oscillatory motion. Damped oscillations. Frequency of oscillatory motion. Dynamic characteristics of the system. Concept of systems with an infinite number of degrees of freedom. Systems with uniformly distributed mass. Differential equation of motion and its solution. Dynamic characteristics of the system. Module 3. Approximate methods of calculating structures Theory of approximate methods. Dynamic impact. Impulse. Shock. Seismic load. Impact of a moving force. Impact of a shock on a structure. Impact of short-term loads. Introduction to the stability of structures. Basic concepts of stability. Calculation schemes and basic methods for calculating stability.
Forms of assessment	Oral questioning, presentations, written assignments, practical tasks, computational and graphical work, and final exams.
Requirements for study and assessment	To successfully complete the module, students must attend classes and earn a minimum number of points in the current, interim, and final assessments.
Bibliography	1. Dusmatov A.D., Akhmedov A.U. <i>Mechanics of Structures. Textbook.</i> – Fergana: ALPHA BRAND, 2024. – 212 p. 2. Dusmatov A.D., Akhmedov A.U. <i>Examples and Problems in Structural Mechanics. Study guide.</i> – Fergana: Classic, 2022. – 376 pages. 3. Vasilkov G.V., Buiko Z.V. <i>Structural mechanics. Dynamics and stability of structures. Study guide, 1st ed.</i> 2020. – 256 pages. 4. Shakirzyanov R.A., Shakirzyanov F.R. <i>Dynamics and Stability of Structures. Textbook.</i> – Kazan: KSUAE Publishing House, 2015. – 120 pp. 5. Kobilov B.A. <i>Fundamentals of Structural Dynamics and Seismic Resistance. Textbook (Part 1) / Tashkent Architectural and Construction Institute.</i> Tashkent, 2005. – 108 p. 6. Turaev Kh.Sh., Ismatov M.Kh., Yuldashev F.Kh., Zhavliev B.K. <i>Mechanics of Structures. Theoretical Foundations and Practical Problems</i> – Tashkent, Molia, 2002. 7. Abdurashidov K.S., Khobilov B.A., Tuychiev N.Dj., Rakhimbayev A.F. <i>Mechanics of Structures.</i> Tashkent: 'Uzbekistan', 1999. – 384 pages. 8. Nabiev A. <i>Strength of Materials. Textbook for universities.</i> – Tashkent: Yangi asr avlodi, 2008. – 380 pages.
Reviewers	M.M. Bakhramov — Associate Professor, Department of Civil Engineering, Fergana State Technical University T.M. Sabirjonov — Associate Professor, Department of Applied Mechanics, Fergana State Technical University