

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

Automation of Building and Structure Design

MODULE HANDBOOK

Field of knowledge:	700000	- Fields of Engineering, Processing, and Construction
Field of Education:	730000	-Architecture and Construction
Ta'lim yo'nalishi:	60730300	- Civil Engineering

Module title	<i>Automation of Building and Structure Design</i>
Code (if available)	<i>OPCT76</i>
Semester(s) of module teaching	<i>7</i>
Responsible for the module	<i>Abduraxmonov Abduxoliq Abduxodi, Department of Civil Engineering, Senior Lecturer</i>
Language of instruction	<i>Uzbek</i>
Connection to the curriculum	<i>Elective</i>
Teaching methods	<i>Practical training</i>
Study load (including classroom and independent study hours)	<i>Total hours: 180 hours. Audience hours: 72 hours Practical training - 72 hours Independent hours 108 hours.</i>
Credit units	6
Required and recommended prior knowledge for studying the module	<i>Computer Technologies in Structural Design, Building Structures, Earthquake Resistance of Buildings and Structures, Structural Mechanics, Theoretical Mechanics, Soil Mechanics</i>
Module objectives/intended learning outcomes	Module Objective: <i>The main objective of this module is to familiarize students with the preparation of design documentation during the process of designing buildings and structures, as well as with the possibilities of automating this process using modern information and communication technologies. Additionally, an important task of the module is to develop students' skills in systematically solving professional problems and to lay the foundation for deep mastering of design methods using modern computer software.</i> <i>The subject "Automation of Building and Structure Design" is a multi-disciplinary, integrated field formed as a result of scientific and technological progress, combining the following disciplines: computer technologies in structural design, computer-aided design (CAD), mathematical modeling, drafting and descriptive geometry, informatics and information technologies, structural mechanics, as well as the fundamentals of calculation and design of building structures.</i> <i>During the achievement of the above objectives, one of the important aspects in building and structure design is the independent study and analysis of scientific and technical literature related to design and construction calculations, and the development of skills to prepare summarized reference materials or analytical reports based on this literature. Furthermore, students must be able to systematically summarize theoretical and practical research results, analyze them scientifically, and effectively use modern computing tools and engineering software for processing calculation results.</i> <i>The following knowledge, skills, and competencies are required from students in this subject. The student:</i> <i>• Knowledge in computer modeling: The student must know how to correctly create computer models of buildings and structures during the design process and perform static and dynamic analyses of structures using modern calculation software. The student should also possess the ability to solve complex engineering problems related to spatial structures within a short time.</i>

	• <i>Calculation of reinforced concrete structures: The student must have the competence to determine the required amount of reinforcement and their cross-sectional areas, verify reinforced concrete structures according to ultimate and serviceability limit states, determine optimal dimensions of structural elements, and evaluate them based on relevant normative documents.</i> • <i>Input and analysis of necessary data for calculations: The student should know the mechanical properties of construction materials, correctly apply loads in the computer model, perform in-depth analysis of the obtained results, and select optimal technical solutions for the project.</i>
Content	1-modul. Capabilities of the Sapfir software. Introduction. Capabilities of the Sapfir software. Sapfir software interface. Designing foundation structures in Sapfir. 2-modul. Designing structures in Sapfir. Designing column structures in Sapfir. Designing beam structures in Sapfir. Designing stair structures in Sapfir. Designing wall structures in Sapfir. Designing lift shaft structures in Sapfir. Designing floor slab structures in Sapfir. Designing diaphragm structures in Sapfir. Designing truss structures in Sapfir. 3-modul. Reinforcement calculation. Designing roof structures in Sapfir. Modeling multi-storey frame buildings without beams in Sapfir. Modeling complex buildings in Sapfir. Modeling multi-storey frame buildings in Sapfir. 4-modul. Design using the SAPFIR-JBK system. Creating and applying loads. Opening calculation schemes in the LIRA-SAPR system. Designing inter-floor monolithic reinforced concrete slabs using the SAPFIR-JBK system. 5-modul. Additional reinforcement in the SAPFIR-JBK system. Additional reinforcement of reinforced concrete slabs using the SAPFIR-JBK system. Importing reinforcement selection results into the SAPFIR-JBK system. Placing additionally reinforced areas in the scheme. Generating reinforcement specifications and drawing sheets.
Forms of assessment	Oral presentations, written assignments, practical tasks, and final exams.
Requirements for study and assessment	To successfully complete the module, a student must attend classes and accumulate the minimum required scores from current, mid-term, and final assessments.
Bibliography	1. Yusufxojayev S. A. "Construction Structures" textbook. Tashkent, 2019. 2. V.F. Usmonov. "Reinforced Concrete and Masonry Structures" textbook. Sahhof, 2022, 552 pages. 3. Introduction to the LIRA 10.4 software package: Textbook / O.A. Kovalchuk, A.V. Kolesnikov, E.M. Rusanova, R.N. Suvorov. Moscow, 2015. 158 pages. 4. LIRA software package for calculation and design of structures. Basic theoretical and calculation principles: Textbook / Yu.N. Pchel'nikova, I.A. Kurohtina; Karaganda State Technical University. — Karaganda: KarGTU Publishing, 2015. — 84 pages.

Reviewers	<i>A.T. Jo'raboyev – Senior Lecturer (PhD), Department of Architecture, Fergana State Technical University; B.O. Egamberdiyev – Head of the Educational and Scientific Laboratory of “Assessment of Seismic Resistance of Building and Structure Constructions”;</i>
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