

## MODULE SPECIFICATION

Module code	
Module title in Polish	<b>Maszyny i urządzenia budowlane</b>
Module title in English	<b>Building Machines and Devices</b>
Module running from the academic year	<b>2016/2017</b>

### A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	<b>Civil Engineering</b>
Level of qualification	<b>First cycle</b> <i>(first cycle, second cycle)</i>
Studies profile	<b>Academic</b> <i>(academic/practical)</i>
Mode of study	<b>Full-time</b> <i>(full-time / part-time)</i>
Specialism	
Organisational unit responsible for module delivery	<b>The Department of Geotechnical and Hydraulic Engineering</b>
Module co-ordinator	<b>Kazimierz Sokołowski, PhD, Eng.</b>
Approved by	<b>Marek Iwański, Professor</b>

### B. MODULE OVERVIEW

Module type	<b>Core module</b> <i>(core/programme-specific/elective HES*)</i>
Module status	<b>Compulsory module</b> <i>(compulsory / non-compulsory)</i>
Language of module delivery	<b>English</b>
Semester in the programme of study in which the module is taught	<b>Semester 5</b>
Semester in the academic year in which the module is taught	<b>Winter semester</b> <i>(winter / summer)</i>
Pre-requisites	<b>None</b> <i>(module code/module title, where appropriate)</i>
Examination required	<b>No</b> <i>(yes / no)</i>
ECTS credits	<b>1</b>

Mode of instruction	lectures	classes	laboratories	project	others
<b>Total hours per semester</b>	<b>15</b>				

\* elective HES – elective modules in the Humanities and Economic and Social Sciences

### C. LEARNING OUTCOMES AND ASSESSMENT METHODS

<b>Module aims</b>	The aim of the module is to familiarise students with the principles of constructing and exploitation features of basic building machines and devices. Other aims are as follows: acquiring the abilities of appropriate selection of machines for working conditions (and their structure); acquiring students with machines and devices used to realise building structures, roads, and motorways; familiarising students with machine structure (as well as their equipment, efficiency, and work technology); teaching the structure and principles of operation concerning innovative control system (and building machine control).
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Module outcome code	Module learning outcomes	Mode of instruction (l/c/lab/p/ others)	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student knows the principle of construction and operation of basic building machines and devices.	l	B_W15	T1A_W06; T1A_W08; T1A_W09
W_02	A student is knowledgeable about the efficiency and technology of work concerning building machines.	l	B_W13	T1A_W02; T1A_W03; T1A_W06; T1A_W08
W_03	A student is knowledgeable about the structure and principle of operation as regards innovative systems of controlling and steering building machines.	l	B_W13	T1A_W02; T1A_W03; T1A_W06; T1A_W08
K_01	A student can formulate conclusions and describe the results of his/her own work.	l	B_K04	T1A_K01; T1A_K07

#### Module content:

##### 1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	The history of constructing building machines and devices until the beginning of the 20 <sup>th</sup> century. The types of building machine and device drives: a) first generation of building machine drives (a steam drive); b) second generation of building machine drives (a drive with IC and electric engine)	W_01
2.	c) third generation of building machine drives: a hydraulic drive, a drive with fixed delivery pumps d) fourth generation of building machine drives: a hydraulic drive equipped with pumps with variable efficiency (with automatic controllers)  Single-bucket excavators and loaders: general characteristics; main work parameters; the process of moving cohesive and non-cohesive soil; excavators and rope devices; multi-bucket excavators for ditches.	W_01
3.	Bulldozers, scrapers, graders, crushers, sifting machines, and transporters: general characteristics, main work parameters, calculating work efficiency.	W_01
4.	The automation of work concerning building machines: the systems of mutual engine and hydraulic system control; the systems of precision realisation of equipment motion; the systems providing faultless and non-collision work; the systems of gearbox control; the systems of automatic hydraulic clutch exchange; the systems of traction stabilization; the systems of supporting an operator; hydraulic system (closed, open, and load sensing ones); active systems of ground moving.  The systems of steering and controlling building machines:	W_02 W_03

	<ul style="list-style-type: none"> <li>a) the system of control for excavators and loaders</li> <li>b) the system of control for bulldozers, graders, and spreaders: 1D, 2D, and 3D systems</li> </ul>	
5.	<p>Machines and devices for consolidating subgrade; measurement systems of automatic control of the condensation state: static, vibrating, yielding rollers; vibro-plates, compactors, beaters, and other devices; active systems of controlling the current condensation state of soil and asphalt</p> <ul style="list-style-type: none"> <li>a) measurement systems for whole-surface for controlling condensation (Variocontrol, BTM Terrameter and BEM E<sub>vib</sub>-Meter )</li> <li>b) COMPATROL ® - an innovative system of continuous soil condensation control</li> <li>c) the system of automatic condensation control of bituminous mixes (Asphalt Manager): assessment criteria concerning soil condensation; normative requirements</li> </ul>	W_01 W_03
6.	<p>Machines and devices for pile and subgrade reinforcement works: hammers (gravity drop, single-acting, and double-acting); devices for reinforcing subgrade with the impact test method; vibrating hammers, vibroflots, vibration subgrade reinforcement, ram engines, machines for driven piles (Frank piles), access arms, chisels, drill rigs</p> <ul style="list-style-type: none"> <li>- devices for making piles drilled and formed in soil (Wolfsholz, BSP, H-W, CFA)</li> <li>- devices for making piles with the vibrofloting method</li> <li>- devices for making diaphragm walls</li> <li>- drill rigs for making anchorings, soil anchors</li> </ul>	W_01 W_03
7.	<p>Machines and devices for transporting construction elements:</p> <ul style="list-style-type: none"> <li>- constructional elements of cranes (headblocks, compound pulleys, band systems, and hoisting winches)</li> <li>- cranes (sheer, mast, and Derrick); wheeled cranes; telescope cranes; tower cranes; creeping cranes.</li> </ul> <p>Special machines and devices: machines for recycling building rubble; machines for recycling asbestos-cement products; robots.</p>	W_03

2. Topics to be covered in the classes
3. Topics to be covered in the laboratories
4. Topics to be covered in the projects

### Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
W_01	A paper
W_02	A paper
W_03	A paper
K_01	A paper

### C. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	Study time/ credits
1	Contact hours: participation in lectures	<b>15</b>
2	Contact hours: participation in classes	
3	Contact hours: participation in laboratories	

4	Contact hours: attendance at office hours (2-3 appointments per semester)	
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	
8		
9	<b>Number of contact hours</b>	<b>15</b> <i>(total)</i>
10	<b>Number of ECTS credits for contact hours</b> <i>(1 ECTS credit =25-30 hours of study time)</i>	<b>0.6</b>
11	Private study hours: background reading for lectures	
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	<b>15</b>
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	
18	Private study hours: preparation for an examination	
19		
20	<b>Number of private study hours</b>	<b>15</b> <i>(total)</i>
21	<b>Number of ECTS credits for private study hours</b> <i>(1 ECTS credit =25-30 hours of study time)</i>	<b>0.6</b>
22	<b>Total study time</b>	<b>30</b>
23	<b>Total ECTS credits for the module</b> <i>(1 ECTS credit =25-30 hours of study time)</i>	<b>1</b>
24	<b>Number of practice-based hours</b> <i>Total practice-based hours</i>	<b>15</b>
25	<b>Number of ECTS credits for practice-based hours</b> <i>(1 ECTS credit =25-30 hours of study time)</i>	<b>0.6</b>