


Kyiv National University
of Construction and Architecture

Department _ of environmental
protection technologies
and labor protection


Cipher of specialty	Name of speciality, educational program	Page 1 з 4
183	Technologies of environmental protection	

Head of Department

TKACHENKO T. /  /
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Syllabus developer

KOTOVENKO O. /  /

SYLLABUS

Mathematical methods in ecology

1) Cipher according to the educational program	183
2) Academic year	2023-2024
3) Educational level , second level of higher education (master's degree)	
4) Study form	full-time/external
5) Knowledge Field	18 Production and technologies
6) Speciality, educational program name	Technologies of environmental protection
7) Educational component status	optional
8) Semester	10 (2M)
9) Teacher contact details	associate professor Kotovenko O., kotovenko.oo@knuba.edu.ua , +380674644709, http://www.knuba.edu.ua/?page_id=45372
10) Language of teaching	Ukrainian
11) Pre-requisites	higher mathematics, modeling and environment state forecasting, information technologies
12) Purpose:	The discipline studying purpose is students acquire scientifically based knowledge about mathematical methods for solving problems of nature management, modeling and environmental state forecasting, the evolutionary technogenesis development, which arise in ecology in connection with anthropogenic environmental load.

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9) Study results				
№	Program study result	Method of checking educational effect	The form of classes	Reference to competence
	PR01. Analyze complex systems, understand their relationships and organizational structure.	Discussion, discussion during classes, report	Lectures	IC GC 01,03,05 SC 02
	PR03. To use modern communication and computer technologies in the field of environmental protection, to collect, store, process and analyze information about the environment state and the production sphere in order to solve the professional activity task	Discussion, discussion during classes	Lectures, practical classes	IC GC 01,03 SC 02
	PR04. To justify decisions aimed at minimizing environmental risks of economic activity at the national, regional and local levels.	Discussion, discussion during classes	Lectures , practical classes	IC GC 01,03 SC 02
	PR10. Assess the industrial facilities impact on the environment, the engineering activities consequences on the environment and the related responsibility for the decisions made, plan and conduct applied research on the problems of the industrial facilities impact on the environment	Individual task	Lectures, practical classes	IC GC 01,03 SC 02
	PR15. Develop models, recommendations and forecasts, standards and other normative documents when designing technological processes in the conditions at global climate changes.	Discussion, discussion during classes	Lectures , practical classes	IC GC 01,03 SC 02

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9) Course structure						
Lectures, hours	Practical classes, hours	Laboratory classes, hours	Course project/ term paper CGW/ Control work	Independent work of the acquirer, hours.	Final control form	
20/12	10/6		Individual work	60/72	test	
Sum of hours:			90/90			
Total number of credits ECTS			3/3			
The number of hours (ECTS credits) of classroom workload			30/18			
						30/18
Lectures:						
Content module 1. <i>Mathematical methods of approximate calculation and their application in solving environmental problems</i>						
Topic 1. Mathematical methods of nonlinear equations approximate solution and their application in state environmental mathematical modeling						
Topic 2. Methods of linear equations systems approximate solution and their application in environmental state mathematical modeling						
Topic 3. Methods of nonlinear equations systems approximate solution and their application in environmental state mathematical modeling						
Topic 4. Methods of numerical integration of ordinary differential equations and their application in environmental state mathematical modeling						
Topic 5. Approximate solution a linear boundary value problem and its application in environmental state mathematical modeling						
Topic 6. Methods of numerical solution partial differential equations and their application in environmental state mathematical modeling						
Topic 7. Mathematical programming methods and their application in operation research models for solving environmental problems (rational nature management problems and environmental- economic problems)						

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Practical classes:	
1	Numerical solution nonlinear equations
2	Numerical solution systems linear algebraic equations
3	Numerical solution systems nonlinear algebraic equations.
4	Numerical solution ordinary differential equations
Course project/ term paperCGW/ Control work	
CGW. Application approximate methods solving linear boundary value problems and numerical methods solving partial differential equations for specific ecological models	
Individual work:	
<ol style="list-style-type: none"> 1. Mastering the lecture material 2. Preparation for practical classes and individual work under the guidance of the teacher 3. Performance of an individual task 4. Work with literature and electronic media 	
13) Literature:	
Methodic literature	
<ol style="list-style-type: none"> 1. Navchal'nyj posibnyk (u 2 chastynakh) dlja studentiv spetsial'nosti 101 «Ekolohiia» , 183 «Tekhnolohii zakhystu navkolyshn'oho seredovyscha» / Chastyna 1. Matematychni metody nablyzhenoho obchyslennia ta ikh zastosuvannia pry vyrishenni ekolohichnykh zadach. Kyiv: KNUBA, 2019. 48 s. 2. Matematychni metody v ekolohii: Metodychni vказivky do vykonannia praktychnykh robit dlja studentiv spetsial'nosti/ O.A. Kotovenko, L.I. Sobolevs'ka, O.Yu. Miroshnychenko, O.V. Hapula. Kyiv:KNUBA, 2007. 32 s. (Onovleno v elektronnomu vyhliadi u 2020 r.) 	
Basic	
<ol style="list-style-type: none"> 1. <i>Branovyts'ka S.V., Medvedev R.B., Fialkov Yu.Ya.</i> Obchysliuval'na matematyka ta prohramuvannia : Obchysl. matematyka v khimii i khim. tekhnolohii: Pidruch. dlja stud. khim.-tekhnol. spets. vysch. navch. zakl. Kyiv: Politekhnik NTUU "KPI"; Periodyka, 2004. 2. <i>Demedovych V.P., Maran Y.A.</i>, Osnovy vychyslytel'noj matematyky. Nauka, 1970. 664 s. 3. <i>Zavarykyn V.M., Zhytomyrskyj V.H., Lapchyk M.P.</i> Chyslennye metody. Prosveschenye, 1990. 170 s. 4. <i>Wagner, H.</i> Principles of Operations Research, 2d ed. En-. 5. <i>M. Mynu</i> Matematycheskoe prohrammyrovanye. Teoryia y alhorytmy. Nauka Hl. red.. fyz-mat. lyt 1990. 480 s. ISBN 5-02-013980-7 	