

D. E. Turalina
D. Zh. Bosinov

Laboratory works for **FLUID MECHANICS**

Educational-methodical manual



QAZAQ
UNIVERSITY
PUBLISHING HOUSE

UDC 532 (075.8)
LBC 22.365 я 73
T 95

*Recommended by the publishing council
and the Scientific Council of the Faculty of Mechanics
and Mathematics of the Kazakh National University of Al-Farabi
(Protocol №4 dated 29.12.2017)*

Author of review:
PhD *A.A. Kudaikulov*

Turalina D.E.

T 95 Laboratory works for fluid mechanics: educational-methodical manual / D.E. Turalina, D.Zh. Bosinov. – Almaty: Qazaq University, 2018. – 53 p.

ISBN 978-601-04-3245-1

The manual was developed in accordance with the program of the discipline «Mechanics of liquids and gases», which is studied on the professional module block, specialty 5B060300 – Mechanics.

The manual contains explanation of 7 laboratory works related to the mechanics of liquids and gases. The purpose of each laboratory work, a brief theoretical introduction, explanation of experimental devices, the order of work execution, tasks and topics.

The manual is intended for students studying on the specialty of Universities.

Published in authorial release.

UDC 532 (075.8)
LBC 22.365 я 73

ISBN 978-601-04-3245-1

© Turalina D.E., Bosinov D.Zh., 2018
© KazNU named after Al-Farabi, 2018

INTRODUCTION

«Laboratory works for fluid mechanics», which included the content of the «Mechanics of liquids and gases», «Mechanics of liquids and gases» and «Practical hydromechanics», specialty «5B060300 – Mechanics», compiled in accordance with the content of the main curriculum of these disciplines.

The manual book explains the practical exercises in the laboratory «Hydrostatics» and «Hydrodynamics» in the field of mechanics of liquids and gases. The purpose of each laboratory work is to summarize the short theories, the interpretation of experimental devices, the order of the practice, the tasks and the self-exam questions and reports. Each laboratory work was supplemented by visual illustrations, tables, and the list of available basic and additional literature.

The educational and methodical manual is offered to students, teachers and specialists in the field of mechanics of liquids and gases specialty «5B060300 – Mechanics».

Your comments and suggestions to improve the content and quality of the teaching manual will be welcomed by the writer and will be considered in the following issue.

Author
dinara.turalina@kaznu.kz

CONTENTS

INTRODUCTION.....	3
1. HYDROSTATICS.....	4
1.1. BASIC CONCEPTS OF HYDROSTATICS.....	4
1.1.1. Devices of liquids	9
1.1.2. Pressure force fluid on the flat walls	12
1.2. DESCRIPTION LABORATORY BENCH «HYDROSTATIC HS»	15
1.3. LABORATORY WORK AT THE STAND «HYDROSTATICS – HS»	16
1.3.1. Determination hydrostatic pressures	16
Laboratory work №1.3.1	16
1.3.2. Determination of density of an unknown liquid.....	18
Laboratory work №1.3.2.....	18
1.3.3. Determine the force the fluid pressure at a flat wall	20
Laboratory work №1.3.3	20
2. HYDRODYNAMICS	23
2.1. BASIC CONCEPTS OF HYDRODYNAMICS.....	23
2.2. DESCRIPTION LABORATORY BENCH «HYDRODYNAMICS»	27
2.3. PREPARING TO WORK BENCH	30
2.4. LABORATORY WORK at the stand «HY DRODYNAMICS HD»	30
2.4.1. Pressure losses on pipe length.....	30
2.4.2. Diagramming the Bernoulli equation.....	33
2.4.3. Pressure loss at sudden axisymmetric expansion of pipe	37
2.4.4. Researching the changes of flow regimes	40
APPLICATIONS.....	43
REFERENCES.....	51

Educational issue

Turalina Dinara Eleusizovna
Bosinov Daniyar Zhumadilovich

LABORATORY WORKS FOR FLUID MECHANICS

Educational-methodical manual

Typesetting and
cover design *G. Kaliyeva*

IB №11735

Signed for publishing 23.02.2018 Format 60x84 ¹/₁₆. Offset paper.
Digital printing. Volume 3,31 printer's sheet. 50 copies. Order №741.
Publishing house «Qazaq University»
Al-Farabi Kazakh National University
KazNU, 71 Al-Farabi, 050040, Almaty

Printed in the printing office of the «Kazakh University» publishing house.

Новые книги

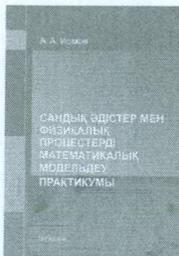
издательского дома «КАЗАК УНИВЕРСИТЕТИ»

Исахов А.А. Сандық әдістер мен физикалық процестерді математикалық модельдеу практикумы: оқу құралы / А.А. Исахов. – Алматы: Қазақ университеті, – 2017. – 212 б.

ISBN 978-601-04-2812-6

Оқу құралы сандық әдістер мен физикалық процестерді математикалық модельдеу негіздерін баяндауға арналған. Студенттерді физикалық процестерді математикалық модельдеу дағдыларына үйрету мақсатында сандық әдістер мен оларды C/C++ программалау тілінде жазылған код түрінде жүзеге асыру мысалдары көп мөлшерде берілген.

Оқу құралы бакалавриат және магистратура бағдарламасына сәйкес математикалық және компьютерлік пішіндеу мамандығы бойынша білім алатын төменгі де, жоғарғы да курс студенттеріне арналған. Сонымен қатар механика, физика және т.б. мамандықтарды оқыту кезінде де қолданылады.

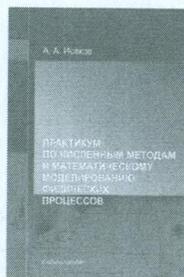


Исахов А.А. Практикум по численным методам и математическому моделированию физических процессов: учебное пособие / А.А. Исахов. – Алматы: Қазақ университеті, 2017. – 210 с.

ISBN 978-601-04-2813-3

Учебное пособие посвящено изложению основ численных методов и математическому моделированию физических процессов. Содержит большое количество численных методов и примеры их реализации в виде программных кодов, написанных на языке C/C++ в целях обучения студентов навыкам математического моделирования физических процессов.

Учебное пособие предназначено для студентов как младших курсов, так и старших, обучающихся по специальности «Математическое и компьютерное моделирование» в соответствии с программой бакалавриата и магистратуры, а также может быть полезным при обучении студентов других специальностей, таких как «Механика», «Физика» и т.д.



По вопросам приобретения обращаться в отдел продаж издательства «Казак университеті». Контактные тел.: 8 (727) 377-34-11, 328-56-51.

E-mail: baspa@kaznu.kz, сайт: www.read.kz, www.magkaznu.com