

Department of Physics and Mathematics
of IPMC of Pirogov Russian National
Research Medical University



Pirogov
University

«PHYSICS, MATHEMATICS»

Specialty: Dentistry





1st SEMESTER

LINK for LECTURES **“PHYSICS, MATHEMATICS”**

Dentistry 2026

<https://my.mts-link.ru/j/RNIMU/24275060289>



ABOUT THE DEPARTMENT

The Department provides training in Russian and English to first-year students in the following Specialties:

- ✓ **General Medicine**
- ✓ **Pediatrics**
- ✓ **Dentistry**
- ✓ **Pharmacy**
- ✓ **Biotechnical Systems and Technologies**
- ✓ **Clinical Psychology**



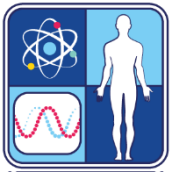
**Pirogov
University**



**Institute of Pharmacy
and Medicinal Chemistry
(IPMC)**



**Department of Physics
and Mathematics of IPMC**



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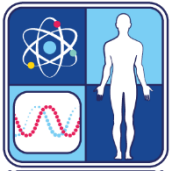


ELECTIVE COURSES

2nd Semester

- ✓ **3-D Modeling and Nanomaterials in Dentistry**
- ✓ **Modern Technologies in Dentistry**





ABOUT THE DEPARTMENT

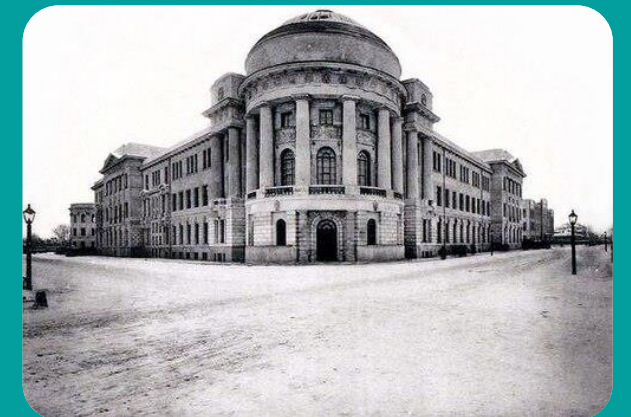


The history of the Department of Physics and Mathematics begins in 1906, when Professor **Alexander EIKHENVALD** organized the teaching of Physics for medical students of the Moscow Higher Women's Courses (MHWC) and for the first time in history introduced Practical Classes in Physics for medical students

Alexander Eikhenvald was the head of the Department of Physics at MHWC from 1906 to 1917



EICHENVALD
Alexander
Alexandrovich
(1863–1944)



MHWC

ABOUT THE DEPARTMENT



Pirogov
University



Department
of Physics and
Mathematics



**Machneva
Tatyana Vyacheslavovna**

Head of the Department of
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Kyagova Alla Anatolievna

Responsible for international students at the
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room 1025
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Pirogov
University

STUDENT SCIENTIFIC CIRCLE

✓ Research areas:

1. Study of mechanical properties of human biological tissues.
2. Medical and Biological Physics in Medicine.

*The research is being conducted jointly with
the clinical departments of Pirogov University*

Scientific supervisors: Professor Fedorova V.N
Senior Lecturer Nemchenko O.Yu.





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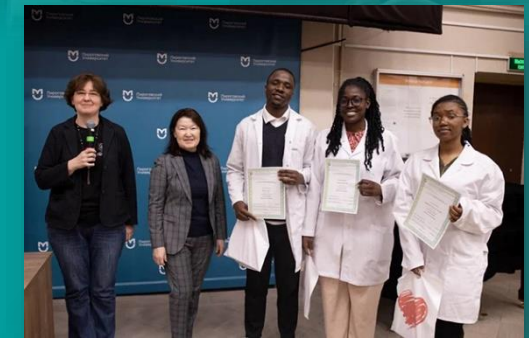


Pirogov
University

EXTRACURRICULAR ACTIVITIES

✓ Conference
«Physics in Medicine»

✓ Conference
«The Physical Foundations of Dental
Materials Science»





Why Do Dentists Study Physics

Physics is necessary to understand how medical equipment and instruments work

- ❖ Dentists use **physical instruments** (tweezers, hooks, clamps, etc.) and devices (ultrasound devices for cleaning and treating teeth, X-ray machines, etc.) on a daily basis
- ❖ Knowing the basics of Physics allows us to understand **how** these **devices work** and **how to use them correctly**



Mechanical instruments



Ultrasonic scaler for teeth cleaning and polishing



Laser Therapy device



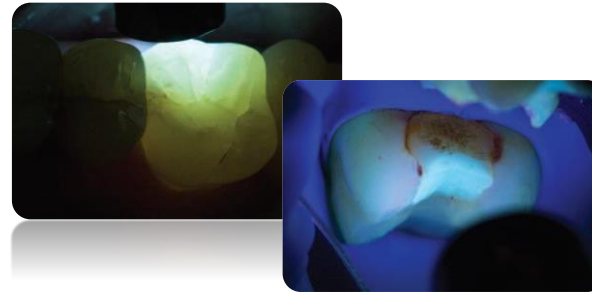
Why Do Dentists Study Physics

Physical Diagnostic Methods in Dentistry



Electroodontometry (EDO)

(EDO is a dental technique that uses **weak electrical currents** to determine the dental pulp vitality)



Laser Diagnostics

(A diagnostic method based on the use of **UV and visible light** to detect hidden caries, cracks in the tooth structure and restorations)



Dental Doppler Ultrasonography

(A non-invasive imaging technique that uses US waves to visualize and assess blood flow in the soft tissues and structures of the mouth.

Technic is based on the **Doppler Effect** for ultrasound waves)



Why Do Dentists Study Physics

Physical Diagnostic Methods in Dentistry



Radiography (Roentgenography)



Computed tomography (CT)

- ❖ Both methods are based on the application of X-ray radiation and the attenuation of its flux as a result of absorption and scattering by the patient's tissues.
- ❖ The ways by which images are obtained by these methods differ:
 - **Radiography** gives a **flat 2D image** obtained by a single passage of the ray beam through the patient's tissues;
 - **CT** creates **layered 3D slices** of the area being examined by rotating the machine around the patient and computer processing the data



Why Do Dentists Study Physics



Ultrasonic preparation of teeth

(Method of treating hard dental tissues and root canals using high-frequency ultrasonic waves)



Dental Microscope

- A Dental Microscope is needed to increase the working area multiple times, which allows the doctor to conduct precise diagnostics and treatment of teeth
- Working with such a microscope requires the doctor to have knowledge in such a Section of Physics as "**Optics**"



Orthopedics

- Orthopedic surgeons work with materials, mechanical restorations and prostheses
- **Physical principles** are the foundation for understanding the properties of these materials, the mechanisms of their interaction with the patient's tissues for the successful restoration of tissue functions using orthopedic structures
- A doctor have to knowledge in such sections of Physics as "**Mechanics**" and "**Biomechanics**"



Why Dentists Should Study Mathematics

- ❖ **Understanding Mathematical Principles** helps the dentist to correctly evaluate cause-and-effect relationships when **making a diagnosis and choosing treatment**, as well as calculate accurate doses of medications
- ❖ **Mathematical models and calculations** are necessary to determine the optimal shape, size and materials for orthopedic prostheses, taking into account the individual characteristics of the patient, the condition of the jaw and the remaining teeth
- ❖ **Mathematics** is necessary for **processing and interpreting images** obtained by CT and X-ray machines and other devices





Content of the Discipline "PHYSICS, MATHEMATICS"

Section	Topic Names
Section 1	
Basic concepts of Mathematical Statistics	<i>Practical Classes</i> 1. Basic concepts of Mathematical Statistics 1 2. Basic concepts of Mathematical Statistics 2 3. Current midterm (Module) control for Section 1: CONTROL WORK
Section 2	
Mechanical and thermal properties of biological tissues and dental materials. Thermal properties of materials	<i>Practical Classes</i> 1. Mechanical properties of materials 1 2. Mechanical properties of materials 3. Viscosity and flow of fluids 4. Surface tension. Capillary phenomena. Humidity 5. Thermal properties of materials 6. Current midterm (Module) control for Section 2: COLLOQUIUM 1 Lectures: Mechanics. Fundamentals of statics. Biomechanics Adhesion: Role in Dentistry



Content of the Discipline "PHYSICS, MATHEMATICS"

Section	Topic Names
Section 3	
Physical Fundamentals of Diagnostic and Treatment Methods in Dentistry	<i>Practical Classes</i> 1. Geometrical Optics and its importance in Dentistry 2. Optical microscopy. Dental microscope 3. Light absorption and scattering in Dentistry 4. Photometry. Light sources in Dentistry 5. X-ray and its application in Dentistry. Dosimetry 6. Current midterm (Module) control for Section 3: COLLOQUIUM 2 Lectures: Acoustic methods in Dentistry Electrical physiotherapeutic methods in Dentistry Laser radiation. Lasers in Dentistry



TYPES OF CLASSES AND FORMS OF CURRENT PROGRESS MONITORING

TYPE OF CLASS	FORM OF CURRENT CONTROL OF ACADEMIC PERFORMANCE
Practical Class	Written survey Checking laboratory work Checking the notes Testing
Control work	Written survey
Colloquium	Oral survey

The form of INTERMEDIATE CERTIFICATION is a CREDIT



DISCIPLINE RATING STRUCTURE

- ✓ The **RATING** for the Discipline is calculated based on the current academic performance of the student
- ✓ The type of control for all forms of control is **differentiated**, grades are given on a scale: "unsatisfactory", "satisfactory", "good", "excellent"
- ✓ Based on the ratio and number of controls, **rating points are calculated** that correspond to the differentiated control system

Виды занятий		Формы текущего контроля успеваемости/виды работы		Кол-во контролей	Макс. кол-во баллов	Соответствие оценок рейтинговым баллам ***				
						ТК	ВТК	Отл.	Хор.	Удовл.
Лабораторно-практическое занятие	ЛПЗ	Опрос письменный	ОП	1	13	В	Т	13	9	5
		Проверка лабораторной работы	ЛР	11	143	В	Т	13	9	5
		Проверка конспекта	К	5	65	В	Т	13	9	5
		Тестирование в электронной форме	ТЭ	7	91	В	Т	13	9	5
Контрольная работа	КР	Опрос письменный	ОП	1	234	В	Р	234	156	78
Коллоквиум	К	Опрос устный	ОУ	2	468	В	Р	234	156	78
Сумма баллов за семестр					1014					

Based on the results of calculating the rating for a discipline in the first semester, a student can be certified for the Discipline **without attending the Credit procedure**, provided that:

Оценка	Рейтинговый балл
Зачтено	600



STUDY MATERIALS



Unified personal
account

Вход - Единый личный кабинет РНИМУ им. Н.И. Пирогова

Единый личный кабинет
Пироговский Университет

Навигация
Главная

Вход

Email *

Пароль *

Не выходить из учетной записи автоматически

Войти Зарегистрироваться

Забыли пароль?

Инструкция для сотрудников
Инструкция по работе с
Единым личным кабинетом для
сотрудников Университета

Документы для поступления
иностранцев граждан

Инструкция для студентов
По входу в Единый ЛК и ЛК
студента



Платформа электронного обучения РНИМУ

Обучение

Физика, математика

Прогресс: 2%

Учебное пособие | Занятие 1.0. Отд...

Учебное пособие | Конспект лекц...

Учебное пособие | Занятие 2. Отд...

Механические свойства твердых...

Pirogov University
e-learning platform

<https://lk.rsmu.ru>

РНИМУ им. Н.И. Пирогова - C x Учебное пособие | Конспект л x +

lms.rsmu.ru/subject/lesson/index/lesson_id/4292/subject_id/1227

ПИРОГОВСКИЙ
УНИВЕРСИТЕТ

Главная
Обучение
Каталог курсов
База знаний
Новости

Тема: Механические свойства материалов 1

Цель: рассмотрение физических явлений по теме «Механические свойства материалов 1» и примеров их применения в области медицины.

Содержание:

1. Деформация. Способы деформирования.
2. Закон Гука. Модуль Юнга. Механическое напряжение.
3. Коэффициент Пуассона.
4. Диаграмма растяжения.
5. Явления ползучести и релаксации напряжения, их проявления в стоматологии.
6. Механические характеристики тканей зуба и пломбировочных материалов.

Следующее занятие >

Учебное пособие | Занятие 5. Механические свойства материалов 2

Учебное пособие | Занятие 5. Механические свойства материалов 2

Окончание занятия
Не ограничено

Предыдущее занятие <

Механические свойства материалов

Окончание занятия
Не ограничено

Рубежный контроль по Разделу 2: Механические и тепловые свойства биологических тканей и стоматологических материалов.

ПРИМЕР БИЛЕТА

КОЛЛОКВИУМ 1

1. Деформация. Способы деформирования твердых тел (растяжение, сжатие, сдвиг, изгиб, кручение). Механическое напряжение.
2. Адгезия. Адгезивы и субстраты.

ПИРОГОВСКИЙ
УНИВЕРСИТЕТ

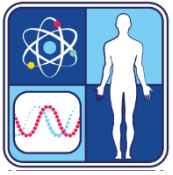
Кафедра физики и математики

Лабораторная работа
"Определение поверхностного
натяжения жидкостей"

ФГАОУ ВО "РНИМУ им. Н.И. Пирогова"
Минздрава России
Кафедра физики и математики

Видео-демонстрация
выполнения лабораторной
работы «Определение
поверхностного натяжения
жидкостей»

0:00 / 2:46



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THANK YOU FOR ATTENTION