**Federal State Autonomous Educational Institution for Higher Education**

**Peoples' Friendship University of Russia named after Patrice Lumumba**

**(RUDN University)**

**ENGINEERING ACADEMY**

(name of the main educational unit - program developer)

**Department of Nanotechnology and Microsystem Engineering**

(name of the basic educational unit - program developer)

# COURSE SYLLABUS

DESIGN AND TECHNOLOGY OF INSTRUMENTATION AND RADIOELECTRONIC EQUIPMENT

(course title)

**Scientific specialty:**

2.2.9 Design and technology of instrumentation and radioelectronic equipment

(speciality code and title)

**Mastering the discipline is carried out within the framework of the postgraduate program:**

Design and technology of instrumentation and radioelectronic equipment

(program name)

**2024**

## 1. PURPOSE OF THE DISCIPLINE

The aim of the discipline " Design and technology of instrumentation and radioelectronic equipment" is to prepare for the candidate examinations, as well as to master the competences (AK - academic competences, RC - research competences).

## 2. REQUIREMENTS FOR THE RESULTS OF THE DISCIPLINE

The study of the discipline " Design and technology of instrumentation and radioelectronic equipment" is aimed at preparing for the candidate examinations.

## 3. SCOPE OF THE DISCIPLINE AND TYPES OF STUDY

The total workload of the discipline " Design and technology of instrumentation and radioelectronic equipment" is 3 credits.

*Table 3.1. Types of academic work by period of study of the postgraduate programme*

| **Type of study** | | **TOTAL,** ac. h. | **Course** | | | |
|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** |
| *Contact work, ac.h.* | | 60 | | | 60 | |
| including: | | | | | | |
| Lectures (**LC**) | | 30 | | | 30 | |
| Laboratory work (**LW**) | | | | | | |
| Practical/seminar classes (**SP**) | | 30 | | | 30 | |
| *Independent work of students, ac.h.* | | 48 | | | 48 | |
| *Control (credit with grading), ac.h.* | | | | | | |
| **Total time commitment of the discipline** | ac.h. | **108** | | | **108** | |
| | credits | **3** | | | **3** | |

## 4. CONTENT OF THE DISCIPLINE

*Table 4.1. Content of the discipline (module) by type of study work*

| **Name of discipline section** | **Section (topic) content** | **Type of study** |
|---|---|---|
| Section 1: Design features of nanoelectronics products. | The basic principles of the design process. The main trends in the development of electronic equipment. Printed circuit boards (basic definitions, functions). Planar technology and integrated circuits (basic concepts, technological operations, design). Basic elements of the nanoelectronic base. | SP, SRS |
| Section 2: Production technology for micro- and nanosystems | The concept of micro- and nanoelectronic circuit technology. Preparation of semiconductor substrates. The alloying of semiconductor substrates. Application of films to the surface of substrates. | SP, SRS |

| Name of discipline section | Section (topic) content | Type of study |
|---|---|---|
| Section 3: Reliability of nanoelectronic and microsystem devices. | Reliability indicators of technical systems. Reliability assessment of nanoelectronic and microsystems technology devices. Fundamentals of physics of failure theory of nanoelectronics and microsystems engineering devices. Control and testing methods for nanoelectronic and microsystems devices. | SP, SRS |

## 5. LOGISTICS OF THE DISCIPLINE

*Table 5.1. Logistical support for the discipline*

| Type of audience | Classroom equipment | Specialised training/laboratory equipment, software and materials for the discipline (if necessary) |
|---|---|---|
| Lecture room | Study rooms №554 for lectures, practical classes, group and individual consultations, current monitoring and interim certification. Set of specialized furniture: technical means: plasma TV Samsung PS-50 A410C1 | |
| Laboratory | Study rooms №554 for lectures, practical classes, group and individual consultations, current monitoring and interim certification. Set of specialized furniture: technical means: plasma TV Samsung PS-50 A410C1 | |
| Seminar room | Study rooms №554 for lectures, practical classes, group and individual consultations, current monitoring and interim certification. Set of specialized furniture: technical means: plasma TV Samsung PS-50 A410C1 | |
| Computer lab | Computer room for classes, group and individual consultations, current control and interim certification, equipped with personal computers (____ pcs.), blackboard (screen) and technical means of multimedia presentations. | |
| For independent work of students | An auditorium for students' independent work (can be used for seminars and consultations), equipped with a set of specialised furniture and computers with access to the EIOS. | |

* - the classroom for students' independent work is obligatory!

## 6. TRAINING, METHODOLOGICAL AND INFORMATION SUPPORT

**FOR THE DISCIPLINE**

*Basic literature:*


1. Норенков И.П. Основы автоматизированного проектирования. Учеб. для вузов. М.: Изд-во МГТУ, 2000 г.
2. Муромцев Д. Ю., Тюрин И. В., Белоусов О. А. Конструирование узлов и устройств электронных средств: учебное пособие. Ростов н/Д: Феникс, 2013 г. – 540 с.
3. ЭБС «Znanium. com.» Основы конструирования и технологии производства радиоэлектронных средств : учебное пособие / Г. М. Алдонин, А. К. Дашкова, Ф. В. Зандер [и др.]. - Красноярск : Сиб. федер. ун-т, 2019. - 372 с. - Режим доступа: http://znanium.com/
4. Юрков, Н. К. Технология производства электронных средств : учебник / Н. К. Юрков. — 2-е изд., испр., доп. — Санкт-Петербург : Лань, 2021. — 480 с. — ISBN 978-5-8114-1552-6. — Текст : электронный // Лань : электронно-библиотечная система.
5. Основы конструирования и технологии производства радиоэлектронных средств. Интегральные схемы : учебник для вузов / Ю. В. Гуляев [и др.] ; под редакцией Ю. В. Гуляева. — Москва : Издательство Юрайт, 2023. — 460 с.


*Further reading:*


1. ЭБС «Znanium. com.» Головков, А. А. Компьютерное моделирование и проектирование радиоэлектронных средств : учебник для вузов / А. А. Головков, И. Ю. Пивоваров, И. Р. Кузнецов. - Санкт-Петербург : Питер, 2021. - 208 с. - Режим доступа: http://znanium.com/
2. Основы конструирования и технологии производства радиоэлектронных средств. Электронные радиационные технологии: учебник для вузов / А. С. Сигов, В. И. Иванов, П. А. Лучников, А. П. Суржиков ; под редакцией А. С. Сигова. — Москва : Издательство Юрайт, 2023. — 321 с.
3. Технология тонких пленок и покрытий: учебное пособие / Л. Н. Маскаева, Е. А. Федорова, В. Ф. Марков ; под общей редакцией Л. Н. Маскаевой ; Министерство образования и науки Российской Федерации, Уральский федеральный университет имени первого Президента России Б.Н. Ельцина. — Екатеринбург : Издательство Уральского университета, 2019. — 236 с. — ISBN 978-5-7996-2560-3.


*Resources of the information and telecommunication network "Internet":*

1. the RUDN electronic library system and third-party electronic libraries to which university students have access on the basis of contracts:

- RUDN Electronic Library System - RUDN EBS http://lib.rudn.ru/MegaPro/Web
- The University Library Online electronic library system http://www.biblioclub.ru
- The Yurite electronic library system http://www.biblio-online.ru
- Student Consultant electronic library system www.studentlibrary.ru
- Lan LGS http://e.lanbook.com/
- Trinity Bridge

2. databases and search engines:

- electronic collection of legal and normative-technical documentation http://docs.cntd.ru/

- search engine Yandex https://www.yandex.ru/

- Google search engine https://www.google.ru/

- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

*Teaching materials for students' independent work while mastering the discipline/module*:*

1. Course of lectures on the discipline "Theoretical Mechanics, Dynamics of Machines".

* - all teaching materials for students' independent work are placed in accordance with the current procedure on the discipline page in TUIS!

## 7. ASSESSMENT MATERIALS AND SCORING SYSTEM FOR ASSESSING THE LEVEL OF COMPETENCE IN THE DISCIPLINE

The assessment materials and grading system for the discipline are presented in the Appendix to this Work Programme of the discipline.

* - OM and BRS are formed based on the requirements of the relevant local normative act of PFUR.

**DEVELOPERS:**

Assistant Professor M.O. Makeev

**HEAD OF THE BASIC EDUCATIONAL UNIT**

Assistant Professor S.V. Popov