Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
RUDN University

Academy Of Engineering
(educational division (faculty/institute/academy) as programme developer)

Department of Nanotechnology and Microsystem Engineering
(department realizing the PhD program)

COURSE SYLLABUS

Design and technology of instrumentation and radio electronic equipment
(course title)

Scientific specialty:
2.2.9 Design and technology of instrumentation and radio electronic equipment
(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:
Design and technology of instrumentation and radio electronic equipment
(PhD program title)

2026 г.

1. DISCIPLINE (MODULE) GOAL

The objective of mastering the discipline «Design and technology of instrumentation and radio electronic equipment» is to prepare for the candidate examinations.

2. REQUIREMENTS TO PHD-STUDENTS ON FINISHING THE COURSE

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

3. WORKLOAD OF THE DISCIPLINE AND TYPES OF ACTIVITIES

The overall workload of the discipline «Design and technology of instrumentation and radioelectronic equipment» is 3 credit units (108 academic hours).

Types of activities		**Total ac. hrs.**	**Semesters**
Classroom activities (total), including:		36	36
в том числе:			
Lectures (LC)		20	20
Laboratory activities (LA)		–	–
Practical lessons/Seminars (PC)		16	16
Independent work		36	36
Intermediate certification (test with assessment/exam)		36	36
Overall workload	ac. hrs.	108	108
	credits	3	3

4. CONTENT OF THE DISCIPLINE

Name of the discipline section	**Contents of the section (topic)**	**Type of study work**
Section 1. Design features of nanoelectronics products	Theme 1.1. The basic principles of the design process.	SP, SRS
	Theme 1.2. The main trends in the development of electronic equipment.	SP, SRS
	Theme 1.3. Printed circuit boards (basic definitions, functions).	SP, SRS
	Theme 1.4. Planar technology and integrated circuits (basic concepts, technological operations, design).	SP, SRS
	Theme 1.5. Basic elements of the nanoelectronic base.	SP, SRS
Section 2. Production technology for micro- and nanosystems	Theme 2.1. The concept of micro- and nanoelectronic circuit technology.	SP, SRS
	Theme 2.2. Preparation of semiconductor substrates.	SP, SRS
	Theme 2.3. The alloying of semiconductor substrates.	SP, SRS
	Theme 2.4. Application of films to the surface of substrates.	SP, SRS
Section 3. Reliability of nanoelectronic and microsystem devices.	Theme 3.1. Reliability indicators of technical systems.	SP, SRS
	Theme 3.2. Reliability assessment of nanoelectronic and microsystems technology devices.	SP, SRS

	Theme 3.3. Fundamentals of physics of failure theory of nanoelectronics and microsystems engineering devices.	SP, SRS
	Theme 3.4. Control and testing methods for nanoelectronic and microsystems devices.	SP, SRS

5. EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Room Type	Room Equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline
Class for Seminars	Room for seminar-type classes, equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets	Not necessary
Self-Work Class	Room for self-working (can be used for lecture and seminars activities), equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets and computers with an access to EIPES	Not necessary

6. METHODOLOGICAL SUPPORT AND LEARNING MATERIALS

Main readings:

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.

Additional readings:

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.

Internet sourses:

ELS RUDN University and third party EBS, to which university students have accessbased signed contracts:

- RUDN Electronic Library System, http://lib.rudn.ru/MegaPro/Web ;
- ELS University Library Online, http://www.biblioclub.ru ;
- EBS Urayt, http://www.biblio-online.ru ;
- ELS Student Consultant, http://www.studentlibrary.ru ;
- EBS Lan, http://e.lanbook.com ;
- EBS Trinity Bridge http://www.trmost.ru

Databases and search engines:

- Electronic fund of legal and normative-technical documentation, http://docs.cntd.ru ;
- Yandex search system https:// www .yandex.ru ;
- Google search system https://www.google.com ;
- Reference database Scopus , http://www.elsevierscience.ru/products/scopus

Educational and methodological materials for students' self-work studying the discipline / module:

A course of lectures on the discipline «Design and technology of instrumentation and radio electronic equipment».

7. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR MIDTERM ATTESTATION OF STUDENTS IN THE DISCIPLINE (MODULE)

Assessment toolkit and a grading system to evaluate the level of competences (competences in part) formation as the course results are specified on the TUIS platform.

DEVELOPERS:
Assistant Professor M.O. Makeev

HEAD OF THE DEPARTMENT
Assistant Professor S.V. Popov