Moscow Bauman State Technical University

POWER ENGINEERING Faculty
Refrigeration, Cryogenic and Air Condition department

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Using of the master preparations in a direction «the Refrigerating, cryogenic technics and life-support systems» CURRICULUM for training the Electrical engineering masters

Programs of direction «the Refrigerating, cryogenic technics and life-support systems»

- **the Refrigerating engineering and technology**
- **the Cryogenic engineering and technology the Systems of gas liquefaction and separation and its transportation**
- **the Climatic engineering**
- **The Life-support systems**
- **The Low temperature medical engineering and technology**

European Commission
TEMPUS

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The variant part of **the Cryogenic engineering and technology** program permits to specialize in:

- **Helium engineering and technology**
- **Hydrogen engineering and technology**
- **Oxigen engineering and technology**
- **Nitrogene engineering and technology**
- **Rare gases engineering and technology**
- **Natural gas engineering and technology**
- **Transport cryogenic systems**
- **Space cryogenic systems**
- **Superconducting systems**
- **others**

superconductivity

the Electrical engineering

the Cryogenic engineering

Time budget, in weeks

Courses	Theoretical training	Examinations	Practical training	Research practical training	State certification according to results	Holidays/Vacations	In total
I	35	6	4			7	52
II	18	3		19	2	10	52
Total:	53	9	4	19	2	17	104

In total 120 credits/units

(4,320 hours) (1credit/unit - 36 hours)

- ***General scientific cycle:***

  25 credits/units (900 hours)

- ***Professional cycle :***

  35 credits/units (1,260 hours)

- ***Practical training and research work:***

  40 credits/units (1,440 hours)

- ***State certification according to results***

  20 credits/units (720 hours)

General scientific cycle: a base part
7 credits/units *(252* hours*)*

- Foreign language :

  5 credits/units ***(180 hours)***

- History and philosophy of a science and engineering

  2 credits/units ***(72 hours)***

General scientific cycle: a variant part
17 credits/units (612 hours)

- Strategic and innovative management :

  4 credits/units ***(144 hours)***

- Methods of similarity and mathematical processes modeling (cryogenics and superconductivity) :

  4 credits/units ***(144 hours)***

- Seminar on foreign special scientifical literature (cryogenics and superconductivity):

  3 credits/units ***(108 hours)***

Disciplines to choose by student (for example)

- Experiment planning, processing and analysis (for superconducting systems):

  3 credits/units ***(108 hours)***

- Modern problems of electrical engineering (for superconducting systems) :

  3 credits/units ***(108 hours)***

Professional cycle:a base part

12 credits/units (432 hours)

- Special sections of thermodynamics of cryogenic systems (using for superconducting devices):

  4 credits/units (144 hours)

- Actual problems of cryogenic systems and plants (for superconducting devices):

  2 credits/units (72 hours)

Professional cycle: a base part

- The analysis and design of cryogenic systems (using for superconducting devices):

  4 credits/units ***(144 hours)***

- Computer gas and hydrodynamics, heat exchange (in cryogenic system of superconducting devices):

  2 credits/units ***(72 hours)***

Professional cycle:variant part
23 credits/units (828 hours)

- Superconducting devices :

  4 credits/units ***(144 hours)***

- Safety in extremely situations :

  2 credit/unit ***(72 hours)***

- The analysis and design superconducting devices :

  4 credits/units ***(144 hours)***

Professional cycle: variant part

- Superconducting materials :

  3 credits/units ***(108 hours)***

- Theory of superconductivity:

  3 credits/units ***(108 hours)***

Disciplines to choose by student (for example)

- Modern superconducting devices :

  4 credits/units ***(144 hours)***

- Mathematical modeling of processes in superconducting devices :

  3 credits/units ***(108hours)***

Practical training:

- At industrial enterprises

  2 credit/unit ***(72 hours)***
- Research and development practical training

  4 credits/units ***(144 hours)***
- Scientific and research practical training

  4 credits/units ***(144 hours)***
- Student training on teaching methodology

  2 credit/unit ***(72 hours)***

Research work

28 credit/unit ***(1008 hours)***

Superconducting devices :

- Electrical engines
- Electrical generators
- Lines of electrical transfer
- Storage devices of electrical energy
- Magnetic systems for physical research

The analysis and design of superconducting devices:

- Magnetic fields analysis of superconducting windings
- Temperature interval definition of work for various superconducting devices
- Determination of superconducting wires materials
- Strength analysis of superconducting windings in magnetic fields
- Design of superconducting devices

Theory of superconductivity:

- Superconductors of first, second and third kind
- Theory of Londons, BCSh Thermodynamics of superconductors
- Element of theory GLAG
- High temperature superconductivity

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Superconducting materials :

- Niobium material and other materials working under helium temperatures
- High temperature superconducting materials
- Matrix materials of superconducting wires
- Materials of superconducting devices current leads

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Modern superconducting devices :

- Magnetic systems of thermonuclear reactors and charged particulars accelerators
- Magnetic bearings
- Tomography devices
- Electronics devices

Mathematical modeling of processes in superconducting devices :

- Action of mechanical forces upon superconducting windings in magnetic fields
- Propagation of normal (resistanto zone in superconducting wires
- Cooling of superconducting devices
- Electrodynamics and heat stability of superconducting systems
- Distributions of superconducting windings magnetic field

Safety in extremely situations :

- Emergency removal of electrical energy from из superconducting devices
- Emergency removal of gas during transaction of superconducting devices from superconducting state to resistant state
- Safety from magnetic fields, created by superconducting devices