

## COURSE CERTIFICATE

№ 02ADTMME-0124-1

Date of issue 05/06/2024

This is to certify that

**Олешицкий Алексей Вячеславович**

Successfully completed the course

**ADDITIVE TECHNOLOGIES IN METALLURGY AND MECHANICAL ENGINEERING**

2 credits

The description of the course and the achieved learning results are given in the appendix to this certificate.

E-CERTIFICATE

<https://open.spbstu.ru/certificate/02ADTMME-0124-1.pdf>



Vice-rector for academic affairs  
Ludmila V. Pankova

# Олешицкий Алексей Вячеславович

STUDENT ID 449622

PETER THE GREAT ST. PETERSBURG POLYTECHNIC UNIVERSITY

<http://www.spbstu.ru/>

THE NAME OF THE COURSE ADDITIVE TECHNOLOGIES IN METALLURGY AND  
MECHANICAL ENGINEERING

<https://openedu.ru/course/spbstu/ADTMME/>

LEAD-TIME

From March 11, 2024 to May 26, 2024

Assessment, number of hours and credits per course

Credits	Hours		Assessment		
	General	Aca- demic	100-point	5-point	Letter
2	54	72	95	5	A

GRADING POLICY

Evaluation scale ranges (100-point scale)	Score (5-point scale)	Letter
90-100	5	A
75-89	4	B
60-74	3	C
0-59	2	F

COURSE PROGRAM

**Module 1. Metallurgical and mechanical engineering industries as an application of additive technologies**

- Topic 1. Additive technologies: what is it?
- Topic 2. Mechanical Engineering and Metallurgy
- Topic 3. Application of additive technologies in mechanical engineering
- Topic 4. Application of additive technologies in metallurgy

**Module 2. Object digitization and 3d prototyping**

- Topic 1. 3D – scanning
- Topic 2. Prototyping: value and functions
- Topic 3. SLA (stereolithography laser) and SLS (selective laser sintering)
- Topic 4. FDM (Fused Deposition Modeling) and MJM (Multi-jet Modeling) technology

### **Module 3. Selective laser sintering**

- Topic 1. Features of SLS, SLM and DMLS technologies
- Topic 2. Powder materials for SLM technology
- Topic 3. Microstructure and properties of SLM products
- Topic 4. SLM technologies in mechanical engineering

### **Module 4. Thermal spraying**

- Topic 1. Gas-thermal spraying
- Topic 2. Detonation spraying
- Topic 3. Microstructure and properties of coatings produced by detonation spraying
- Topic 4. Detonation spraying application in metallurgy and mechanical engineering

### **Module 5. Laser metal deposition**

- Topic 1. Laser cladding
- Topic 2. Restoration of parts and accessories with laser cladding
- Topic 3. Materials used for laser cladding
- Topic 4. Examples of how to recover worn parts cilities

### **Module 6. Direct metal deposition**

- Topic 1. Methods of obtaining metal products with a complex shape
- Topic 2. Coaxial laser processing of powder materials
- Topic 3. Microstructure and properties during direct laser growth
- Topic 4. The areas of application of complex shape products obtained by direct laser growth

### **WHAT YOU'LL LEARN:**

At the end of the course you will be able to:

- Additive technologies: what is it?
- Applications of additive technologies in mechanical engineering
- Applications of additive technologies in metallurgy
- Prototyping: value and functions
- Application of selective laser fusion in mechanical engineering
- Powder materials for SLM technology
- Gas-thermal spraying of functional coatings
- Detonation spraying application in metallurgy and mechanical engineering
- Microstructure and properties of coatings produced by detonation spraying
- Restoration of parts and accessories with laser cladding
- The areas of application of complex shape products obtained by direct laser
- The areas of application of complex shape products obtained by Direct Metal Dposition
- Microstructure and properties during Direct Metal Deposition

SCORING FORMULA:

№	Assessment Type	Points scored	Maximum score	Quotient
1	Test 1	100	100	0,05
2	Test 2	87	100	0,05
3	Test 3	100	100	0,10
4	Test 4	87	100	0,10
5	Test 5	100	100	0,20
6	Test 6	100	100	0,20
7	Final Exam	90	100	0,30
8	Final Score	95	100	1



Appendix to the certificate №  
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