TOMSK
POLYTECHNIC
UNIVERSITY
ТОМСКИЙ
ПОЛИТЕХНИЧЕСКИЙ
УНИВЕРСИТЕТ

APPROVED BY

Director of the School of Advanced Manufacturing
Technologies _____ Alexey N. Yakovlev

Course Name
Computer Simulation of Materials and Technologies

Field of Study: Major 22.04.01 Material Science and Technologies

Programme name: Material Science

Level of Study: Master Degree Programme

Year of admission: 2019

Semester, year: 3, 2020

ECTS: 6
Total Hours: 216
Contact Hours: 64
- **Lectures:** 16
- **Labs:** 40
- **Practical experience:** 8

Assessment: exam

Division for Materials Science

Head of Division for Materials Science _____ Vasiliy A. Klimenov

Instructor(s) _____ Mikhail V. Burkov

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Course Name

Course Overview

Course Objectives	The subject is focused on training of specialists in the field of research and development of novel structural and functional materials. The students will obtain knowledge and skills in the field of computer simulation of materials and technological processes.
Learning Outcomes	Professional competency includes knowing of issues on the research and development of novel materials and structures, in particular: - materials for structural and functional applications for different industries, including mechanical engineering, aerospace and medicine - technology of surface hardening and coating; - principles for design of novel materials – nanostructured, smart, gradient and composite materials with ceramic, metal and polymer matrix; - technologic facilities and devices for surface hardening and coating deposition; - manufacturing processes for advanced materials; - methods for investigation of properties and diagnostics of loaded materials and structures; - physical and chemical models of materials and manufacturing processes; - law and regulatory issues of application of new materials.
Course Outline	The course involves lectures, practical classes and laboratory works. Application of finite element method for simulation of loaded materials, machining (milling, drilling, etc.) and metallurgical (casting, forging, rolling, etc.) processes;
Prerequisites (if available)	Theory of materials structure; Physical and mechanical properties of materials; Modelling and optimization of materials properties and technological processes
Course Structure	• Simulation of materials and structures; • First principal modeling (quantum and electron, atomistic, etc.); • Molecular dynamics; • Cellular automata (as well as movable cellular automata for modeling of materials); • Finite element method; • Simulation of technological processes.
Facilities and Equipment	Computer class equipped with ANSYS software. Optical microscopes, Optical profilometer New View 6200, Universal electromechanical Inston 5582 and hydraulic BiSS UTM 150 testing machines.
Grading Policy	In accordance with TPU rating system we use: - Current assessment which is performed on a regular basis during the semester by scoring the quality of mastering of theoretical material and the results of practical activities (performance tests, perform tasks, problem solving). Max score for current assessment is 80 points. - Course final assessment (exam/ credit test) is performed at the end of the semester. Max score for course final assessment is 20 points. The final rating is determined by summing the points of the current assessment during the semester and exam (credit test) scores at the end of the semester. Maximum overall rating corresponds to 100 points, min pass score is 55.
Course Policy	Class attendance will be taken into consideration when evaluating students' participation in the course. Students are expected to actively engage in class discussions about the assigned readings. Attendance is strictly controlled. All classes

	are obligatory to presence.
Teaching Aids and Resources	Electronic learning course LMS Moodle «Computer Simulation of Materials and Technologies» - http://stud.lms.tpu.ru/course/view.php?id=166.
Instructor (-s)	Mikhail V. Burkov, burkovispms@mail.ru, (3822) 286922