

APPROVED BY

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

Course Name
Design of manufacturing processes

Field of Study: Major 22.04.01 Material Science and Technologies

Programmer name: Material Science

Level of Study: Master Degree Programmer

Year of admission: 2020

Semester, year: 1, 2020

ECTS: 3

Total Hours: 108

Contact Hours: 48

- **Lectures:** 8
- **Labs:** 16
- **Practical experience:** 24

Assessment: exam

Division for Materials Science

Head of Division for Materials Science

 Vasiliy A. Klimenov

Instructor(s)

 Mikhail V. Burkov

Course Name

Course Overview

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| Course Objectives | The main objective of the subject is to give a knowledge in the field of mechanical engineering technology and modern production methods (including high-performance CNC machining tools), as well as to train the skills of solving particular tasks during design of manufacturing processes and preparation of technological documentation. |
| Learning Outcomes | Professional competency includes knowing of issues on the research and development of manufacturing processes, in particular: - Materials for structural and functional applications for different industries, including mechanical engineering, aerospace and medicine, and technology of surface hardening and coating; - Manufacturing and processing methods (different machining methods with and without removal of material: milling, turning, drilling, rolling, electric-discharge machining, etc.); - Design of technological processes and documentation; - CNC machining and 3D additive manufacturing. |
| Course Outline | The course involves lectures, practical classes and laboratory works. The lectures are devoted to learning of modern manufacturing processes including CNC machining and 3D additive technologies. The practical works include course project of technological process for manufacturing of mechanical engineering part (shafts, gear wheels, etc.). |
| Prerequisites (if available) | Theory of materials structure; Physical and mechanical properties of materials; |
| Course Structure | <ul style="list-style-type: none"> • Technological process; • Manufacturing (casting, forming, forging, rolling for preforms production) and processing methods (different machining methods with and without removal of material: milling, turning, drilling, rolling, electric-discharge machining, etc.); • Design of technological processes and documentation • Typical technological processes for production of mechanical parts (shafts, discs, gear wheels, etc.); • The features of CNC machining: advantages and application |
| Facilities and Equipment | CNC milling machine and 3D printer. Optical microscopes, optical profilometer New View 6200, Nano indenter Nanotest 600 and G200 (MTS), 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 60 points, min – 33 points. - Course final assessment (exam/ credit test) is performed at the end of the semester. Max score for course final assessment is 40 points, min – 22 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 |

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| | discussions about the assigned readings. Attendance is strictly controlled. All classes are obligatory to presence. |
| Teaching Aids and Resources | <p>DeGarmo: E.P. DeGarmo et al, Materials and Processes in Manufacturing, Wiley, 2003.</p> <p>http://itdc.lbcc.edu/cps/machineTool/machiningOperations.htm</p> <p>Manufacturing Science by Amitabha Ghosh and Asok Kumar Mallik, East-West Press Pvt Ltd.</p> <p>Tool and Manufacturing Engineers Handbook, Volume 1 – Machining by Tom Drozda, Charles Wick, John T. Benedict, Raymond F. Veilleux, Society of Manufacturing Engineers Publications Committee</p> <p>Manufacturing Engineering and Technology by Serope Kalpakjian and Steven R. Schmid, Pearson Education</p> <p>Manufacturing Processes Reference Guide by Robert H. Tadd, Dell K. Allen and Leo Alting, Industrial Press</p> |
| Instructor (-s) | Mikhail V. Burkov, burkovispms@mail.ru , (3822) 286922 |