

APPROVED BY
Head of the Department
Arlyapov A.Yu.
« ____ » _____ 201__ г.

ANNOTATION OF THE SUBJECT

1. SUBJECT TITLE

FUNDAMENTALS OF MECHANICAL ENGINEERING

2. CODE GIVEN IN CURRICULUM Б3. Б.9

3. CURRICULUM 150900 Mechanical Engineering

4. COURSE

Technologies, Equipment and Automation of Engineering Manufacturing

5. QUALIFICATION (DEGREE) Bachelor

6. PROVIDING DEPARTMENT Department of Automated Mechanical
Manufacturing Engineering of Institute of Cybernetics

7. LECTURERS Skvortsov V.F., Kim A. B.

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8. OBJECTIVES:

The objective of the «Fundamentals of Mechanical Engineering» course is to acquire knowledge, skills and experience in the field of analysis and design of the manufacturing processes.

9. COURSE OUCOMES

After completion of the «Constructional Materials Engineering» the student is to know the following:

- methods of workpiece production;
- methods of cutting, constructions of the common metal cutting tools and machine tools;
- methods of electrophysical and electrochemical machining;
- basic welding methods.

After completion of the «Metrology, Standardisation and Certification» the student is to know the following:

- principles of the Russian unified system of tolerances and fits;
- drawing indications of dimensional tolerances, geometrical tolerances and fits;
- methods of tolerance analysis;
- basic means and methods of parts accuracy assessment.

After completion of the «Materials Science» the student is to know the following:

- mechanical properties and performance characteristics of the constructional materials;
- methods of heat and chemical heat treatment of metals and metal alloys.

After completion of the «Material Cutting and Cutting Tools» the student is to know the following:

- physics of material cutting;
- characteristics of the basic methods of machining;
- ways of improving machinability of the constructional materials;
- procedures of selection of the cutting tools and cutting parameters.

The following competences are formed upon completion of the course:

1. Universal (cultural) -

- an ability to apply basic and special knowledge of math, natural science, humanities and economic sciences in engineering (OK-10).

2. Professional -

- an ability to apply basic laws of natural sciences, methods of mathematic analysis and simulation, basics of theoretical and experimental researches in engineering to design objects and engineering processes in mechanical engineering using standard CAD software (ПК-10);
- readiness to maintain engineering discipline during production, develop new engineering methods of production, apply methods of quality assessment of samples, parts, assemblies and products (ПК-1);
- readiness to apply state-of-the-art methods for developing low-waste, energy-saving and environmentally friendly mechanical engineering techniques, that ensure human safety and protection from potential accidents and natural disasters, readiness to apply methods of conservation of raw materials, energy and other resources (ПК-8).

10. SUBJECT CONTENT

10.1 Basic concepts of mechanical engineering production (lectures – 5 hour, self-study – 9 hours)

10.2 Dimensional chains and principles of part locating (lectures – 12 hours, self-study – 16 hours)

10.3 Theory of ensuring required machining accuracy (lectures – 6 hours, self-study – 20 hours)

10.4 Theory of ensuring required properties of the part material and surface layer quality (lectures – 6 hours, practice – 6 hours, laboratory works – 10 hours, self-study – 12 hours)

10.5 Ensuring efficiency of the production process (lectures – 6 hours, practice – 2 hours, laboratory works – 8 hours, self-study – 20 hours)

10.6 Fundamentals of production process design (lectures – 10 hours, practice – 10 hours, self-study – 22 hours)

11. YEAR OF STUDY 3 SEMESTER 6 CREDITS 6

12. PREREQUISITES

B3.B3 «Constructional Materials Engineering»; B3.B4 «Metrology, Standardisation and Certification»; B3.B8 «Materials Science»; B3.B2.1 «Material Cutting and Cutting Tools»

13. COREQUISITES B3.B2.2 «Metalworking Machinery»; B3.B2.1 «Material Cutting and Cutting Tools»; B3. B2.3 «Engineering Metrology in Mechanical Engineering»

14. ALLOCATION OF CLASS HOURS:

LECTURES	45 hours
LABORATORY WORKS	18 hours
CLASS HOURS IN TOTAL	18 hours
SELF-STUDY TRAINING	81 hours
TOTAL	180 hours

EDUCATION FORM full-time

15. LIST OF LABORATORY WORKS

1. Industrial investigation of a turning machine rigidity
2. Statistical analysis of machining accuracy
3. Measurement of thermal deflection of cutters in finish turning
4. Influence of cutting parameters and diamond burnishing on surface finish
5. Accuracy analysis of the process of ring manufacturing

16. PERSONAL HOME ASSIGNMENTS

- lathe self-centering chucks;
- collet chucks;
- magnetic and electromagnetic chucks;
- vacuum operated fixtures;
- centerless grinding;
- honing and siperfinishing;
- cold working of workpieces;
- methods of part labeling;
- methods of deburring;
- methods of sheet material cutting;
- trends in teat treatment and chemical-heat treatment;
- trends in machining with cutting tools;
- trends in machining with abrasive tools;
- trends in casting methods.

18. ASSESSMENT FORM examination

19. BASIC AND AUXILIARY LITERATURE

Required textbooks:

1. Основы технологии машиностроения : учебное пособие / В. Ф. Скворцов ; Национальный исследовательский Томский политехнический университет (ТПУ). — Томск : Изд-во ТПУ, 2012. — 352 с. : ил.
2. Суслов А.Г., Дальский А.М. Научные основы технологии машиностроения. —М.: Машиностроение, 2002. —684 с.
3. Колесов И.М. Основы технологии машиностроения: Учебник для машиностроительных специальностей вузов. — М.: Высшая школа, 1999. — 591 с.
4. Технология машиностроения: В 2 т. Т. 1. Основы технологии машиностроения: учебник для вузов / В.М. Бурцев, А.С. Васильев, А.М. Дальский и др.; под ред. А.М. Дальского. — М.: Изд-во МГТУ им. Н.Э. Баумана, 1997. —564 с.
5. Скворцов В.Ф. Выбор технологических баз при изготовлении деталей. Учебное пособие. — Томск: Изд-во ТПУ. 2007. —56 с.
6. Скворцов В.Ф. Основы размерного анализа технологических процессов изготовления деталей. — Томск: Изд-во ТПУ, 2009. —91 с.
7. Drake P. Dimensioning and tolerancing handbook. McGraw-Hill, New York, 1999.
8. Encyclopedia of production and manufacturing management / Editor Paul M. Swamidass. Kluwer Academic Publishers, 2000.
9. Foster L.W. Geometrics III: The application of geometric and tolerancing technique. Addison-Wesley, 1994.
10. Handbook of Manufacturing Engineering / Edited by Jack M. Walker. Marcel Dekker, 1996.
11. Manufacturing Engineering and Technology. Fifth edition. Serope Kalpakjian, Steven R. Schmid, 2006.

Recommended textbooks:

12. Машиностроение. Энциклопедия. Т. III-3. Технология изготовления деталей машин / А.М. Дальский, А.Г. Суслов, Ю.Ф. Назаров и др.; под общ. ред. А.Г. Суслова. —М.: Машиностроение-1, 2000. —840 с.
13. Справочник технолога-машиностроителя. В 2-х т. Т. 1 / Под ред. А.М. Дальского, А.Г. Косиловой, Р.К. Мещерякова, А.Г. Суслова. — М.: Машиностроение-1, 2003. —912 с.
14. Справочник технолога-машиностроителя. В 2-х т. Т. 2 / Под ред. А.М. Дальского, А.Г. Косиловой, Р.К. Мещерякова, А.Г. Суслова. — М.: Машиностроение-1, 2003. —944 с.
15. Ashby, M.F., Materials selection in Mechanical Design, 3rd ed., Elsevier, 2005
16. ASM Handbook, Vol. 4: Heat Treating, ASM International, 1991
17. Boljanovic, V., Sheet Metal Forming Process and Die Design, Industrial Press, 2004

18. Boothroyd, G., Dewharst, P. and Knight, W., Product Design for Manufacture and Assembly, 2nd edition, Marcel Dekker, 2001
19. Dieter, G.E., Kuhn, H.A. and Semiatin, S.L., Handbook of Workability and Process Design, ASM International, 2003
20. Drake P. Dimensioning and tolerancing handbook. McGraw-Hill, New York, 1999.
21. Encyclopedia of production and manufacturing management / Editor Paul M. Swamidass. Kluwer Academic Publishers, 2000.
22. Foston, A.L., Smith, C.L. and Au, T., Fundamentals of Computer-Integrated Manufacturing, Prentice Hall, 1991
23. Galyer J.F.W., Shotbolt C.R. "Metrology for Engineers", Cassell, 1969.
24. Handbook of Manufacturing Engineering / Edited by Jack M. Walker. Marcel Dekker, 1996.
25. Ibrahim Z. Mastering CAD/CAM. McGraw-Hill, New York, 2005.
26. ISO 8015:1985, Technical drawings – Fundamental tolerancing principles
27. Luggen, W.W., Flexible Manufacturing Cells and Systems, Prentice Hall, 1991
28. Machine Shop Practice. Fifth edition. Karl Hans Moltrecht, 1979.
29. Manufacturing Engineering and Technology. Fifth edition. Serope Kalpakjian, Steven R. Schmid, 2006.
30. Mechanical Engineer's Handbook / Edited by Dan B. Marghitu. Academic Press, 2001.
31. Precision Manufacturing, by David Dornfeld and Dae-Eun Lee, Springer, 2008.
32. Rechetov, D.N. and Portman, V.T., Accuracy of Machine Tools, ASME International, 1989
33. Shaw, M.C., Metal Cutting Principles, 2nd ed., Oxford, 2005
34. Shetty, D., Design for Product Success, Society of Manufacturing Engineers, 2002
35. The fundamentals of product design. R. Morris. AVA Publishing, 2009.

20. COORDINATOR Assistant Professor Kim A. B. (tel. 41-95-39)

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