

Vehicle Manufacturing and Repair

Code: MK3JAGJJ05JX20-EN

ECTS Credit Points: 5

Evaluation: exam

Semester: 4th semester

Its prerequisite(s): Vehicles and Mobile Machinery

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Internal hierarchy and construction of part manufacturing systems. The basic theorem of CNC programming, classification of coordinate systems to the machines. Interpretation of simple and complex cycles. Drilling cycles, thread cutting cycles, manufacturing and measurement of 2D, 3D and 5D surfaces by CNC machines and devices. Application possibilities of special transformation techniques during the manufacturing. The process of mechanical designing. Designing based on features, CIM interpretation of life section and product models. Basic methods and implementation of competing product designing. Manufacturing of statue surfaces. Finishing techniques considering the part's shape. Overview of rapid prototyping and reverse engineering techniques. Manufacturing analysis of typical parts of the vehicles. Basic definitions, systems and strategies of vehicle maintenance and reparation. Reparation technologies of typical surfaces. Laboratory practice and measurement: manufacturing of 2D, 3D, and 5D surfaces by CNC machines. Application and demonstration of the Reverse Engineering process. Application of designing and manufacturing of shape features by a CAM software.

Literature:

- Klocke, F.: Manufacturing Processes I., Cutting, Springer, RWTH edition, 2011, ISBN 978-3-642-11978-1, p. 524.
- Halderman, J. D.: Automotive Technology, Fourth edition, Pearson New International Edition, 2014, ISBN 10: 1-292-04218-4, p. 1831
- Gupta, H. N., Gupta, R. C., Mittal, A.: Manufacturing Processes, Second Edition, New Edge International Publishers, 2009, ISBN (13) : 978-81-224-2844-5, p. 194.
- Kief, H. B., Roschiwal H. A.: CNC Handbook, The McGraw-Hill Companies, 2011, ISBN 978-0-07-179948-5, p. 451
- Tom Denton Technique\\Transportation: Cars, motorcycles Butterworth-Heinemann, 2011
ISBN 10: 0080969461; ISBN 13: 9780080969466
- Auto Repair and Maintenance ISBN 13: 9781615647620
- Robert L. Mott, Edward M. Vavrek, Jyhwen Wang Machine Elements in Mechanical Design Technology\\Mechanical Engineering 2018, ISBN 13: 978-0134441184

Schedule

1st week Registration week

2nd week:

Lecture: Basic theorem of working machines. The manufacturing opportunities of classical machines.

3rd week:

Lecture: The theorem of turning technology. The main manufacturing opportunities by this process.

Practice: Determination of allowances for different parts

4th week:

Lecture: Drilling methods. The types of drilling and counterbore tools.

Practice: Task solution for drilling technology.

6th week:

Lecture: The construction of CNC machines. Overview of rapid prototyping and reverse engineering techniques.

Practice: Task solution for face milling technologies.

8th week: 1st drawing week

9th week:

Lecture: The basic definitions of machine repair. The relation of the maintenance and machine repair. The causes of vehicle's attrition. Recording error, error findings. The types of wearing. The basic theorem of tribology.

Practice: Analysis of disassembled and faulty workpieces. Wearing measurement methods in the **Practice** (length and weight measurement, impressive method).

11th week:

Lecture: Restoration of machine parts by welding technology. Knitting welding and fill welding of steel parts. Corrective welding of cast iron and aluminium parts. Thermal dispersion methods, spraying technologies and typical applications of them. Creation of various thermal dispersion methods. Part preparation, methods and properties of the coating. Methods of plastic application, occurring technological errors

Practice: Restoration of worn parts by traditional methods. Half-year presentation of the task.

13th week:

Lecture: Malfunction of rolling and sliding bearings. Working analysis of bearings. Repair and restoration of bodies and chassis.

Practice: Task solution for turning technology.

5th week:

Lecture: Analysis of milling technologies. The milling strategies.

Practice: Task solution for plain milling technology.

7th week:

Lecture: Manufacturing analysis of typical parts of the vehicles. Analysis of the vehicle production process.

Practice: Manufacturing of complex parts by cutting technology

10th week:

Lecture: Repair method of typical vehicle parts. Different cleaning methods.

Practice: Wearing measurement of worn parts. Creation of troubleshooting instruction of defective parts.

12th week:

Lecture: Increasing methods of deadweight. Surface hardener methods. Restoration of shafts and bore parts. Malfunction of toothed gears. Sticking and plastic coating technologies in case of repair of vehicle parts.

Practice: Restoration of faulty shaft-like part by thermal dispersion. Task consultation.

14th week:

Lecture: Malfunction, repair and restoration of elements of hydraulic systems. Malfunction and repair of elements of pneumatic systems.

Practice: Task consultation.

Practice: Task consultation

15th week: 2nd drawing week

Requirements

two test: manufacturing field and reparation field

two designing task solution: manufacturing field and reparation field

Thermodynamics and Fluid Machines of Vehicles

Code: MK3JAHBJ06JX20-EN

ECTS Credit Points: 6

Evaluation: exam

Semester: 5th semester

Its prerequisite(s): Fluid Mechanics

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+1

Topics:

Basics of thermodynamics and fluid mechanics, processes, efficiencies. Classification of the caloric engines and fluid machines. Typical constructions. Theoretical basics: fundamental equations, delivery- and friction-head, efficiencies, velocity triangles.

Operation, construction, and characteristic curves of the radial- and axial machinery (compressors and turbines). The turbocharger. Basics of the gas turbine and jet engine.

Basics of the fluid mechanics of hydrodynamic clutch and torque converter.

Fundamentals, operation and characteristic curves of the positive displacement compressors, fans and pumps. Fundamentals of the internal combustion engines.

Classification of refrigerators. Processes of the vapour-compression refrigerators. Multistage refrigerators.

Laboratory practice, measurements:

Measurements of centrifugal compressors, radial turbines and turbochargers. Measuring the characteristic diagrams of internal combustion engines. Measurements of vapor-compression refrigerators.

Literature:

Compulsory:

- Dixon S.L. (1978): Fluid Mechanics, Thermodynamics of Turbomachinery (Third ed.), Pergamon Press, ISBN 0-08-022722-8
- Bloch, H.P. and Hoefner, J.J. (1996). Reciprocating Compressors, Operation and Maintenance. Gulf Professional Publishing. ISBN 0-88415-525-0
- Y.V.C. Rao (2003). An Introduction to Thermodynamics (2nd ed.). Universities Press. ISBN 978-81-7371-461-0

Schedule

1st week Registration week

2nd week:

Lecture: Basics of thermodynamics and fluid mechanics, processes, efficiencies. Classification of the caloric engines and fluid machines. Typical constructions.

Practice: Calculation problems. Laboratory measurements.

4th week:

Lecture: Theoretical basics of fluid machines: fundamental equations, delivery- and friction-head, efficiencies, velocity triangles II.

Practice: Calculation problems. Laboratory measurements.

6th week:

Lecture: Operation, construction, and characteristic curves of the radial- and axial machinery (compressors and turbines)

Practice: Calculation problems. Laboratory measurements.

8th week: Midterm Test I.

9th week:

Lecture: Operation and constructions of gas turbines and jet engines.

Practice: Calculation problems. Laboratory measurements

11th week:

Lecture: Fundamentals, operation and characteristic curves of the positive displacement compressors, fans and pumps I.

Practice: Calculation problems. Laboratory measurements.

13th week:

Lecture:

Fundamentals of the internal combustion engines.

3rd week:

Lecture: Theoretical basics of fluid machines: fundamental equations, delivery- and friction-head, efficiencies, velocity triangles I.

Practice: Calculation problems. Laboratory measurements.

5th week:

Lecture: Operation, construction, and characteristic curves of the radial- and axial machinery (compressors and turbines) I.

Practice: Calculation problems. Laboratory measurements.

7th week:

Lecture: Construction, and characteristic curves of the turbocharger. Basics of the gas turbine and jet engine.

Practice: Calculation problems. Laboratory measurements.

10th week:

Lecture: Basics of the fluid mechanics of hydrodynamic clutch and torque converter.

Practice: Calculation problems. Laboratory measurements.

12th week:

Lecture: Fundamentals, operation and characteristic curves of the positive displacement compressors, fans and pumps II.

Practice: Calculation problems. Laboratory measurements.

14th week:

Lecture: Classification of refrigerators. Processes of the vapour-compression refrigerators. Multistage refrigerators.

Practice: Calculation problems. Laboratory measurements.

Practice: Calculation problems. Laboratory measurements.

15th week: 2nd drawing week

Requirements

A, for a signature:

Participation in practice classes is compulsory. Students must attend practice classes and may not miss more than three occasions during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent to an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor.

During the semester there are two tests: the mid-term test on the 8th week and the end-term test on the 15th week. Students must sit for the tests.

B, for a grade (ESE):

The course ends in an **examination**.

The minimum requirement of the mid-term test and the end-term test is 50% separately. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

The grade is given according to the following table:

%	Grade
0-49	fail (1)
50-62	pass (2)
63-75	satisfactory (3)
76-89	good (4)
90-100	excellent (5)

If the score of any test is below 50%, the student once can take a retake test of the whole semester material.

An offered grade: It may be offered for the students if the average of the mid-term test, end-term tests and the teamwork is at least good (4). The offered grade is the average of them.