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|---|---|
| **1. Subject name, code:** Chemistry | |
| **2. Name of course, level of education:** Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Compulsory subject | **5. Evaluation:** Mid-term grade |
| **6. Number of lessons per week (lecture+ exercise + lab):** 2+0+2<br>**Number of consultation hours:** | **7. Credit value:** 3 |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |
| **10. Prerequisites:** - | |
| **11. Department:** Department of Innovative Vehicles and Materials | |
| **12. Subject coordinator:** Eszter Kókai, PhD | |
| **13. The teacher of the subject:** Eszter Kókai, PhD | |

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

The aim of the course is to familiarise vehicle engineering students with the most important general chemical relationships, the production and properties of different materials, the chemistry of energy carriers, fuels, lubricants, and water.

**The knowledge to be aquired:**

Introduction. Atomic structure. Periodic table. Chemical bonds. States of matter. Molecular motions. Colloids. Solutions, concentrations. Electrochemistry: electrolytes, pH, electrolysis, electrode potential, galvanic and fuel cells. Thermochemistry: thermodynamics of chemical reactions, Hess theorem, heat of formation, enthalpy and entropy. Reaction kinetics: reaction rate, reaction mechanism, activation energy, catalysis. Organic chemistry. Chemistry of structural materials: characterisation and preparation of ceramics, metals, polymers, composites. Corrosion of structural materials. Polymer chemistry: formation of macromolecules, chemical reactions of polymers. Chemistry of energy carriers: coal, oil and natural gas. Properties of motor fuels, their production, combustion, exhaust gas purification, Nuclear energy, nuclear reactors. Alternative energy sources. Technical fluids: water and water treatment. Characterisation, production and consumption of lubricants. Laboratory programme: demonstration of laboratory equipment. Chemical calculations. Ion reactions. Dissolution of metals in acids. pH scale.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

The student will be able to distinguish between different materials and recognise their structural characteristics based on their properties. They will be able to interpret changes in properties under chemical effect. Be able to apply the knowledge acquired in the subject to the choice of materials.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

The report of the laboratory exercises must be submitted by the following laboratory practice. At the end of the semester, the average of the results will be calculated. To be eligible to take the exam, you must have at least a satisfactory (2) average in the laboratory exercises. The grade will be 30% of the lab and 70% of the exam. All labs must be attended to complete the semester. In the case of an unsuccessful exam, the result of the lab exercise can be used for 1 additional semester, after which only the result of the exam counts. Two grades offered on the basis of two non-compulsory written examinations may be obtained.

**Examination requirements:** Oral or written exam.

**16. Study aids, laboratory background:**

Some of the presentation material is available in pdf format. Equipment of the Laboratory of the Department of Innovative Vehicles and Materials.

**17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**

**Compulsory literature:**

**Recommended literature:**

https:// https://chem.libretexts.org/Bookshelves

https://chem.libretexts.org/Bookshelves/General_Chemistry

https://chem.libretexts.org/Bookshelves/Organic_Chemistry

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|---|---|
| **1. Subject name, code:** Informatics for Engineers | |
| **2. Name of course, level of education:**<br>Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Compulsory subject | **5. Evaluation:** Exam |
| **6. Number of lessons per week (lecture+ exercise + lab):** 2+2+0<br>**Number of consultation hours:** | **7. Credit value:** |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |
| **10. Prerequisites:** | |
| **11. Department:** Department of Information Technology | |
| **12. Subject coordinator:** István Pintér, PhD | |
| **13. The teacher of the subject:** Rajmund Drenyovszki, PhD | |

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

The aim of the course is to introduce the basic concepts of informatics and to apply them to solving technical problems.

**The knowledge to be acquired:**

Tasks of information technology. Number representations (number systems, fixed point, floating point, BCD). Representational coding. Sign, digitisation. Basics of logical operations (logical functions, implementation with programmable logic controllers). Electronic digital computer, algorithms, data structures, programs. Computers and peripherals. Basic concepts of operating systems. Computer networks and protocols (elements of error-constrained coding, bandwidth, data rates, classification of computer networks, ISO/OSI model, basic protocols). Industrial computer networks. Compression coding, the concept of information, Shannon entropy.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

Comprehensive knowledge of the basics, limits and requirements of the information technology disciplines integrally related to the field of mechanical engineering.Comprehensive knowledge of the basics, limits and requirements of the information technology disciplines integrally related to the field of mechanical engineering. Ability: able to understand and use the literature, computer and library resources typical of his/her field; able to apply the acquired IT knowledge in solving tasks in his/her field. Attitude: open to the use of IT tools, willing to learn and use software in the field of engineering, with at least one such program at a proficiency level. He/she is open to the use of IT tools and endeavours to learn and use software in the field of mechanical engineering, and has a good knowledge and use of at least one such programme. Keeps abreast of legislative, technical, technological and administrative changes in the field.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

Earn at least 50 points with the assignments, study material and the scoring paper.

**Examination requirements:**

The exam is written, but a mark may be awarded for the subject in accordance with the current TVSz.

**16. Study aids, laboratory background:**

**17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**

Irv Englander: The Architecture of Computer Hardware, Systems Software, & Networking: An Information Technology Approach, 5th Edition, 2014, Wiley, ISBN-13 : 978-1118322635

Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Kevin R. Coombes, John E. Osborn, Garrett J. Stuck: A Guide to MATLAB for Beginners and Experienced Users, Cambridge University Press; 2nd edition (July 10, 2006), ISBN-13 : 978-0521615655

**1. Subject name, code:** Materials Engineering

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|---|---|
| **2. Name of course, level of education:** Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Compulsory subject | **5. Evaluation:** Exam grade |
| **6. Number of lessons per week (lecture+ exercise + lab):** 2+0+2<br>**Number of consultation hours:** | **7. Credit value:** 4 |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |

**10. Prerequisites:**

**11. Department:** Department of Innovative Vehicles and Materials

**12. Subject coordinator:** Zoltán Weltsch, PhD

**13. The teacher of the subject:** Miklós Berczeli

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

The aim of Materials Engineering is to provide students of automotive engineering with an understanding of the internal structure and properties of materials, and the different groups of materials, which provides the basis for the knowledge required for the related materials production and processing technologies.

**The knowledge to be acquired:**

The role of materials, the concept and scope of materials science. Atomic structure of materials, laws of crystallization. Basic knowledge of crystallography, the real crystal, crystal defects. Mechanical properties of single phase metallic materials, metal alloys. Equilibrium crystallization of iron alloys. Phase diagrams. Phases of Fe-C alloys, fabric structures. Treatment of state diagrams. Non-equilibrium transformation of iron alloys, C curves. Treatment of practical C curves, Mechanisms of perlite, benzenite and martensitic transformations. Non-destructive material tests. Non-alloy steels. Alloy steels: main alloying elements of steels, their effects. Alloy steels, types of steels. Effect of heat treatment on the mechanical properties of steels (hardening, tempering, normalizing, annealing, bainite, martensite). Cast irons. Non-ferrous metals and their alloys. Ceramics.

Laboratory exercises:

1. Safety education. Protocol requirements. Tensile testing.*
2. Hardness measurements. Impact-bending test. *
3. Fatigue tests, fatigue phenomenon. *
4. Metallography. *
5. Effect of heat treatment on mechanical properties of steels (hardening, tempering, normalizing, annealing, bainite, martensite). *
6. Effect of cold working on the mechanical properties of metals. Study of hardening, metallurgical explanation. *
7. Classification and designation of steels. General purpose steels, steels with good weldability.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

The student masters the terminology, theories and theories of the subject area of materials science, is able to apply the terminologies and theories of the given technical field when performing the related tasks. Using the technical knowledge acquired, he/she will endeavour to gain a deeper understanding of observable phenomena and to describe and explain their laws. He/she is responsible for and represents the values of the engineering profession and is open to professionally well-founded critical comments.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

Participation in the lab exercises is compulsory! Lab exercises marked with an asterisk (*) must be completed before a signature can be given! Participation in these labs is conditional on the correct answering of the pre-assigned (preparation) pop-up questions (there will be no assessment in the first lab). If you do not know these questions, you can try to make up the lab at another (pre-arranged) time. During the semester, the preparation and submission of the measurement reports is mandatory. Successful completion of a final examination (50% of the total)

**Examination requirements:**

Written exam.

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| **16. Study aids, laboratory background:** Lecture notes. Building 7: Instron tensile testing machine, hardness measuring equipment, metal microscopes. |
| **17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**<br>Jason Rowe: Advanced Materials in Automotive Engineering, 1st Edition, Elsevier, 2012, ISBN: 9780857095466;<br>William D. Callister: Materials Science and Engineering, An Introduction, 7th Ed., John Wiley, 2007. |

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|---|---|
| **1. Subject name, code:** Mathematics I | |
| **2. Name of course, level of education:** Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Compulsory subject | **5. Evaluation:** Mid-term grade |
| **6. Number of lessons per week (lecture+ exercise + lab):** 2+2+0<br>**Number of consultation hours:** | **7. Credit value:** 5 |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |
| **10. Prerequisites:** | |
| **11. Department:** Department of Science and Engineering | |
| **12. Subject coordinator:** Tamás Ladics, PhD | |
| **13. The teacher of the subject:** Tamás Ladics, PhD | |

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

The aim of the course is to make the students learn the basic concepts and tools of advanced mathematical analysis that are necessary and required in engineering studies and later on in their profession.

**The knowledge to be acquired:**

Three-dimensional vectors. Solving systems of linear equations. Matrices, multiplication of matrices, inverse matrix, rank. Linear transformations, eigenvector, eigenvalue. Complex numbers. Elementary operations of complex numbers. Power and *n*th root in trigonometric form. Real sequences and their properties. Convergence, special limits. Real functions of a single variable. Elementary functions and their properties. Limits of real functions, continuity. Differential calculus of one variable functions. Rules and procedures of differentiation. Applications of differential calculus: sketching graphs, local and global extrema, shape of curves.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

The students will become familiar with the basic concepts and tools of advanced mathematical analysis, they know and understand the scientific principles, relations and procedures that are necessary and required in engineering professions. They will be able to recognize a problem of higher mathematics, identify the adequate method to solve it and they can apply the method in a quick and precise manner. They are able to build an adequate mathematical model for a given technical problem, to generalize it for similar cases.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

During the semester two tests will be written. At the end of the semester the students can write one test to improve they final evaluation. For a satisfactory grade a performance of at least 50% is required.

**Examination requirements:**

**16. Study aids, laboratory background:**

**17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**

George B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano: Thomas' Calculus,Pearson, 2009.

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|---|---|
| **1. Subject name, code:** Physics | |
| **2. Name of course, level of education:** Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Compulsory subject | **5. Evaluation:** Exam |
| **6. Number of lessons per week (lecture+ exercise + lab):** 2+2+0<br>**Number of consultation hours:** | **7. Credit value:** 5 |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |
| **10. Prerequisites:** | |
| **11. Department:** Department of Basic Sciences | |
| **12. Subject coordinator:** Péter Nagy, PhD | |
| **13. The teacher of the subject:** Sándor Lakó, PhD. | |

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

Comprehensive, almost complete processing of the curriculum of the subject of high school physics, solution of basic physics problems and problems without higher mathematical knowledge, description and mastering of solution methods. Physical foundation of technical expertise.

**The knowledge to be acquired:**

Physical quantity; measure, unit of measure. The SI system of units. Ratio and level value. Quantities describing the motion of a point of mass. Movement along a line, plane movements.

Newton's axioms. Newton's law of gravity. Applications of the basic equation of dynamics. Work, energy. Work. Theorem of conservation of mechanical energy. Dynamics of the point system. Internal and external forces. Impulse theorem, center of gravity theorem. Collisions.

Hydrostatics. Hydrostatic pressure, the law of Pascal and Archimedes.

Changes in the state of ideal gases. Interpretation of pressure based on kinetic gas theory. Absolute temperature concept. Equation of conditions for ideal gases, gas laws. The concept of heat and temperature, temperature scales. Thermal expansion of solids and liquids. Temperature dependence of density. Changes in the state of gases. Heat capacity, specific heat.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

The student knows the general and specific physical principles, rules, contexts, procedures necessary for the cultivation of the technical field, is able to formulate them mathematically and to solve specific problems, striving for efficient and high-quality work. Is able to evaluate realistically the results of his/her own work.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

Students will write 20-40 minutes papers, each with a 20-40 points at a pre-announced time 3 times during the semester, containing theoretical questions and calculation tasks. There is no possibility to replace or correct the papers. The practice leader can also give points for class performance. You will be able to earn at least 100 points in total during the semester. Students who have not been able to score a threshold score of at least 40 points (required for admission to the exam) by the penultimate internship may write a 45-point corrective test from the entire semester for the last lesson, lasting 45 minutes.

**Examination requirements:**

A student (enrolled in a full-time course) who has achieved a total of at least 40 points by the time of the semester or at least 40 points for the corrective test written may be admitted to the exam.

The exam is written and lasts 100 minutes. It consists of the examination of the curriculum and the solution of the tasks given in the lectures or for the individual processing. Only the published collection of formulas and pocket calculator can be used when writing the exam and writing the dissertations. The maximum score of the exam paper is 100 points. In the case of students who have taken the subject for full enrollment and have not written the corrective test, the part of the points collected during the semester above the threshold score (40) will be added to the score of the examination paper. In the case of students who only take the subject for the exam or have written the corrective test, no extra points can be added to the score of the exam paper.

Determination of the exam grade:

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|---|
| Under 50 points: 1, 50-65[ points: 2, [65-80[ points: 3, [80-90[ points::4, from 90 points: 5. |
| **16. Study aids, laboratory background:**<br>Downloadable resources. |
| **17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**<br>[1] P. P. Urone, R. Hinrichs: College Physics, OpenStax, Rice University, 2012., ISBN 1-938168-00-3 (web: https://openstax.org/details/books/college-physics)<br>[2] J. Walker: Fundamentals of Physics, 8th Edition, Wiley, 2007., ISBN 0471758019 |

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|---|---|
| **1. Subject name, code:** Safety and Protection | |
| **2. Name of course, level of education:** Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Compulsory subject | **5. Evaluation:** Exam |
| **6. Number of lessons per week (lecture+ exercise + lab):** 2+0+0<br>**Number of consultation hours:** | **7. Credit value:** 2 |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |
| **10. Prerequisites:** - | |
| **11. Department:** Department of Innovative Vehicles and Materials | |
| **12. Subject coordinator:** Jakab Sándor, PhD | |
| **13. The teacher of the subject:** Gábor Kónya, István Miskolczi | |

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

Get to know the legal background of occupational safety and fire protection, the basic concepts related to the topic. By acquiring this knowledge, they are able to identify and identify work and fire hazards in a given activity. They should be familiar with the hazards of work, prevention options and related regulations, and learn how to create safe workplaces and work environments.

**The knowledge to be acquired:**

The concept and areas of occupational safety: safety technology, occupational health in domestic and international terms.
Legal institutions of the regulatory levels of labor protection.
Internal regulation of occupational safety and health, control system.
Occupational safety supervision system, tasks of authorities.
Workplace safety characteristics and design.
Safety technology for electrical equipment.
Security technology for material handling and storage.
Human-machine environment system.
Purpose and tasks of occupational health.
Risk analysis and management.
Accident-work-industrial accident concept.
General concepts of fire and burn protection.
Description of fire protection rules.
Methods of firefighting, extinguishing media.
Control of fire protection.
Environmental protection concept.
Methods and areas of environmental protection.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

The student will become familiar with the basic facts, interrelationships, limits and boundaries of the knowledge and activity system of the field of engineering and materials technology. He/she is able to apply the acquired technical scientific principles, rules, contexts and procedures in solving routine tasks in the field of engineering. Ability to understand and process technical documentation. Open to general and specific knowledge underpinning the technical discipline. Is able to evaluate realistically the results of his/her own work.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

Knows the rules for designing and operating jobs.
Knows and is able to apply workplace safety systems.
He / she is familiar with the requirements for determining the personal conditions of performance, the tasks related to the procedure for the examination of suitability for the job and the verification of the fulfillment of the personal conditions.
Able to interpret and utilize information related to health preservation, apply health promotion knowledge, create a workplace environment that supports health and efficiency.

Able to propose short- and long-term prevention and risk management solutions and alternatives, oversee their coordination, implementation and follow-up.
Able to think strategically in the creation of the workplace, with his knowledge he contributes to the creation of appropriate working conditions.

**Examination requirements:**

written

**16. Study aids, laboratory background:**

**17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**

Lecture PPT

| | |
|---|---|
| **1. Subject name, code:** Engineering Drawing | |
| **2. Name of course, level of education:** Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Basic subject | **5. Evaluation:** Mid-term grade |
| **6. Number of lessons per week (lecture+ exercise + lab):** 1+0+3<br>**Number of consultation hours:** | **7. Credit value:** 4 |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |
| **10. Prerequisites:** None | |
| **11. Department:** Department of Innovative Vehicles and Materials | |
| **12. Subject coordinator:** László Tóth, PhD | |
| **13. The teacher of the subject:** Vajda, Zsuzsanna | |

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

The aim of the course of Engineering drawing is to familiarise students the rules of technical drawing. Students will learn about the technical communication, communicate with using of dimensioned detail drawing. They study the meaning of international way of engineering drawing. They learn about limits and fits, roughness.

**The knowledge to be acquired:**

Basic expressions of engineering drawing.. Rule of tehcnical wievs. Intersection of planes.. Plane-shapes wievs. Revolutad surfaces and their intersection. Sections, wiews., part-sections. Scaling on engineering drawings. Screw thread and its tehcnical drawing. ISO tolerance and fit system Surface ruoghness standards. Representation of welted joints. Simple drawing of splined shaft and gear.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

The student will become familiar with the basic facts, interrelationships, limits and boundaries of the knowledge and activity system of the field of engineering and materials technology. He/she is able to apply the acquired technical scientific principles, rules, contexts and procedures in solving routine tasks in the field of engineering. Ability to understand and process technical documentation. Open to general and specific knowledge underpinning the technical discipline. Is able to evaluate realistically the results of his/her own work.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

Maximum points of paper: 20 + 30 points, minimum is 10 + 25. Papers are 1 drawing (20 poits) and 1 test (30 points). Maximum points of drawings are made at home 20, 10 and 20 poits, the minimums are 10, 5 and 10 points.

**Examination requirements:** none

**16. Study aids, laboratory background:**

Each announcemet of .drawings are on Teams.

**17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**

Tolossa Deberie: Basic Technical Drawing Student Textbook (2007), ISBN 978-99944-2-096-4, K Venkata Reddi: Textbook of Engineering Drawing (2008), ISBN 81-78000-149-7

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|---|---|
| **1. Subject name, code:** Skills Development | |
| **2. Name of course, level of education:** Vehicle engineer BSc | **3. Language:** English |
| **4. Subject category:** Compulsory subject | **5. Evaluation:** Mid-term grade |
| **6. Number of lessons per week (lecture+ exercise + lab):** 0+1+0<br>**Number of consultation hours:** | **7. Credit value:** 1 |
| **8. Location of the subject:** 1. semester | **9. Type of lecture:** Regular course |
| **10. Prerequisites:** - | |
| **11. Department:** Department of Innovative Vehicles and Materials | |
| **12. Subject coordinator:** Andrea Ádámné Major, PhD | |
| **13. The teacher of the subject:** Andrea Ádámné Major, PhD, Dorottya Antaliczné Nagy | |

**14. Subject description (published in Neptun)**

**The aim of teaching the subject:**

The aim of the course Skills Development is to improve the self-knowledge, communication, problem solving skills and technical point of view of the students. Other aim is to widen the learning methods connecting to their personality and to the technical science.

**The knowledge to be acquired:**

Self-knowledge. Communication. Conflict management. Learning methodology. Technical point of view. In the communication section, the students can learn and improve their verbal communicative skill. They have possibility to work in a team and improve their cooperation skill and attitude. They can use different methods for technical problems and they learn apply the connecting logical steps and learning methods.

**Professional competences to be acquired (knowledge, skills, attitudes, autonomy and responsibility):**

The students are able to plan, organize and carry out independent study. They undertake and authentically represent the social role of their profession, their basic relationship to the world. They seek that their self-education become a resource of their professional goals. They seek that the problems could be solved in a team. They take responsibility and represent the values of the engineering profession; they receive openly the professionally sound critical remarks.

**15. System of assessment and evaluation (published in Neptun)**

**Semester requirements:**

Attendance at block practice classes is mandatory. Completion of assignments in class.

**Examination requirements:**

**16. Study aids, laboratory background:** Written materials, tests, questionnaires received during the lessons.

**17. List of the 2-5 most important compulsory or recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, ISBN) (published in Neptun):**

F. Várkonyi Zsuzsa: Tanulom magam, Budapest, 2003., ISBN: 963547393 1