Subject name: **Analysis I.**	Credits: 5
A tantárgy besorolása: *Mandatory*	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50-50%	
Classes per week: 2 hours lecture és 2 hours practical (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 1.	
Preliminary requirements: *none*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Set theory, properties of real functions, sequences. Limit value, continuity of univariate real functions, Notable curves, Differential calculus and its applications, Mean value theorems of differential calculus (Rolle, Lagrange, Cauchy), L'Hospital rules, Function analysis. The indefinite integral, integration rules. Rational fractional functions, decomposition of rational fractional functions into partial fractions, integration of partial fractions, integration of rational fractional functions of the exponential function, cos(x), sin(x).	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1.James Stuart: Calculus: Concepts and Contexts, Cengage Learning, 2009. 2.James Stuart, Multivariable Calculus, ISBN-13: 9781305266643 Publisher: Brooks Cole 3. Robert G. Bartle, Donald R. Sherbert. Introduction to Real Analysis	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása - They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering. - They know the conceptual framework, the most important relations and theories related to the field. - They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.	

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer: Dr. Hriczó Krisztián, egyetemi docens, PhD
Co-Lecturer(s):

Subject name: **Analysis II.**	Credits: 5
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50-50%	
Classes per week: ea. / gyak. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 2.	
Preliminary requirements: *Alalysis I.*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The definite integral and its applications, improper integral. Bivariate functions. Double integral and its applications. Triple integral and its applications. First-order ordinary differential equations, second-order differential equations with constant coefficients. Vector-scalar functions. Scalar-vector functions. Vector-vector functions.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1..James Stuart: Calculus: Concepts and Contexts, Cengage Learning, 2009. 2.James Stuart, Multivariable Calculus, ISBN-13: 9781305266643 Publisher: Brooks Cole 3. George Cain & James Herod Multivariable Calculus http://people.math.gatech.edu/~cain/notes/calculus.html.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering. • They know the conceptual framework, the most important relations and theories related to the field. • They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.	

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer: Dr. Hriczó Krisztián, egyetemi docens, PhD
Co-Lecturer(s):

Subject name: **Linear Algebra**	Credits: 5
A tantárgy besorolása: Mandatory (compulsory)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50 (kredit%)	
Classes per week: lectures/practical course: 2+2	
Requirement type: **exam**	
Suggested semester: first	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Vectors in 2D and 3D, vector algebra, norm, dot product, projection, cross product, lines and planes. Vector Spaces, subspaces, linear independence, bases, dimension. Pivot table techniques. Matrices and matrix operations, rules of matrix arithmetic, different methods of finding the inverse, determinant. Introduction to systems of linear equations, Homogeneous and inhomogeneous systems, Gaussian elimination, pivot table technique. Complex numbers, general form, polar form, operations with complex numbers, polynomials, operations, Horner scheme,	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1.Howard Anton: Elementary Linear Algebra, John Wiley & Sons, 2010 2. Gilbert Strang: Introduction to Linear Algebra 3.Obádovics J. Gyula: Lineáris Algebra példákkal	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering. • They know the conceptual framework, the most important relations and theories related to the field. • They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field. 2. képességei	

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr Veres Laura, associate professor, PhD
Co-Lecturer(s): -

Subject name: **Engineering Chemistry**	Credits: 3
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2+1… az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 1	
Preliminary requirements:	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Summary of basic knowledge and concepts of technical chemistry, introduction to and mastery of the basics of special fields related to mechanical engineering (e.g. lubrication, corrosion, etc.). The lecture should cover the basic chemical knowledge essential for engineering practice. General basic chemistry concepts: chemical substance, physical field, elements of atomic structure. Chemical bonds: first and second order bonds. States of matter and their characterisation. Constituents and their changes. Equilibrium phase diagrams. Acids, bases, salts. Dissolution. Hydration, solvation, hydrolysis. Basic electrochemical concepts. Colloidal systems. Lubrication technology, basics of corrosion protection. Basics of environmental protection. Basics of organic chemistry and plastics chemistry.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. edited by Dr. Endre Berecz, Chemistry for Technical Students, Budapest, 1991. 2. Tamás Veszprémi: General Chemistry, Akadémiai Kiadó, 2008. 3. Ebbing-Gammon: General Chemistry 11th Edition C. R. Dillard, D.E. Goldberg: Chemistry, Reactions, Structures, Properties, Gondolat Kiadó, Budapest, 1982.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.	

- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

2. képességei

- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Mogyoródy Ferenc Ph.D. adjunktus
Co-Lecturer(s): -

Subject name: **General Physics I**	Credits: **4**
A tantárgy besorolása: Mandatory(a nem kívánt törlendő) compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: (kredit%) 50%-50%	
Classes per week: 2 ea. / szem. / 2 gyak. / konz. és hoursszáma: 4 az adott félévben, 2 lectures + 2 recitations (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: test	
Suggested semester: 2	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts of kinematics. Newton’s laws. Work and power. Conservative fields, the law of mechanical energy. The law of momentum. Torque. The law of angular momentum. Central force fields. Damped linear free oscillations. Forced oscillations. The law of momentum and angular momentum for a system of mass points. Euler description of continuous media. Continuity equation. Bernoulli equation. Thermodynamics of gases, solids, and liquids. Processes of ideal gases. First law of thermodynamics. Entropy. Second law of thermodynamics. Cyclic processes.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
R.A. Serway and Chris Vuille: Essentials of College Physics, 2007, ISBN: 0-495-10619-4 P.A. Tipler and Gene Mosca: Physics for Scientists and Engineers, 2004, ISBN: 0-7167-0809-4, 0-7167-0810-8	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. Tudás (knowledge) •They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering. •They know the conceptual framework, the most important relations and theories related to the field. •They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.	

2. Képességei (skills)

•They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

•They can plan, organize and carry out independent learning.

3. Attitűd (attitude)

•They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

•They strive to make self-directed learning a means to achieve their professional goals.

•They strive to solve problems, preferably in cooperation with others.

•They have the stamina and tolerance for monotony required to perform practical activities.

4. autonómiája és felelőssége (autonomy and responsibility)

•They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

Responsible Lecturer (név, beosztás, tud. fokozat): Dr. Gábor Pszota, associate professor, PhD

Co-Lecturer(s):

Subject name: **General Physics II**	Credits: **3**
A tantárgy besorolása: Mandatory(a nem kívánt törlendő) compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: (kredit%) 67%-33%	
Classes per week: 2 ea. / szem. / 1 gyak. / konz. és hoursszáma: 2 lectures + 1 recitation (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: test	
Suggested semester: 3	
Preliminary requirements: General Physics I *(GEFIT001-B2)*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Electric charge, field, potential. Gauss' law. Conductors in a static electric field. The flow of electric charges. Voltage sources. Kirchhoff's laws. Joule's law. The concept of magnetic induction. Magnetic field strength. Dia-, para-, and ferromagnetism. The magnetic Gauss law. Ampere's law. Biot-Savart law. Neumann's law and Faraday's law. Displacement current. Ampere-Maxwell law. The system of Maxwell's equations. EM waves in homogeneous isotropic insulators.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
R.A. Serway and Chris Vuille: Essentials of College Physics, 2007, ISBN: 0-495-10619-4 P.A. Tipler and Gene Mosca: Physics for Scientists and Engineers, 2004, ISBN: 0-7167-0809-4, 0-7167-0810-8	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. Tudás (knowledge) •They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering. •They know the conceptual framework, the most important relations and theories related to the field. •They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field. 2. Képességei (skills)	

•They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

•They can plan, organize and carry out independent learning.

3. Attitűd (attitude)

•They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

•They strive to make self-directed learning a means to achieve their professional goals.

•They strive to solve problems, preferably in cooperation with others.

•They have the stamina and tolerance for monotony required to perform practical activities.

4. autonómiája és felelőssége (autonomy and responsibility)

•They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

Responsible Lecturer (név, beosztás, tud. fokozat): Dr. Gábor Pszota, associate professor, PhD

Co-Lecturer(s):

Subject name: **Descriptive Geometry**	Credits:4
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50%-50%	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2+2 Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: --	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: --	
Suggested semester: 1	
Preliminary requirements: --	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Representation of Monge: mapping of space elements, incidence, connection, intersection. Introducing new image planes. Orthogonal space elements, revolution of planes, metric problems. Polyhedra: representation, intersection with lines and planes, interpenetration. Representation of circles. Mapping of spheres, cones and cylinders of revolution, their intersection with lines and planes, interpenetration. The cylindrical helix, helicoid.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Kathryn Holliday-Darr:Applied Descriptive Geometry, Delmar, 1998 Pottmann, H., Asperl, A., Hofer, M., Kilian, A.: Architectural geometry, Bentley Institute Press, 2010	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the conceptual framework, the most important relations and theories related to the field. 2. képességei • They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities. • They can plan, organize and carry out independent learning.	

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to make self-directed learning a means to achieve their professional goals.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They share their experience with colleagues to help them grow.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Rozgonyi Erika, associate professor, Phd
Co-Lecturer(s): Dr. Zsuzsanna Balajti, associate professor, habil. PhD Dr. József Túri , associate professor, PhD Sándor Lajos, master educator

Subject name: **Mechanical Drawing**	Credits: 4…
A tantárgy besorolása: Required (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 50%, Practice 50% (kredit%)	
Classes per week: Lecture / Practice. és hoursszáma: 28/28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 2	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Technical drawing is the international language of communication between technical professionals. The technical drawing is a system of rules, the elements of which are fixed by international standards. In the framework of the subject, the rules applicable to the field of mechanical engineering will be presented. In addition to the general representation rules, the drawing rules of the most important machine elements are also explained, as well as the special solutions required for machine design.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. ISO Standards Handbook: Technical Drawing. Vol. 1. 2002, Ed. 4, 826 p., ISBN 92-67-10370-9. 2. ISO Standards Handbook: Technical Drawing. Vol. 2. 2002, Ed. 4, 938 p., ISBN 92-67-10371-7. 3. Ron Hanifan: Perfecting Engineering and Technical Drawing Reducing Errors and Misinterpretations, Springer, 2015, ISBN 978-3-319-06982-1	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the conceptual framework, the most important relations and theories related to the field.	

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Sarka Ferenc, associate professor, PhD.
Co-Lecturer(s): Németh Géza senior lecturer, Drágár Zsuzsa Department Engineer.

Subject name: **Fundamentals of Machine Elements**	Credits: **4**...
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: ... (kredit%)	
Classes per week: Lecture/Practice és hoursszáma: 28 Hours lecture28 hours practical az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 1	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Aim of the course: The aim of the course is to acquaint students with the various machines, machine elements, their mechanism of operation and to use the basic physical connections in practice. Course description: Mechanical work and performance in motion on straight line. Sliding friction and rolling resistance. Weightlifting work, potentional energy. The law of conservation of energy in a closed mechanical system. The force of acceleration and inertia. Characteristics of rotating motion. Torque work and performance. Efficiency, machine losses, energy figures. Periodic motion of machines. Bevel gear, crank gear. Determination of motion characteristics. Main types of gears. The flywheel, the degree of inequality. Drive systems. Friction drive. Flexible drive. Gear drive. Brakes, single-jaw and double-jaw brakes. Band brakes. Springs. The spring characteristic. Spring constant of a spring connected in series and in parallel. Laboratory exercises: Measurement of coefficient of friction Measurement of flow losses Gear pump capacity and volumetric efficiency	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Required literature: P. Sandori: The Logic of Machines and Structures (Dover Books on Engineering) Dover 2016.	

M. Clifford, R. Brooks, A. Howe, A. Kennedy, S. McWilliam, S. Pickering, P. Shayler, P. Shipway: An Introduction to Mechanical Engineering Part I. Hodder Education Co, UK 2009.

Recommended literature:

R.C. Hibbeler: Engineering Mechanics, 14. Edition, Pearson Education Inc, 2016.

K. Otto - K. Wood: Product Design, Prentice Hall, New Jersey, 2001.

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.

- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

Responsible Lecturer (név, beosztás, tud. fokozat): Prof. Dr. Gabriella Vadászné Bognár, professor, DSc
Co-Lecturer(s): Dr. Ágnes Takács, associate professor, PhD

Subject name: **Computer Studies**	Credits: **4**
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: … az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 1.	
Preliminary requirements:	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Familiarization with the structure and operation of the Computers, building user competencies for the advanced use of MS Office applications, providing knowledge on the topic of viruses, developing intermediate C language programming skills. • PC hardware basic concepts. A functional system diagram of a computer. The microprocessor. The bus. Memory, libraries. Turing machine. Neumann principle. • Software basic concepts. Tasks of the operating system. • Advanced Excel knowledge. • The general structure of C programs. Data structures. In- and out. • The concept of title, value, indicator. C language instructions. Branch organization, cycle organization. • Basic algorithms interpreted on vectors. Structures. File management. • Library functions. Computer viruses, protection.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1.) Michael Vine: C Programming for the Absolute Beginner (2nd Edition) 2008. 2.) T. Bailey: An Introduction to the C Programming Language and Software Design, 2005. 3.) Alan Murray: Advanced Excel Success, Apress, 2020, ISBN-1484264665 4.) John Michaloudis: 101 most populat excel formulas, 2019, ISBN: 1700300911	

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása
   - They know the conceptual framework, the most important relations and theories related to the field.
2. képességei
   - They can plan, organize and carry out independent learning.
3. attitűd
   - They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
4. autonómiája és felelőssége
   - They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Nehéz Károly, egyetemi docens, PhD

Co-Lecturer(s): Szabó Matrin, egyetemi tanársegéd

Subject name: **Information Technology for Engineers**	Credits: 4
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő): obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 60%-40% (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: ... az adott félévben, 2 lecture+2 practice (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 2	
Preliminary requirements: *Computer Studies*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Introduction to graphics programming in C language. Deep knowledge of Excel, up to Visual Basic programming. Giving an overview of computer networks, databases. Introduction to the basics of using and programming MatLab: Introduction to the possibilities of Wolfram Alpha and the semantic web.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. David Houcque: Introduction to MatLab for Engineering Students, 2005, https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf 2. Dick Kusleika, Michael Alexander: Excel 2019 Power Programming with VBA, 2019, ISBN: 978-1119514923 3. Roger T. Stevens: Graphics Programming in C: A Comprehensive Resource for Every C Programmer, 1988, ISBN: 978-1558510180	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to the field. 2. képességei • They can apply the acquired IT knowledge in solving the tasks arising in the field.	

3. attitűd

- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

– They share their experience with colleagues to help them grow.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Kunné Dr. Tamás Judit, egyetemi adjunktus, PhD
Co-Lecturer(s):

Subject name: **Structural materials I.**	Credits: **5**
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”12: The subject contains about half theoretical and half practical knowledge. The theoretical lectures are supplemented by practical exercises involving numerical examples, measurements and their evaluation. (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2 lectures and 2 practical classes weekly, (ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English) Az adott ismeret átadásában alkalmazandó további (sajátos) módok, jellemzők2 (ha vannak): -	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (sajátos) módok4 (ha vannak): for the signature: passing at least 50% of one of the 2 tests or 40% of the total score of the 2 tests	
Suggested semester: 1. semester	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Classification of materials used in engineering practice and their production technologies. Structural overview of material properties and behaviour. Test methods for mechanical properties (Uniaxial tension test and Hardening test). Basic crystallography - Ideal, realistic crystal lattice. Laws of crystallization. Crystallization of non-ferrous metals. Theoretical basis of properties of single-phase metallic materials. Alloys, equilibrium diagrams of two-constituent systems. Henry-Charpy twin diagram of iron-carbon alloy system. Analysis of crystallization of typical iron-carbon alloys. Bending, compression, impact tests. Mechanical properties and fabric structure of non-alloy steels.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Miklos, T.: Introduction to Materials Sciences, Miskolci Egyetem, Miskolc 2003. (ISBN 963 661 437 7) 2. Callister, W. D.: Materials Science and Engineering, John Wiley & Sons, New York, 2007. ISBN 978-0-471-73696-7, pp. 1-721. 3. Smith, W. F.: Principles of Materials Science and Engineering, McGraw Hill Int. New York, 2006. pp. 1-856. ISBN 0-07-059-169-5 4. James Newell: Essentials of Modern Materials Science and Engineering, Wiley, 2009. ISBN 978-0-471-75365-0	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	

1. tudása

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application.
- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They monitor legislative, technical, technological and administrative changes related to the field.
- They share their experience with colleagues to help them grow.

Responsible Lecturer (név, beosztás, tud. fokozat): Zsolt Lukacs, associate professor, PhD

Co-Lecturer(s):

Zsuzsanna Simon-Koncsik, associate professor, PhD

Péter Zoltán Kovács, associate professor, PhD

Raghawendra Pratap Singh Sisodia, associate professor, PhD

Subject name: **Structural materials II.**	Credits: 5
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: The subject contains about half theoretical and half practical knowledge. The theoretical lectures are supplemented by practical exercises involving numerical examples, measurements and their evaluation. (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2 lectures and 2 practical classes weekly, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: -	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: for the signature: passing at least 50% of one of the 2 tests or 40% of the total score of the 2 tests	
Suggested semester: 2. semester	
Preliminary requirements: *Structural materials I.*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The aim of the course is to develop students' knowledge of structural materials. The object of the course is to familiarise students with the typical properties, potential damage, and applications of the most important groups of materials. During the semester, the following topics are covered in detail: the effect of temperature on the structure and properties of steels. Classification and designation of steels. Structural steels. Tool steels. Non-ferrous and light alloys. Typical loads on and damage to metallic materials. Defect detection tests. Technical ceramics. Engineering polymers. Composites, foams.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Callister, W. D.: Materials Science and Engineering, John Wiley & Sons, New York, 2007. ISBN 978-0-471-73696-7, pp. 1-721. 2. Smith, W. F.: Principles of Materials Science and Engineering, McGraw Hill Int. New York, 2006. pp. 1-856. ISBN 0-07-059-169-5 3. James Newell: Essentials of Modern Materials Science and Engineering, Wiley, 2009. ISBN 978-0-471-75365-0	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They monitor legislative, technical, technological and administrative changes related to the field.
- They share their experience with colleagues to help them grow.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Zsuzsanna Simon-Koncsik, associate professor, PhD
Co-Lecturer(s): Zsolt Lukács, associate professor, PhD

Péter Zoltán Kovács, associate professor, PhD

Raghawendra Pratap Singh Sisodia, associate professor, PhD

Subject name: **Engineering Thermodynamics**	Credits: **3**
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 ea.+14 gy. az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: The condition for acquiring a signature from the subject is that the student must attend at least 60% of the lectures and at least 70% of the practical lessons. The student should reach at least 50% of the maximum attainable points on both of two written tests during the semester. The type of exam is oral (evaluation criteria according to faculty rules).	
Suggested semester: 2.	
Preliminary requirements: GEMAN114-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts - Thermodynamic systems classification, state and state variables. Intense and extensive, specific and molar state variables. Equation of state. Theorem I of Thermodynamics - Internal energy, work of volume change, work of friction and total work. Heat, Principal Theorem I for stationary closed systems, Principal Theorem I for moving closed systems, Principal Theorem I for open systems. Entropy, exergy, anergy and the second law of thermodynamics. Cycles - The Carnot cycle, Thermal efficiency, Exergetic efficiency. Thermodynamics of pure media - The ideal gas, incompressible gas, state changes of the ideal gas. Energy conversion cycles - The Joule cycle, Steam working fluid cycles. Energy conversion cycles - Compressor refrigeration cycles. Energy conversion cycles - Combined cycle gas/steam, cogeneration. Heat transfer fundamentals - Heat conduction in a solid wall, Newton's law of heat transfer.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
P.K.Nag-Basic and Applied Thermodynamics-Tata Mc Graw Hill Publishing Company, 2002 R.K.Rajput-Engineering Thermodynamics-Laxmi Publications S.C.Somasundaram-Thermal Engineering-New Age International (P) Ltd,1996 Baehr, Hans Dieter: Thermodynamik, Springer-Verlag, Berlin, Heidelberg, New York	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.
- They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can create basic models of technical systems and processes.
- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They have the stamina and tolerance for monotony required to perform practical activities.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.They strive to solve problems, preferably in cooperation with others.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They evaluate the efficiency, effectiveness and safety of their subordinates' work.
- They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts, applying the principle of equal access.
- They share their experience with colleagues to help them grow.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Péter Bencs, associate professor, Ph.D.
Co-Lecturer(s):

Subject name: **Engineering Fluid Mechanics**	Credits: 3
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 ea.+12 gy. az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: The condition for acquiring a signature from the subject is that the student should reach at least 50% of the maximum attainable points on both of two written tests during the semester.	
Suggested semester: 3.	
Preliminary requirements: GEMAN124-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Properties of liquids and gases: compressible/incompressible fluids. Ideal/real fluids, surface tension, capillarity. Hydrostatic law, pressure variation in fluids. Communicating vessels, manometers, barometer. Pressure variation in the atmosphere. Hydrostatic thrust on submerged plane and curved surfaces. Kinematics of fluids, Lagrangian and Eulerian specification of the flow field. Streamline, streak line, path line, stream tube. continuity equation for steady flow, Bernoulli's equation. Specific energy diagram, applications of the Bernoulli's equation: Venturi meter, orifice flow meter, Pitot-static tube. Discharge from open tank and pressurized vessel, time of discharge. Energy equation. Minor and major losses in piping systems. Moody diagram. Flow in channels. Hydraulic diameter, radius. Buoyancy force and drag in flow.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
White, F.M.: Fluid Mechanics. 7th Edition, McGraw-Hill, Boston, 2011, ISBN 978-0-07-352934-9 Philip M. Gerhart, Andrew L. Gerhart, John I. Hochstein: Munson, Young and Okiishi's Fundamentals of Fluid Mechanics, 8th Edition, Wiley Loose-Leaf Print Edition, 2018, ISBN: 978-1-119-54799-0	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They know the conceptual framework, the most important relations and theories related to the field.

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.

- They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.

- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can create basic models of technical systems and processes.

- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They have the stamina and tolerance for monotony required to perform practical activities.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They evaluate the efficiency, effectiveness and safety of their subordinates' work.
- They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts, applying the principle of equal access.
- They share their experience with colleagues to help them grow.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Szaszák Norbert Tibor
Co-Lecturer(s):

Subject name: **Statics**	Credits: 5
A tantárgy besorolása: Compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2 + 2 az adott félévben, (ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English) Az adott ismeret átadásában alkalmazandó további (sajátos) módok, jellemzők[2] (ha vannak): –	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (sajátos) módok[4] (ha vannak): **–**	
Suggested semester: 2	
Preliminary requirements: Linear Algebra, Mathematical analysis I.	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Introduction to engineering mechanics. Fundamental concepts and models in mechanics. Equilibrium of a particle. Moment of a force about a point and an axis. Three-dimensional force systems acting on a rigid body. Resultants of a force and couple system. Equivalent and equilibrated systems of forces. The main theorem of statics. The Coulomb-model of dry friction. Supports for rigid bodies. Equilibrium of a rigid body. The free-body diagram. Distributed loading and its resultant. Center of gravity, center of mass and the centroid. Equilibrium of structures. Plane and space trusses. The method of joints and the method of sections. Internal forces and moments in structural members. Bars and beams. Equations of equilibrium for internal forces and moments. Axial force, shear force and bending moment diagrams. Cables.	
A 2-5 legfontosabb Mandatory, illetve ajánlott irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Beer, F.P., Johnston, E.R., Mazurek, D.F., Cornwell, P.J.: Vector Mechanics for Engineers: Statics & Dynamics, McGraw-Hill, 2012 2. Bedford, A.M., Fowler, W.L.: Engineering Mechanics: Statics & Dynamics, Pearson 2022 3. Hibbeler, R.C.: Engineering Mechanics: Statics & Dynamics, Pearson, 2022	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek (tudás, képesség stb., KKK 7. pont) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása: • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. képességei:

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

3. attitűd:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége:

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (név, beosztás, tud. fokozat): Dr. Balázs Tóth, associate professor, PhD
Co-Lecturer(s): –

(1.) Subject name: **Mechanics of Materials**	Credits: 5
A tantárgy besorolása: Compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2 + 2 az adott félévben, (ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English) Az adott ismeret átadásában alkalmazandó további (sajátos) módok, jellemzők[2] (ha vannak): –	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (sajátos) módok[4] (ha vannak): **–**	
Suggested semester: 3	
Preliminary requirements: Statics	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts of mechanics of materials. Introduction to matrix and tensor algebra. Deformable bodies. Deformation gradient, displacement gradient. Strain tensor and rotation tensor. Stress tensor. The tension-compression test. Hooke's law, Poisson's ratio. Strain energy. Elastic deformation of an axially loaded member. Torsion of circular shafts. Bending of straight members. Shear in straight members. Moments of inertia for an area. Combined loading, design of beams and shafts. General equations of elasticity: equilibrium equations, kinematic equations, generalized Hooke's law. Mohr's circle. Principal stresses and strains. The concept of equivalent stress. Theories of failure. Deflection of beams and shafts. Curved beams. Statically indeterminate beams and shafts. Buckling and stability of columns.	
A 2-5 legfontosabb Mandatory, illetve ajánlott irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Beer, F.P. - Johnston, E.R.: Mechanics of Materials, McGraw-Hill, 2007 2. Bedford, A.M., Liechti, K.M., Fowler, W.L.: Statics and Mechanics of Materials, Pearson, 2002 3. Hibbeler, R.C.: Mechanics of Materials, Pearson, 2022	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek (tudás, képesség stb., KKK 7. pont) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása: • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. képességei:

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

3. attitűd:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége:

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (név, beosztás, tud. fokozat): Dr. Sándor Szirbik, associate professor, PhD
Co-Lecturer(s): –

Tantárgyneve: **Numerical Methods**	Credits:5
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50-50(kredit%)	
Classes per week: 2 ea. +2 gyak.és hoursszáma: 56 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: english)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2]*(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4]*(ha vannak)*:	
Suggested semester: 3	
Preliminary requirements: Analysis I, Analysis II, Linear Algebra	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
1. Basic elements of model building. Types of errors, classical error analysis. Error propagation. 2. Vector and matrix norms. Linear algebraic equations. Gauss elimination. 3. LU and Cholesky decomposition. Matrix inversion. 4. Jacobi and Seidel iteration. 5. Eigenvalues and eigenvectors, The power method. 6. Roots of equations: bisection method, fixed-point iteration, Newton method. 7. Curve fitting: Lagrange interpolating polynomials. 8. Least-squares regression. 9-10. Numerical differentiation and integration. 11-12. Runge-Kutta methods for solving ordinary differential equations. 13-14. Using Matlab (Octave) in solving numerical problems.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
S. C. Chapra, R. P. Canale: Numerical Methods for Engineers, McGraw-Hill, 2010. H. Moore: MATLAB for Engineers, Prentice Hall, 2011	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

3. attitűd

- They have the stamina and tolerance for monotony required to perform practical activities.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Körei Attila, associate professor, PhD
Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. Fokoza9999t*): Dr. Földvári Attila József, assistant professor, PhD

Subject name: **Material Technologies**	Credits: **5**
9A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 40 - 60 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 - 42 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 3	
Preliminary requirements: *GEMTT002-B2*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Definition of heat treatment, groups of heat treating technologies. Microstructural changes during heat treatment. Heat treating processes for hardness and strength increase. Hardenability. Machinability improving by heat treatment. Heat treatment processes for toughness increase. Annealings. Thermochemical heat treatments. Microstructural changes during thermochemical heat treatments. Planning of heat treating technologies. Heat treating equipments. Mass effect in case of heat treating. Welding and related technologies. Definition and classification of welding. Energy sources of welding. Characteristics of heat sources. Properties of welding seam and heat affected zone. The electric arc. Manual metal arc welding and submerged arc welding: principles, characteristics, technologies, welding materials, equipments and applications. Metal active/inert gas and tungsten inert gas welding processes: principles, characteristics, technologies, welding materials, equipments and applications. Pressure welding processes. Characteristics of resistance spot welding, electrode geometries and materials, schedules. Resistance projection and seam welding. Material science background of forming. Cutting technology planning. Layout and strip plans, determination of technological parameters for cutting. Cutting tools. Planning of bending technologies and characteristics. Bending tools. Deep drawing technology planning: number of drawings, drawing tools. Production planning with serial drawing tools. The technological process of cold extrusion and cold compression, the steps of their technological design. Characteristics of forging technologies, design principles for forging. Forming machines, principles of machine selection. Processing of plastics: extrusion, injection molding, overview of their technological design and tools.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. ASM Handbook, Vol. 4 Heat Treating (ISBN 0-87170-379-3) 2. ASM Handbook, Vol. 6 Welding, Brazing and Soldering (ISBN 0-87170-377-7). 3. ASM Handbook, Vol. 14 Forming and Forging (ISBN 0-87170-007-7)	

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

a) knowledge

- Knowledge and understanding of basic principles, boundaries of the epistemic and functional system of the engineering field and the expected directions of development and innovation

- Broad theoretical and practical background as well as methodological and practical knowledge of design, manufacture, operation and control of complex mechanical systems and processes

b) skills

- Ability to approach and solve special problems arising in engineering in a versatile, interdisciplinary way

- Ability to process, systemize and analyse information gained through the operation of mechanical systems and processes, as well as to draw conclusions

- Ability to apply integrated knowledge from the field of machines, mechanical engineering devices, systems and processes, engineering materials and technologies, as well as related electronics and informatics

c) attitude

- Openness and aptness to know, accept and credibly communicate professional and technological development and innovation in engineering

- Striving to understand, describe and explain observable phenomena as thoroughly as possible applying the engineering knowledge acquired

d) autonomy and responsibility

- Ability to perform engineering tasks individual

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Ákos Meilinger, associate professor, PhD.

Co-Lecturer(s):

- Dr. Marcell Gáspár, associate professor, PhD
- Dr. Zsolt Lukács, associate professor, PhD
- Dr. László Kuzsella, associate professor, PhD
- Dr. Péter Kovács, associate professor, PhD

Subject name: **Machine Elements I.**	Credits: **4**...
A tantárgy besorolása: Required (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 60%, Practice 40%... (kredit%)	
Classes per week: Lecture / Practice és hoursszáma: 28/28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 3	
Preliminary requirements: GEGET001-B2a és GEGET002-B2a	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The aim of the course is to familiarize students with basic machine components. Get to know their operation and properties. Know their sizing, checking or selection. With the help of mid-year tasks, mastering the basic level of planning and construction. Basic principles of sizing machine components. Connection methods, detachable and non-detachable joints. Dimensioning of mover and tie screws. Couplings. Springs. Dimensioning of shafts. Basics of tribology. Friction, wear, lubrication. Dimensioning and structural designs of sliding bearings. Rolling bearings and their selection. Mechanical drives, their grouping, their most important characteristics. Flexible drives. Gaskets.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Shigley: Mechanical Engineering Design, ISBN 978–0–07–352928–8, McGraw-Hill 2. Robert L. Mott: Machine Elements in Mechanical Design. Pearson Education Ltd. ISBN0131911295 3. Robert C Juvinal - Kurt Marshek: Fundamentals of Machine Component Design, John Wiley & Sons, New York, 2000, ISBN 0-471-24448-**1**	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They know the conceptual framework, the most important relations and theories related to the field.

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can apply the acquired IT knowledge in solving the tasks arising in the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

- They monitor legislative, technical, technological and administrative changes related to the field.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Ferenc Sarka, associate professor, PhD.
Co-Lecturer(s): Dr. Csaba Dömötör associate professor PhD, Németh Géza senior lecturer.

Subject name: **Machine Elements II.**	Credits: …**5**
A tantárgy besorolása: obligatory (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 60% theory, 40 % practice (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: english* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: 3 design project and 1 gear measurement task during the semester	
Suggested semester: 4	
Preliminary requirements: *Machine Elements I*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Expansion and application of the knowledge acquired from the Mechanical Drawing, and Machine Elements I subject. Familiarization and calculation of toothed machine elements (spur, helical, bevel, internal gears, worm drives), manufacturing of gears. Crank mechanisms, flexible drives, Design issues of transmissions	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Jelaska, D.: Gears and gear drives, Jonh Wiley& Sons Ltd. 2012 (ISBN 9781119941309) 2. Lynwander, P.: Gear drive systems – Design and application, Taylor&Francis Group, 1983, (ISBN 0-8247-1896-8) 3. Terplán Z.: Gépelemek II. Tankönyvkiadó, Bp. 1988.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.
- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to solve problems, preferably in cooperation with others.
- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They share their experience with colleagues to help them grow.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Károly Jálics, associate professor, PhD.
Co-Lecturer(s):

Subject name: **Manufacturing Technology**	Credits**: 5**
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50 (kredit%)	
Classes per week: 28 lectures + 28 practical hours / semester, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 3.	
Preliminary requirements: Structural materials I.	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Main scientific fields, basic terms structure and systems approach characteristics of manufacturing technology. Manufacturing éd technological process. Cutting by tools with define edge geometry. Main characteristics of chip removal. Basic elements, workpiece, tool, movements cutting parameters. Role of bases and dimension chains in manufacturing technology. Edge geometry materials of cutting tools. Wear and tool life of cutting tools. Main cutting methods: turning, shaping, drilling, boring, face- and slab milling. Fine machining methods, grinding superfinishing, honing, lapping, polishing. Machine industrial measurements and their tools. Mechanical, optical, electrical and laser measuring devices used in length and angle measurements.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. E. Trent – P. Wright: Metal Cutting, Butterworth–Heinemann Boston, 2000, p446, ISBN 0-7506-7069-X 2. J. Paulo Davim: Machining. Fundamentals and Recent Advances, Springer, 2007, p361, ISBN 978-1-84800-212-8 3. Fritz Klocke: Manufacturing Processes I, Springer-Verlag Berlin Heidelberg 2011, p504, ISBN 978-3-642-11978-1	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.	

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Zsolt Maros, associate professor, PhD
Co-Lecturer(s):

Subject name: **Machine Tools**	Credits: 4
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 4	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Definition of machine tools. The development history of machine tools and their impact on industrial culture and economic progress. Grouping the division of machine tools. The structural design and main building units of machine tools. Characteristics of the design of main and secondary drives. Description of lathe-type machine tools. Description of milling machines, planers, chisels, drilling machines, horizon type machines. Description of abrasive machining machines. Description of gear and thread processing machines. Drilling and milling centers. Description of turning centers. Description of plastic forming machine tools. Description of high energy density radial machine tools and spark cutting machines. Description of rapid prototype technologies and machines. Description of wiring systems used on machine tools. Theory of machine industry measurements applicable to machine tools.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Milberg, J.: Werkzeugmaschinen-Grundlagen, Berlin, Springer Verlag, 1992. 2. Weck, M.: Werkzeugmaschinen , I. - VI., VDI Buch, Düsseldorf, 2013. 3. Liang, S., Shih, A. J.: Analysis of Machining and Machine Tools, 2016, doi:10.1007/978-1-4899-7645-1 4. López de Lacalle, L. N., Lamikiz, A.: Machine Tools for High Performance Machining, 2009, doi:10.1007/978-1-84800-380-4	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They know the conceptual framework, the most important relations and theories related to the field.

- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.

- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Hegedűs György, egyetemi docens, PhD
Co-Lecturer(s): Simon Gábor, mesteroktató

Subject name: **Dynamics**	Credits: 5
A tantárgy besorolása: Compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2 + 2 az adott félévben, (ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English) Az adott ismeret átadásában alkalmazandó további (sajátos) módok, jellemzők[2] (ha vannak): –	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (sajátos) módok[4] (ha vannak): **–**	
Suggested semester: 4	
Preliminary requirements: Mechanics of Materials	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Kinematics of a particle. Kinematics of a rigid body: translation and rotation, relations for velocities and accelerations. Relative-motion analysis of particles and rigid bodies. Kinetics of a particle. Newton's laws of motion. Principle of impulse and momentum. Power and work of a force. Principle of work and energy. Conservative forces and potential energy. Equation of motion for a system of particles. Kinetics of a rigid body. Linear and angular momentum. Moments of inertia. Tensor of inertia. Newton-Euler equations of motion for a rigid body. Kinetic energy of a rigid body. Power and work of system of forces acting on a rigid body. D'Alembert's principle. Constrained motions. Planar kinetics of a system of rigid bodies. One-degree-of-freedom vibration of a rigid body. Equation of motion, circular and natural frequency. Undamped, damped and forced vibrations. Resonance.	
A 2-5 legfontosabb Mandatory, illetve ajánlott irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Beer, F.P., Johnston, E.R., Mazurek, D.F., Cornwell, P.J.: Vector Mechanics for Engineers: Statics & Dynamics, McGraw-Hill, 2012 2. Bedford, A.M., Fowler, W.L.: Engineering Mechanics: Statics & Dynamics, Pearson, 2022 3. Hibbeler, R.C.: Engineering Mechanics: Statics & Dynamics, Pearson, 2022	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek (tudás, képesség stb., KKK 7. pont) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása: • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. képességei:

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

3. attitűd:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége:

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (név, beosztás, tud. fokozat): Dr. Edgár Bertóti, full professor, PhD, DSc
Co-Lecturer(s): –

Subject name: **Fluid Machinery**	Credits: 5
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 ea.+28 gy. az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: The condition for acquiring a signature from the subject is that the student should reach at least 50% of the maximum attainable points on both of two written tests during the semester.	
Suggested semester: 4.	
Preliminary requirements: GEAHT211-B2, GEHAT321-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Categorization based on the direction of energy conversion: fans, pumps and turbines. Characteristic curve of pipes. Basic operating characteristics of pumps and turbines. Pump in a piping system. Operating characteristics of turbomachines. Principle of operation, characteristics, curves and regulation of turbopumps. Principle of operation, characteristics, curves and regulation of fans. Head, main properties and characteristic speed of impulse and reaction type water turbines. Hydrodynamic torque converter and hydrostatic transmission. Operation of turbocompressors. Main properties and fields of application of gas and steam turbines. Categorization of volumetric machines. Operating characteristics of reciprocating pumps, fluid delivery as a function of time, effect of air vessel. Reciprocating compressor. Radial and axial piston pumps. Types of rotating piston pumps, fluid delivery.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Karassik, I.J., McGuire, T.: Centrifugal Pumps. Second Edition International Thomson Publishing, 1996. ISBN: 978-1-4615-6604-5 R.I. Lewis: Turbomachinery performance analysis, John Wiley & Sons Inc., New York, 1996. ISBN-13: 978-0340631911	

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.
- They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can create basic models of technical systems and processes.

- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.

- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

- They have the stamina and tolerance for monotony required to perform practical activities.

- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

- They evaluate the efficiency, effectiveness and safety of their subordinates' work.

- They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts, applying the principle of equal access.

- They share their experience with colleagues to help them grow.

- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Norbert Tibor Szaszák, egyetemi docens, PhD
Co-Lecturer(s): Tollár Sándor, mesteroktató

Subject name: **Chemical Technologies and Equipment**	Credits: 4
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2+2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: english)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: -	
Suggested semester: 4	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
World history of the chemical industry, Hungarian and regional conditions. Basic operational concepts, physical quantities and equations describing units in unit operation, classifying of operations. Sedimentation, filtration, dust and drop separation and their equipment. Centrifugation, mixing, size reduction and their equipment. Theoretical foundations of heat transfer, heat exchange. Heat transfer calculation and equipment. Theoretical foundations of mass transfer, distillation. Rectification, batch distillation, structural designs. Basic concepts of pressure vessel design, sizing foundations. Risks, hazardous materials. The overpressure protection, designation of designing guidelines, subsystems. Overpressure protection devices. Safety valves and rupture discs and panels.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Fonyó-Fábry: Vegyipari művelettani alapismeretek. Nemzeti Tankönyvkiadó, Budapest, 1998. 2. Coulson-Richardson: Coulson and Richardson's chemical engineering, Pergamon, 1993 3. Fábry: Vegyipari gépészek kézikönyve. Műszaki Könyvkiadó, Budapest, 1987.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have comprehensive knowledge of the basic economic, business and legal regulations and instruments.
- They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They are open and receptive to new, modern and innovative processes and methods related to organic farming and health awareness.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.
- They comply with and enforce relevant safety, health, environmental, quality assurance and control requirements.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They monitor legislative, technical, technological and administrative changes related to the field.
- They share their experience with colleagues to help them grow.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Szamosi Zoltán, egy. docens, PhD
Co-Lecturer(s): Dr. Szamosi Zoltán, egy. docens, PhD

Subject name: **Industrial Machining**	Credits: ...**4**
A tantárgy besorolása: Mandatory/ obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 75... (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 lectures/28 practical/semester... az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 4	
Preliminary requirements: *Manufacturing technology*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Machining procedures of flat and cylindrical surfaces, their kinematics, machines, tools and devices. Machining of shaped rotational surfaces and torque-transmitting surfaces. Procedures for the manufacturing of external and internal threads. Machining of different types of gear parts, e.g. spur gears, helical gears, straight and spiral bevel gears, internal gears. Manufacturing of worms and worm wheels. Determining the technological data of each machining, monitoring the processes. Introduction of service life-enhancing treatments. Description of non-traditional machining processes.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Obligatory literature: 1. Milton C. Shaw: Metal Cutting Principles, CBS, 2003, p.594, ISBN 9788123901367 2. E.M. Trent & P.K. Wright: Metal Cutting, 4th edition, Butterworth-Heinemann, 2000, p 446, ISBN 9780750670692 Recommended : 1. El-Hofy, Hassan: Fundamentals of machining processes : conventional and non-conventional processes, Second Edition, CRC Press, 2014, ISBN 9781466577022 2. D.A Stephenson & J.S. Agapiou: Metal Cutting Theory and Practice, Second Edition, CRC Press, 2005, p.864, ISBN 0-8247-5888-9 3. Brusins - Dröger: Werkzeuge und Werkzeugmaschienen für die spannende Metallbearbeitung Teil. 1., Carl Hauser Verlag, München Wien 1980	

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

   - They know the conceptual framework, the most important relations and theories related to the field.
   - They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
   - They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
   - They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

   - They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
   - They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

   - They strive to make self-directed learning a means to achieve their professional goals.
   - They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

4. autonómiája és felelőssége

   - They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Csaba Felhő, associate professor, PhD

Co-Lecturer(s):

Subject name: **Fundamentals of CAD**	Credits: 3
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő) obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%) 40%-60%	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: … az adott félévben, 1 lec. + 2 prac. (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 4	
Preliminary requirements: Descriptive Geometry	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts related to CAD systems. Structure, hardware and software components, basic functions of CAD systems. Computer aided drawing systems. Geometric modeling systems. Wireframe, surface and solid models. Representations of models, visibility algorithms, lighting, shading, photorealistic rendering. Parametric and direct modeling systems. Rapid prototyping methods. Learning basic solid model creation methods using a specific parametric design system (Creo Parametric). Creating parts, assemblies, mechanisms, animations and photorealistic images, Create technical drawings of parts and assemblies.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Obligatory: 1. Lajos, Sándor: 3D models, electronic excercise book 2. Lee, Kunwoo: Principles of CAD/CAM/CAE Systems, Addison-Wesley 1999. Offered: 1. Lajos, Sándor: 2D-s sketches, electronic excercise book 2. Creo Parametric Primer	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.	

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They monitor legislative, technical, technological and administrative changes related to the field.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Lajos Sándor, mesteroktató, -
Co-Lecturer(s): Szilvásiné dr. Rozgonyi Erika, egyetemi docens, PhD Óváriné dr. Balajti Zsuzsanna, egyetemi docens, PhD

Subject name: **Electrotechnics-Electronics**	Credits: **5**
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50-50% (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2 lecture + 2 practice az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: -	
Suggested semester: 5	
Preliminary requirements: *General physics II. (GEFIT002-B2)*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Introducing the basic electrical and magnetic phenomena, laws and circuit calculations in the case of direct current, single and three-phase alternating current excited networks. Introducing the main characteristics of equipment used in electrical energy generation, distribution, conversion and utilization (one and three-phase transformers, one and three-phase synchronous and induction machines, DC machines). Introducing semiconductors, diode, transistor, rectifier circuits, power electronic converters.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Mandatory literature: 1. William H. Hayt: Engineering Circuit Analysis with CD-ROM, McGraw-Hill, 2001, ISBN: 0072283645 2. Theodore Wildi: Electrical machines, drives and power systems, Prentice Hall, 2005, ISBN: 978-0131776913 3. Leon O. Chua, Charles A. Desoer, Ernest S. Kuh: Linear and nonlinear circuits, McGraw-Hill College, 1987, ISBN: 978-0070108981 4. Tietze, U., Schenk, Electronic Circuits - Handbook for Design and Applications, 2008, ISBN: 978-3-540-78655-9 Recommended literature: 1. Fraser, Milne: Integrated Electrical and Electronic Engineering for Mechanical Engineers, McGraw-Hill Publ., 1994, ISBN: 978-0077079734 2. https://www.khanacademy.org/science/physics/electrical-engineering	

3. Robert W. Erickson, Dragan Maksimovic: Fundamentals of Power Electronics, 2001, ISBN: 978-0-306-48048-5

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása (knowledge)

   - They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

   - They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.

2. képességei (skills)

   - They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

   - They can create basic models of technical systems and processes.

3. attitűd (attitude)

   - They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.

   - They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

4. autonómiája és felelőssége (autonomy and responsibility)

   - They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

   - Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.

   - They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Judit Somogyiné Dr. Molnár, associate professor, PhD

Co-Lecturer(s): -

Subject name: **Mechatronics, Hydraulics-Pneumatics**	Credits: 3
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The concept of mechatronics, the elements of the mechatronic system. Sensor concept, switch type sensors: inductive, capacitive, optical, magnetic, ultrasonic. Types of actuators, actuator chains and motion converters. Application examples. Comparison of hydraulic, pneumatic, electric and mechanical drive technology devices. Construction and representation of hydraulic circuits. Characteristics, advantages and disadvantages of hydraulics and pneumatics. Basics of hydraulic and pneumatic energy transmission. Hydraulic circuit elements, symbols. Operating principle and grouping of cylinders. Typical structural designs, symbols, correct and incorrect installation methods. Sizing work cylinders for force and deflection. End-of-stroke damping of working cylinders. Pressure control elements used in hydraulic circuits. Grouping of directional valves, structural design of seat and valve diverters, characteristic features, symbols.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Abdus Salam: Fundamentals of Pneumatics and Hydraulics, 2022, doi: doi.org/10.1007/978-981-19-0855-2 2. Rabie, M. G., Fluid Power Engineering, McGraw-Hill, 2009, ISBN 978-0071622462 3. M. Winston, Essential Hydraulics: Fluid Power Basic, 2014, ISBN 978-1484120590 4. A. Parr: Hydraulics and Pneumatics, 3rd ed., 2011, ISBN: 978-0080966748 5. R. H. Bishop: The Mechatronics Handbook - 2 Volume Set, 2nd ed., 2008, ISBN 978-1315217710	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.

- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.

- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

- They have the stamina and tolerance for monotony required to perform practical activities.

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- They share their experience with colleagues to help them grow.

- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Rónai László, egyetemi docens, PhD
Co-Lecturer(s): Simon Gábor, mesteroktató

Subject name: **Automation**	Credits: **4**...
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő) obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: (kredit%) 60%-40%	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: ... az adott félévben, 2 lec. + 2 prac. (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve:) English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: *GEMAN124-B2*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
It is an important foundational subject in the curriculum of engineering majors, and its most important objective is to present the approach to engineering tasks, to develop basic practical knowledge and independent problem-solving skills. The subject presents the structure and operation of automations and control tecthniques, their quality requirements and their satisfaction. They acquire theoretical and practical knowledge in the design of automation and in the design and implementation of control technique. In the case of control technique, they acquire analytical knowledge of stability issues. They become familiar with control principles, with particular regard to PID control. They gain insight into the construction of complex control technique.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. William Y. Svrcek, Donald P. Mahoney, Brent R. Young: Real-Time Approach to Process Control; John Wiley & sons, 2013; ISBN: 111868138X, 9781118681381 2. http://newton.ex.ac.uk/teaching/cdhw/Feedback/ControlTypes.html	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. Tudás (knowledge) • They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes. 2. Képességei (skills) • They can create basic models of technical systems and processes. 3. Attitűd (attitude)	

- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége (autonomy and responsibility)

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (név, beosztás, tud. fokozat): Dr. Móré Árpád Gábor, teacher

Co-Lecturer(s):

Subject name: **Cutting Theory**	Credits: **4**
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50%-50% (kredit%)	
Classes per week: lect. + prac. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: Industrial machining	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The role of cutting in machining. Chip formation, chip deformation, associated phenomena. Theoretical and experimental determination of the cutting force. Edge geometry and material grades of tools. Machinability of materials used in industrial practice. The quality of the machined surface, factors affecting accuracy. Theoretical issues of cutting in precision finishing and environmentally friendly technologies.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Milton C. Shaw: Metal Cutting Principles, Oxford University Press, 2005, p649 2. David Dornfeld, Dae-Eun Lee: Precision Manufacturing, Springer, 2008, p7750	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
Knowledge: •They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes. Skills: •They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks. •They can create basic models of technical systems and processes. Attitude: •They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.	

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

Autonomy and responsibility:

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Csaba Felhő, associate professor, PhD
Co-Lecturer(s):

Subject name: **CNC technology**	Credits: …**5**
A tantárgy besorolása: specializáción Mandatory/ obligatory in specialization	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50… (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 lectures/28 practical/semester… az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: Enlgish)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: *Industrial machining*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Classification of NC machines and technologies, the basic process of NC machining. Coordinate systems, zero points, tool correction. Structure of NC technology planning, coordinate plan, operation plan, tool plan, program sheet. Program structure of NC programming with word addressing, typical instruction groups, preparatory, geometric, technological and miscellaneous instructions. Typical canned cycle instructions for NC lathes, turning centers and machining centers. Characteristics and application of computer-aided NC programming systems.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Obligatory literature: 1. *Peter Smid: CNC Programming Handbook: A Comprehensive Guide to Practical CNC Programming. Industrial Press Inc, New York, 2003, p.508* 2. *Ken Evans: Programming of CNC Machines, Fourth Edition (+ Workbook), Industrial Press, Inc, 2016, p.488 ISBN 9780831193522* *Recommended :* 1. *Warren S. Seames: Computer Numerical Control, Concepts and Programming, ASM Delmar Thompson Learning, 2001. ISBN 0-7668-2290-7, p441.* 2. *Alan Overby: CNC Machining Handbook: Building, Programming, and Implementation, McGraw-Hill, 2010, p.274, ISBN 9780071623018*	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They have the stamina and tolerance for monotony required to perform practical activities.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They monitor legislative, technical, technological and administrative changes related to the field.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Dr. Csaba Felhő, associate professor, PhD**
Co-Lecturer(s):

Subject name: **Quality Inspection in Machining Industry**	Credits: 4
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő): obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50% (kredit%)	
Classes per week: lect. + prac. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve:* ***English*** Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: *Manufacturing technology*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts of metrology. Measurement errors. Measurement methods of special geometrical features. Direct and indirect angle measurement. Shape- and position errors. Analysis of micro-geometrical parameters. Measurement system analysis. Capability analysis. Sampling methods. Continuous sampling. Inbound quality check, during-process check, final check of machined products.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Compulsory: 1. Montgomery, D.C.: Introduction to statistical quality control, Wiley, 2002. 2. Juran, J. M., De Feo, J.A.: Juran’s Quality Handbook, MCGraw Hill, 2010. Recommended: 1. J. Paulo Davim: Machining – Fundamentals and Recent Advances, Springer, 2008. 2. Kai Cheng – Dehong Huo: Micro-Cutting – Fundamentals and Applications, Wiley, 2013.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása: • They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment. 2. képességei:	

- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

3. attitűd:

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége:

5. They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Viktor Molnar, PhD, associate professor
Co-Lecturer(s): -

Subject name: **Technology Planning**	Credits**: 4**
A tantárgy besorolása: obligatory on speciality	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50 (kredit%)	
Classes per week: 28 lectures + 28 practical hours / semester, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5.	
Preliminary requirements: Manufacturing technology	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Structure and main elements of production systems. Internal structure of the technological process. Technological graphs. Hierarchical structure of technological process planning, tasks of the different levels and their connection to the product design. Possibilities of automation of process planning. Functional analysis. Technology proper design. Methods of operation sequence planning: Varian, generative and vario-generative methods, expert systems. Methods of determination of technological parameters. Determination of the optimal tool life. Characteristic operation sequence of special parts: technology planning of of shafts, discs, sleeves, bushings, toothed and housing-like parts.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Fritz Klocke: Manufacturing Processes I, Springer-Verlag Berlin Heidelberg 2011, p504, ISBN 978-3-642-11978-1 2. T.E. Vollman: Manufacturing Planning and Control Systems, Irwin Professional Publishing, 1997, p896 3. Peter Scallan: Process Planning, Butterworth-Heinemann Oxford 2003, ISBN 0 7506 5129 6, p496 4. George Chryssolouris: Manufacturing Systems: Theory and Practice, Springer Science-i-Business Media, Inc. 2006,ISBN 0-387-25683-0, p602	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They know the conceptual framework, the most important relations and theories related to the field.	

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Dr. Zsolt Maros, associate professor, PhD**
Co-Lecturer(s):

Subject name: **Machine Industrial Assembly**	Credits: **5**
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50%-50% (kredit%)	
Classes per week: lect. + prac. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: Manufacturing technology	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The placement and importance of assembly in the production process. Basic concepts. The theoretical foundations of assembly. Interchangeability. Dimension chain solutions. The technological process and design of the assembly. Planning levels, sub-tasks. Hierarchy of parts, family tree. Analysis of technological correctness, assembly correct construction. Technological characteristics of joint methods. Assembly procedures and tools. Mechanization of assembly. Designing the assembly of typical machine industry products. Creation of assembly workplaces. The basics of organizing the installation: description, analysis and conditions of application of various installation systems. Quality assurance in assembly.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Daniel E. Whitney: Mechanical Assemblies, Oxford University Press; 1st edition 2004. 2. Kalpakjian - Schmid: Manufacturing Engineering and Technology, Prentice-Hall Inc. Publ. 2001, ISBN 0-201-36131-0	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
Knowledge: •They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes. •They can apply the relevant calculation and modelling principles and methods of product, process and technological design. Skills:	

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can create basic models of technical systems and processes.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

Autonomy and responsibility:

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. István Sztankovics, senior lecturer, PhD
Co-Lecturer(s):

Subject name: **Production Technology of Typical Parts**	Credits: **2**
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 100% (kredit%)	
Classes per week: prac. és hoursszáma: 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: Technology Planning	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Development of production plans for parts of medium complexity. The main activities to be performed during the solution of the task: creating the body model of the part; development of a conceptual outline of the technological process; development of the diagrammatic operation sequence plan for the machining of the part; detailed planning of the CNC operation forming the technological process; machining simulation with NX software; CNC program generation. Planning of measurement tasks and selection of measuring instruments. Checking the shape, size and roughness of a component.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. T.E. Vollman: Manufacturing Planning and Control Systems, Irwin Professional Publishing, 1997, p896 2. Peter Scallan: Process Planning, Butterworth-Heinemann Oxford 2003, ISBN 0 7506 5129 6, p496	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
Knowledge: •They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes. •They can apply the relevant calculation and modelling principles and methods of product, process and technological design. Skills:	

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can create basic models of technical systems and processes.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

Autonomy and responsibility:

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. István Sztankovics, senior lecturer, PhD
Co-Lecturer(s):

Subject name: **CAD Systems**	Credits: **5**
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: *Mechanical Drawing*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basics of 2D technical drawing with AutoCAD software. The importance and place of integrated design systems in machine design, the characteristics and structure of such systems. Basics of sketching, creating simple 2D sketch elements, applying geometric and dimension constraints. Creating simple shape features: extruding, rotating. Boolean operations: addition, subtraction, intersection. Parametric design, model building with equations, modification of parts. Overview of shape-based building elements (chamfering, rounding, bevel). Advanced model creation (sweeps), modification, variable rounding and transitions. Transformation of shape features, allocations, reflections. Creating assembly models. Examination of assembly models (interference, sections).	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. M. Hzirz, W. Dietrich, A. Gfrerrer and J. Lang, Integrated Computer-Aided Design in Automotive Development, Berlin: Springer-Verlag, 2013. 2.Max K. Agoston: Computer graphics and geometric modeling, Implementation and algorithms, Springer, 2005, ISBN 1-85233-818-0 3. Christoph M. Hoffmann: Geometric and solid modeling, Morgan Kaufmann, 1989, ISBN 1-55860-067-1 4. Ian Stroud: Boundary Representation Modelling Techniques, Springer, 2006, ISBN 978-1-84628-616-2 5. Jean Gallier: Curves and Surfaces in Geometric Modeling: Theory and Algorithms, Morgan Kaufmann, 1999, ISBN 978-1-55860-599-2	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can apply the acquired IT knowledge in solving the tasks arising in the field.

- They can create basic models of technical systems and processes.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Hegedűs György, egyetemi docens, PhD
Co-Lecturer(s): Kiss Dániel, tanársegéd

Subject name: **Design of Tools and Fixtures**	Credits: **4**
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50%-50% (kredit%)	
Classes per week: lect. + prac. és hoursszáma: 18 + 18 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: Technology Planning	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Tasks and purposes of production tools. Aspects of edge geometry, kinematics and production geometry of tool design. Design of shaped turning tools and cutters, broaching tools, hobbing tools. Computer aided tool design. Fixtures in the machining system. General structure of the Fixtures. Requirements for Fixtures. Design of fixture components. Positioning and its elements. Choice of bases. Clamping and its elements. Selection of fixture components. Orientation, centralization and distribution structures. Fixtures that can be assembled from elements.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. David Spitler, Jeff Lantrip, John Nee, David A Smith: Fundamentals of Tool Design, Fifth Edition, 2003, p.404 2. George E. Kane: Modern Trends in Cutting Tools, 1982, p262	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
Knowledge: • They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes. • They can apply the relevant calculation and modelling principles and methods of product, process and technological design. Skills: • They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.	

- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

Autonomy and responsibility:

- BGF1
- BGF3
- BGF4

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. István Sztankovics, senior lecturer, PhD
Co-Lecturer(s):

Subject name: **Material Technologies in Manufacturing Processes**	Credits: **3**
A tantárgy besorolása: optional	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50 - 50 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 18 - 18 az adott félévben, 1 (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: *Material technologies*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Application of welding processes, and selection methods. Welding processes for individual and low volume production, their characteristics. Welding processes for mass production, their characteristics. The effect of preparation for the welding process, consequences of welding. Brazing and soldering, applicability, preparation, and consequences. Bonding technologies, selection criteria, preparation, and consequences. Applicability of heat treating processes, selection criteria, preparation, and consequences. Opportunities in mass production. Typical forming processes in low volume and mass production, selection, characteristics, and forming tools.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. ASM Handbook, Vol. 4 Heat Treating (ISBN 0-87170-379-3) 2. ASM Handbook, Vol. 6 Welding, Brazing and Soldering (ISBN 0-87170-377-7). 3. ASM Handbook, Vol. 14 Forming and Forging (ISBN 0-87170-007-7)	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. knowledge: • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application. - They can apply the relevant calculation and modelling principles and methods of product, process and technological design.	

b) skills:

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

c) attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to solve problems, preferably in cooperation with others.

d) autonomy and responsibility:

– They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Ákos Meilinger, associate professor, PhD.

Co-Lecturer(s):

- Dr. Marcell Gáspár, associate professor, PhD
- Dr. Zsolt Lukács, associate professor, PhD
- Dr. László Kuzsella, associate professor, PhD
- Dr. Péter Kovács, associate professor, PhD

Subject name: **Production processes and systems** (GEGTT126-B2a)	Credits: **4**
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő) obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50-50 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 18+18 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: -	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: -	
Suggested semester: 7	
Preliminary requirements: Technology Planning	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Aims, main activities and characteristics of production processes and production systems. General types and characteristics of intermittent and continuous production processes: project production, job-shop production, batch production, mass production and process production. Aims and main steps of planning of production processes and systems. Calculation of production capacities, bottleneck analysis. Types of layouts (location of machines; material flow paths, etc.) of manufacturing plants. Essence of the Computer Integrated Manufacturing (CIM). Characteristics of the Flexible Manufacturing Systems. Sub-systems of the Flexible Manufacturing Systems. Case studies.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Required reading: 1. Li, Jingshan; Meerkov, Semyon M.: Production Systems Engineering. 2009., ISBN: 978-0-387-75578-6 Springer 2. Bellgran, M., Säfsten, E. K.: Production Development. Design and Operation of Production Systems. 2010., ISBN: 978-1-84882-494-2, Springer 3. Tullio Tolio: Design of Flexible Production Systems. 2009. ISBN: 978-3-540-85413-5, Springer Suggested reading: 1. Hackman, S. T.: Production Economics. 2008. ISBN: 978-3-540-75750-4, Springer 2. Sachin, K.: A Reference Architecture for Real-Time Performance Measurement. An Approach to Monitor and Control Manufacturing Processes. 2014., ISBN: 978-3-319-07006-3, Springer	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	

1. tudása

   - They know the conceptual framework, the most important relations and theories related to the field.

2. képességei

   - They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

3. attitűd

   - They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

4. autonómiája és felelőssége

   - They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Prof. Dr. György Kovács**, full professor, Ph.D. Habil.

Co-Lecturer(s): -

Subject name: **Design of Machine Tools**	Credits: 4
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Description of the requirements system for machine tools. Description of tools for increasing productivity. Overview and analysis of kinematic chains of main and secondary drives. Standard speed ranges for machine tools. Gear units for stepless and stepless gears. Compound engines. Laws of series and parallel connection of gears. Exploration of possible engine versions, order versions, member number versions, definition of the engine equation. Choosing the optimal gear. Overview and analysis of regular and over-covered engines. Analysis of gear member number and regularity variations. Principle of drawing a revolution diagram. Examination of driving conditions. Methods of increasing controllability. Inspection of regular, overhead and gear shaft drives. Application of Dahlander motor in main drives. Description and analysis of common gear drives. Description of auxiliary engines. Thread cutting on universal and CNC lathes. Introduction to some dynamic issues of machine foundations and belt drives.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Milberg, J.: Werkzeugmaschinen-Grundlagen, Berlin, Springer Verlag, 1992. 2. Weck, M.: Werkzeugmaschinen, I. - VI., VDI Buch, Düsseldorf, 2013. 3. Liang, S., Shih, A. J.: Analysis of Machining and Machine Tools, 2016, doi:10.1007/978-1-4899-7645-1 4. López de Lacalle, L. N., Lamikiz, A.: Machine Tools for High Performance Machining, 2009, doi:10.1007/978-1-84800-380-4	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They know the conceptual framework, the most important relations and theories related to the field.

- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.

- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can create basic models of technical systems and processes.

- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They are open and receptive to new, modern and innovative processes and methods related to organic farming and health awareness.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.
- They share their experience with colleagues to help them grow.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Hegedűs György, egyetemi docens, PhD
Co-Lecturer(s): Simon Gábor, mesteroktató

Subject name: **Theory of Design**	Credits: 4
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The basic idea and typical techniques of methodical design. Designer catalogs. Methods of creating solution variants. Machine tool morphology, coding of machine tool parts, formation of structural equation, derivation of first-order, second-order and third-order machine tool structures. Derivation of robot structures and construction variants. Production series and their design methods. Selection of solution options, basics of technical value analysis. One- and two-dimensional technical valuation models. Functional parts of CNC machine tools. Functional structures of typical main drives and spindles. Motor spindles. Function structures of various NC auxiliary drives. NC rotary tables, tilting tables and tilting heads. function structures. Indirect and direct drive rotary tables, main function carriers: rotary table bearings, torque motor, etc. Stand systems for modern machine tools. Additional systems for NC machine tools. Chip and coolant handling systems. Operating principle of various distance and angle sensors. Practical level acquisition of a CAD program used during design engineering work.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. N. Cross: Engineering Design Methods - Strategies for Product Design (3rd ed), 2005, ISBN 978-0471872504 2. G. Pahl, W. Beitz, J. Feldhusen, K.-H. Grote: Engineering Design - A Systematic Approach, 2007, ISBN 978-184628318 3. M. Hzirz, W. Dietrich, A. Gfrerrer and J. Lang: Integrated Computer-Aided Design in Automotive Development, Berlin: Springer-Verlag, 2013, ISBN 978-3642119392	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

2. képességei

•They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

•They can understand and use the literature, computer technology and library resources of the field.

•They can use their knowledge in a creative way to effectively manage the resources of the workplace.

•They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

3. attitűd

•They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

•They strive to make self-directed learning a means to achieve their professional goals.

•They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

•They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

•– They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

•– They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

•– They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

•– They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Hegedűs György, egyetemi docens, PhD

Co-Lecturer(s): Szabó Kristóf, tanársegéd

Subject name: **Design Projects**	Credits: **2**
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
In the case of machine tool engineering and special purpose machine design specialization students, students must deal with the solution of a specific industrial problem from the field of production equipment. Industrial and/or departmental consultants help in the development of the project work, but initiative is required on the part of the student and increasing independence is expected as the task progresses. There are no developed solution templates for the tasks of the design projects, because each task is unique. During the design project assignment, the student proves that he is capable of independent engineering by applying the previously learned knowledge in connection with a specific design task.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field. • They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes. • They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.	

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can understand and use the literature, computer technology and library resources of the field.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.
- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Kiss Dániel, tanársegéd
Co-Lecturer(s): Simon Gábor, mesteroktató

Subject name: **Tribology**	Credits: **4**...
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: ... (kredit%)	
Classes per week: Lecture/Practice és hoursszáma: 28 Hours lecture28 hours practical az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements:	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
1. What is tribology? Tribotechnology. The tribological system. Types of friction and wear. Static and dynamic friction. Friction coefficient and factors affecting it1. What is tribology? Tribotechnics. The tribological system. Friction and wear types. Static and dynamic friction. The coefficient of friction and the factors affecting it 2. Viscosity, characteristics affecting viscosity factors. Measurement of viscosity by rotational viscometer 3. Purpose of lubricants, their classification. Lubricating oils and requirements for lubricating oils. Additives. Lubricating greases. 4. Stribeck diagram. Formation of fluid friction. Conditions for the generation of hydrodynamic forces. Fluid friction characteristics due to sliding motion of a plane surface 5. Possibilities of practical implementation of the lubricating film. Constant load and constant sliding velocity wedge effect plane surface pairs. Hydrodynamic horn designs. Reynolds equation and its solutions for simple planar surfaces. The load number, friction number and flow number. 6. Velocity and pressure distribution of hydrodynamic bearings with constant load and constant speed cylinder sliding surfaces. 7. Method of calculating the heat generated in a bearing per unit time. The heat balance equation. Calculation of the amount of heat transferred to the environment per unit time. 8. Design of a hydrodynamic plain bearing, independent problem solution 9. Hydrostatic bearings. Dimensioning exercise.	

A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)

Required literature:

P. Sandori: The Logic of Machines and Structures (Dover Books on Engineering) Dover 2016.

M. J. Neale, The Tribology Handbook, Butterworth Heinemann, London, 1995.

M. Clifford, R. Brooks, A. Howe, A. Kennedy, S. McWilliam, S. Pickering, P. Shayler, P. Shipway: An Introduction to Mechanical Engineering Part I. Hodder Education Co, UK 2009.

Recommended literature:

The Design of Rolling Bearing Mountings (Design Examples covering Machines, Wehicles and Equipment), Publ. No. WL 00 200/5 EA, FAG OEM und Handel AG FAG Bearings Limited, Schweinfurt, 1998.

The Design of Rolling Bearing Mountings (Design Examples covering Machines, Wehicles and Equipment), Publ. No. WL 00 200/5 EA, FAG OEM und Handel AG FAG Bearings Limited, Schweinfurt, 1998. (http://www.basco.com.pe/fag.htm)

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

   - They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
   - They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

2. képességei

   - They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
   - They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
   - They can plan, organize and carry out independent learning.
   - They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
   - They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Prof. Dr. Gabriella Vadászné Bognár, professor, DSc**
Co-Lecturer(s):

Subject name: **Measuring of Machines**	Credits: 5
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Concept of measurement, description of measurement procedures. General measuring circle. Physical principles of signal conversion. Methods of resistive signal conversion, strain gauge stamp. Error sources of resistive signal conversion. The principle of piezoelectric signal conversion. Load cases, material properties. 1-degree-of-freedom model of seismic vibration sensors. Frequency analysis of general periodic signals, Fourier series. Spectrum analysis of aperiodic signals. Basic principles of bearing diagnostics. Signal conversion based on the optoelectronic (laser) principle. Pressure sensors, inductive displacement measurement.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. J.G. Webster: The Measurement, Instrumentation and Sensors Handbook. CRC Press, 1999. 2. S.P. Venkateshan: Mechanical measurements. Wiley&Sons, 2015 3. A. Bewoor, V. Kulkarni: Metrology&Measurement. McGraw-Hill, 2009 4. V.K. Madisetti: The digital signal processing handbook, CRC-Press, 2009 5. S. A. Dyer: Instrumentation&Measurement, John Wiley&Sons, Inc. 2001	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can create basic models of technical systems and processes.

- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Rónai László, egyetemi adjunktus, PhD
Co-Lecturer(s): Kiss Dániel, tanársegéd

Subject name: **Special and Precision Manufacturing Technologies**	Credits: 4
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő): compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50% (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2/2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: -	
T antárgy-leírás: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic characteristics of machining. Development of precision and special machining technologies. Classification of machining procedures and technologies based on the surface quality and accuracy. Surface integrity and its influencing components. Measurement and parameters of surface topography. Tools in precision machining: superhard tool materials. Rotational turning. Combined procedures of hard machining. Micro- and nano machining procedures. Additive technologies. Cutting temperature and vibration phenomena in machining.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Compulsory: 1. Wit Grzesik: Advanced Machining Processes of Metallic Materials Elsevier, Amsterdam, 2017. 2. David Dornfeld – Dae-Eun Lee: Precision Manufacturing Springer, New York, 2008. 3. Kai Cheng – Dehong Huo: Micro-Cutting – Fundamentals and Applications, Wiley, 2013. Recommended: 1. J. Paulo Davim: Machining – Fundamentals and Recent Advances, Springer, 2008. 2. Mark J. Jackson: Micro and Nanomanufacturing Springer, New York, 2007.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása:	

- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

2. képességei:

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can create basic models of technical systems and processes.

3. attitűd:

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége: BGF2, BGF5

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Viktor Molnar, PhD, associate professor
Co-Lecturer(s): -

Subject name: **Single Purpose Machines and its Designing**	Credits: 5
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Characteristics of discrete production processes, basic concepts of production automation. Description of automated production equipment. Description of basic concepts related to aggregate special purpose machines, characteristics of construction units. Presentation of typical special purpose machine building elements. Presentation of compositional principles. Description of the basic parameters of special purpose aircraft design. Problems of time allocation of special purpose machine operations. Characteristics and results of spatial merging of operational assets. Characteristics of multi-position special purpose machines. Typical special purpose machine structures and their time cyclograms. Equipment of aggregate special purpose machines, issues of tool change schedule. Select special purpose units. Presentation of an aggregate special purpose machine design sample task. Analysis of realized special purpose machine structures. Non-cutting special purpose machines. Product catalogs and presentation of their use. Overview of the basic knowledge required for designing the control of special purpose machines.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Tolouei Rad, M. : Intelligent analysis of utilization of special purpose machines for drilling operations, 2012. In Vladimir Mikhailovich Koleshko (Eds.). Intelligent Systems (pp. 297-320), doi.org/10.5772/2350 2. Weck, M.: Werkzeugmaschinen , I. - VI., VDI Buch, Düsseldorf, 2013. 3. Liang, S., Shih, A. J.: Analysis of Machining and Machine Tools, 2016, doi:10.1007/978-1-4899-7645-1 4. López de Lacalle, L. N., Lamikiz, A.: Machine Tools for High Performance Machining, 2009, doi:10.1007/978-1-84800-380-4	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can create basic models of technical systems and processes.
- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.

- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.

- They share their experience with colleagues to help them grow.

- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Hegedűs György, egyetemi docens, PhD
Co-Lecturer(s): Simon Gábor, mesteroktató

Subject name: **Metal-forming Machine Tools**	Credits: 3
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
General presentation, grouping and organization of machine tools. The history of their development. Grouping of plastic forming machine tools, grouping and description of forming technologies. Machines with energy characteristics (impact hammers, mechanical hammers, spring hammers, air cushion hammers). Machines with energy characteristics (rubbing presses). Machines with stroke characteristics (crank mechanisms). Kinematic analysis of crank mechanisms. Machines with force characteristics (hydraulic presses). Cylinder lines, cylinder works. Bending machines (plate, tube and spring bending machines). Cutting and plate cutting machines. Rapid prototyping technologies and machines. High energy density shaping machines. Plastic forming machine tools (injection molding machines). Wire and cable production machines.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1.H. Tschaetsch: Metal Forming Practise: Processes - Machines – Tools, 2006, doi: doi.org/10.1007/3-540-33217-0 2. Weck, M.: Werkzeugmaschinen , I. - VI., VDI Buch, Düsseldorf, 2013. 3. Liang, S., Shih, A. J.: Analysis of Machining and Machine Tools, 2016, doi:10.1007/978-1-4899-7645-1 4. López de Lacalle, L. N., Lamikiz, A.: Machine Tools for High Performance Machining, 2009, doi:10.1007/978-1-84800-380-4	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
a) tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

b) képességei

– They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

c) attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

d) autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Simon Gábor, mesteroktató
Co-Lecturer(s): Simon Gábor, mesteroktató

Subject name: **Hydraulic and Pneumatic Systems**	Credits: 4
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Description of the requirements system for machine tools. Description of tools for increasing productivity. Overview and analysis of kinematic chains of main and secondary drives. Standard speed ranges for machine tools. Gear units for stepless and stepless gears. Compound engines. Laws of series and parallel connection of gears. Exploration of possible engine versions, order versions, member number versions, definition of the engine equation. Choosing the optimal gear. Overview and analysis of regular and over-covered engines. Analysis of gear member number and regularity variations. Principle of drawing a revolution diagram. Examination of driving conditions. Methods of increasing controllability. Inspection of regular, overhead and gear shaft drives. Application of Dahlander motor in main drives. Description and analysis of common gear drives. Description of auxiliary engines. Thread cutting on universal and CNC lathes. Introduction to some dynamic issues of machine foundations and belt drives.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Abdus Salam: Fundamentals of Pneumatics and Hydraulics, 2022, doi: doi.org/10.1007/978-981-19-0855-2 2. Rabie, M. G., Fluid Power Engineering, McGraw-Hill, 2009, ISBN 978-0071622462 3. M. Winston, Essential Hydraulics: Fluid Power Basic, 2014, ISBN 978-1484120590 4. A. Parr: Hydraulics and Pneumatics, 3rd ed., 2011, ISBN: 978-0080966748 5. R. H. Bishop: The Mechatronics Handbook - 2 Volume Set, 2nd ed., 2008, ISBN 978-1315217710	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

2. képességei
   - They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
   - They can plan, organize and carry out independent learning.
   - They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
   - They can understand and use the literature, computer technology and library resources of the field.
   - They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.
3. attitűd
   - They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
   - They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
   - They have the stamina and tolerance for monotony required to perform practical activities.
   - They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.
4. autonómiája és felelőssége
   - They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
   - They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
   - They share their experience with colleagues to help them grow.
   - They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Rónai László, egyetemi adjunktus, PhD
Co-Lecturer(s): Simon Gábor, mesteroktató

Subject name: **Programming of CNC Machine Tools**	Credits: **5**
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Characteristics and areas of application of NC and CNC control. Advantages and disadvantages of using CNC technology. Geometrical information systems, geometrical information systems of lathes, drilling and milling machines. The characteristics of the machine, programming and tool coordinate systems, their selection rules and relationships. Typical operating modes of CNC machines. The role, methods and tools of road surveying. Specifics of the use of incremental gauges, the importance and method of recording a reference point. The process and main steps of manual programming. The steps of preparing the grasp plan, the tool plan and the movement plan. Specifics of programming lathe machines. Programming lathe machines. Usage a referenced contour as a subroutine. Contour programming exercises. Geometric information system for milling machines. Preparation of an individual programming task. Milling programs in G code, the process of program writing, segmenting, editing, and documenting programs.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. P. Smid: CNC Programming Handbook Third Edition, New York: Industrial Press Inc., 2007. 2. K. Apro: Secrets of 5-Axis Machining, New York: Industrial Press, 2008. 3. J. P. Davim: Machining of Complex Sculptured Surfaces, London: Springer, 2012. 4. Heidenhain User’s Manual Cycle Programming iTNC 530 5. SINUMERIK 840D/840Di/810D, Programming Guide Advanced	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can communicate professionally in their mother tongue and in at least one foreign language both orally and in writing in a professionally adequate manner.
- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.
- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.
- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They have the stamina and tolerance for monotony required to perform practical activities.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.
- They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts, applying the principle of equal access.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Kiss Dániel, tanársegéd
Co-Lecturer(s):

Subject name: **Methods of Mechanical Engineering Design**	Credits: **4**
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: theory 50%, practice 50% (kredit%)	
Classes per week: lecture/practice és hoursszáma: 28/28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: english)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5. semester	
Preliminary requirements: *GEGET004-B2a*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
An introduction to the fundamental questions of design methodology, by mastering which the student deepens the necessity of thinking in a system. Historical Overview. The role and importance of design in the development of machines and products. Methodological characteristics of mechanical design schools. Extension and generalization of machine design principles. The general structure and elements of the design process. Task definition, search for solutions, evaluation procedures. Methods of principled (production, maintenance, recycling, material saving) design. Scope and methods of documentation.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Pahl, G. – Beitz, W. – Feldhusen, J. – Grote, K. H.: Engineering Design, third edition, 978-1-84628-318-5, Springer Verlag, London, 2007. 2. Otto, K. –Wood, K.: Product Design, ISBN 0-13-021271-7, Prentice Hall, New Jersey, 2001. 3. Suh, N. P.: The principles of design, ISBN 0-19-504345-6, Oxford University Press, 1990.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the conceptual framework, the most important relations and theories related to the field.	

- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.

2. képességei

- They can create basic models of technical systems and processes.
- They can apply and comply with safety, fire protection and hygiene rules and regulations in the workplace.
- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

3. attitűd

- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Takács Ágnes, associate professor, PhD.
Co-Lecturer(s): -

Subject name: **Finite Element Applications of Machine Structures**	Credits: **4**...
A tantárgy besorolása: compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere" theory 50%, practice 50%	
Classes per week: 2 lectures and 2 practical sessions per week. ...(2+2) (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: .....Hungarian, English.....)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: *Machine Elements I, Machine Elements II*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Development and market of finite element program systems. Connection of optimization and finite elements. Multidisciplinary optimization. Programming possibilities inside of COSMOS/M and ANSYS program systems. Preprocessing and model buildong for finite element analysis. Material data, meshing and numerical solution of the model. Solving some interesting examples, proposing useful results and developments for machine structures. Post processing, understanding and qualification of the finite element results and contours of the stress and displacements. Effects of the numerical finite element results to the on the products, constructions, more development ideas. Some multidisciplinary analysis, multidisciplinary optimization examples of design of machine structures, machine lements and products. Demonstrations of successful analysis examples of several projects fulfilled in the last years. Finite element analysis and optimization of the models given by the students, in order to provide more interesting and important finite element results for their complex design tasks.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
ANYS Inc.: ANSYS Mechanical APDL Command Reference. Canonsburg, PA, USA, 2013. SRAC: COSMOS/M User Cuide. Santa Monica, CA. USA, 1995. Szabó J. Ferenc, Bihari Zoltán, Sarka Ferenc: Termékek, szerkezetek, gépelemek végeselemes modellezése és optimálása. Szakmérnöki jegyzet. Készült a Foglalkoztatáspolitikai és Munkaügyi Minisztérium (HEFOP) Humánerőforrás-fejlesztés Operatív Program keretében (elektronikus jegyzet), Miskolci Egyetem, Miskolc, 2006.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

3. attitűd

- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They share their experience with colleagues to help them grow.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Szabó Ferenc János, PhD, associate professor
Co-Lecturer(s): -

Subject name: **Nonmetallic Materials and Technologies**	Credits: **4**
A tantárgy besorolása: választható (optional) (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50+50 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2 ea+2 gyak az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: videos, case studies, topical presentation by students in team work	
Requirement type: **exam** 2 Zh, electronic tests, teamwork (ppt report). Conditions for signature: 100% active participation in the laboratory lessons, successful completion of the mid-year main tests (2 times), min. 50% (sufficient) completion each of the main tests. In case of an unsuccessful main tests (or missed for any reason), the 50% (sufficient) completion of the corrective test(s). Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: min. satisfactory completion of 3 laboratory measurements (by submitting a written test report for each)	
Suggested semester: 5	
Preliminary requirements: GEMTT003-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
I. PLASTICS: Formation and production of polymer structures. Classification of polymers. Structural characterization: constitution, conformation, configuration. The correlation betwen the macromolecular structure and the properties and mechanical behaviour. Thermomechanical curve, viscoelasticity, rheological behavior, mechanical models. Testing of mechanical properties of polymers and the most important influencing factors. Modification of properties: polymer mixtures, additives and fillers. The most common forming technologies of plastics. Industrial applications, recycling, environmental protection. II: CERAMICS. The concept, classification, basic characteristics of ceramics, the relationship between structure and properties. Processing of crystalline and glassy ceramics. Mechanical behaviour of ceramics, typical failure modes. Mechanical testing and advanced toughening methods of technical ceramics.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Lynch, C T.: Handbook of Materials Science: Nonmetallic Materials & Applications, 1st Ed., CRC Press 2021, 448p, ISBN 9780367258924 2. Fakirov, S.¨Fundamentals of Polymer Science for Engineers, Wiley-VCH Verlag GmbH & Co. KGaA, 2017, Online ISBN:9783527802180 3. Somiya at al.: Handbook of Advanced Ceramics, 2 Volume Set, Elsevier, 2003, ISBN 0-12-654640-1;	

4. Barsoum, M.W.: Fundamentals of Ceramics (Series in Materials Science and Engineering) 1st Edition, Routledge; 2002, ISBN 978-0750309028, p624.

5. Marosné, B.M.: Nonmetallic materials and technologies, GEMTT306-B2 electronic lecture notes and educational aids for laboratory exercises, ME, http://edu.uni-miskolc.hu/moodle/course/view.php?id=166;

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége

– They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Prof. Dr. Maria Berkes Maros, full professor, PhD. Dr. habil.

Co-Lecturer(s): Nhours Nagy, assistant professor,

Subject name: **Computer Aided Design**	Credits: **4**
A tantárgy besorolása: Mandatory/obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 30%, Practice 70% (kredit%)	
Classes per week: Lecture/Practice. és hoursszáma: 28+28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: GEGET003-B2a, GEGET004-B2a	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Within the framework of the course, students will get acquainted with the modern tools of mechanical design, the milestones of its formation, software and hardware tools, master the basics of 2D and 3D modeling, get acquainted with its basic technical background. Through specific design/drawing tasks, they gain experience in using the basic tools of a CAD software.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Kátai L. (Editor): CAD Book. Typotex Publishing House. 2012. www.tankonyvtar.hu/hu Pahl G. - Beitz W.: A géptervezés elmélete és practicala. Műszaki Könyvkiadó. Bp., 1981. Encarnaçao J.-Schlechtendal E.G.: Számítógéppel segített tervezés. Műszaki Könyvkiadó. Bp., 1987. Bernhardt, R.: A számítógéppel támogatott tervezés. Műszaki Könyvkiadó. Bp., 1989. 1. Horváth I. - Juhász I.: Számítógéppel segített gépészeti tervezés. Műszaki Könyvkiadó. Bp. 1996. 2. Kátai L. (szerk): CAD tankönyv. Typotex Kiadó. 2012. www.tankonyvtar.hu/hu 3. Kátai L. (Editor): CAD Book. Typotex Publishing House. 2012. www.tankonyvtar.hu/hu 1. Szente J. – Bihari Z.: Gépelemek, alkatrészek számítógépes tervezése - Terméktervezés. HEFOP-3.3.1-P-2004-06-0012, Miskolc, 2005. 2. Kunwoo Lee: Principles of CAD/CAM/CAE Systems. Addison-Wesley. 1999. 3. McMahon C. – Browne, J.: CADCAM. 2nd Ed. Addison-Wesley. 1998.	

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

   - They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
   - They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
   - They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
   - They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.
   - They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

   - They can apply the acquired IT knowledge in solving the tasks arising in the field.

3. attitűd

   - They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

   - They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Csaba Dömötör PhD, associate professor**

Co-Lecturer(s): -

Subject name: **Prototyping and machine building techniques**	Credits: **5**...
A tantárgy besorolása: Required (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 60%, Practice 40% (kredit%)	
Classes per week: Lecture / Practice. és hoursszáma: 28/28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: GEGET008-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The task of the course is to introduce students to modern prototype production technologies not only in theory but also in practice. Students gain proficiency in using a 3D printer by solving independent tasks. The further aim of the course is to present and characterize aluminum machine building elements and related fasteners. Within the framework of the subject, students learn the practical application of machine building elements, catalog use, and gain experience in the use of individual elements through independent practical tasks.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Gibson l D. W. Rosen l B. Stucker: Additive Manufacturing Technologies - Rapid Prototyping to Direct Digital Manufacturing, ISBN: 978-1-4419-1119-3 e-ISBN: 978-1-4419-1120-9, DOI 10.1007/978-1-4419-1120-9 Springer 2010 2. David L. Bourella, Joseph J. Beaman, Jr.a , Ming C. Leub and David W. Rosenc A Brief History of Additive Manufacturing and the 2009 Roadmap for Additive Manufacturing: Looking Back and Looking Ahead 2009 RapidTech US-TURKEY Workshop on Rapid Technologies 3. https://www.fath24.com/hubfs/Downloads/Catalogs%20and%20Brochures/000169-FATH-Engineering-Components-Catalog-18.1-DE-EN	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.

2. képességei

- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of machinery and equipment.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Sarka Ferenc, associate professor, PhD.**
Co-Lecturer(s):

Subject name: **Design Knowledge**	Credits: **2**
A tantárgy besorolása: Required (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 60%, Practice 40%... (kredit%)	
Classes per week: Practice és hoursszáma: 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: GEGET004-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The purpose of the course is to provide students studying mechanical design specialization with knowledge that will directly help them write their thesis work. In its appearance and especially in its content. It introduces the students to the most important laws and regulations necessary in connection with planning tasks. Color dynamics. Ergonomics. Anthropometry. Workplace planning.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. ASME Y14.5 Dimensioning and Tolerancing, ISBN 9780791872192, 2019, ASME 2. ISO 1101: Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out. 3. Wesley E. Woodson - Donald W. Conover :Human Engineering Guide for Equipment Designers, 1964, ISBN 0520013638, University of California Press.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have comprehensive knowledge of the basic economic, business and legal regulations and instruments.
- They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They have working knowledge of the workplace and fire safety, safety technology and occupational health and safety requirements and standards related to the field, as well as the relevant environmental regulations.
- They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

- They can use their knowledge in a creative way to effectively manage the resources of the workplace.
- They can apply and comply with safety, fire protection and hygiene rules and regulations in the workplace.
- They can communicate professionally in their mother tongue and in at least one foreign language both orally and in writing in a professionally adequate manner.
- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.
- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.
- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They are open and receptive to new, modern and innovative processes and methods related to organic farming and health awareness.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.
- They comply with and enforce relevant safety, health, environmental, quality assurance and control requirements.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Sarka Ferenc, associate professor, PhD**
Co-Lecturer(s): **Takács Ágnes associate professor PhD, Dömötör Csaba associate professor PhD.**

Subject name: **Noise Protection**	Credits: …**5**
A tantárgy besorolása: obligatory (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 60% theory, 40 % practice (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: english)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: 1 semester test and workout 1 topic incl. its presentation	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Introducing the students to the basics of acoustics, familiarizing them with acoustic measurements and calculations. Teaching the fundamentals of noise reduction. Simple spectrum analysis with free softwares. Determining the sound power level of machines by surface measurement. Determination of the equivalent A-sound pressure level of time-varying noise.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Fahy, Frank: Foundation of Engineering Acoustics, 2003, 2003 Elsevier Ltd. (ISBN 978-0-12-247665-5) 2. Vér, István L.; Beranek, Leo L.: Noise and Vibration Control Engineering, John Wiley & Sons, 2006, (ISBN 9780471449423) 3. Own script	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They know the conceptual framework, the most important relations and theories related to the field. 2. képességei • They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).	

3. attitűd

- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. **Károly Jálics, associate professor, PhD.**
Co-Lecturer(s):

Subject name: **Bearings**	Credits: 3
A tantárgy besorolása: Required	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 60%, Practice 40%... (kredit%)	
Classes per week: Lecture / practice. és hoursszáma:. 18/18... az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: GEGET004-B2a	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The aim of the course is to familiarize students with the different types of bearings in detail. To acquire knowledge related to the installation and removal of bearings. Recognizing the forms of bearing damage and detecting the cause of damage. Get to know the requirements related to the maintenance of bearings. Learn how to use the laser axis alignment device. In addition, learn the technique of adjusting belt drives and the use of the belt tension adjustment device.	
A 2-5 legfontosabb Mandatory, illetve ajánlott irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. SKF Genereal Catalog 6000I/EN, 2008, SKF Sweden. 2. Johannes Brändlein- Paul Eschmann- Ludwig Hasbargen - Karl Weigand: Ball and Roller Bearings: Theory, Design and Application, ISBN-13: 978-0471984528 3. Wälzlagerpraxis – Hanbuch zur Gestaltung und Berechnung von Wälzlagerungen. Schaeffler. ISBN978-3-7830-0401-4	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek (tudás, képesség stb., KKK 7. pont) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can apply the acquired IT knowledge in solving the tasks arising in the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

- They monitor legislative, technical, technological and administrative changes related to the field.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Sarka Ferenc, associate professor, PhD.**
Co-Lecturer(s): **Németh Géza, senior lecturer.**

Subject name: **Fundamentals of Tribology**	Credits: **4**...
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: ... (kredit%)	
Classes per week: Lecture/Practice és hoursszáma: 18 hours lecture18 hours practical az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements:	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
1. What is tribology? Tribotechnology. The tribological system. Types of friction and wear. Static and dynamic friction. Friction coefficient and factors affecting it1. What is tribology? Tribotechnics. The tribological system. Friction and wear types. Static and dynamic friction. The coefficient of friction and the factors affecting it 2. Viscosity, characteristics affecting viscosity factors. Measurement of viscosity by rotational viscometer 3. Purpose of lubricants, their classification. Lubricating oils and requirements for lubricating oils. Additives. Lubricating greases. 4. Stribeck diagram. Formation of fluid friction. Conditions for the generation of hydrodynamic forces. Fluid friction characteristics due to sliding motion of a plane surface 5. Possibilities of practical implementation of the lubricating film. Constant load and constant sliding velocity wedge effect plane surface pairs. Hydrodynamic horn designs. Reynolds equation and its solutions for simple planar surfaces. The load number, friction number and flow number. 6. Velocity and pressure distribution of hydrodynamic bearings with constant load and constant speed cylinder sliding surfaces. 7. Method of calculating the heat generated in a bearing per unit time. The heat balance equation. Calculation of the amount of heat transferred to the environment per unit time. 8. Design of a hydrodynamic plain bearing, independent problem solution 9. Hydrostatic bearings. Dimensioning exercise.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	

Required literature:

P. Sandori: The Logic of Machines and Structures (Dover Books on Engineering) Dover 2016.

M. J. Neale, The Tribology Handbook, Butterworth Heinemann, London, 1995.

M. Clifford, R. Brooks, A. Howe, A. Kennedy, S. McWilliam, S. Pickering, P. Shayler, P. Shipway: An Introduction to Mechanical Engineering Part I. Hodder Education Co, UK 2009.

Recommended literature:

The Design of Rolling Bearing Mountings (Design Examples covering Machines, Wehicles and Equipment), Publ. No. WL 00 200/5 EA, FAG OEM und Handel AG FAG Bearings Limited, Schweinfurt, 1998.

The Design of Rolling Bearing Mountings (Design Examples covering Machines, Wehicles and Equipment), Publ. No. WL 00 200/5 EA, FAG OEM und Handel AG FAG Bearings Limited, Schweinfurt, 1998. (http://www.basco.com.pe/fag.htm)

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

   - They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
   - They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

2. képességei

   - They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
   - They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
   - They can plan, organize and carry out independent learning.
   - They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
   - They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

   - They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

4. autonómiája és felelőssége

5. BGF1, BGF2

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Prof. Dr. Gabriella Vadászné Bognár, professor, DSc**
Co-Lecturer(s):

Subject name: **CNC Machine Tools**	Credits: **5**
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts related to CNC machine tools. Machine tools with serial, parallel and hibrid kinematics. Structures of machine tools with serial kinematics and their derivation. Functional parts of CNC machine tools. Functional structures of typical main drives and spindles, main function carriers: spindle bearings, motors, rotary encoders, brakes, etc. Motor spindles. Function structures of various NC auxiliary drives. Indirect and direct drive sleds, main function carriers: ball screws, linear motors, wires, direct gauges, etc. NC rotary tables, tilting tables and tilting heads. function structures. Indirect and direct drive rotary tables, main function carriers: rotary table bearings, torque motor, etc. Stand systems for modern machine tools. Water-cooled spindle cooling systems. Automatic lubrication systems. Typical lubrication locations, lubricants and quantities. Chip and coolant handling systems. Automatic tool and workpiece measuring devices. Automatic tool supply for NC machine tools. Automatic workpiece supply of NC machine tools. Operating principle of various distance and angle sensors.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. P. Smid: CNC Programming Handbook Third Edition, New York: Industrial Press Inc., 2007 2. K. Apro: Secrets of 5-Axis Machining, New York: Industrial Press, 2008 3. J. P. Davim: Machining of Complex Sculptured Surfaces, London: Springer, 2012 4. Liang, S., Shih, A. J.: Analysis of Machining and Machine Tools, 2016, doi:10.1007/978-1-4899-7645-1 5. López de Lacalle, L. N., Lamikiz, A.: Machine Tools for High Performance Machining, 2009, doi:10.1007/978-1-84800-380-4	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	

1. tudása

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can understand and use the literature, computer technology and library resources of the field.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.
- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Kiss Dániel**, tanársegéd
Co-Lecturer(s):

Subject name: **Technology Planning**	Credits**: 4**
A tantárgy besorolása: obligatory on speciality	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50 (kredit%)	
Classes per week: 28 lectures + 28 practical hours / semester, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5.	
Preliminary requirements: Manufacturing technology	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Structure and main elements of production systems. Internal structure of the technological process. Technological graphs. Hierarchical structure of technological process planning, tasks of the different levels and their connection to the product design. Possibilities of automation of process planning. Functional analysis. Technology proper design. Methods of operation sequence planning: Varian, generative and vario-generative methods, expert systems. Methods of determination of technological parameters. Determination of the optimal tool life. Characteristic operation sequence of special parts: technology planning of of shafts, discs, sleeves, bushings, toothed and housing-like parts.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
2. Fritz Klocke: Manufacturing Processes I, Springer-Verlag Berlin Heidelberg 2011, p504, ISBN 978-3-642-11978-1 3. T.E. Vollman: Manufacturing Planning and Control Systems, Irwin Professional Publishing, 1997, p896 4. Peter Scallan: Process Planning, Butterworth-Heinemann Oxford 2003, ISBN 0 7506 5129 6, p496 5. George Chryssolouris: Manufacturing Systems: Theory and Practice, Springer Science-i-Business Media, Inc. 2006,ISBN 0-387-25683-0, p602	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
2. tudása • They know the conceptual framework, the most important relations and theories related to the field.	

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

3. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

4. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to solve problems, preferably in cooperation with others.

5. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Dr. Zsolt Maros, associate professor, PhD**
Co-Lecturer(s):

Subject name: **Design Knowledge**	Credits: **2**
A tantárgy besorolása: Required (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 60%, Practice 40%... (kredit%)	
Classes per week: Practice és hoursszáma: 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: GEGET004-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The purpose of the course is to provide students studying mechanical design specialization with knowledge that will directly help them write their thesis work. In its appearance and especially in its content. It introduces the students to the most important laws and regulations necessary in connection with planning tasks. Color dynamics. Ergonomics. Anthropometry. Workplace planning.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
2. ASME Y14.5 Dimensioning and Tolerancing, ISBN 9780791872192, 2019, ASME 3. ISO 1101: Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out. 4. Wesley E. Woodson - Donald W. Conover :Human Engineering Guide for Equipment Designers, 1964, ISBN 0520013638, University of California Press.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
2. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have comprehensive knowledge of the basic economic, business and legal regulations and instruments.
- They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application.
- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.
- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.
- They have working knowledge of the workplace and fire safety, safety technology and occupational health and safety requirements and standards related to the field, as well as the relevant environmental regulations.
- They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.
- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

3. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

- They can use their knowledge in a creative way to effectively manage the resources of the workplace.
- They can apply and comply with safety, fire protection and hygiene rules and regulations in the workplace.
- They can communicate professionally in their mother tongue and in at least one foreign language both orally and in writing in a professionally adequate manner.
- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.
- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.
- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

4. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They are open and receptive to new, modern and innovative processes and methods related to organic farming and health awareness.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.
- They comply with and enforce relevant safety, health, environmental, quality assurance and control requirements.

5. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Sarka Ferenc, associate professor, PhD**
Co-Lecturer(s): **Takács Ágnes associate professor PhD, Dömötör Csaba associate professor PhD.**

Subject name: **Finite Element Applications of Machine Structures**	Credits: **4**...
A tantárgy besorolása: compulsory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere" theory 50%, practice 50%	
Classes per week: 2 lectures and 2 practical sessions per week. ...(2+2) (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: .....Hungarian, English.....)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: *Machine Elements I, Machine Elements II*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Development and market of finite element program systems. Connection of optimization and finite elements. Multidisciplinary optimization. Programming possibilities inside of COSMOS/M and ANSYS program systems. Preprocessing and model buildong for finite element analysis. Material data, meshing and numerical solution of the model. Solving some interesting examples, proposing useful results and developments for machine structures. Post processing, understanding and qualification of the finite element results and contours of the stress and displacements. Effects of the numerical finite element results to the on the products, constructions, more development ideas. Some multidisciplinary analysis, multidisciplinary optimization examples of design of machine structures, machine lements and products. Demonstrations of successful analysis examples of several projects fulfilled in the last years. Finite element analysis and optimization of the models given by the students, in order to provide more interesting and important finite element results for their complex design tasks.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
ANYS Inc.: ANSYS Mechanical APDL Command Reference. Canonsburg, PA, USA, 2013. SRAC: COSMOS/M User Cuide. Santa Monica, CA. USA, 1995. Szabó J. Ferenc, Bihari Zoltán, Sarka Ferenc: Termékek, szerkezetek, gépelemek végeselemes modellezése és optimálása. Szakmérnöki jegyzet. Készült a Foglalkoztatáspolitikai és Munkaügyi Minisztérium (HEFOP) Humánerőforrás-fejlesztés Operatív Program keretében (elektronikus jegyzet), Miskolci Egyetem, Miskolc, 2006.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
2. tudása	

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

3. képességei

- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

4. attitűd

- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

5. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They share their experience with colleagues to help them grow.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Szabó Ferenc János, PhD, associate professor
Co-Lecturer(s): -

Subject name: **Welding and Related Technologies**	Credits: 4
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50-50%(kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 2+2 hours/week az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5. félév	
Preliminary requirements: Materials Technologies	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Introduction to the fundamentals and application of welding and related technologies. The place of welding in joining technologies. Classification of welding processes. Basic theoretical knowledge of welding processes. Arc welding processes: shielded metal arc welding, gas metal arc welding, gas tungsten arc welding, submerged arc welding. Beam welding: laser beam and electron beam welding. Oxyfuel gas welding. Electric slag welding. Electrogas welding. Resistance welding: spot, seam and projection welding. Pressure welding: cold pressure welding, friction welding, explosive and ultrasonic welding. Brazing and Soldering. Thermal cutting processes and their equipment. Thermal spraying. Adhesice bonding. Combined joining methods.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. ASM Handbook, 10th Edition, Vol. 6.: Welding, Brazing, Soldering, ISBN-13: 978-0871703828 2. Welding and Welding Technology, Richard L. Little, McGraw-Hill Companies, ISBN-13: 978-0070380950 3. Welding Processes and Thermal Cutting, Robert Killing, DVS – Verlag, ISBN-10 : 3871557900 4. Manufacturing Engineering and Technology, 7th Edition, Serope Kalpakjian, Steven Schmid, Pearson, ISBN-10 : 0133128741 5. Electron Beam Welding, H. Schultz, Abington Publishing: Cambridge, UK, 1993	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása	

- They know the conceptual framework, the most important relations and theories related to the field.

- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can apply and comply with safety, fire protection and hygiene rules and regulations in the workplace.

- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They comply with and enforce relevant safety, health, environmental, quality assurance and control requirements.

4. autonómiája és felelőssége

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

- They monitor legislative, technical, technological and administrative changes related to the field.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Raghawendra Pratap Singh Sisodia, associate professor, PhD, IWE/EWE
Co-Lecturer(s): Dr. Marcell Gáspár, associate professor, PhD, IWE/EWE

Subject name: **Heat Treatment and Surface Technologies**	Credits: **5**
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő) obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%) 50-50%	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: … az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: lecture + practice 2 + 2 hours/week	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: -	
Suggested semester. 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Review of surface related degradation phenomena (wear, corrosion, fatigue), their importance in failure of engineering components, methods for characterization of engineered surfaces. General overview and classification of SE processes i.e. Surface Modification Technologies (work hardening, localized transformation hardening, remelting of surface layers, traditional and advanced processes in thermochemical processes, ion implantation, laser alloying and cladding) and Coating processes (electroplating, Physical and Chemical Vapour Deposition, Thermal spraying). Economic and environmental impact of Surface Engineering, trends if research and industrial applications, with special focus on automotive industry.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Surface Engineering – e-learning materials developed by MinSE, e2ngineering and Innovate international projects, funded by EU (www.minse.net) 2. 3. G. Krauss: Steels and its Heat Treatment - ASM International, ISBN-087170370X, 2002 3. E.J. Mittemeijer, M.A.J. Somers: Thermochemical Surface Engineering of Steels Improving Materials Performance, Woodhead Publ., 2015, ISBN 978-0-85709-592-3, DOI https://doi.org/10.1016/C2013-0-16318-0 4. William D. Callister: Material Science and Engineerings, ISBN-13: 978-0-471-73696-7, 2007 5. ASM International Handbook, Vol5. Surface Engineering, ISBN 0-87170-377-7	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	

1. tudása

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application.
- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They monitor legislative, technical, technological and administrative changes related to the field.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Dr. László Kuzsella, associate professor, PhD**
Co-Lecturer(s):

Subject name: **Quality Inspection in Machining Industry**	Credits: 4
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő): obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50% (kredit%)	
Classes per week: lect. + prac. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve:* ***English*** Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: *Manufacturing technology*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts of metrology. Measurement errors. Measurement methods of special geometrical features. Direct and indirect angle measurement. Shape- and position errors. Analysis of micro-geometrical parameters. Measurement system analysis. Capability analysis. Sampling methods. Continuous sampling. Inbound quality check, during-process check, final check of machined products.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Compulsory: 2. Montgomery, D.C.: Introduction to statistical quality control, Wiley, 2002. 3. Juran, J. M., De Feo, J.A.: Juran’s Quality Handbook, MCGraw Hill, 2010. Recommended: 2. J. Paulo Davim: Machining – Fundamentals and Recent Advances, Springer, 2008. 3. Kai Cheng – Dehong Huo: Micro-Cutting – Fundamentals and Applications, Wiley, 2013.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
2. tudása: • They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment. 3. képességei:	

- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

4. attitűd:

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

5. autonómiája és felelőssége:

6. They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Viktor Molnar, PhD, associate professor
Co-Lecturer(s): -

Subject name: *Safety Engineering in Chemical Industries*	Credits: 3
A tantárgy besorolása: *Compulsory*	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 18 ea.+18 gy. az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: The condition for acquiring a signature from the subject is that the student must attend at least 60% of the lectures and at least 70% of the practical lessons. The student should reach at least 50% of the maximum attainable points on both of two essays during the semester. The type of exam is oral (evaluation criteria according to faculty rules) and demonstration of practical knowledge.	
Suggested semester: 7	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The aim of the course is to provide basic knowledge of the safety design and testing of chemical systems. To provide a diversified knowledge base on which the student can build when selecting the most commonly used overpressure protection devices. The course contains these main topics: Managing risk in system security investigations. General risk assessment, risk of pressure vessel failure. Basic safety engineering concepts, hazard analysis aspects, safety subsystem designation. Hazard analysis and hazard analysis methods. Safety engineering protection. Probability of occurrence of a hazardous disturbance. Analysis of industrial disasters that have occurred. Hazardous materials. Design guidelines for overpressure protection. Location and installation of pressure relief devices. Types, classification and construction of safety valves and manifolds. Operation, maintenance, inspection and laboratory testing of safety valves. Dust and gas explosion protection design, standard specifications, construction solutions. ATEX directives.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Perry- Chemical engineering handbook, 8th ed. Section 5. DOI: 10.1036/0071511288 API 521 Pressure-relieving and Depressuring Systems Rolf K. Eckhoff, Dust Explosions in the process industries, Butterworth-Heinemann, 1997.	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	

1. tudása

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They know the conceptual framework, the most important relations and theories related to the field.
- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.
- They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can plan, organize and carry out independent learning.
- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).
- They can understand and use the literature, computer technology and library resources of the field.
- They can create basic models of technical systems and processes.
- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

- They have the stamina and tolerance for monotony required to perform practical activities.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- BGF1, BGF2, BGF3, BGF4, BGF7, BGF8, BFG9, BGF10

Responsible Lecturer (*név, beosztás, tud. fokozat*): Prof. Dr. Zoltán Siménfalvi, full professor, PhD.
Co-Lecturer(s): Prof. Dr. Zoltán Siménfalvi, full professor, PhD.

Subject name: **Noise Protection**	Credits: …**5**
A tantárgy besorolása: obligatory (a nem kívánt törlendő)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 60% theory, 40 % practice (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 + 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: english)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: 1 semester test and workout 1 topic incl. its presentation	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Introducing the students to the basics of acoustics, familiarizing them with acoustic measurements and calculations. Teaching the fundamentals of noise reduction. Simple spectrum analysis with free softwares. Determining the sound power level of machines by surface measurement. Determination of the equivalent A-sound pressure level of time-varying noise.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
2. Fahy, Frank: Foundation of Engineering Acoustics, 2003, 2003 Elsevier Ltd. (ISBN 978-0-12-247665-5) 3. Vér, István L.; Beranek, Leo L.: Noise and Vibration Control Engineering, John Wiley & Sons, 2006, (ISBN 9780471449423) 4. Own script	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
2. tudása • They know the conceptual framework, the most important relations and theories related to the field. 3. képességei • They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).	

4. attitűd

- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.

5. autonómiája és felelőssége

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. **Károly Jálics, associate professor, PhD.**
Co-Lecturer(s):

Subject name: **Hydraulic and Pneumatic Systems**	Credits: 4
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Description of the requirements system for machine tools. Description of tools for increasing productivity. Overview and analysis of kinematic chains of main and secondary drives. Standard speed ranges for machine tools. Gear units for stepless and stepless gears. Compound engines. Laws of series and parallel connection of gears. Exploration of possible engine versions, order versions, member number versions, definition of the engine equation. Choosing the optimal gear. Overview and analysis of regular and over-covered engines. Analysis of gear member number and regularity variations. Principle of drawing a revolution diagram. Examination of driving conditions. Methods of increasing controllability. Inspection of regular, overhead and gear shaft drives. Application of Dahlander motor in main drives. Description and analysis of common gear drives. Description of auxiliary engines. Thread cutting on universal and CNC lathes. Introduction to some dynamic issues of machine foundations and belt drives.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Abdus Salam: Fundamentals of Pneumatics and Hydraulics, 2022, doi: doi.org/10.1007/978-981-19-0855-2 2. Rabie, M. G., Fluid Power Engineering, McGraw-Hill, 2009, ISBN 978-0071622462 3. M. Winston, Essential Hydraulics: Fluid Power Basic, 2014, ISBN 978-1484120590 4. A. Parr: Hydraulics and Pneumatics, 3rd ed., 2011, ISBN: 978-0080966748 5. R. H. Bishop: The Mechatronics Handbook - 2 Volume Set, 2nd ed., 2008, ISBN 978-1315217710	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
2. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the conceptual framework, the most important relations and theories related to the field.

- They have basic knowledge of machine design principles and methods, production technology, control technology procedures and operational processes.

- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

3. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

4. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.

- They have the stamina and tolerance for monotony required to perform practical activities.

- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

5. autonómiája és felelőssége

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

- They share their experience with colleagues to help them grow.

- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Rónai László, egyetemi adjunktus, PhD	
Co-Lecturer(s): Simon Gábor, mesteroktató	
Subject name: **Measuring of Machines**	Credits: 5
A tantárgy besorolása: Mandatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / gyak. és hoursszáma: 2/2 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Concept of measurement, description of measurement procedures. General measuring circle. Physical principles of signal conversion. Methods of resistive signal conversion, strain gauge stamp. Error sources of resistive signal conversion. The principle of piezoelectric signal conversion. Load cases, material properties. 1-degree-of-freedom model of seismic vibration sensors. Frequency analysis of general periodic signals, Fourier series. Spectrum analysis of aperiodic signals. Basic principles of bearing diagnostics. Signal conversion based on the optoelectronic (laser) principle. Pressure sensors, inductive displacement measurement.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. J.G. Webster: The Measurement, Instrumentation and Sensors Handbook. CRC Press, 1999. 2. S.P. Venkateshan: Mechanical measurements. Wiley&Sons, 2015 3. A. Bewoor, V. Kulkarni: Metrology&Measurement. McGraw-Hill, 2009 4. V.K. Madisetti: The digital signal processing handbook, CRC-Press, 2009 5. S. A. Dyer: Instrumentation&Measurement, John Wiley&Sons, Inc. 2001	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
2. tudása	

- They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.
- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.
- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.

3. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.
- They can create basic models of technical systems and processes.
- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

4. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

5. autonómiája és felelőssége

- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Rónai László, egyetemi adjunktus, PhD
Co-Lecturer(s): Kiss Dániel, tanársegéd

Subject name: **Quality Management**	Credits: **3**
A tantárgy besorolása: Mandatory/ obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: ...90 (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 lectures/0 practical/semester az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: *Manufacturing technology*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The importance of quality in the process of product production, transportation, usage, etc. Measurability of quality, types of parameters determining of quality (quality parameters). Tasks of planning, developing and assurance of quality: analysing of information, formation of product concept, production planning, feasibility analysis, assuring of sources (machine, tool, technology, human research), planning of inspection technology. Quality assurance of purchasing, choosing and qualification of deliverers. Quality assurance of production processes. Quality assurance, quality protection in the process of transportation, storage, and packaging. Methods and instruments for helping quality assurance.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Obligatory literature: 1. Poornima M. Charantimath: Total Quality Management, Second Edition, 2011 Dorling Kindersley (India) Pvt. Ltd, ISBN 9788131732625, eISBN 9789332501034 2. Total Quality Management and Six Sigma, Edited by Tauseef Aized, Intechopen.com, http://dx.doi.org/10.5772/2559, ISBN 978-953-51-0688-3 Recommended : 1. Godfrey, A. B.; Juran, J. M.: Juran's Quality Handbook,, ISBN 007034003X, 1999 2. Titus De Silva, Integrating Business Management Processes, Volume 3: Harmonising Quality, Food Safety and Environmental Processes, 2021, Taylor & Francis, ISBN: 978-0-367-48786-7 (hbk), ISBN: 978-0-367-48547-4 (pbk), ISBN: 978-1-003-04284-6 (ebk) 3. Graeme Knowles: Quality management & bookboon.com, ISBN 978-87-7681-875-3	

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

- They have working knowledge of the workplace and fire safety, safety technology and occupational health and safety requirements and standards related to the field, as well as the relevant environmental regulations.

2. képességei

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can apply and comply with safety, fire protection and hygiene rules and regulations in the workplace.

3. attitűd

- They are open and receptive to new, modern and innovative processes and methods related to organic farming and health awareness.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (*név, beosztás, tud. fokozat*): **Dr. Gyula Varga, associate professor, PhD**

Co-Lecturer(s):

Subject name: **Lean Logistics**	Credits: **4**
A tantárgy besorolása: obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50%(kredit%)	
Classes per week: ea. + gyak. és hourszáma: 28+28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: -	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: -	
Suggested semester: 6. semester	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Tantárgy feladata és célja: During the course, students get to know the basics of logistics, as well as the application possibilities of the lean corporate management philosophy in the field of logistics. At the end of the course, students will be able to develop logistics processes. *Tantárgy tematikus leírása:* Development of material handling, closed chain complex material flow system, structure of material flow system, RST operations, concept of logistics, logistics as an integrated science, logistics principles and goals, logistics operations, logistics costs and performances, material and information flow of logistics system, characteristics of material handling machines, lean development history, description of 5 principles, value-creating and non-value-creating processes, method of determining losses, description of lean tools (5S, Andon system, basic principles of visual management, Poka Yoke, SMED, Pull principle, JIT, Kanban, Jidoka, Heijunka, Kaizen, A/3 etc.), case studies.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Mandatoryirodalom: 1. Tamás, P.: Innovative simulation testing methods in logistics: Miskolc, 2021., ISBN: 978-963-358-239-8 2. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4 3. Bartholdi, J. J., Hackman, S. T.: Warehouse & Distribution Science, Release 0.85, www.warehouse-science.com	

4. Rother, M., Shook, J.: Learning to See: Value Stream Mapping to Add Value and Eliminate Muda, Lean Enterprise Institute, 2003.www.warehouse-science.com

Ajánlott irodalom:

1. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007.

2. Pedro García Márquez, F.; Segovia R. I.; Bányai, T., Tamás, P.: Lean Manufacturing and Six Sigma – Behind the Mask: London, Egyesült Királyság/Anglia: InTech Open Access Publisher, 2021.,

2. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

   - They know the conceptual framework, the most important relations and theories related to the field.
   - They have thorough knowledge of the structural materials used in the field, their production methods and the conditions for their application.

2. képességei

   - They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

3. attitűd

   - They strive to solve problems, preferably in cooperation with others.

4. autonómiája és felelőssége

   - They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
   - They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Prof. Dr. Péter Tamás, head of institute and full professor

Co-Lecturer(s): Dr. Ákos Cservenák, assistant professor

Subject name: **Management and Organization**	Credits: **5**
A tantárgy besorolása: Mandatory(obligatory)	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: (kredit%) 100 %	
Classes per week: ea. / gyak. / konz. és hoursszáma: 2+2 az adott félévben, 2 lec. (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol (English)*	
Requirement type: **exam**	
Suggested semester: 6	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Vezetés- és szervezéselméletek alapjai, vezetéselméleti iskolák, különféle vezetési stílusok, vezetői szerepek rendszertani helye, szerepe és practicali jelentősége. Alapvető szervezeti struktúrák, klasszikus és modern szervezeti formák jellemzői, létrehozásuk és hatékony működtetésük vezetői vonatkozásai. A szervezetfejlesztés jelentősége, a fejlesztési folyamat eszközei és menedzselése.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Jeffrey A. Miles: Management and Organization Theory, John Wiley & Sons Inc, New York, 2015, ISBN10 1118008952 2. Watson Tony: Management Organization and Employment Strategy. Taylor & Francis, New York, 2015, ISBN13 (EAN): 9781138980303 3. Louis A. Allen: Management and Organization, McGraw Hill, 2019, New York, ISBN10 1258784904	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. Tudás (knowledge) • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. 2. Képességei (skills) • They can understand and use the literature, computer technology and library resources of the field. • They can create basic models of technical systems and processes. 3. Attitűd (attitude)	

- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.
- They strive to solve problems, preferably in cooperation with others.
- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

4. autonómiája és felelőssége (autonomy and responsibility)

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (név, beosztás, tud. fokozat): Dr. habil Kunos István, Ph.D., egyetemi docens

Co-Lecturer(s): Andráskó Dhours egy. adj.

Subject name: **Operations Management**	Credits: **2**
A tantárgy besorolása: Mandatory/ választható (a nem kívánt törlendő) obligatory	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: (kredit%) 100%%	
Classes per week: **ea**. / szem. / gyak. / konz. és hoursszáma: … az adott félévben, 2 lec. (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 7	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The purpose is to learn the processes and planning calculations of operations management. In this context, the curriculum emphasizes the interpretation of the increasingly widely used pull approach in production and management and the acquisition of the applicable toolset. The students will be able to contribute to the timely delivery of the products and services in their position by mastering production planning calculations and supporting effective resource and organizational management. The lessons and practical parts help to acquire the guidelines of the raw material and stock management, the tools and methods of planning, implementation of the production plan, analysis and assessment of progress, as well as the principles of management and organization.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Compulsory: Heizer, J., Render, B., Munson, C. (2020). Operations Management: Sustainability and Supply Chain Management. London: Pearson. ISBN 9780134130422 Slack, N. (2006). Operations and process management: Principles and practice for strategic impact. Harlow: Financial Times Prentice Hall ISBN 9781292350066 Recommended: Schenk, M., Wirth, S., müller, E. (2010). Factory planning manual: Situation-driven production facility planning. Berlin: Springer. ISBN 9783642036347 Greasley, A. (2008). Operations management. Los Angeles: SAGE. ISBN 9781412918831	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. Tudás (knowledge)	

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. Képességei (skills)

- They can understand and use the literature, computer technology and library resources of the field.

3. Attitűd (attitude)

- They strive to solve problems, preferably in cooperation with others.
- They strive to perform tasks and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

4. autonómiája és felelőssége (autonomy and responsibility)

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Responsible Lecturer (név, beosztás, tud. fokozat): László Berényi, PhD dr. habil

Co-Lecturer(s): -

Subject name: **Introduction to the Finite Element Method**	Credits: *5*
A tantárgy besorolása: *Compulsory*	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: *50/50* (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: *2 + 2* az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: –	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: **–**	
Suggested semester: *5*	
Preliminary requirements: *Dynamics*	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Basic concepts of the finite element method. Matrix algebra. The equation system of linear elasticity. The principles of virtual work and minimum potential energy. The truss element. Finite element modelling of planar and space trusses. Beam elements. Plane problems of elasticity and their modelling by isoparametric finite elements. Construction and characteristics of the linear equation systems of the finite element method. Special modelling issues and error analysis. Vibration problems. Multi-degree of freedom systems. Effective methods for the computation of the eigenfrequencies: Jacobi's method, iterative techniques. Forced vibrations. Introduction to commercial finite element softwares.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Bathe, K.J.: Finite Element Procedures, Prentice Hall, Englewood Cliffs, 1996 2. Fish, J., Belytschko, T.: A First Course in Finite Elements, John Wiley & Sons, Chichester, 2007 3. Szabó, B., Babuška, I.: Introduction to Finite Element Analysis: Formulation, Verification and Validation, John Wiley & Sons, 2011	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása: • They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.	

- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.
- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei:

- They can plan, organize and carry out independent learning.
- They can apply the acquired IT knowledge in solving the tasks arising in the field.
- They can create basic models of technical systems and processes.

3. attitűd:

- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége:

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): *Dr. Attila Baksa, associate professor, PhD*
Co-Lecturer(s): –

Subject name: **Computational Fluid Dynamics**	Credits: **5**
A tantárgy besorolása: Mandatoryen választható	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: … (kredit%)	
Classes per week: ea. / szem. / gyak. / konz. és hoursszáma: 28 ea.+28 gy. az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: The condition for acquiring a signature from the subject is that the student must attend at least 60% of the lectures and at least 70% of the practical lessons. The student should reach at least 50% of the maximum attainable points on both of two essays during the semester. The type of exam is oral (evaluation criteria according to faculty rules) and demonstration of practical knowledge.	
Suggested semester: 5.	
Preliminary requirements: GEAHT431-B2	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Review of the basic equations of fluid flow. A description of the various boundary conditions. Methods of finite differences and finite volumes and their programming. Modern techniques for processing data from transient calculations using a commercial software package. Two- and three-dimensional simulations, presentation of a commercial software package. Application example: three-dimensional simulation of pipe flows, visualisation. Numerical simulation of the Ahmed body using commercial software. Numerical simulation of an aircraft airfoil. Dynamics of vortex separation, theory of vibrations excited by vortex separation.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Ferziger, J.H., Peric, M., 2002. Computational Methods for Fluid Dynamics, 3rd edition, Springer ANSYS FLUENT Theory Guide. ANSYS Inc., Canonsburg, 2013 Blevins, R.D., 2001. Flow-Induced Vibration. 2nd edition, Krieger Publishing Company	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering.	

- They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.

- They know the conceptual framework, the most important relations and theories related to the field.

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

- They have comprehensive knowledge of the working principles and structural units of machines and power tools, mechanical equipment, and tools used.

- They have working knowledge of the measurement procedures used in engineering, their tools, instruments and measuring equipment.

- They have thorough knowledge of the learning, knowledge acquisition and data collection methods related to the field, their ethical barriers and problem-solving techniques.

- They can interpret, characterise and model the construction and operation of the structural units and components of mechanical engineering systems, as well as the design and connection of system components applied.

- They can apply the relevant calculation and modelling principles and methods of product, process and technological design.

2. képességei

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

- They can apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks.

- They can plan, organize and carry out independent learning.

- They can identify routine professional problems, explore the theoretical and practical background necessary for their solution, formulate and solve them (using standard operations in practice).

- They can understand and use the literature, computer technology and library resources of the field.

- They can create basic models of technical systems and processes.

- They can diagnose mechanical failures, select remedial actions and carry out repair technology tasks.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.

- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.
- They strive to ensure that their self-directed learning in the field of mechanical engineering is continuous and consistent with their professional goals.
- They have the stamina and tolerance for monotony required to perform practical activities.
- They are open and receptive to new, modern and innovative processes and methods related to organic farming and health awareness.
- They strive to understand observable phenomena as thoroughly as possible to describe and explain their laws by applying the acquired technical knowledge.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.
- They evaluate the efficiency, effectiveness and safety of their subordinates' work.
- They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts, applying the principle of equal access.
- They share their experience with colleagues to help them grow.
- They take responsibility for the consequences of their technical analyses, proposals formulated and decisions made based on those analyses.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. Péter Bencs, associate professor, Ph.D.
Co-Lecturer(s):

Subject name: **History of Physics**	Credits: **2**
A tantárgy besorolása: **elective**	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: (kredit%) **100%**	
Classes per week: **2 ea**. / szem. / gyak. / konz. és hoursszáma: **2** az adott félévben, **2 lectures** (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: **English**)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: **test**	
Suggested semester: 7	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The place of Physics among the sciences. The antique natural philosophy (Aristotle, Archimedes, Heron). Development of astronomy in the ancient and middle ages. The mechanics of Galilei. Century of the geniuses (Descartes, Fermat, Torricelli, Pascal, Boyle, Huygens). Newton's life and works. Development of the views about the nature of light. Development of mechanics after Newton. Development and laws of electromagnetism. The giants of electrodynamics: Faraday and Maxwell. The electromagnetic theory of light. The beginnings of thermodynamics. The law of energy conservation, development of the kinetic theory of heat. The theory of relativity, the works of Einstein. Proving the atomic structure of materials, atomic models. The emergence of quantum theory and nuclear physics. The exploration of elementary particles, development up to the Standard Model. History of the Nobel prize, prize winners with Hungarian origin. Development of Physics in Hungary.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Asimov: The History of Physic, ISBN-13: 978-0802707512 S. Cohen: The History of Physics, 2000 BCE to 1945, ISBN-13: 978-1456607432	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. Tudás (knowledge) •They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering. •They know the conceptual framework, the most important relations and theories related to the field.	

- They have comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.

2. Képességei (skills)

- They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.
- They can plan, organize and carry out independent learning.

3. Attitűd (attitude)

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.
- They strive to solve problems, preferably in cooperation with others.
- They have the stamina and tolerance for monotony required to perform practical activities.

4. autonómiája és felelőssége (autonomy and responsibility)

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.

Responsible Lecturer (név, beosztás, tud. fokozat): ***Dr. Pszota Gábor, associate professor, PhD***

Co-Lecturer(s):

Subject name: **History of Technics**	Credits: **3**
A tantárgy besorolása: elective	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: Theory: 100%, (kredit%)	
Classes per week: Lecture és hoursszáma: 28 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: English)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*:	
Requirement type: **exam** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*:	
Suggested semester: 5	
Preliminary requirements: -	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
The bumpy road to the realization of technical works, from the discovery of novelties through legal protection to their realization, to ideological and business success. To present the successes of Hungarian mechanical and electrical engineers on the 110-year history of the Ganz factory. Presentation of significant turning points in technical development from both a technological and a historical point of view.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
1. Hong-Sen Yan - Marco Ceccarelli: International Symposium on History of Machines and Mechanisms, Springer, 2008, ISBN: 978-1-4020-9484-2. 2. Bettany Hughes - The Hemlock Cup: Socrates, Athens and the Search for the Good Life, 2012, Vintage, 9781400076017 3. Vitruvius Polio: The Ten Books on Architecture, 1960, Dover Publication, ISBN-10 0486206459	
Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul	
1. tudása • They have comprehensive knowledge of the basic facts, directions and boundaries of engineering. • They know the general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering.	

2. képességei

- They can plan, organize and carry out independent learning.
- They can understand and use the literature, computer technology and library resources of the field.

3. attitűd

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to make self-directed learning a means to achieve their professional goals.

4. autonómiája és felelőssége

- They independently think through and develop comprehensive and foundational professional issues based on given resources even in unexpected decision-making situations.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.
- They can identify gaps in the technologies used, the risks of the processes and to initiate action to reduce them.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Dr. **Sarka Ferenc, associate professor, PhD**
Co-Lecturer(s): **Németh Géza, senior lecturer.**

Subject name: **Industry 4.0 in Engineering Practice**	Credits: **2**
A tantárgy besorolása: optional	
A tantárgy elméleti vagy practicali jellegének mértéke, „képzési karaktere”[12]: 50/50%(kredit%)	
Classes per week: ea. + gyak. és hourszáma: 18+0 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a nyelve: angol)* Az adott ismeret átadásában alkalmazandó további (*sajátos*) módok, jellemzők[2] *(ha vannak)*: -	
Requirement type: **term mark** Az ismeretellenőrzésben alkalmazandó további (*sajátos*) módok[4] *(ha vannak)*: -	
Suggested semester: 7. semester	
Preliminary requirements: min. 150 completed credits	
Subject description: az elsajátítandó ismeretanyag tömör, ugyanakkor informáló leírása	
Tantárgy feladata és célja: The aim of the course is to shape students' perceptions of current and future labor market needs and to help them think in digital systems. The course will be delivered by industry experts from companies, who will present their current Industry 4.0 solutions and future development ideas. The course also aims to provide a scientific background to the concept of Industry 4.0. *Tantárgy tematikus leírása:* Basic concepts related to Industry 4.0 (cyber-physical systems, IoT, BigData, etc.). Potential applications of cyber-physical systems in production and services. Design issues of cyber-physical systems. Current and future labor market needs. Presentation of business case studies on Industry 4.0.	
A 2-5 legfontosabb *Mandatory,* illetve *ajánlott* irodalom (jegyzet, tankönyv) felsorolása bibliográfiai adatokkal (szerző, cím, kiadás adatai, (esetleg oldalak), ISBN)	
Mandatoryirodalom: 1. Bányai, T., Petrillo, A., De Felice, F. Industry 4.0 - Impact on Intelligent Logistics and Manufacturing. London, Egyesült Királyság / Anglia : IntechOpen (2020) ISBN: 9781789854534 2. Viktor Mayer-Schönberger, Kenneth Cukier: Big Data, A revolution that will transform how we live, work, and think, ISBN 978-0-544-00269-2, 2014. 3. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007. 4. Tamás, P., llés, B., Dobos, P.: Waste reduction possibilities for manufacturing systems in the industry 4.0, IOP CONFERENCE SERIES: MATERIALS SCIENCE AND ENGINEERING 161: pp. 1-8., 2016 *Ajánlott irodalom:*	

1. Bányai, T., Petrillo, A., De Felice, F. Industry 4.0 - Impact on Intelligent Logistics and Manufacturing. London, Egyesült Királyság / Anglia: IntechOpen (2020) ISBN: 9781789854534

2. Pedro García Márquez, F.; Segovia R. I.; Bányai, T., Tamás, P.: Lean Manufacturing and Six Sigma – Behind the Mask: London, Egyesült Királyság/Anglia: InTech Open Access Publisher, 2021.

Azoknak az előírt szakmai kompetenciáknak, kompetencia-elemeknek *(tudás, képesség* stb., *KKK 7. pont*) a felsorolása, amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul

1. tudása

•They can carry out basic analyses of the disciplines which make up the knowledge system of the technical field, formulate interrelations synthetically and carry out adequate evaluation activities.

•They can apply the technical specifications related to the operation of mechanical systems, the principles and economic relations of the setting and operation of machines and mechanical equipment.

2. képességei

- They can create basic models of technical systems and processes.
- They can manage and control technologically specialised production processes, considering the elements of quality assurance and quality control.

3. attitűd

- They are open to know, accept and credibly communicate professional and technological development and innovation in engineering.
- They strive to solve problems, preferably in cooperation with others.
- They are open to the use of information technology tools, strive to get to know and use mechanical engineering software, and know and use at least one such program at a skill level.

4. autonómiája és felelőssége

- They cooperate with qualified professionals of other (primarily technical, economic and legal) disciplines during their professional duties.

Responsible Lecturer (*név, beosztás, tud. fokozat*): Prof. Dr. Péter Tamás, head of institute and full professor

Co-Lecturer(s): Dr. Róbert
Skapinyecz, associate professor