Subject:: **Computer Aided Process Planning**	**Credits: 3**
Obligatory subject int he **1th semester**	
A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*” 60-40%(kredit%)	
28 lectures + 14 practical hours / semester	
Exam **at the end of the semester**	
Pre-studies requirements: -	

Subject description:

Computer Aided Engineering methods in forming processes. Analysis of the technological processes from the point of view of Computer Aided Process Planning. The various methods of Computer Aided Process Planning: the variant and the generative approach. Application of knowledge based systems in the process planning of forming processes. Technological databases: development, structure and handling of technological databases. The balance of interactivity and programmed process planning (batch processing) in manufacturing processes. The documentation requirements. Connection between CAD, CAPP and CAM systems. Application of commercial CAD systems to support the tool design. The concept of Computer Integrated Manufacturing.

Suggested literature:

1. Tisza, M.: *Metal Forming*, University Publisher, University of Miskolc, Miskolc, 2004. p. 1-316.
2. Zeid, I.: *CAD/CAM Theory and Practice*, Mc Graw Hill, Inc. New York, 1991. p. 1-1052.
3. Groover, M., Zimmers, E.: *Computer Aided Design and Manufacturing*, Prentice Hall Inc., New Jersey, 1994. p. 1-489

Competences gained by completing the program:

a) knowledge

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

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

b) skills

- Ability to apply information and communication technologies and methods to solve engineering problems

Ability to study and analyse the materials used in mechanical engineering in a laboratory, as well as to assess and document research results

c) attitude

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

d) autonomy and responsibility

- Ability to perform engineering tasks individually

Name of professor: Dr. Zsolt Lukács, associate professor, PhD.

Others involved in teaching the subject: -

Tantárgy neve: **Advanced Materials Processing**	**Kreditértéke: 3**

A tantárgy **besorolása**: **obligatory**

A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*” 60-40 (kredit%)

A **tanóra típusa**: lect. + pract. és **óraszáma**: **28+14** az adott **félévben**,

(*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *English)*

Az adott ismeret átadásában alkalmazandó **további** (*sajátos*) **módok, jellemzők** *(ha vannak)*: tematikus prezentációk

A **számonkérés** módja (koll. / gyj. / **egyéb)**: term mark

Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok** *(ha vannak)***: -**

A tantárgy **tantervi helye** (hányadik félév): 1. semester

Előtanulmányi feltételek *(ha vannak)*: -

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

Advanced materials processing for primary shaping. Technology of powder metallurgy, characteristic metallic, ceramic and composite products. Advanced casting processes used in machine part manufacturing. Properties and design principles of cast products. Introduction to welding theories. The most important fusion and pressure welding processes and their modern process variants. High energy densitiy welding processes. Brazing and soldering. Thermal cutting. Heat treating processes of machinery. Heat and material transport. Annealing processes. Hardening and strengthening processes. Toughening processes. Structure and properties modification in surface layers with thermal, physical and chemical methods. Advanced cold and hot metal forming for machine parts manufacturing.

A **2-5** legfontosabb *kötelező,* 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. 7 Powder Metal Technologies (ISBN 0-87170-387-4)
4. ASM Handbook, Vol. 14 Forming and Forging (ISBN 0-87170-007-7)
5. ASM Handbook, Vol. 15 Casting (ISBN 0-87170-007-7)

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** 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, systemise 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 individually

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. Marcell Gyula Gáspár, senior lecturer, PhD**

Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:**
Raghawendra P. S. Sisodia, assistant research fellow

Tantárgy neve: **Automated Machine Tools**	**Kreditértéke: 3**
A tantárgy **besorolása**: **obligatory**	
A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*” 66-33% (kredit%)	
A **tanóra típusa**: lect. + pract. és **óraszáma**: 8+14 az adott félévben, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *English)* *Az* adott ismeret átadásában alkalmazandó **további** (*sajátos*) **módok, jellemzők** *(ha vannak)*:	
A **számonkérés** módja (koll. / gyj. / **egyéb**): **exam** Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok** *(ha vannak)***: -**	
A tantárgy **tantervi helye** (hányadik félév): **1. semester**	
Előtanulmányi feltételek *(ha vannak)*: **-**	

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

Definition of automation. Discrete and continuous systems, methods for describing and handling them. Basic types of controllers. Principle of Numerical Control (NC). History of NC. NC generations. Functions of NC controllers. Controlled machine functions. Geometry of NC machine tools. Coordinate systems: machine CS, programmer's CS, tool CS. Programming methods. Structure of NC programs. Codes, programming tips. WOP in CNCs. Manufacturing cells, manufacturing systems as higher level of automation in machinery. Simulation of discreet systems (e.g. manufacturing cells): event-based simulation. Theory of interpolation. Interpolation methods. 2-3-5D interpolation.

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

1. Calrence W. de Silva: Mechatronics An Integrated Approach CRC Press LLC 2005 ISBN 0-8493-1274-4
2. López de Lecalle, L. N. et al.: Machine Tools for High Performance Machining. Springer-Verlag London Limited 2009
3. Sotiris L. Omirou: Space Curve Interpolation for CNC Machines. Journal of Materials Processing Technology 141 (2003) 343-350

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** pont*) a felsorolása, **amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul**

a) knowledge
- Knowledge of fundamental theories, relations, and the terminology used in the engineering field.
- A comprehensive understanding of the methods used in machine, system and process design in the field of mechanical engineering.

b) skills
- Ability to approach and solve special problems arising in engineering in a versatile, interdisciplinary way.
- Ability to process, systemise and analyse information gained through the operation of mechanical systems and processes, as well as to draw conclusions.

c) attitude
- Openness and aptness to know, accept and credibly communicate professional and technological development and innovation in engineering
- Striving to perform work in a complex, system based and process oriented way.

d) autonomy and responsibility
- Ability to perform engineering tasks individually
- Acting independently and initiatively to solve professional problems.

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. György Hegedűs, associate professor, PhD.**
Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:** **Dr. Tibor Csáki, honorary professor, CSc**

Tantárgy neve: **iCAD Systems I**	**Kreditértéke: 4**
A tantárgy **besorolása**: **obligatory**	
A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*” 55%/45% (kredit%)	
A **tanóra típusa**: lect. + pract. és **óraszáma**: **28+14 az adott félévben**, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *English)* Az adott ismeret átadásában alkalmazandó **további** (*sajátos*) **módok, jellemzők** *(ha vannak)*:	
A **számonkérés** módja (koll. / gyj. / **egyéb**): exam Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok** *(ha vannak)***:**	
A tantárgy **tantervi helye** (hányadik félév): **1. semester**	
Előtanulmányi feltételek *(ha vannak)*:	

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

Structure of the integrated CAD systems, typical features. Managing processes in iCAD environment, typical strategies. Sketching, geometrical constraints, dimensioning. Part modelling. Different modelling techniques. Surface modelling principles. Creating assemblies, assembly constraints, assembling strategies. Documenting iCAD works. Possibilities for enhancement of the designing process, managing teamwork. Portability of CAD files, compliance between CAD systems, file types and conversions. Examples from the field of designing manufacturing devices.

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

Dugan Um, Solid Modeling and Applications - Rapid Prototyping, CAD and CAE Theory, Springer International Publishing, 2017, ISBN 978-3-319-74593-0
J. Duhovnik, I. Demsar, P. Drešar, Space Modeling with SolidWorks and NX, Springer International Publishing, 2014, ISBN 978-3-31903-862-9
Mario Hirz, Wilhelm Dietrich, Anton Gfrerrer, Johann Lang,Integrated Computer-Aided Design in Automotive Development, Springer, 2013, ISBN 978-3-642-11939-2
Ian Stroud, Hildegarde Nagy: Solid modelling and CAD systems, How to survive a CAD system, Springer, 2011, ISBN 978-0-85729-259-9
Max K. Agoston: Computer graphics and geometric modeling, Implementation and algorithms, Springer, 2005, ISBN 1-85233-818-0

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** pont*) a felsorolása, **amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul**

a) knowledge
- Knowledge of general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering
- Knowledge and understanding of devices and methods of computer modelling and simulation related to mechanical engineering

b) skills
- Ability to solve problems using engineering theories and related terminology in an innovative way
- Ability to solve specific engineering problems by applying modern knowledge acquisition and data collection methods

c) attitude
- Openness and aptness to know, accept and credibly communicate professional and technological development and innovation in engineering
- Striving to design and perform tasks individually or in a team at a professionally high level

d) autonomy and responsibility

- Ability to perform engineering tasks individually
- Acting independently and initiatively to solve professional problems

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. György Hegedűs, associate professor, PhD**
Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:**

Tantárgy neve: **Simulation of Manufacturing Devices**	**Kreditértéke: 3**
A tantárgy **besorolása**: **compulsory optional**	
A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*” 66-33% (kredit%)	
A **tanóra típusa**: lect. + pract. és **óraszáma**: **28+14** az adott **félévben**, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *English)* Az adott ismeret átadásában alkalmazandó **további** (*sajátos*) **módok, jellemzők** *(ha vannak)*: -	
A **számonkérés** módja (koll. / gyj. / **egyéb**): exam Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok** *(ha vannak)***:** a 10-week tailored project work that should be completed by the last week of the term.	
A tantárgy **tantervi helye** (hányadik félév): **3. semester**	
Előtanulmányi feltételek *(ha vannak)*: -	

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

Construction analysis of machine tools units. The finite element analysis of structures composed of these units: structural, thermal, and vibrational analysis of the cover plates of devices, vibration analysis of machine beds and the cutting process, balancing problems.

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

Harris and Piersol.: Shock & Vibration Handbook, McGraw – Hill Book Co., Inc. 2002.;
W., Bottega: Engineering vibrations, Taylor and francis, 2009.;
Den Hartogh, J.P.: Advanced strength of materials, Dover Publications, 1987.

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** pont*) a felsorolása, **amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul**

a) knowledge
- Knowledge of general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering
- Knowledge of fundamental theories, relations, and the terminology used in the engineering field
- 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
- Knowledge of general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering
- Ability to approach and solve special problems arising in engineering in a versatile, interdisciplinary way
- Ability to study and analyse the materials used in mechanical engineering in a laboratory, as well as to assess and document research results
- Ability to process, systemise and analyse information gained through the operation of mechanical systems and processes, as well as to draw conclusions

c) attitude

- Striving to participate in the development of new methods and equipment related to engineering. A deep sense of vocation
- Striving to acquire a comprehensive knowledge
- Striving to design and perform tasks individually or in a team at a professionally high level
- Commitment to enrich the field of mechanical engineering with new findings and scientific results

d) autonomy and responsibility

- Ability to perform engineering tasks individually
- Initiative to solve engineering problems
- Making professional decisions individually within the field

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. Attila Szilágyi, associate professor PhD.**
Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:-**

Tantárgy neve: **Polymer Processing**	**Kreditértéke: 4**
A tantárgy **besorolása**: **obligatory**	
A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*" 40-60%	
A **tanóra típusa**: lect. + pract. és **óraszáma**: 28+14 az adott **félévben**, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *English)* Az adott ismeret átadásában alkalmazandó **további** (*sajátos*) **módok, jellemzők:** -	
A **számonkérés** módja (koll. / gyj. / **egyéb**): term mark Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok**: *A 10-week tailored project work that should be completed by the last week of the term.*	
A tantárgy **tantervi helye** (hányadik félév): **4. semester**	
Előtanulmányi feltételek *(ha vannak)*: iCAD Systems 1	

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

Material knowledge of plastics and their specific properties of forming. Detailed discussion of the technological variants of plastic forming, touching on the basic designs of machine and tool solutions. Planning methods for plastic forming processes. Analyze the technological design process taking into account the requirements of computer design. Structure and application of expert systems in the process of technological design. Tool design in the NX Mold Wizard system. Structure and function of the NX Mold Wizard program. Understand the operation of the Databases Database. Drawing on the foundations of plastic forming students are prepared to acquire the design of plastic forming tools and can connect to the plastics processing plants.

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

1. R. J. Crawford: Plastics engineering, 3rd Edition, Imprint: Butterworth-Heinemann, 1998. ISBN: 9780750637640
2. Zeid, I.: CAD/CAM Theory and Practice, Mc Graw Hill, Inc. New York, 1991. p. 1-1052.
3. Groover, M., Zimmers, E.: Computer Aided Design and Manufacturing, Prentice Hall Inc., New Jersey, 1994. p. 1-489

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** pont*) a felsorolása, **amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul**

a) knowledge
- Knowledge of general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering
- Knowledge and understanding of devices and methods of computer modelling and simulation related to mechanical engineering
- Broad theoretical and practical background as well as methodological and practical knowledge of design, manufacture, operation and control of complex mechanical systems and processes
- A comprehensive understanding of the methods used in machine, system and process design in the field of mechanical engineering

b) skills
- Ability to solve problems using engineering theories and related terminology in an innovative way
- Ability to solve specific engineering problems by applying modern knowledge acquisition and data collection methods
- Ability to solve problems in a creative, and complex tasks in a flexible way, as well as to pursue life-long learning and to demonstrate a commitment to diversity and value-basedness

c) attitude

- Openness and aptness to know, accept and credibly communicate professional and technological development and innovation in engineering
- Striving to participate in the development of new methods and equipment related to engineering. A deep sense of vocation
- Striving to design and perform tasks individually or in a team at a professionally high level
- Striving to perform work in a complex, system based and process oriented way

d) autonomy and responsibility

- Sharing acquired knowledge and experience with representatives of the field communicating in formal, non-formal and informal ways
- Ability to perform engineering tasks individually
- Making professional decisions individually within the field

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. Péter Zoltán Kovács, associate professor, PhD**

Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:** -

Tantárgy neve: **NC Programming**	**Kreditértéke: 3**
A tantárgy **besorolása**: **obligatory**	
A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*” 55-45% (kredit%)	
A **tanóra típusa**: lect. + pract. **óraszáma**: **28+14** az adott **félévben**,	
A **számonkérés** módja (koll. / gyj. / **egyéb**): exam (*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *English* Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok** *(ha vannak)***:** A 10-week tailored project work that should be completed by the last week of the term.	
A tantárgy **tantervi helye** (hányadik félév): **4. semester**	
Előtanulmányi feltételek *(ha vannak)*: -	

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

Programming methods of NC machine tools: manual programming, WOP, computer aided programming. Advantages and disadvantages of methods. Process of computer aided NC programming. Introduction to Topsolid program. Menus, windows, bars. Machine and control definition. File handling. Importing and drawing the geometry. Editing the geometry. Coordinate systems, views. Solids, solid operations. Technological operations, handling of operation manager. Tool choice. Machining parameters, setup of work piece. Toolpathes in milling machines. Checking the NC program. Postprocessing, editing the NC program. Documentation, setup sheets. Examples.

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

1. Topsolid User’s Guide and Help
2. Helmi A. Youssef, Hassan El-Hofy: Machining Technology – Machine tools and operations, 2008.
3. J. Paulo Davim: Machining of Complex Sculptured Surfaces, 2012.

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** pont*) a felsorolása, **amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul**

a) knowledge
- Knowledge of general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering
- Knowledge and understanding of terminology, main regulations and aspects of other areas relating to and having a priority for practising engineering (primarily that of logistics, management, environmental protection, quality assurance, information technology, law, economics, occupational and fire safety, industrial safety)
- Knowledge and understanding of devices and methods of computer modelling and simulation related to mechanical engineering

b) skills
- Knowledge of general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences necessary to work in the field of engineering
- Ability to solve problems using engineering theories and related terminology in an innovative way
- Ability to solve specific engineering problems by applying modern knowledge acquisition and data collection methods.

c) attitude
- Striving to comply with and enforce quality standards
- Striving to design and perform tasks individually or in a team at a professionally high level.

d) autonomy and responsibility

- Taking responsibility for sub-processes under their control
- Responsibility for sustainability, health and safety culture at work, as well as environmental consciousness

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. György Hegedűs, associate professor, PhD.**
Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:** **Dániel Kiss, assistant lecturer**

Tantárgy neve: **Materials Selection**	**Kreditértéke: 3**
A tantárgy **besorolása**: **compulsory optional**	
A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*” 50-50 (kredit%)	
A **tanóra típusa**: lect. + pract. és **óraszáma**: **28+14** az adott **félévben**, (*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *English)* Az adott ismeret átadásában alkalmazandó **további** (*sajátos*) **módok, jellemzők** *(ha vannak)*: –	
A **számonkérés** módja (koll. / gyj. / **egyéb**): exam Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok** *(ha vannak)***: –**	
A tantárgy **tantervi helye** (hányadik félév): **4. semester**	
Előtanulmányi feltételek *(ha vannak)*: –	

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

The aim and scope of Materials Selection. The role of materials selection in fulfilling functional, technological, economical and environmental aspects in design, process planning and manufacturing processes. Effect of material properties on design and manufacturing processes, and on the reliability of engineering structures. The development and evolution of material selection procedures. The nature of the selection process. Computer Aided Materials and Process selection. Conventional and electronic material databases. Sources of information on materials. Procedures for implementing networked materials database systems.

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

1. Ashby, F. M.: *Materials Selection in Mechanical Design*, Cambridge University Press, Cambrdige, 2004. p. 1-246.
2. ASM Handbook, Volume 20: Materials Selection and Design, ASM International, London, 1997. ISBN 0-87170-386-6, p. 1-900.
3. Kutz, M.: *Handbook of Materials Selection*, John Wiley, New York, 2002. p. 1-564.

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** pont*) a felsorolása, **amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul**

a) knowledge
- Knowledge of fundamental theories, relations, and the terminology used in the engineering field
- A comprehensive understanding of the main properties and application fields of structural materials related to mechanical engineering
- Knowledge of measurement techniques and theory related to mechanical engineering
- Knowledge and understanding of devices and methods of computer modelling and simulation related to mechanical engineering
- 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 solve specific engineering problems by applying modern knowledge acquisition and data collection methods
- Ability to study and analyse the materials used in mechanical engineering in a laboratory, as well as to assess and document research results
- Ability to process, systemise and analyse information gained through the operation of mechanical systems and processes, as well as to draw conclusions
- Ability to apply and further develop procedures, models and information technologies used in the design, organisation and operation of mechanical systems and processes.

c) attitude
- Striving to participate in the development of new methods and equipment related to engineering. A deep sense of vocation
- Striving to organise and perform tasks in accordance with environmentally and health conscious, as well as sustainability expectations

d) autonomy and responsibility
- Ability to perform engineering tasks individually.

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. Zsuzsanna Koncsik, associate professor, PhD.**

Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:**
Dr. László Kuzsella, associate professor, PhD.

Tantárgy neve: **ICAD System II.**	**Kreditértéke: 3**

A tantárgy **besorolása**: obligatory

A tantárgy elméleti vagy gyakorlati jellegének mértéke, „*képzési karaktere*" 60/40 (kredit%)

A **tanóra típusa**: lect. + pract. és **óraszáma**: 28+14 az adott **félévben**,
(*ha nem (csak) magyarul oktatják a tárgyat, akkor a* **nyelve**: *english)*
Az adott ismeret átadásában alkalmazandó **további** (*sajátos*) **módok, jellemzők** *(ha vannak)*:

A **számonkérés** módja (koll. / gyj. / **egyéb)**: exam
Az ismeretellenőrzésben alkalmazandó **további** (*sajátos*) **módok** *(ha vannak)***:**

A tantárgy **tantervi helye** (hányadik félév): **2. semester**

Előtanulmányi feltételek *(ha vannak)*: ICAD System I.

Tantárgy-leírás: az elsajátítandó **ismeretanyag tömör, ugyanakkor informáló leírása**

Nowadays, different CAD/CAM solutions play a significant role in process planning of sheet metal products. In this course, first a general overview is given on CAD/CAM program systems and it will be demonstrated how these programs can help the process planning and die designer engineers' work.
By the end of this course the students will acquire the fundamental knowledge:
- in various types of CAD/CAM program systems
- the basic principles of their working
- the main input parameters need to be given and
- the main results that can be achieved by using them.

During the course two program codes used in process planning of sheet metal forming will be presented. The first one is the *Autoform FEM code*, which gives possibility of examining feasibility of process planning of sheet metal forming. The second one is *NX Sheet Metal*, which permits of planning of such parametric workpiece, which make design processing procedure faster.

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

1. Tisza, M.: *Metal Forming,* University Publisher, University of Miskolc, Miskolc, 2004. p. 1-316.
2. Zeid, I.: *CAD/CAM Theory and Practice*, Mc Graw Hill, Inc. New York, 1991. p. 1-1052.
3. Groover, M., Zimmers, E.: *Computer Aided Design and Manufacturing*, Prentice Hall Inc., New Jersey, 1994. p. 1-489

Azoknak az **előírt szakmai kompetenciáknak, kompetencia-elemeknek** *(tudás, képesség* stb., *KKK **8.** pont*) a felsorolása, **amelyek kialakításához a tantárgy jellemzően, érdemben hozzájárul**

a) knowledge

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

b) skills

- Ability to solve problems using engineering theories and related terminology in an innovative way
- Ability to apply information and communication technologies and methods to solve engineering problems
- Ability to study and analyse the materials used in mechanical engineering in a laboratory, as well as to assess and document research results

c) attitude

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

d) autonomy and responsibility

- Ability to perform engineering tasks individually.

Tantárgy felelőse (*név, beosztás, tud. fokozat*)**: Dr. Zsolt Lukács, associate professor, PhD.**
Tantárgy oktatásába bevont oktató(k), ha van(nak) (*név, beosztás, tud. fokozat*)**:**