

<b>University:</b> University of Žilina		
<b>Faculty:</b> Faculty of Mechanical Engineering		
<b>Course ID:</b> 2Y001	<b>Course name:</b> Automation of Mechanical Engineering Production (AMEP_E)	
<b>Povinnosť predmetu:</b> Electorial; <b>Ukončenie:</b> Exam		
<b>Profile course:</b> - <b>Core course:</b> -		
<b>Form, extent and method of teaching activities:</b>		
Number of classes per week in the form of lectures, laboratory exercises, seminars or clinical practice	Lectures: 2 classes Seminars: 0 classes Lab.exercises: 2 classes	
Methods by which the educational activity is delivered	Present form of education	
Applied educational activities and methods suitable for achieving learning outcomes	Lectures: problem-based lectures, interactive lectures with discussion, lectures supported by multimedia and audiovisual means Examination: presentation and defence of the project, oral examination	
<b>Number of credits:</b> 4		
<b>Study workload:</b> 120 hours in total; of which 52 hours are direct teaching, 30 hours are project development and consultation with the supervisor on project preparation, 38 hours are independent study of the student.		
<b>Recommended semester/term of study:</b> winter		
<b>Study degree:</b> 4		
<b>Required subsidiary courses:</b>		
Prerequisites: -		
Co-requisites: -		
<b>Course requirements:</b>		
Continuous assessment / evaluation: - active participation in exercises, project presentation		
Final assessment /evaluation: - written and oral exam		
The resulting classification of the subject:		
A: 93 – 100 points		
B: 85 – 92 points		
C: 77 – 84 points		
D: 69 – 76 points		
E: 61 – 68 points		
FX: Less than 61 points		
Minimálny počet bodov pre prihlásenie na skúšku nie je zadaný		
Forms and methods of assessment	Predetermined weight %	Area of knowledge, skills and competence
student portfolio (1 x semester project)	50%	practical skills, application of expertise, activities and correctness of solving tasks during the semester, working with various information sources, self-study
Exam (test / oral)	50%	Theoretical knowledge
<b>Course outcomes:</b>		
After completing the course the student:		
<ul style="list-style-type: none"> <li>knows and can characterize automated workplaces equipped with CNC production machines,</li> <li>knows and can characterize the basic technologies, methods and key technical elements in the field of automation of engineering production</li> </ul>		

- knows basic information, classification and technical parameters of CNC machines, flexible production systems, assembly automation systems, robots and handling equipment.
- knows how to apply appropriate optimization methods in programming the trajectory of CNC production machines and equipment,
- understand the structure, requirements and method of creating an NC program and apply it to real CNC production equipment

#### Course scheme:

##### Lectures:

1. Automation of Mechanical Engineering Production - specifics, basic concepts, distribution. Hard and flexible automation of engineering production. The importance of automation of engineering production.
2. Automation of production systems in general: production systems - characteristics, division.
3. Automation of pre-production and production phases in selected production areas.
4. Numerically controlled production technique. Origin and development of NC machines, generations of NC machines. Numerically controlled lathes, machining centers, multi-professional and multi-technological CNC machines.
5. Basic components of NC machines design - drives, sensors, control systems.
6. Systems of automatic tool (ATC) and workpiece exchanging (AWC).
7. Introduction to CA systems.
8. NC machine programming - coordinate systems, NC program structure, instructions.
9. Systems for automated programming of NC machines, CAD/CAM systems for programming NC machines.
10. Flexible production systems (PVS) - structure, subsystems, material and information flow.
11. Automation of the transport, handling and storage subsystem in PVS.
12. Industrial robots and manipulators.
13. Assembly – automated assembly.

##### Lab.exercises:

1. Programming of the EMCO Concept TURN 55 CNC lathe - creation of a control NC program for the production of a rotary part on an EMCO lathe with a Sinumerik 840D control system and using the WinNC software.
2. Automation of engineering technologies - work on CAx systems.
3. Automation of assembly processes - demonstrations in the laboratory of the DAaPS.

#### Literature:

- ČUBOŇOVÁ, N.: CNC machines programming, computer aided manufacturing: internal textbooks for Erasmus students. – 1st ed. – EDIS Žilina : University of Žilina, 2013. – p. 53, - ISBN 978-80-554-0650-3.
- ČUBOŇOVÁ, N.: Computer aided CNC machine tools programming (in Slovak), 1st ed. – EDIS Žilina : University of Žilina, 2012, p. 115, ISBN 978-80-554-0514-8.
- ČUBOŇOVÁ, N. – BULEJ, V. – NÁPRSTKOVÁ, N. – DODOK, T. - TLACH, V. Automation of Mechanical Production (in Slovak). 1st ed. – EDIS Žilina : University of Žilina, 2021. – p. 259, - ISBN 978-80-554-1836-0.
- DODOK, T. - ČUBOŇOVÁ, N. - CÍŠAR, M. Basics of CAD/CAM system Edgecam 2020.0. (in Slovak) - 1st ed. – EDIS Žilina : University of Žilina, 2020. – p. 129- ISBN 978-80-554-1672-4.
- CÍŠAR, M. – BULEJ, V. – ZAJAČKO, I. - ČUBOŇOVÁ, N. Basics of CNC machine programming with the Sinumerik 840D control system: support in the development of multi-criteria diagnostics (in Slovak). 1st ed. – EDIS Žilina : University of Žilina, 2018. – p. 164. - ISBN 978-80-554-1529-1.
- SÁGA, M. – VAŠKO, M. - ČUBOŇOVÁ, N. – PIEKARSKA, W. Optimisation algorithms in mechanical engineering applications. Harlow, Essex : Pearson, 2016. – p. 291, - ISBN 978-1-78449-135-2.
- ČUBOŇOVÁ, N. - SALAJ, J. - URÍČEK, J.: Machining in system Pro/ENGINEER (in Slovak). University textbook. 1st ed. – EDIS Žilina : University of Žilina, 2012, 2000, ISBN 80-7100-620-3, 297 s.
- GROOVER, M.P: Automation, Production Systems and Computer –Integrated Manufacturing. Učebnica, Second edition, Prentice Hall, USA, January 2000, ISBN 0-13-088978-4, 832 p.
- COTETIU, R. - KURIC, I. - NOVÁK-MARCINČIN, J. - UNGUREANU, N. New Trends in Mechanical Design and Technologies, Risoprint, Cluj Napoca 2005, ISBN 973-751-084-4, 223p

**Instruction language:** english

**Notes:**

**Course evaluation:**

Total number of evaluated students: 0

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>FX</b>
00.00 %	00.00 %	0.00 %	0.00 %	0.00 %	0.00 %

**Course teachers:**

Lecture: Prof. Ing. Nadežda Čuboňová

Lecture: Assoc.-prof. Ing. Vladimír Bulej, PhD.

Lab.exercises: Assoc.-prof. Ing. Vladimír Bulej, PhD.

Lab.exercises: Ing. Tomáš Dodok, PhD.

**Last updated:**

**Approved by:** prof. Ing. Ivan Kuric, Dr.