SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Industrial Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	1.00

2. Data about the subject

2.1	Subject name			*Mathematical analysis*		
2.2	Subject area			Mathematics		
2.2	Course responsible/lecturer			Lect. Dr. Daniela Marian daniela.marian@math.utcluj.ro		
2.3	Teachers in charge of seminars			Lect. Dr. Daniela Marian daniela.marian@math.utcluj.ro		
2.4 Year of study	I	2.5 Semester	I	2.6 Assessment	E	Gr
2.7 Subject category	Formative category					DF
	Optionality					DI

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	2	3.3 Laborator	0	3.3 Proiect	0
3.4 Total hours in the curriculum	56	of which	3.5 Course	28	3.6 Seminar	28	3.6 Laborator	0	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	18
(b) Supplementary study in the library, online and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
(d) Tutoring	3
(e) Exams and tests	3
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	N/A Electronic Course

5.2	For the applications seminarului / laboratorului / proiectului	Individual work

6. Specific competences

Professional competences	C1. Application of fundamental knowledge of general and specialized technical culture to solve technical problems specific to the field of Mechatronics and Robotics. C1.1 Defining the fundamental notions of mathematics C1.2 Explaining the specific concepts of technological processes and the step-by-step solution of specialized engineering problems based on mathematical calculation algorithms C1.3 The use of schemes and organizational charts in the development of dedicated IT applications, numerical and matrix calculation methods in solving equations and systems of equations and in the comparative analysis of possible solutions C1.4. Appreciation of the quality of mechatronic and robotic systems depending on the characteristics of the materials and components used C1.5 Design of assisted calculation algorithms and technological processes specific to the execution of mechatronic and robotic products Solving applications using fundamental knowledge of numerical calculation methods, material characteristics and calculation algorithms specific to mechatronic and robotic subsystems	
Cross competences	C.T.1 The fulfillment of professional tasks with the exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the working time and related deadlines. C.T.2 The responsible execution of some work tasks in the multidisciplinary team with the assumption of roles on different hierarchical levels.	

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	1. Knowledge and understanding of basic concepts, theories and methods in the field and area of specialization, their appropriate use in professional communication 2 2. The use of basic knowledge to explain and interpret various types of concepts, situations, processes, etc. associated with the domain 3. The application of basic principles and methods for solving well-defined problems/situations, typical of the field in conditions of qualified assistance 4. Elaboration of professional projects using principles and methods dedicated to the field.
7.2	Specific objectives	• To compute partial derivatives of functions of several variables • To compute the differential of functions of several variables and vector functions

		• To write Taylor's formula for functions of several variables • To study the extrema of functions of several variables • To compute definite integrals, improper integrals, double integrals, triple integrals, line integrals • To know applications of mathematics in different domains

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1.Series of real numbers	2	Practical problems Students are asked and encouraged to ask questions	
2.Power series	2		
3. Part I: Sets Endowed with different Structures (metric spaces, linear spaces, normed spaces). Real Functions. Vector Functions Part II: Differential Calculus for Real Functions of Several Variables. Partial Derivatives. Partial Derivatives of Higher Orders.	2		
4. Derivatives of Composite Functions. Homogeneous Functions. Directional Derivative. Differential Operators. Differentials. Differentials of Higher Orders	2		
5. Taylor's Formula for Real Functions of Several Variables. Differential Calculus for Vector Functions.	2		
6. Implicit Functions. Changes of Variables	2		
7.Extrema of Functions of Several Variables	2		
8. Antiderivatives. Riemann integrals. Applications	2		
9. Improper integrals	2		
10. The length of a curve. Line Integrals with Respect to Arc Lenght	2		
11. Line Integrals with Respect to Coordinates. Line Integrals Path Independent. Applications of Line Integrals	2		
12. Double Integrals. Calculus by Iteration	2		
13. Green-Riemann's Formula. Changes of variables. Applications of Double Integrals	2		
14. Triple Integrals. Calculus by Iteration. Changes of variables. Applications	2		
Bibliography 1. D. Marian, Mathematical Analysis, Ed. Mega, 2012 2. D. Inoan, Problems in differential and integral calculus, Mediamira, Cluj-Napoca, 2007 3. M. Ivan, Calculus, Ed. Mediamira, Cluj-Napoca, 2002			

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
1.Limits of sequences. Limits of functions	2	Practical problems Students are asked and encouraged to ask questions	
2.Series of real numbers	2		
3.Power series	2		
4.Differential Calculus for Real Functions of One Real Variable (Derivatives, Derivatives of Higher Orders. Taylor's Formula. Extrema)	2		
5. Differential Calculus for Real Functions of Several Variables. Partial derivatives. Partial Derivatives of Higher Orders. Derivatives of Composite Functions	2		
6. Directional Derivative. Differential Operators. Differentials. Differentials of higher orders	2		
7. Taylor's Formula for Real Functions of Several Variables	2		
8. Implicit Functions. Changes of Variables	2		
9.Extrema of Functions of Several Variables.	2		
10.Antiderivatives. Riemann integrals. Applications. Improper integrals	2		
11. Line Integrals with Respect to Arc Length	2		
12. Line Integrals with Respect Coordinates. Applications	2		
13. Double Integrals. Applications	2		
14. Triple Integrals. Applications	2		

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1. D. Marian, Mathematical Analysis, Ed. Mega, 2012
2. D. Inoan, Problems in differential and integral calculus, Mediamira, Cluj-Napoca, 2007
3. M. Ivan, Calculus, Ed. Mediamira, Cluj-Napoca, 2002

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The ability to answer to theoretical questions and to solve practical problems	Written test (mark T)	T is 80%
10.5 Seminars /Laboratory/Project	The activity during classes is appreciated	Questions on each class. Activity of seminar (mark AS)	AS is 10% H is 10%

		Homework (mark H)	
10.6 Minimum standard of performance N=0,8T+0,21AS+0,1H;			
The final credit can be received only if each of the mark's components is fulfilled: N≥5; T≥5			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Lect. Dr. Daniela Marian daniela.marian@math.utcluj.ro	
	Teachers in charge of application	Lect. Dr. Daniela Marian daniela.marian@math.utcluj.ro	

Date of approval in the department of Mathematics

____

Head of department
Prof.dr. Dorian Popa

Date of approval in the faculty of Industrial Engineering, Robotics and Production Management

____

Dean
Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Mathematics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	02.00

2. Data about the subject

2.1	Subject name			Linear Algebra, Analytic and Differential Geometry			
2.2	Subject area			Mathematics			
2.2	Course responsible/lecturer			Asist. univ. dr. Liana Timboș – liana.timbos@math.utcluj.ro			
2.3	Teachers in charge of seminars			Asist. univ. dr. Liana Timboș – liana.timbos@math.utcluj.ro			
2.4 Year of study		1	2.5 Semester 1	2.6 Assessment			E
2.7 Subject category		Formative category					
		Optionality					

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	2	3.3 Laborator		3.3 Proiect	
3.4 Total hours in the curriculum	56	of which	3.5 Course	28	3.6 Seminar	28	3.6 Laborator		3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	7
(b) Supplementary study in the library, online and in the field	7
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	10
(e) Exams and tests	4
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	42
3.9 Total hours per semester (3.4+3.8)	84
3.10 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. **Requirements (where appropriate)**

5.1	For the course	Blackboard, chalk,internet, projector
5.2	For the applications seminarului / laboratorului / proiectului	Blackboard, chalk,

6. **Specific competences**

Professional competences	**C1.1.** Identifying the concepts, principles, basic theorems and mathematical methods, physics, chemistry, technical drawing, computer programming. **C1.2**. Using basic knowledge in the fundamental disciplines for theoretical explanation and interpretation of results, theorems, phenomena or specific processes of industrial engineering. **C1.3.** Applying the theorems, principles and basic methods of fundamental disciplines, for basic engineering calculations in design and operation of technical systems specific to industrial engineering, under qualified assistance **C1.4.** Appropriate use of standard assessment criteria and methods of fundamental disciplines for identification, modelling, analysis and qualitative and quantitative assessment of characteristics of the phenomena and parameters as well as the processing and interpretation of the results from specific industrial engineering processes. **C1.5.** Developing of specific industrial engineering projects and models based on identification, selection and use of principles, optimal methods and acknowledged solutions from the fundamental disciplines.
Cross competences	**CT1.** Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. **CT2.** Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	- to obtain skills and use the basic results of linear algebra, analytic geometry and linear optimization to illustrate their application in other disciplines
7.2	Specific objectives	to present the basic results of linear algebra and analytic geometry - to illustrate their applications in other disciplines - to know and to be able to operate the basic properties of matricial calculus and that of determinants - required to apply the Gauss-Jordan method - to operate with the notions of linear space, linear dependancy, bases and dimensions - to use the notions of inner product spaces, norm and distance, orthonormal basis - to operate with vectors, planes in spaces, straight lines in space - to be able to calculate angles and distances - to be able to generate surfaces of different types - recognise the different types of curves and surfaces - recognise the different types of tangency (lines and planes), normals - calculate the lenght of arcs and the angle of arbitrary surfaces to present the basic results of differential geometry

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Matrices and determinats. Systems of linear equations. The Gauss-Jordan elimination method.	2	Blackboard. Projector,	
Linear spaces and subspaces. Linear dependence	2		
Bases and dimensions	2		
Inner product spaces	2		
Vector in spaces.	3		
Planes in space	2		
Straight lines in space	2		
Angles and distances	1		
Conic Sections - Circles, Ellipses, Parabolas, Hyperbola	2		
Quadric surfaces	2		
Plane curves. Differential properties of the plane curves. The tangent and normal. The curvature of plane curves.	2		
Differential properties of curves in space. The moving trihedron. The curvature and torsion of a curve in space	4		
Differential properties of the surfaces	2		

Bibliography

1. D. Cimpean, D. Inoan, I. Rașa, *An invitation to Linear Algebra and Analytic Geometry*, Ed. Mediamira, 2009, 101p., ISBN 978-973-713-255-0.
2. V. Pop, I. Corovei, Algebra pentru ingineri, Probleme, Ed. Mediamira, 2003
3. V. Pop, Algebră liniara si geometrie analitica, Ed. Mega Cluj, 2012. 6. R.A. Horn, C.R. Johnson: Analiză matricială, Ed. Theta, Bucureşti, 2001.
4. Blaga Lucia& colectiv, Algebra , Geometrie analitica, Geometrie diferentiala,Ecuatii diefentiale, Culegere de probleme- Ed. UT Press, 1995.
5. Blaga Lucia, Lupşa Liana, Algebra, Analytic Geometry, Differential Geometry, Ed.MEGA, Cluj-Napoca, 2008.
6. Blaga Lucia, Lupşa Liana, Algebra, Analytic geometry, Differential Geometry, Problems, Ed.MEGA, Cluj-Napoca, 2009.
7. V. Pop, Algebră liniară. Matrice si determinanti , Ed. Mediamira, 2007. 2. V. Pop, I.
8. Corovei, Algebra liniara. seminarii, teme , concursuri, Ed. Mediamira, 2006.
9. V. Pop, I. Rașa, *Linear Algebra with applications to Markov Chains*, Ed. Mediamira, 2005, 211p., ISBN 973-713-059-6.

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Matrices and determinats. Systems of linear equations. The Gauss-Jordan elimination method.	4	blackboard	
Linear spaces and subspaces. Linear dependence	2		
Bases and dimensions	2		

Inner product spaces	2		
Vector in spaces.	2		
Planes in space	2		
Straight lines in space	2		
Angles and distances	2		
Conic Sections - Circles, Ellipses, Parabolas, Hyperbola	2		
Quadric surfaces	2		
Plane curves. Differential properties of the plane curves. The tangent and normal. The curvature of plane curves.	2		
Differential properties of curves in space. The moving trihedron. The curvature and torsion of a curve in space	4		
Differential properties of the surfaces	2		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The ability to answer to theoretical questions (some of them abstract ones)	Written test oral examination, face to face or on Teams	80%
10.5 Seminars /Laboratory/Project	The ability to do parallelism between the theory and formulae in order to solve problems in connection to theory The ability to do a geometric interpretation of a problem in analytic geometry.	Questions at each seminar and individual work (as homework), face to face or on Teams	20%
10.6 Minimum standard of performance			
The final credit can be received only if each of the mark's components is fulfilled: Grade 5 (five)			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Asist. univ. dr. Liana TIMBOȘ	
	Teachers in charge of application	Asist. univ. dr. Liana TIMBOȘ	

Date of approval in the department ……..	Head of department Prof.dr. Dorian POPA
Date of approval in the faculty ……………	Dean Prof.dr.ing. Corina Julieta BIRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machines Building
1.3	Department	Physics and Chemistry
1.4	Field of study	Mechatronics and robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	3.00

2. Data about the subject

2.1	Subject name	Physics					
2.2	Subject area	DF					
2.3	Course responsible/lecturer	Prof.dr. Ioan Ardelean – ioan.ardelean@phys.utcluj.ro					
2.4	Teachers in charge of laboratory	Asist. Dr. fiz. Mihai Rusu – mihaimrusu@gmail.com					
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	Ex	2.8 Subject category	DF

3. Estimated total time

3.1 Number of hours per week	10	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	100	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	20
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
Tutoring	0
Exams and tests	2
Other activities	

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	General knowledge about high school physics General knowledge of the high school mathematics
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	N/A

6. Specific competences

Professional competences	C1.1. Identifying the concepts, principles, basic theorems and mathematical methods, physics, chemistry, technical drawing, computer programming. C1.2. Using basic knowledge in the fundamental disciplines for theoretical explanation and interpretation of results, theorems, phenomena or specific processes of industrial engineering.
Cross competences	Are able to document themselves on different topics using the library and the Internet

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	To acquire the necessary physics knowledge for understanding the specialized engineering subjects.
7.2	Specific objectives	Acquiring of information and skills to describe the oscillatory motion, elastic waves, sound and ultrasound waves. Understanding the electric and magnetic phenomena The ability to represent the graphical data and their interpretation

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Introduction. The physical quantities of cinematic and dynamics. Measuring units.	Direct expository approach	Direct discussions + Simulations
2.	Principles of Newtonian mechanics. Systems of material points. Elements of kinematics and dynamics of the rigid solid.		
3.	Harmonic oscillator, damped oscillator, forced oscillator. Resonance phenomena.		
4.	Overlapping of oscillations.		
5.	Waves. The wave equation of harmonic plane waves. Energy carried by the waves. Intensity, Flux. Doppler's effect.		
6.	Wave interference. Wave velocity, Group velocity.		
7.	Elements of acoustics and characteristic physical quantities. Sound intensity. Sound pressure. Sound level.		
8.	Sound reflexion and refraction phenomena. Sound attenuation. Reverberation.		
9.	Elements of ultrasound physics. Production and applications of ultrasounds.		

10.	Elements of electrostatics. Electric field intensity. Electric potential. Potential difference. Electric current.		
11.	Gauss law. Local Ohm's law.		
12.	Magnetic field. Biot-Savart's law. Lorentz's force. Hall effect		
13.	Ampere's law and applications.		
14.	Electromagnetic induction's lawand applications.		

Bibliography

1. H. D. Young, R. A. Freedman - Sears and Zemansky's University Physics with Modern Physics Technology Update (lb. engleza), Pearson – 2013
2. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics Extended, John Wiley & Sons, 2013
3. I.Ardelean, Fizica pentru ingineri, Ed. UTPres, 2005.
4. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
5. http://nmr.utcluj.ro/teaching/

8.2. Applications		Teaching methods	Notes
1.	Measuring physical quantities and the evaluation of the errors. Graphical representation.	Experiments performed in small working groups/ Data interpretation onsite or using TEAMS	Active participation of all students. Collaboration between students
2.	Determining the elastic constant of a string		
3.	Study the stationary transverse waves		
4.	Study of the longitudinal stationary waves		
5.	Determining the electric conductivity of metals		
6.	Study of an optical spectroscope		
7.	Determining the activation energy of a semiconductor		
8.	Determining the gravitational acceleration with a physical pendulum		
9.	Study of the thermoelectric effect		
10.	Determining the viscosity coefficient of a liquid		
11.	Applications: kinematics and dynamics		
12.	Applications: energy conservation and elastic waves		
13.	Applications: electrostatics and magnetostatics		
14.	Recapitulation. Finalising of the laboratory reports.		

Bibliography

1. H. D. Young, R. A. Freedman - Sears and Zemansky's University Physics with Modern Physics Technology Update (lb. engleza), Pearson – 2013
2. I.Ardelean, Fizica pentru ingineri, Ed. UTPres, 2005.
3. I. Ardelean, Note de curs, materiale incarcate pe Teams.
4. http://nmr.utcluj.ro/teaching/

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline has a fundamental character providing the students with the necessary knowledge and the abilities required to understand the field of building machinery.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Onsite evaluation: a set of 8 questions (theory and	Onsite: handwritten evaluation report	80%

	applications) Online evaluation: a set of 40 questions about theory and applications	(time 2h) Online: Quits on TEAMS (time 1h)	
Laboratory	Data interpretation and preparation of laboratory reports	Laboratory reports submitted as response to assignments or directely collected in the laboratory	20%
10.4 Minimum standard of performance:			
Obtaining of minimum 50 points			

Date of filling in:	Responsible	Title First name LAST NAME	Signature
	Course	Prof. Ioan ARDELEAN, Ph.D.	
	Applications	Prof. Ioan ARDELEAN, Ph.D. Asist. Mihai RUSU, Ph.D.	

Date of approval in the department council

____

Head of department,
Prof. Petru PASCUTA, Ph.D.

Date of approval in the faculty council

____

Dean,
Prof. eng. Corina BÎRLEANU, Ph.D.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Mechanical Systems Engineering
1.4	Field of study	Robotics and Mechatronics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/Engineer
1.7	Form of education	Full time
1.8	Subject code	4.00

2. Data about the subject

2.1	Subject name			Computer Programming and Programming Languages 1			
2.2	Subject area			Computer Programming (DAP, DCA)			
2.3	Course responsible/lecturer			Prof. dr. ing. ANTAL Tiberiu Alexandru – antaljr@bavaria.utcluj.ro			
2.4	Teachers in charge of seminars			Prof. dr. ing. ANTAL Tiberiu Alexandru			
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DF/DI

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	30
Supplementary study in the library, online and in the field	20
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	4
Tutoring	0
Exams and tests	6
Other activities	

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Attendance at the laboratory is mandatory.

6. Specific competences

Professional competences	After completing the discipline students will be able to: • understand the principle of operation of PC computers and their physical structure; • operate under DOS, Windows and Linux operating systems, to implement security concepts related to their operation; • operate with text editors, spreadsheets and vector drawing; • connect computers to the network and the Internet; • make simple web pages; • understand the fundamental differences and similarities between compilers and interpreters; • to understand and describe fundamental numerical algorithms specific to applied engineering.
Cross competences	Applying the values and ethics of the engineering profession and responsible execution of complex professional tasks in conditions of professional autonomy and independence. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-evaluation in decision making. Planning your own work priorities, drawing up your own action plan.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Development of communication and interaction between the computing machine and man, understanding security in computing systems and description of fundamental numerical algorithms.
7.2	Specific objectives	1. Understanding the representation of numbers in the computer and its operation. 2. Operating under DOS, Windows and Linux. 3. The procedure for connecting a computer to the network. 4. Securing computer systems. 5. Making simple web pages. 6. Operation in Word, Excel and Draw in order to create technical documents. 7. Description and creation of fundamental numerical algorithms in pseudocode, logical or object-oriented schemes 8. Elaboration of professional and / or research projects for the realization of applications or human-computer interface, computer - computer.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
1. Brief history of the development of computer technology.	Use of TIC/blended	Video projector, board and/or
2. Hardware architecture of personal computers.		

3. Operating systems: concepts and architectures.	learning resources, discussions, Internet.	online meetings on MS Teams (Zoom)
4. Windows: architecture and implementation.		
5. Linux: architecture and implementation.		
7. WWW.		
8. Security concepts in computer systems.		
9. Data models. Imperative and declarative languages. Usual programming pradigms. Compilers and interpreters.		
10. Fundamental algorithms 1: Symbols of logic diagrams. Pseudo. Data. Data operations. Pseudocode instructions.		
11. Fundamental algorithms 2: Calculating the value of an expression. Calculating the values of a function in a range. The sum and product of the terms of an array. Maximum (or minimum) of an array. Swapping of two variables. In situ sorting of arrays.		
12. Fundamental Algorithms 3: Calculating the value of a function using a series. Solve an equation using the bisection and Newton methods.		
13. Fundamental Algorithms 4: Cycles. Matrix operations - sum, product.		
14. Concepts on microcontroller architecture and programming.		

Bibliography

1. Andrew Tanenbaum , Organizarea structurată a calculatoatelor, Agora, 1999, ISBN: 973-97706-4-9.
2. David Solomon, Inside Winows NT, Microsoft Press, 1998, ISBN: 1-57231-677-2.
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4. Ştefan Tanasă, Cristian Olaru, Ştefan Andrei, Java de la 0 la expert, Polirom, 2003, ISBN: 973-681-201-4.
5. Leon Livovschi, Horia Georgescu, Sinteza şi analiza algoritmilor,Ed ştiinţifică şi enciclopedică, 1986
6. Peter Norton, William Stanek, Ghid de programare în Java, Teora, 1997, ISBN: 973-601-719-2.
7. Herber Schild, Java 2 - The Complete Reference, Fourth Edition, Osborne, 2001, ISBN: 0-07-213084-9.
8. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-7.
9. Knuth, D.E. - Arta programării calculatoarelor. Volumul I – Algoritmi fundamentali, Ed. Teora, 2000
10. Knuth, D.E. – Arta programării calculatoarelor. Volumul II – Algoritmi seminumerici, Ed. Teora, 2000.
11. Knuth, D.E. – Arta programării calculatoarelor. Volumul III – Sortare şi căutare, Ed. Teora, 2002.

8.2. Applications/Seminars	Teaching methods	Notes
1. PC components and features. Standards for the representation in calculation systems of integers with and without a sign, of fixed and floating point numbers.	Use of TIC/blended learning resources, discussions, Internet.	Video projector, board and/or online meetings on Skype (or MS Teams)
2. Arithmetic operations in bases 2, 10 and 16. Conversions. ASCII.		
3. Windows. DOS commands.		
4. Operating under Linux (Ubuntu).		
5. Creating a web page using HTML.		
6. Word 2003: General. Equations.		

7. Word 2003: Tables. Drawings.		
8. Excel. Tables. Function values. Graphics. Solutions of equations.		
9. Test no. 1. Editing a technical text containing equations, tables and drawings. Calculating the value of a given function, its graphical representation and finding the solutions of an equation in Excel.		
10. Fundamental algorithms 1. Calculating the values of a function in an interval. Solving an equation with the bisection/tangent method.		
11. Fundamental algorithms 2: Calculation of some functions using series of powers. Calculation of defined integrals.		
12. Fundamental algorithms 3: Calculation of the values of the derivative of a given function. Minimum, maximum of a function.		
13. Fundamental algorithms 4: Determining the values of some means (arithmetic, geometric), under imposed conditions, in the case of matrices.		
14. Test no. 2. on fundamental algorithms in pseudocode and flowcharts.		

Bibliography

1. Andrew Tanenbaum , Organizarea structurată a calculatoatelor, Agora, 1999, ISBN: 973-97706-4-9.
2. David Solomon, Inside Winows NT, Microsoft Press, 1998, ISBN: 1-57231-677-2.
3. Andrew Tanenbaum, Reţele de calculatoare, Agora, 1998, ISBN: 973-977706-3-0.
4. Leon Livovschi, Horia Georgescu, Sinteza şi analiza algoritmilor,Ed ştiinţifică şi enciclopedică, 1986
5. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-
7. Knuth, D.E. - Arta programării calculatoarelor. Volumul I – Algoritmi fundamentali, Ed. Teora, 2000
7. Knuth, D.E. – Arta programării calculatoarelor. Volumul II – Algoritmi seminumerici, Ed. Teora, 2000.
8. Knuth, D.E. – Arta programării calculatoarelor. Volumul III – Sortare şi căutare, Ed. Teora, 2002.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Students can choose to apply their knowledge acquired in industry, research or to expand, through master's school and the skills acquired in undergraduate studies.
Regardless of their option, the acquired competencies will be necessary in case they will carry out their activity within the specialized companies on a certain field (robots, economics, machine building) or within the software companies oriented on the engineering programming field.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Verification of knowledge by solving problems presented in the course.	Written test - evaluation time 2 hours	60%
10.5 Applications	Development of applications in a required	Practical test - duration 2 + 2 hours	40%

	time.		
10.6 Minimum standard of performance			
Grade >= 5 at course and grade >= 5 at laboratory.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof.dr.ing. ANTAL Tiberiu Alexandru	
	Teachers in charge of application	Prof.dr.ing. ANTAL Tiberiu Alexandru	
		Conf.dr.ing. Felicia CRISTEA	

Date of approval in the department	Head of department Prof.dr.ing. ANTAL Tiberiu Alexandru.
Date of approval in the faculty …………..	Dean Prof.dr.ing. Corina BIRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of industrial engineering, robotics and production management
1.3	Department	Physics and chemistry
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	5.00

2. Data about the subject

2.1	Subject name	Chemistry
2.2	Course responsible/lecturer	Prof. JÄNTSCHI Lorentz lorentz.jantschi@campus.utcluj.ro
2.3	2.3 Seminar / Laboratory applications / Project applications responsible	Prof. JÄNTSCHI Lorentz lorentz.jantschi@campus.utcluj.ro

2.4 Year of study	1	2.5 Semester	1	2.6 Method of assessment	ex
2.7 Subject	Category				DF
	Type				DOB

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laborator	1	3.3 Proiect	0
3.4 Total hours in the curriculum	100	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laborator	14	3.6 Proiect	0

3.7 Distribution of time (hours per semester) for:	
(a) Study after the textbook, course support, bibliography, and course notes	14h
(b) Supplementary study in the library, on specialty electronic platforms and in the field	4h
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14h
(d) Tutoring	
(e) Exams and tests	4h
(f) Other activities	

3.8	Total hours of individual study	33

3.8	Total hours per semester	100
3.9	Number of credit points	4

4. **Pre-requisites (where appropriate)**

4.1	Curriculum	-
4.2	Competence	-

5. **Requirements (where appropriate)**

5.1	For the course	Projector: course in electronic format; laptop: for connectivity with TEAMS
5.2	For the applications	The students work in groups (2-5 students), conducted by rotating the laboratory equipment. Requires preparation of working procedures prior to conducting of the experiments.

6. **Specific competences**

Professional competences	Knowledge and understanding of concepts, models, theories and methods of basic chemistry and their appropriate use in professional communication; Using basic knowledge of chemistry for explanation and interpretation of concepts and processes specific situations; Applying the basic principles and methods for solving problems and defined situations typical field of study; Use of criteria and evaluation methods to assess the quality, advantages and limitations of processes, concepts, methods and theories; Filling of activity registry records during and after obtaining the results of laboratory experiments and applying the principles and methods described.
Cross competences	Responsible execution of laboratory activities in conditions of autonomy and support from the supervisor; Familiarizing with specific roles and teamwork activities and distribution of tasks within the team conducted experiments in working groups; Awareness of the need for continuing training; Efficient use of resources (course support, manual laboratory notebook laboratory list of questions and answers; individual documentation) and learning techniques (reading, writing, communication, exercise, problem solving, building issues) for personal d and professional evelopment.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Understanding and accomodation with the general concepts of chemistry.
7.2	Specific objectives	Understanding and proper operation with the concepts of chemical compound, chemical structure, chemical process, chemical reaction and chemical equilibrium.

8. **Contents**

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Periodic system; periodic properties; electronic structure	Using interactive	Each course

2.	The abundance of elements; chemical formulas; stoichiometry	multimedia (students have the opportunity to ask questions)	takes 2 hours
3.	Minerals; physical and chemical properties; chemical reactions		
4.	Hydrogen; oxygen; water		
5.	Alkali and alkaline earth metals		
6.	"p3-p6" elements block (groups 15-18)		
7.	"d1-d5" elements block (groups 3-7)		
8.	"d6-d10" elements block (groups 8-12)		
9.	"f" elements block (lanthanides and actinides)		
10	Boron group; Carbon group		
11	Organic chemistry; hardness and hard materials		
12	Ceramics; semiconductors; superconducting		
13	Advanced Materials; polymers & plastics; & reaction mechanisms; biomolecules		
14	Methods & models; structure activity / property relationships		
Bibliography: Lorentz JÄNTSCHI, Mihaela Ligia UNGUREŞAN, 2001. Capitole speciale de chimie pentru automatică, UTPres, Cluj-Napoca, Romania. 202 p. Internet resources: Lorentz JÄNTSCHI, 2013. General chemistry. Annually updated course support: http://lori.academicdirect.org/courses/ Other: sources of information listed at the end of training materials updated annually.			
8.2. Applications/Seminars		Teaching methods	Notes
1.	Presentation chemistry laboratory. Activities: a. The presentation glassware; b. the presentation of analytical balance; c. are presented and assumed signature protection rules and obligations in chemistry lab	Exposition and conversation	2 hours (the first and second week of the semester)
2.	Coomon operations in the laboratory. Activities: a. Sampling; b. experiments and measurements; c. data analysis; d. Students are divided into groups (2-5 students) work; following ($3 \div 7$) will perform works by rotation cycle ($3 \rightarrow 4$, $4 \rightarrow 5$, $5 \rightarrow 6$, $6 \rightarrow 7$; $7 \rightarrow 3$)	Frontal experiment and conversation	2 hours (in weeks 3 and 4 of the semester)
3.	Study of gaseous diffusion and molecular velocities	Exposition, applicative activity, conversation, work in groups of 2-5 students	Each lab takes 2 hours
4.	Qualitative analysis of metals and alloys		
5.	Obtaining of the oxygen and study of the gas laws		
6.	Study the corrosion process by gravimetric and volumetric methods		

7.	Protection against corrosion - nickel plating		

Bibliography
Lorentz JÄNTSCHI, 2016. Experiments and tests of general chemistry. Cluj-Napoca: AcademicDirect. 171 p.
Lorentz JÄNTSCHI, Sorana D. BOLBOACĂ, 2015. General chemistry laboratory activities. Cluj-Napoca: AcademicDirect. 109 p.
Horea Iustin NAŞCU, Liana Teodora MARTA, Elena Maria PICĂ, Violeta POPESCU, Mihaela Ligia UNGUREŞAN, Lorentz JÄNTSCHI, 2002. Chimie – lucrări practice. Cluj-Napoca: UTPres. 159 p.
Elena Maria PICĂ. Laboratory works guide, available in several editions in the UTCN library.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

To corroborate the contents expectations academia and economic focus is on training skills and practical skills to use basic concepts of chemistry to explain the phenomena that manifest in the training of students, namely construction and deployment of chemical experiments that highlight phenomena whose direction and magnitude of interest is ongoing; They are using examples and applications dedicated to the field and collected issues of current concerns of companies employing especially contents and examples of their use are updated annually on the experience gained from exchanges of experience with scientific and professional communities.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Gained knowledge	Testing on the way before the exam (TC)	60%
	Final checking	Oral checking with laboratory notebooks (TO)	20%
Applications	Chemical formulas	Testing on the way in the 4th and 5th laboratories (T1)	10%
	Laboratory activities	Testing on the way in the 6th and 7th laboratories (T2)	10%
10.4 Minimum standard of performance E = (6*TC+2*TO+T1+T2)/10 Condition for obtaining the credits: TC≥5; T1≥5; T2≥5;			

Transitional measures covid19:
The course takes place on-site (in an amphitheatre) or online. Laboratory development scenarios:
Scenario 1 (green). The laboratory activities will be carried out onsite in the C407 laboratory with 15 + 3 workstations located 1 m away from each other.
Scenario 2 (yellow). The laboratory activities will take place in an amphitheater provided by the faculty management where the number of students can be increased to 20 and the distance between students to 2 m.
Scenario 3 (red). The laboratory activities will take place online on one of the Microsoft Teams or Zoom platforms, in agreement with the students.

Date of filling in:	Responsible	Title Surname Name	Signature
	Course	Prof. Lorentz JÄNTSCHI	
	Applications		

Date of approval in the department council	Head of department, Prof. eng. Călin NEAMȚU, Ph.D.
Date of approval in the faculty council	Dean, Prof. eng. Corina BÎRLEANU, Ph.D.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Automotive, Mechanics and Mechatronics
1.3	Department	Automotive and Transportation
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics (in English)/engineer
1.7	Form of education	Full time
1.8	Subject code	6.00

2. Data about the subject

2.1	Subject name			Descriptive Geometry			
2.2	Subject area			Descriptive Geometry			
2.2	Course responsible/lecturer			Conf.dr.ing. Andrei KIRALY			
2.3	Teachers in charge of seminars			Conf.dr.ing. Andrei KIRALY, S.l, dr.ing.Prodan Calin			
2.4 Year of study	1	2.5 Semester	1	2.6 Assessment	Colloquium		
2.7 Subject category	Formative category					DF	
	Optionality					DI	

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laborator	2	3.3 Proiect	-
3.4 Total hours in the curriculum	100	of which	3.5 Course	14	3.6 Seminar		3.6 Laborator	28	3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	14
(b) Supplementary study in the library, online and in the field	10
0(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	4
(e) Exams and tests	12
(f) Other activities	4

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	58
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	High school
4.2	Competence	3D Spatial view

5. Requirements (where appropriate)

5.1	For the course	Drawing tools, A3 Sheets
5.2	For the applications seminarului / laboratorului / proiectului	Drawing tools, A3 Sheets

6. Specific competences

Professional competences	- Students should understand and acquire the rules of representing geometric spatial elements in plane, based on methods specific of descriptive geometry; comprehend the ways of representation in double orthogonal projection of assembly components; Students should know, on the basis of thorough analyses of the initial data of a proposed topic, to choose the most appropriate graphical methods for the required representation (problems of metrics, relative positions, involutes); Students should synthesize the basic notions employed in descriptive geometry and technical drawing to acquire an accurate engineering view on technical representations.
Cross competences	– Promoting choice and logical reasoning to solve a given technical applications. – Applying the values and the ethics of the profession of engineer and the responsible execution of the technical drawings under limited autonomy and qualified assistance. – Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of drawing skills and knowledge of technical drawing technology.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	- transmission and will acquire the rules of representation in plan of objects in space, based on rules and regulations established for the purpose of expressing an idea or conception technical, concerning a machine, device, appliance, or installation
7.2	Specific objectives	- acquiring and mastering of a unitary technical language appropriate in view of collaboration between the designer and executor for the practical realization of products designed

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
The object of descriptive geometry. The projection systems. Representation of points and lines using projections. General standards of technical drawing: formats, lines, indicator. Geometric constructions	1	Exposure by computer and PowerPoint. Live or across the MS Teams application	
Descriptive Geometry basics. Projection systems. Double projection planes orthogonal projection. Points and lines Projection.	1		
Lines projection. Projection of lines particularly positioned.	1		
Representation of Planes Particular positions. Relative positions between lines and of planes.	1		
Methods to find real size projections in Descriptive Geometry	1		
Plane sections. Finding the true sizes of the sections Development of surfaces	1		
Axonometric representations	1		
Rules of representation of views and sections.	1		

Cont. Rules of representation of views and sections. Hatching	1		
Dimensioning. Putting dimensions on drawings	1		
Thread representation, representation of threaded parts	1		
Representation and quotation of parts with flanges	1		
Parts with flanges representation	1		
Shafts - Representation, Dimensioning.	1		

Bibliography

1. ***, - http://www.desen.utcluj.ro
2. Morling K., Geometric and Engineering Drawing, Routlege, 2012
3. KIRALY Andrei, Descriptive Geometry and Technical Drawing, Course and applications at : www.desen.utcluj.ro
4. KIRALY Andrei - Geometrie Descriptivă și Desen Tehnic, ISBN 978-606-543-458-5, Ed. Mega Cluj, 2016
5. KIRALY Andrei - Bazele Desenului Tehnic, ISBN 978-606-543-279-6, Ed. Mega Cluj, 2017
6. Rhodes, R.S., Cook. L.B., Basic engineering Drawing, Pitman publishing Limited, London, 1978

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
General standards of technical drawing: formats, lines, indicator. Geometric constructions	2	Practical applications solved manually using drawing tools	
Representation of points and lines using orthogonal double projection. Particular lines and planes	2		
Relative positions between lines	2		
Plates intersections	2		
Methods to find real size projections.	2		
Planar sections through bodies and unfolding	2		
Axonometric representation	2		
Colloquium 1 - Midterm exam (projections, plan figures, methods to find real projections, Axonometry).	2		
Projections layout. Piece of wood projections.	2		
European method of projections layout. Representation of parts using this method	2		
American method of projections layout. Representation of parts using this method	2		
Sectional views	2		
Representation and dimensioning parts with flanges	2		
Colloquium 2. End of practical work and completion of the portfolio. Files handling. Final grades.	2		

Bibliography

1. ***, - http://www.desen.utcluj.ro
2. Morling K., Geometric and Engineering Drawing, Routlege, 2012
3. KIRALY Andrei, Descriptive Geometry and Technical Drawing, Course and applications at : www.desen.utcluj.ro
4. KIRALY Andrei - Geometrie Descriptivă și Desen Tehnic, ISBN 978-606-543-458-5, Ed. Mega Cluj, 2016
5. KIRALY Andrei - Bazele Desenului Tehnic, ISBN 978-606-543-279-6, Ed. Mega Cluj, 2017
6. Rhodes, R.S., Cook. L.B., Basic engineering Drawing, Pitman publishing Limited, London, 1978

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

It's a hard work, but not impossible

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Theory and applications	Control papers - 2 hours each - N1, N2	N1 - 33% N2 - 33%
10.5 Seminars /Laboratory/Project	Portfolio	Practical work s – 2 hours weekly - N3	N3 - 34%
10.6 Minimum standard of performance			
N1>4; N2>4; N3>4			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Assoc prof. PhD. eng. Andrei KIRALY	
	Teachers in charge of application	Assoc prof. PhD. eng. Andrei KIRALY	
		as. PhD. eng. Calin Prodan,	

Date of approval in the department …….. _________________________	Head of department Prof.dr.ing.
Date of approval in the faculty ………….. _________________________	Dean Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	

2. Data about the subject

2.1	Subject name			Materials Science and Engineering I			
2.2	Subject area			Materials Engineering			
2.3	Course responsible/lecturer			Prof. Cătălin Popa, Dr.Eng.			
2.4	Teachers in charge of seminars			Lect. Călin Prică, Dr.Eng.			
2.5 Year of study	I	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DD / DI

3. Estimated total time

3.1 Number of hours per week	2	3.2 of which, course:	1	3.3 applications:	1
3.4 Total hours in the curriculum	28	3.5 of which, course:	14	3.6 applications:	14

Individual study	hours
Manual, lecture material and notes, bibliography	31
Supplementary study in the library, online and in the field	
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
Tutoring	
Exams and tests	2
Other activities	

3.7	Total hours of individual study	47
3.8	Total hours per semester	75
3.9	Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	-

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Lab works on half-groups, individually or in groups of 3 strudents, by rotation at the microscopes / equipment;

6. Specific competences

Professional competences	**C2.4.** Appropriate use of the standard assessment criteria and methods from basic engineering sciences, for identification, modelling, experimentation, analysis and assessment of the qualitative and quantitative aspects, phenomena and definitive parameters as well as gathering data, processing and interpretation of the results from specific industrial engineering trials. **C4.1.** Describing the theory, methods and basic principles for designing the processes specific to machine building technology**.** **C4.2.** Using the basic knowledge for explaining and interpreting of the various types of manufacturing processes specific to machine building technology. **C4.4.** Proper use of standard evaluation criteria and methods to appreciate the quality, advantages and limitations of manufacturing processes on classical machines and/or CNC and the flexible manufacturing systems. **C4.5.** Elaborating the professional projects of the manufacturing technological processes specific for manufacturing technologies, including specific CAM programs **C5.1.** Defining the concepts, theories, methods and basic principles of designing the manufacturing equipment, their components and the industrial logistics specific to machine building technology. **C5.2.** Using basic knowledge to explain and interpret different types of technological equipment and their components specific to the machine building technology. **C5.3.** Applying basic principles and methods for designing the manufacturing equipment and their components specific to the machine building technology **C5.4.** Proper use of standard evaluation criteria and methods to appreciate the quality, advantages and limitations of the manufacturing equipment and / or their components specific to the machine building technology. **C5.5.** Elaborating professional projects for manufacturing equipment specific to the machine building technology.
Cross competences	**CT1.** Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. **CT3.** Objective self-evaluation of the need of continuous training for labour market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication..

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Acquiring the basic understanding of the main categories of engineering materials (alloys, ceramics and glasses, polymers, composites) in what concerns: basic properties of materials; structure of materials at the nano / micro/ macro scale; correlation composition – structure – properties – uses.
7.2	Specific objectives	Theoretical skills: - Structural analysis of the main classes of engineering materials;

		- Application targeted selection of the material type; - Prescription of the optimal type of heat treatment for a certain application; - Decoding the symbols describing materials in technical documents; - Development of applications employing advanced materials; Practical skills: – Utilize the metallographic microscope; – Manipulate the means for the quantitative analysis of materials; – Employ software products for the materials imaging;	

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Introduction to Materials Science. Definition, relation to other topics in Technical Science. Correlation composition – structure – properties – use. Classes of engineering materials. Properties of materials - physical, chemical.	Ppt presentations, available for students prior to lectures; If required by pandemic situation, online,Teams;	Handouts downloaded from Teams classt / files on class files
2.	Properties of materials - mechanical. Crystalline and amorphous structure of materials		
3.	Crystallisation of metals. Notions of plastic deformation of metals. Cold hardening. Recrystallisation. Theory of alloys.		
4.	Phase diagrams. Fe-C diagram. Steels. Basics of heat treatments.		
5.	Alloy steels. Foundry cast irons. Non-ferrous alloys.		
6.	Fundamentals of polymers.		
7.	Fundamentals of ceramics, composites, advanced materials.		

Bibliography

- D.Askeland – Introduction to Materials Science, J.Wiley & Sons, 1993
- C. Paul – Materials Science and Engineering, ASM 1991
- W. D. Callister, D. G. Rethwisch - Fundamentals of materials science and engineering, John Wiley and Sons, 2013;
- W. F. Hosford, Elementary materials science , ASM International 2013;
- D.L. Chung - Composite materials: science and applications : functional materials for modern technologies, Springer 2003;
- *** - ASM Metals Handbook, vol. 1, 2, ASM International, 1993;

8.2. Applications/Seminars		Teaching methods	Notes
1.	Optical basics and utilization of optical or electron microscopes. Microscopic study of metals.	Direct work in the lab, onsite / online, if required by pandemic evolutions	
2.	Microscopic analysis of metals. Macroscopic analysis of metals.		
3.	Structure of Fe-Fe_3C alloys. Unalloyed steels. White cast irons.		
4.	Foundry cast irons.		
5.	Structures obtained hrough heat treatments		
6.	Alloy steels		
7.	Nonferrous alloys. Non-metallic materials		

Bibliography

Leaflets existing in the lab

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

According to industrial employers, graduates should have the basic knowledge about the structure – properties of the materials they use, about their bulk / surface conditioning and processing capabilities.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Understanding of the topics; Ability to solve specific problems; Knowledge of the subjects;	Written test; If required by pandemic situation, Quiz on Forms	80%
Applications	Achievement of the practical tasks;	Reports	20%
10.4 Minimum standard of performance			
Min. 5 for both test and applications			

Date of filling in:	Persons in charge	Title, Name, Surname	Signature
	Lectures	Prof.Dr.Ing. Cătălin Popa	
	Application	S.L.Dr.Ing. Călin Prică	

Date of approval in the Council of SIM Department	Director, SIM Department Conf.dr.ing. Mariana Pop
Date of approval in the Council of IIRMP Faculty _______________________	Dean, Prof.dr.ing. Corina Bârleanu

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics (Instruction in English)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	8.10

2. Data about the subject

2.1	Subject name	Foreign Languages 1 English					
2.2	Subject area	Foreign Languages					
2.3	Course responsible/lecturer	N/A					
2.4	Teachers in charge of seminars	Assistant Lecturer Carmen Muresan, Ph. D. Carmen.Muresan@lang.utcluj.ro Assistant Lecturer Delia Rusu, Ph. D. Delia.Rusu@lang.utcluj.ro					
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DC/DO

3. Estimated total time

3.1 Number of hours per week	1	3.2 of which, course: 0		3.3 seminars:	1
3.4 Total hours in the curriculum	50	3.5 of which, course: 0		3.6 seminars:	14

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	12
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	12
Tutoring	2
Exams and tests	
Other activities	

3.7	Total hours of individual study	36
3.8	Total hours per semester	50
3.9	Number of credit points	2.0

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general English minimum B1 CEFR

5. Requisites (where appropriate)

5.1. for the course	N/A
5.2. for the seminars	According to university regulations, class attendance is compulsory

	Printed resources, laptop, printer, tablet, interactive whiteboard, Internet.

6. **Specific competences**

Professional competences	Acquisition of basic knowledge in the major fields of science and technology. Acquisition of linguistic and communication conventions used in technical English.
Cross competences	CT1. The fulfillment of professional tasks with the exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the time frame and the relevant deadlines. CT2. The responsible execution of some work tasks within a multidisciplinary team with the undertaking of roles on different hierarchical levels. CT3. The identification of the need for continuous training and the efficient use of information resources and communication resources and assisted professional training (portals, internet, specialized software applications, databases, online courses) both in Romanian as well as in an international language.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1 General objective	The students should develop skills to communicate effectively in a foreign language in professional contexts
7.2 Obiectivele specifice	Developing the ability to use oral and written technical English

8. **Contents**

8.1Seminars (syllabus)	Teaching methods	Notes
1. Introduction to Robotics, short history, the three laws of Robotics.	Interactive exercices reflected in written/speaking exercises such as: conversation, debating, team work, problem-solving.	
2. Defining, classifying. Types of robots. Compound nouns		
3. Components of a robot. Describing the operation of a robot-the sequence of phases. Components of a robot. The Passive Voice.		
4. Describing products, technical specifications. Choosing the best option.		
5. Writing technical instructions for different machinery in applied exercises.		
6. Expressing the number and the quantity in different contexts		
7. Final written test		

Bibliography:

Eisenbach, Iris (2011). *English for Materials Science and Engineering.* Exercises, Grammar, Case Studies. Viewveg+Teubner Verlag.

Glendinning, E. (2007). *Technology I*. Student's Book. Oxford: Oxford University Press.

Lansford, Lewis (2009). *Tech Talk*. Workbook. Oxford: Oxford University Press.

Remacha Esteras, Santiago (2012). *Infotech. English for Computer Users*. Cambridge: Cambridge University Press

Rogers, L. and J. Wilkin (2013). *Skillful Reading and Writing*. Student's Book. Oxford: Macmillan. English for Science and Engineering.

William, I. (2007). *English for Science and Engineering*. Thomson ELT.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The improvement of the students' ability to communicate in English in technical contexts is to ensure a successful adjustment to multicultural work environments.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course			
10.5 Seminar	Continuous assessment of speaking+Final written test	Continuous assessment of speaking+Final written test	Continuous assessment of speaking: 30% Final written test: 70%
10.6 Minimum standard of performance: completion of at least 50% of each component of assessment			

Date of completion:	**Instructors in charge**	**Rank name SURNAME**	**Signature**
	Lecture	N/A	
	Seminars	Assistant Lecturer Carmen MURESAN, Ph.D.	
		Assistant Lecturer Delia RUSU, Ph. D.	

Date of approval in the department	Head of department Assoc. Prof. Ruxanda Literat, Ph. D.
Date of approval in the Faculty Council _______________________	Dean, Prof. Corina Bîrleanu, PH. D.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics (Instruction in English)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics (in English) / Engineer
1.7	Form of education	Full time
1.8	Subject code	8.20

2. Data about the subject

2.1	Subject name			Modern Languages I French			
2.2	Subject area			Modern Languages			
2.3	Course responsible/lecturer						
2.4	Teachers in charge of seminars			Assoc. Prof. Dr. Cristiana Bulgaru, Cristiana.Bulgaru@lang.utcluj.ro			
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DC, DO

3.Estimated total time

3.1 Number of hours per week	1	3.2 of which, course:		3.3 applications:	1
3.4 Total hours in the curriculum	50	3.5 of which, course:		3.6 applications:	14

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
Tutoring	
Exams and tests	2
Other activities	

3.7	Total hours of individual study	36
3.8	Total hours per semester	50
3.9	Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general French minimum A1 (CEFR)

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Class attendance, individual study and homework completion

6. Specific competences

Professional competences	●Improving the skills of using French in academical and technical context; ● Increasing the students' awareness in terms of the rules that govern effective communication in French; ●Developing the students' ability to work in teams
Cross competences	● **CT1** The application of the values and ethics of the engineering profession and the responsible completion of professional tasks under conditions of limited autonomy and qualified assistance. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-assessment in decision-making. **Responsible performance of professional tasks.** ●**CT2** Carrying out activities and exercising the specific roles of teamwork on different hierarchical levels. Promoting the sense of initiative, dialogue, cooperation, positive attitude and respect for others, diversity and multiculturalism, and continuous improvement of one's own activity. **Communication and teamwork.** ●**CT3** Objective self-assessment of the need for continuous professional training in order successfully apply for a position in one's area of specialization and to adapt to the dynamics of labour market requirements, and for personal and professional development. Effective use of language skills and knowledge of information and communication technology. **Aware of the need for continuous training.**

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	● Developing the competence of written and oral communication academic and professional contexts.
7.2	Specific objectives	● Strengthening basic lexical, grammar and discursive knowledge in general French ● Developing the ability to understand, convey and evaluate written and oral messages in a professional context.

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes

8.2 Applications / Seminars	Teaching methods	Notes
1. Placement test. **2. Personal information:** creating a business card, filling in an application form. Revision: plurals of countable and uncountable nouns, articles, prepositions combined with articles (de, à), personal pronouns. **3. My timetable:** activities at home, activities at school. Expressing time and place. Revision: the present tense, numerals (cardinal, ordinal), possessives and demonstratives. **4. Engineering as a field of study // Engineering as a career field.** Justifying choices and preferences. The future tense (futur proche / futur simple).	-presenting new contents (vocabulary, grammar); -textual analysis; -practising through exercises; - listening to audio material; -conversation, monologue, role-playing game	

5. Analysing and creating a job or an internship offer. The comparison of adjectives and adverbs. **6. Creating a job-winning CV**. Expressing the past (l'imparfait, le passé composé). **7. Written and oral assessment.**		

Bibliography

1. Parizet, M.L., Grandet, E., Corsain, M., *Activités pour le Cadre Européen Commun de Référence –* Niveau a2, Ed. Clé International, 2005
2. Miquel, C., *Grammaire en dialogues – niveau intermédiaire*, Ed. Clé International, 2007 .
3. Barthes, M. Chavelon, B., *Je parle, je pratique le francais*, PUG, 2005

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The contents of the seminars familiarize students with various aspects of the job-application process (attending an interview, completing the documents necessary to find a job or a scholarship abroad).

10.Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course			
Applications	Completing the tasks of the written test, having a conversation or holding a monologue, seminar activity + homework	A written test Oral evaluation + seminar activity (active participation, homework completed)	Final test: 40 % Oral examination: 30%, Seminar activity 30%
10.4 Minimum standard of performance:			
M= FT +OE +SA Each component of the mark is granted if the tasks have been solved correctly in a proportion of min. 60%			

Date of filling in **:**	Teachers in charge	**Title, Name**	**Signature**
	Lectures		
	Seminars	Assoc. Prof. Dr. Cristiana Bulgaru	

Date of approval in the Department's Board	Head of Department Assoc. Prof. Dr. Ruxanda Literat
Date of approval in the IIRMP Faculty Council	Dean Prof. Dr. Eng. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics (in English Language)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	8.30

2. Data about the subject

2.1	Subject name			Modern Languages I German			
2.2	Subject area			Foreign Languages			
2.3	Course responsible/lecturer			N/A			
2.4	Teachers in charge of seminars			lect.dr. Mona Tripon, Tripon.Mona@lang.utcluj.ro			
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DC/DO

3. Estimated total time

3.1 Number of hours per week	1	3.2 of which, course: 0		3.3 seminars:	1
3.4 Total hours in the curriculum	50	3.5 of which, course: 0		3.6 seminars:	14
Individual study					hours
Manual, lecture material and notes, bibliography					10
Supplementary study in the library, online and in the field					12
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					12
Tutoring					2
Exams and tests					
Other activities					

3.7	Total hours of individual study	36
3.8	Total hours per semester	50
3.9	Number of credit points	2.0

4. Pre-requisites (whereappropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general German A1 CEFR

5. Requisites (whereappropriate)

5.1. for the course	N/A

5.2. for the seminars	According to university regulations, class attendance is compulsory Printed resources, laptop, printer, tablet, interactive whiteboard, Internet.

6. Specific competences

Professional competences	Acquisition of basic knowledge in the major fields of science and technology. Acquisition of linguistic and communication conventions used in technical German.
Cross competences	Identification of the role and of the responsibilities within a team, decision-making, development of critical thinking and of the students' ability to apply communication techniques in German language within a team.

7. Discipline objectives (as results from the *key competences gained*)

7.1 General objective	The students should develop skills to communicate effectively in a foreign language in professional contexts
7.2 Specific objective	Developing the ability to use oral and written German in professional contexts

8. Contents

8.1 Seminars (syllabus)	Teaching methods	Notes
1. Placement test and general introduction	Interactive exercices reflected in written/speaking exercises such as: conversation, debating, team work, problem-solving.	
2. Personal data. General revision; grammar exercises		
3. A student 's timetable. The daily schedule.		
4. The academic technical education. Fields of engineering.		
5. Job offers and internship in Germany		
6. The job interviev		
7. Final written/oral test		

Bibliography:

1. Maria Steinmetz Heiner Dintera, Deutsch für Ingenieure *Ein DaF-Lehrwerk für Studierende ingenieurwissenschaftlicher Fächer,* Springer Fachmedien Wiesbaden, 2014
2. Dengler, Rusch, Schmitz, Sieber, *Netzwerk, Deutsch als Fremdsprache, Kurs- und Arbeitsbuch,* Klett Langenscheidt, 2011, Berlin
3. Hans Földeak, *Sag's besser, Teil 1,* Hueber Verlag, 2011
4. Rusch, Schmitz, *Einfach Grammatik-Übungsgrammatik A1-bis B1,* Klett Langenscheidt, Berlin, 2007

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The improvement of the students' ability to communicate in German in professional/technical contexts is to ensure a successful adjustment to multicultural work environments.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course			
10.5 Seminar	Continuous assessment of language competences during the seminars; Completing the written/oral tasks from the final test.	Continuous assessment Final written test +Final oral test	Continuous assessment: 30% Speaking: 30% Final written test: 40%
10.6 Minimum standard of performance: completion of at least 50% of each component of assessment			

Date of completion:	**Instructors in charge**	**Rankname SURNAME**	**Signature**
	Lecture		
	Seminars	Lecturer Mona TRIPON, Ph.D.	

Date of approval in thedepartment

Head of department

Assoc. Prof. Ruxanda Literat, Ph. D.

Date of approval in the Faculty Council

Dean

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SYLLABUS

Semester I and II

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	Sem. I - 9.00 / Sem. II - 19:00

2. Data about the subject

2.1	Subject area			Physical Education and Sport			
2.2	Course responsible/lecturer			-			
2.3	Teachers in charge of seminars			Şef lucr.dr. Radu Sabău: Radu.Sabau@mdm.utcluj.ro			
2.4 Year of study	I	2.5 Semester	I	2.6 Assessment			DC/DI
2.7 Subject category	Formative Category						
	Optional						

3. Estimated total time

3.1 Number of hours per week	1/2	3.2 of which, course:		3.3 applications:	1/2
3.4 Total hours in the curriculum	25/50	3.5 of which, course:		3.6 applications:	14/28
Individual study					hours
Manual, lecture material and notes, bibliography					
Supplementary study in the library, online and in the field					
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					
Tutoring					
Exams and tests					
Other activities					6/12

3.7	Total hours of individual study	11/22
3.8	Total hours per semester	14/28
3.9	Number of credit points	1 / 2

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	physically fit, necessary skills, knowledge, skills and abilities gained in classes I-XII

5. Requirements (where appropriate)

5.1	For the course	-

5.2	For the applications	Muncii Blvd, no.103-105, Cluj-Napoca, Politehnica Swimming Complex Sports Hall, Muncii Blvd, no.103-105, Cluj-Napoca Outdoor and Fitness - Complex Polytechnic

6. Specific competences

Professional competences	- knowledge, skills and movement skills - means and methods for harmonious and balanced physical development - fair play in sport and social activity The capacity and the habit of practicing physical activities for formative, compensatory and recreational purposes: - formative, by maintaining health, harmonious physical development and body resistance, to combat sedentarism; - compensatory, to alleviate the stress created by professional obligations, to restore the body after physical or intellectual effort - Skills for gaining strength and physical strength Organizing and leading a team - the applicability in everyday life and in future professional practice of the knowledge, skills and abilities of body activities; - improving mental attributes: imagination, anticipation, referral, timely and efficient action, responsible independence, altruism.
Cross competences	**CT2 –** Identifying, describing and conducting processes in the projects management field, assuming different roles inside the team and clearly and concisely describing, verbally or in writing, in Romanian and in an international language, the own results from the activity field. Identify the objectives, the available resources, the conditions for their completion. Realization of projects under co-ordination, under conditions of deontological norms, as well as health and safety at work.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	- ensure the maintenance and improving of health by using exercise in combination with natural quenching factors (air, water, sun, etc.) in order to increase the physical and intellectual work potential and to form personality and character; - ensures normal and harmonious physical development; - ensures recreation, restoration, recovery of the body of students; - increases the body capacity for resistance to illness; - assures the acquisition of skills and skills of general and sport-specific movement; - ensures the development of psychomotor skills and moral and willing skills; - ensures the formation of the habit of exercise of physical exercises in leisure time.
7.2	Specific objectives	- extending the core of basic movements, application-utilitarian and elementary motor skills, and developing related motor skills

		- Independent practice of physical exercise, games and various sports - manifestation of team spirit and competition, depending on a system of accepted rules

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
Legend: a=basketball b=football c=swimming d=table tennis e=voleyball 1 - Information on the requirements of students. - Testing the level of physical ability of the students. - Accommodating of the students with physical effort. 2 a. Exercises, relays and accommodation games with the ball. b. The appropriation of the technical elements without the ball. c. Accommodation with water. d. Learning how to hold a table tennis racket. e. Fundamental positions, squatting and motion in the field, rotating. 3. a. Basic types of dribbling; rules violations: traveling. b. Learning how to kick the ball with top and side of the foot. c. Getting used with horizontal position in the water. d. Learning the fundamental position. e. Passing the ball overhead with two hands . 4. a. Stops. Pivoting skills. Shooting from standing and from dribbling. b. Learning how to kick the ball with ristul (interior, full, exterior). c. Learning how to breath in the water. d. Learning the specific movements. e. Get the ball thrown (service type). 5. a. Fundamental position. Basic moves or steps without the ball. b. Learning how to kick the ball with the knee and with the hell. c. Learning the floatation on the water. d. Learning the middle-game with the forehand. e. Learning the front service up (distance 4 – 5 m). 6. a. Crossover with and without the ball. b. Learning how to kick the ball with the head. c. Learning the slip in water. d. Simple means learning game with backhand. e. The game without the ball with the simulation of the skills	interactive	

learned. 7. a. Complex technical structures: dribbling, stop, pivot, pass. b. Learning processes driving the ball. c. Learning floatation and slipping on the back. d. Learning middle-game cut with forehand. e. Pick up service with two hands above the head. 8. a. Relationship 1x1. b. Learning the receiving of the ball (damping, relocation, counter-hit) c. Front crawl - learning the legs movement. d. Learning the middle-game cut with the backhand. e. Organization of 3 hits, top pickup. 9. a. Jump shot. b. Learning deceptive movements. c. Learning the legs movement in the same time with breath. d. Learning the middle-game from semi-flight with forehand. e. High lift for attack from zone 3 and 4. 10. a. Games by theme: improving the passing. b. Learning to put the ball back in play. c. Learning the arms movement. d. Learning the middle-game from semi-flight with backhand. e. e. Attack shot in the direction of attack using elk from zone 4. 11. a. Relationship 1x1(overcoming). b. Learning opponent ball dispossession. c. Coordinating the movement of arms and legs. d. Learning the serve with forehand. e. Game 6x6 with simplified rules. 12. a. Complex technical structures: catching, dribbling, stop. b. Learning goalkeepers technical procedures. c. Front crawl on 25-50 m distance. d. Learning the serve with backhand. 13. a. Dribbling with different processes: change of direction, pass. b. Learning free kicks practical maneuvers. c. Start learning and return on one side to front crawl. d. Learning the serve return. e. Lifting for attack from zone 2 and 3 (high, medium, forward). 14. a. Protecting the ball. b. Learning of demarcation, penetration and overcoming. c. Breaststroke - learning the movement of the legs. d. Learning how to return with forehand in line.		

e. Taking the ball from down with two hands.		
Improvement and maintenance of health, athletic ability and fitness		
Improving tehnical exercises learned before using tactic tasks		
Automatization of technical and tactics in game conditions (competition).		
Learning regulations of different sports, to be able to practice and organize leisure-time sport activity.		
Necessary skills to practice independent physical activity		
Improving the drills, combinations, schemes in different sport games		
Close the school situation by passing physical test		
Bibliography 1. Curs de Educaţie fizică – Litografiat UTC-N 2. Dezvoltare fizică generală pentru studenţi – UTC-N 3. Cultură fizică pentru tineret - UTPRES		
8.2. Applications/Seminars	Teaching methods	Notes
Bibliography		

9. **Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

The acquired skills will be required for employees who work in environments that require physical activity.

10. **Evaluation**

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	-	-	
10.5 Applications	Medical Exemptions: Minimum 5 attendance to support the essay	The theme for the essay is chosen from the exposed topics in the first month of the	100%

	(assessment). At least 5 attendance to support control samples	semester. Presentation of the essay. Initial testing at the beginning of the semester (applied sports route). Attendance at hours and sustaining of control samples. At the trial tracks progress on initial testing. Control samples: - Applied sports route -	100%
	Online – Microsoft Teams Platform	In case of online teaching activity: Essay with two topics on the Microsoft Teams platform	100%
10.6 Minimum standard of performance			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	-	
	Teachers in charge of application	Şef lucr.dr. Radu Sabău	

Date of approval in the department ……..	Head of department Prof.dr.ing.
__________________________	
Date of approval in the faculty ……………	Dean Prof.dr.ing.
__________________________	

Syllabus

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Facultatea de Inginerie Industriala, Robotica si Managementul Productiei
1.3 Departament	Mathematics
1.4 Field of study	Industrial Engineering
1.5 Cycle of study	Bachelor of Engineering
1.6 Program of study/Qualification	Manufacturing Engineering / Engineer (TCM)
1.7 Form of education	IF-Full time attendance
1.8 Codul disciplinei	10

2. Data about the subject

2.1 Subject name	***Special Mathematics***					
2.2 Course responsible/lecturer	Lect. univ. dr. Alina Ramona Baias– baias.alina@math.utcluj.ro					
2.3 Teachers in charge of applications	Lect. univ. dr. Alina Ramona Baias– baias.alina@math.utcluj.ro					
2.4 Year of study	I	2.5 Semester	2	2.6 Assessment *(E/C/V)*		E
2.7 Type of subject	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*					DF
	DI – compulsory, DO – elective, Dfac – optional					DI

3. Estimated total time

3.1 Number of hours per week	3	of which:	Course	2	Seminar	1	Laboratory	-	Project	-
3.2 Number of hours per semester	42	of which:	course	14	Seminar	7	Laboratory	-	Project	

3.3 Individual study	
(a) Manual, lecture material and notes, bibliography	14
(b) Supplementary study in the library, online and in the field	15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	
(e) Exams and tests	4
(f) Other activities:	

3.4 Total hours of individual study (sum of (3.3(a)…3.3(f)))	47
3.5 Total hours per semester (3.2+3.4)	75
3.6 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1 Curriculum	
4.2 Competence	

5. Requirements (where appropriate)

5.1. For the course	
5.2. For the applications	

6. Specific competences

6.1 Professional competences	**C1.1.** Identifying the concepts, principles, basic theorems and mathematical methods, physics, chemistry, technical drawing, computer programming. **C1.2**. Using basic knowledge in the fundamental disciplines for theoretical explanation and interpretation of results, theorems, phenomena or specific processes of industrial engineering. **C1.3.** Applying the theorems, principles and basic methods of fundamental disciplines, for basic engineering calculations in design and operation of technical systems specific to industrial engineering, under qualified assistance

	C1.4. Appropriate use of standard assessment criteria and methods of fundamental disciplines for identification, modelling, analysis and qualitative and quantitative assessment of characteristics of the phenomena and parameters as well as the processing and interpretation of the results from specific industrial engineering processes. **C1.5.** Developing of specific industrial engineering projects and models based on identification, selection and use of principles, optimal methods and acknowledged solutions from the fundamental disciplines.	
6.2 Cross competences	**CT1.** Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. **CT3.** Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication..	

7. Course objectives

7.1 General objective	to obtain skills and use the basic results of differential geometry and differential equations to illustrate their applications in other disciplines	
7.2 Specific objectives	After the course the students will be abel to : - recognise the different types of curves and surfaces - recognise the different types of tangency (lines and planes), normals - calculate the lenght of arcs and the angle of arbritrary surfaces - to recognise the different types of differential equations and to find their solutions - to present the basic results of differential geometry to illustrate their applications in other disciplines	

8. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
1. Differential equations -the basic notions. The Cauchy's problem	2		
2. Integration of differential equations with separable variables; homogenous equation;	2		
3. Exact differential equations. Equations with integrating factor.	2		
4. First order linear differential equations and applications	2		
5. The Bernoulli and Ricatti differential equations	2		
6. Implicite first order differential equations-the Clairot and Lagrange equations	2		
7. Higher order differential equations which admit a reduction of order.	2		
8. N order differential equations	2		
9. The homogenous n-th order linear differential equations with constant coefficients	2		
10. The solution of nonhomogenous n-th order linear differential equations with constant coefficients	2		
11. The Euler's differential equation	2		
12. Some notions about systems of differential equations	2		
13. Symmetric systems	2		
14. First order partial differential equations	2		
Bibliography 1. D. Marian, L. Blaga, Differential Equations. Theory and Problems, Ed. Mediamira, 2014.			

2. Blaga Lucia, Lupşa Liana, Algebra, Analytic Geometry, Differential Geometry. Problems, Ed.MEGA, Cluj-Napoca, 2009

8.2 Applications (seminar/laboratory/project)	No.hours	Teaching methods	Notes
1. Differential properties of the plane curves			
2. Differential properties of curves in space			
3. Differential properties of the surfaces			
4. Differential equations-integration of different types of first-order differential equations			
5. Integration of first-order linear equations and equations which can be reduced to linear differential equations			
6. The homogenous differential equation of n-th order with constant coefficients			
7. Nonhomogeneous differential equations of n-th order with constant coefficients, Euler's equation.			
Bibliography 1. D. Marian, L. Blaga, Differential Equations. Theory and Problems, Ed. Mediamira, 2014. 2. Blaga Lucia, Lupşa Liana, Algebra, Analytic Geometry, Differential Geometry. Problems, Ed.MEGA, Cluj-Napoca, 2009			

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	-The ability to answer to theoretical questions and solve problems.	Written exam	80%
Seminar	-The ability to do the parallelism between the theory and formulae in order to solve problems in connection to theory - the ability to do a geometric interpretation of the solutions of a problem from differential geometry or differential equations	Solve different types of problems for each topic covered (as homework)	20%
Laboratory			
Project			
Minimum standard of performance: The final credit can be received only if each of the mark's components is fulfilled: Grade 5 (five)			

Date of filling in:		Title Firstname NAME	Signature
	Course	Lect. univ. dr. Alina Ramona Baias	
	Aplications	Lect. univ. dr. Alina Ramona Baias	

Date of approval by the Department Board of Mathematics ___________	Head of Departament Mathematics Prof.dr. Dorian POPA
Date of approval by the Faculty of Machine Building _______________________	Dean Prof.dr.ing. Nicolae Balc

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics, in English
1.7	Form of education	Full time
1.8	Subject code	11

2. Data about the subject

2.1	Subject name			Mechanics I	
2.2	Subject area			Fundamental of Robotics	
2.3	Course responsible/lecturer			Prof. dr. ing. Calin Vaida, Calin.Vaida@mep.utcluj.ro	
2.4	Teachers in charge of seminars			Conf. dr. ing. Adina Crisan, Adina.Crisan@mep.utcluj.ro	
2.5 Year of study	1	2.6 Semester	2	2.7 Assessment	E
2.8 Subject category		Formative category			DD
		Optionality			DI

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	2	3.3 Seminar	1	3.3 Laborator	-	3.3 Proiect	-
3.4 Total hours in the curriculum	42	of which	3.5 Course	28	3.6 Seminar	14	3.6 Laborator	-	3.6 Proiect	-

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	10
(b) Supplementary study in the library, online and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	7
(d) Tutoring	4
(e) Exams and tests	2
(f) Other activities	0

3.8 Total hours of individual study (sum (3.7(a)...3.7(f)))	33
3.9 Total hours per semester (3.4+3.8)	75
3.10 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basic mathematics, physics, and computer programming
4.2	Competence	Basic understanding of physics phenomena, numeric algorithms

5. Requirements (where appropriate)

5.1	For the course (lecture)	Lecture room, blackboard (interactive, multimedia board), projector, access to the virtual campus of TUCN, access to MATLAB
5.2	For the applications Seminary	Access to lecture room, blackboard (interactive, multimedia board), projector, access to the virtual campus of TUCN

6. Specific competences

Professional competences	On the completion of the course, the students should be capable to: ➢ Define the fundamental principles, theorems, and the main mechanical methods (for statics and kinematics) ➢ To apply theorems, principles and mechanics associated methods for solving specific problems ➢ To determine and interpret the static equilibrium conditions for solid bodies and mechanical body systems ➢ To calculate the mass geometry parameters for single and multi-body systems ➢ To understand the notions, phenomena, principles, and theorems specific to the static and kinematic of mechanical systems ➢ To utilize optimum methods and theorems to solve specific problems of Mechanics ➢ To determine the motion equations of material points and rigid bodies, as well as the velocity and acceleration distribution ➢ To apply fundamental general technical and specific knowledge to solve technical problems specific to the field of Mechatronics and Robotics ➢ To understand the basic principles for the geometric, kinematic and dynamic modelling of robotic structures
Cross competences	➢ The use and application of Mechanics specific data to explain and interpret theoretical results, theorems, phenomena and processes specific to the field of Mechatronics and Robotics ➢ The efficient use of information resources and communication solutions along with assisted professional techniques (Specific software applications – MATLAB, databases, on-line lectures, etc.) both in English and in Romanian ➢ The basic values and professional ethics of engineers and the responsible use of resources to achieve professional/technical tasks/assignments ➢ Complex tasks management starting with the proper identification of the main objectives, the activities roadmap, milestones, deliverables

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Basic understanding of phenomena, learning the basic principles and the general theorems that govern the equilibrium and motion of mechanical systems
7.2	Specific objectives	➢ To learn specific notions concerning: resultant of systems of forces, mass geometry, equilibrium of mechanical systems, material point and rigid body kinematics ➢ To understand the phenomena, principles and theorems specific to the statics and kinematics of mechanical systems

		➢ To evaluate the parameters that characterize the motion of a mechanical system ➢ To evaluate the parameters that characterize the motion of a mechanical system ➢ To define the parametric equations for motion, the distribution of velocities and accelerations for a rigid body ➢ To analyse and interpret the experimental data regarding mechanical systems ➢ To use computer software to analyse data regarding mechanical system.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Definitions and simplifying hypotheses. Fundamental notions and principles in mechanics	2	Interactive Blackboard lecture: theory, examples, and applications Practical presentations and demonstrations using multimedia tools, including MATLAB based examples Usage of the portfolio of digital solutions provided by the TUCN virtual campus	
2. The resultant of a generalised system of forces. Resultant torsor (wrench). Properties. Central Axis.	2		
3. Mass geometry	2		
4. Material point statics	2		
5. Rigid body statics	2		
6. Statics of a rigid body with different constraints/ joints without friction	2		
7. Statics of a rigid body with different constraints/ joints with friction	2		
8. Equilibrium of structures	2		
9. Material point kinematics. Displacement (Trajectory), velocity and acceleration of a material point	2		
10. Rigid body kinematics. General notions and elements	2		
11. Rigid body kinematics. Particular/specific motions: translation, rotation around a fixed axis, helicoidal	2		
12. Rigid body kinematics. Plan-parallel motion	2		
13. Rigid body kinematics. Spherical motion	2		
14. Statics and kinematics technical applications. Overview of the lecture	2		

Bibliography/References

1. Itul, T.-P., Haiduc, N., **Mecanica**, Editura UTPRESS, Cluj-Napoca, 2012.
2. Negrean, I., Schonstein, C., s.a., **Mechanics — Theory and Applications**, Editura UT Press, 2015, ISBN 978-606-737-061-4.
3. Sorin Vlase, **Mecanică – Statica**, Ed. Infomarket, 2008
4. Sorin Vlase, **Mecanică – Cinematica**, Ed. Infomarket, 2008
5. John Taylor, **Classical Mechanics**, ISBN 1 -89 1 389-22- X, 2005, University Science Books
6. R.C. Hibbeler, **Engineering Mechanics. Statics**. 13th Ed. Prentice Hall, 2012

7. E.W. Nelson, Charles Best, W.G. McLean, **Theory and Problems of Engineering Mechanics. Statics and Dynamics**. 5th Edition, McGraw-Hill, 1997 8. Bijan Bagchi, **Advanced Classical Mechanics**, CRC Press, Taylor & Francis, 2016 9. Ferdinand Beer et al. **Vector mechanics for engineers. Statics and dynamics**, 9th Ed. McGraw-Hill Higher Education, 2009 **Additional Books for an enriched documentation on Mechanics (outside the lecture syllabus)** Emilio Paz, Marco Ceccarelli, Javier Otero, Jose Sanz, **A Brief Illustrated History of Machines and Mechanisms**, Springer, 2010 Laurence Horwitz, **Relativistic Quantum Mechanics**, Fundamental Theories of Physics 180, Springer, 2015 Giampiero Esposito, et al. **FROM CLASSICAL TO QUANTUM MECHANICS An Introduction to the Formalism, Foundations and Applications**, Cambridge University Press, 2004 Goldstein, Safko & Poole, **Classical Mechanics** 3rd Edition, Pearson, 2001 Kai Lam, **FUNDAMENTAL PRINCIPLES OF CLASSICAL MECHANICS, A Geometrical Perspective**, World Scientific Publishing Co, 2014 John Uicker, et al. **Theory of Machines and Mechanisms**, 3rd Ed., Oxford University Press, 2003

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Introduction to vectorial and matrix calculus	2	Solving applications/ problems with the students. Discussions, case studies, examples, homework Usage of the portfolio of digital solutions provided by the TUCN virtual campus	
Resultant of systems of forces	2		
Mass geometry	2		
Material point and rigid body statics	2		
Equilibrium of structures	2		
Material point kinematics	2		
Rigid body kinematics	2		

Bibliography/References 1. Itul, T.-P., Haiduc, N., **Mecanica**, Editura UTPRESS, Cluj-Napoca, 2012. 2. Negrean, I., Schonstein, C., s.a., **Mechanics — Theory and Applications**, Editura UT Press, 2015, ISBN 978-606-737-061-4. 3. Sorin Vlase, **Mecanică – Statica**, Ed. Infomarket, 2008 4. Sorin Vlase, **Mecanică – Cinematica**, Ed. Infomarket, 2008 5. John Taylor, **Classical Mechanics**, ISBN 1 -89 1 389-22- X, 2005, University Science Books 6. R.C. Hibbeler, **Engineering Mechanics. Statics**. 13th Ed. Prentice Hall, 2012 7. E.W. Nelson, Charles Best, W.G. McLean, **Theory and Problems of Engineering Mechanics. Statics and Dynamics**. 5th Edition, McGraw-Hill, 1997 8. Bijan Bagchi, **Advanced Classical Mechanics**, CRC Press, Taylor & Francis, 2016 9. Ferdinand Beer et al. **Vector mechanics for engineers. Statics and dynamics**, 9th Ed. McGraw-Hill Higher Education, 2009

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Several discussions and professional meetings will be organized at faculty level with representatives of the major companies in the area. A continuous dynamic interaction with the students and graduates to understand their needs, expectations, challenges and usefulness of the lecture. An active collaboration with the Robotics line of study representatives to dynamically define the needs of the student, the academic and professional community to continuously improve the syllabus.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Ability to solve a set of theoretical and/or practical applications	Written exam consisting in a set of theoretical and/or practical applications.	80%
10.5 Seminars /Laboratory/Project	Successful completion of a set of applications as homework (individual study)	Graded with a mark from 1 to 10 based on completion, correctness, and deadlines	20%
10.6 Minimum standard of performance			
The final grade is calculated as: N = 0.8*C+0.2*S Minimum standard of performance in terms of grading: N≥5, C≥5, S≥5			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Prof. dr. ing. Calin VAIDA	
	Teacher in charge of seminary	Conf. dr. ing. Adina CRISAN	

Date of approval in the department IPR ________________________	Head of department Prof.dr.ing. Calin NEAMTU
Date of approval in the faculty IIRMP ________________________	Dean Prof.dr.ing. Corina BIRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrotechnics and Measurements
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	12.00

2. Data about the subject

2.1	Subject name	Electrotechnics					
2.2	Subject area	Electrical Engineering					
2.3	Course responsible/lecturer	Sl.dr.ing. Mihai BILICI					
2.4	Teachers in charge of seminars	Sl.dr.ing. Mihai BILICI					
2.5 Year of study	I	2.6 Semester	II	2.7 Assessment	E	2.8 Subject category	DI
2.7 Subject category	Formative category						
	Optionality						

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	56	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	24
(b) Supplementary study in the library, online and in the field	3
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	6
(e) Exams and tests	3
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	50
3.9 Total hours per semester (3.4+3.8)	106
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Physics and mathematics courses for engineers
4.2	Competence	Basic knowledge in physics (laws of electromagnetism) and mathematics (vectors and complex numbers)

5. Requirements (where appropriate)

5.1	For the course	Blackboard and multimedia system
5.2	For the applications	Equipment for Electrotechnics and Electrical drives laboratory

6. Specific competences

Professional competences	Describing the theory of basic phenomena in electromagnetism (electromagnetic induction, forces in electric and magnetic field) Analysis of DC electric circuits, single-phase and three-phase AC circuits. Proper use of electrical materials (conductor, semiconductor, dielectric, ferromagnetic). Using basic knowledge in electrical diagrams in order to construct and repair an electrical circuit. Using basic knowledge in construction, operation and safe use of electric equipment. Proper use of DC and AC electric motors. Construction, operation principles, characteristics.
Cross competences	Identification of the objectives to be carried out and the available resources, of the conditions of completion, the work stages, identification of the risks CT2. Identification of the roles and responsibilities in a multidisciplinary team, the application of relationship techniques and efficient work in the team Efficient use of information sources, communication resources and training assisted (Internet portals, software applications, databases, on-line courses, etc.) both in the English and in Romanian language

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	To acquire basic knowledge in the field of electrical engineering
7.2	Specific objectives	To understand basic phenomena in electromagnetism and the main applications. To be able to analyze a DC electric circuit, a single-phase and a three-phase AC circuit To understand an electric diagram, to be able to construct and to repair a simple electric circuit To be able to use DC and AC electric motors for variable speed electric drives.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Electric field, electric charge. Voltage, potential difference.	Oral presentation notes on blackboard and multimedia presentation	Students are encouraged to put questions
2.	Applications of the electric fields.		
3.	Electric conduction law. DC electric circuits. Kirchhoff's laws.		
4.	Magnetic field. Forces in magnetic field. Applications.		
5.	Electromagnetic induction law. Applications. Magnetic flux law. Inductivity of an electric circuit		
6.	Ferromagnetic materials, characteristics. Losses in ferromagnetic materials.		
7.	Single-phase AC circuits. Sinusoidal quantities, complex representation.		
8.	Electric impedance, reactance, complex impedance. Active, and reactive power. Power factor.		
9.	Three phase systems. Y and Δ connexions.		
10.	DC motor. Construction, operation principles, characteristics. Applications.		
11.	DC motor: starting, speed control and breaking. Applications.		

12.	Three phase AC motor. Construction, operation principles, characteristics. Applications.		
13.	Three phase AC motor: starting, speed control and breaking. Applications. PM synchronous motors.		
14.	Stepper motor: construction, operation principles, characteristics, control.		

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[1] Roman MORAR, Alexandru IUGA, Eugeniu MAN, Vasile NEAMŢU şi Lucian DĂSCĂLESCU. *Electrotechnics and Electrical Machines. Electromagnetism, electric circuits, Measurements.* Cluj-N., Institutul Politehnic, 1991.(in Romanian)

[2] Roman MORAR, Eugeniu MAN, Vasile NEAMŢU, Lucian DĂSCĂLESCU şi Alexandru IUGA. *Electrotechnics and Electrical Machines. Applications.* Cluj-Napoca, Institutul Politehnic, 1987.(in Romanian)

[3] Adrian SAMUILĂ. *Variable speed electric drives.* Cluj-N., Ed. MEDIAMIRA, 1998.(in Romanian)

[4]. Theodor WILDI. *Electrical Machines, Drives, and Power Systems.* New Jersey, Prentice Hall, 1991.

[5] http://ocw.mit.edu/courses/physics/8-02-electricity-and-magnetism-spring-2002/lecture-notes/

8.2. Applications/Seminars		Teaching methods	Notes
1.	Work safety rules in electrical equipment. Electrical symbols. Electric diagrams	Industrial apparatus are used by the students to realize small electric circuits for electric motor drives.	
2.	Start/Stop of a three phase asynchronous motor. (Application 2.1 [1]).		
3.	Start/Stop of a reversible three phase asynchronous motor (Application 2.5 [1]).		
4.	Y-Δ starting of the three phase asynchronous motor. (Application 2.7 [1]).		
5.	Three phase power system. (Application 3.1 [1]).		
6.	Dynamic breaking of the asynchronous motor. (4.1 [1]).		
7.	Assessment of practical skills & knowledge.		

Bibliography

[1] Roman MORAR, Gheorghe Mindru, Alexandru IUGA, *Electrotechnics and Electrical Machines. Applications*. I.P. Cluj, 1978(in Romanian)

[2] R. Morar, L. Dascalescu, A. Iuga, V. Neamtu, E.Man. *Electrotechnics and Electrical Machines*. Measurements, Electric drives. Applications. Cluj-Napoca Polytechnic Institute, 1985.(in Romanian)

[3] Alexandru IUGA, Roman MORAR, Lucian DĂSCĂLESCU. Principle of Electric diagrams. Cluj-Napoca, Polytechnic Institute, 1987.(in Romanian)

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Professional community, professional associations and employers in EU require engineers having thorough technical knowledge in the field of electrical engineering, able to design, construct and use complex and high level of automation equipment.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade

Course	The ability to answer to theoretical questions and to solve practical problems	Written test without documents for theory (T) and with documents for applications (A)	T + A = 50%
Applications	The ability to use electric diagrams	Written test (L)	L = 50%
10.4 Minimum standard of performance			
The final credit can be received only if each of the components is fulfilled: T > 5/10, A > 5/10, L > 5/10.			

Date of filling in

Lecturer
Sl.dr.ing. Mihai BILICI

Teachers in charge of seminars
Sl.dr.ing. Mihai BILICI

Date of approval in the department

Head of department
Prof. Calin MUNTEANU

Date of filling in:		Title Surname Name	Signature
	Lecturer	Sl.dr.ing. Mihai BILICI	
	Teachers in charge of application		

Date of approval in the department ……..

____

Head of department
Prof.dr.ing. Prof. Calin MUNTEANU

Date of approval in the faculty …………..

____

Dean
Prof.dr.ing. Andrei CZIKER

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Mechanical Systems Engineering
1.4	Field of study	Robotics and Mechatronics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/Engineer
1.7	Form of education	Full time
1.8	Subject code	13.00

2. Data about the subject

2.1	Subject name			Computer Programming and Programming Languages 1			
2.2	Subject area			Computer Programming (DAP, DCA)			
2.3	Course responsible/lecturer			Prof. dr. ing. ANTAL Tiberiu Alexandru – antaljr@bavaria.utcluj.ro			
2.4	Teachers in charge of seminars			Prof. dr. ing. ANTAL Tiberiu Alexandru			
2.5 Year of study	1	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DF/DI

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	30
Supplementary study in the library, online and in the field	20
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	4
Tutoring	0
Exams and tests	6
Other activities	

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Attendance at the laboratory is mandatory.

6. **Specific competences**

Professional competences	After completing the discipline students will be able to: • identify the type of Java application and the conditions under which it can be run; • use JDeveloper to create and test a Java application • program in Java: - structured and object-oriented; - scientific applications that have graphical interfaces; - applications that implement abstract concepts and programming interfaces;
Cross competences	Applying the values and ethics of the engineering profession and responsible execution of complex professional tasks in conditions of professional autonomy and independence. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-evaluation in decision making. Planning your own work priorities, drawing up your own action plan.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Development of human-machine computing and communication applications, implementation of object-oriented applications.
7.2	Specific objectives	1. Planning and designing program applications in object-oriented programming languages for the realization of communication applications; knowledge of object programming environments, concepts, instructions, file operation, creation of graphical interfaces; understanding and using the concepts, paradigms and models of artificial vision applied in robotics, selection and use of artificial vision systems in robotics. 2. Integrated application of advanced software environments for the development of intelligent human-robot interfaces, including interfaces based on artificial vision 3. Critical, quantitative and qualitative evaluation based on methods of analysis, planning and selection of solutions for intelligent interfacing of operators with robots or robots with the working environment 4. Elaboration of professional and / or research projects for the realization of human-robot, robot-robot, robot-work environment communication interfaces

8. **Contents**

8.1. Lecture (syllabus)	Teaching methods	Notes
1. Java History. Benefits. Running Java and JVM applications. JDK, Java packages and packages. Basic concepts. Convention. Compilation and running.	Use of TIC/blended learning resources, discussions, Internet.	Video projector, board and/or online meetings on MS Teams (Zoom)
2. Primitive and structured data types. Basic concepts of object-oriented programming.		
3. Input/output. Arrays and Strings.		

4. Operators and operands. Priority.		
5. Program flow. Types of statements. Sequence and decision.		
6. Cycling and jumping out of cycles.		
7. Classes and objects: declaration, creation, encapsulation.		
8. Methods. Constructors.		
9. Overload. this. Inheritance. Super. Hierarchies.		
10. Polymorphism.		
11. Exceptions.		
12 2D graphics.		
13. Elements of graphical interfaces: Swing (controls and events).		
14. Abstract classes and interfaces.		

Bibliography

1. Ştefan Tanasă, Cristian Olaru, Ştefan Andrei, Java de la 0 la expert, Polirom, 2003, ISBN: 973-681-201-4.
2. Peter Norton, William Stanek, Ghid de programare în Java, Teora, 1997, ISBN: 973-601-719-2.
3. Herber Schild, Java 2 - The Complete Reference, Fourth Edition, Osborne, 2001, ISBN: 0-07-213084-9.
4. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-7.
5. Knuth, D.E. - Arta programării calculatoarelor. Volumul I – Algoritmi fundamentali, Ed. Teora, 2000
6. Knuth, D.E. – Arta programării calculatoarelor. Volumul II – Algoritmi seminumerici, Ed. Teora, 2000.
7. Knuth, D.E. – Arta programării calculatoarelor. Volumul III – Sortare şi căutare, Ed. Teora, 2002.
8. http://www.detect.utcluj.ro/~antaljr/downloads.html
9. http://193.226.7.179/~antaljr/

8.2. Applications/Seminars	Teaching methods	Notes
1. Presentation of the JDeveloper environment. The steps of creating an application.	Use of TIC/blended learning resources, discussions, Internet.	Video projector, board and/or online meetings on Skype (or MS Teams)
2. Entering and displaying data in text and graphics mode. String type. Conversions from String to Integer and Double. Creating swing applications from the JDeveloper environment		
3. Applications with operators of: assignment, arithmetic, bitwise, relational and boolean. Promotion and type forcing for arithmetic operators.		
4. Applications with if,?:, And switch. Specific errors.		
5. Applications with while, do, for, break and continue. Specific errors.		
6. Applications with class, new, public, private, protected.		
7. Applications with arrays and strings.		
8. Creating constructors and methods.		
9. Applying inheritance. Hierarchies of objects.		
10. Use of polymorphism in numerical calculation.		
11. Use of exceptions in numerical calculation.		
12. JPanel, Layout, TextBox, CommandButton, Events.		
13. The graph of a function with the solutions of an equation.		
14. Abstract methods and exceptions in numerical calculation.		

Bibliography

1. Herber Schild, Java 2 - The Complete Reference, Fourth Edition, Osborne, 2001, ISBN: 0-07-213084-9.
2. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-7.
3. Leon Livovschi, Horia Georgescu, Sinteza şi analiza algoritmilor,Ed ştiinţifică şi enciclopedică, 1986
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5. Knuth, D.E. - Arta programării calculatoarelor. Volumul I – Algoritmi fundamentali, Ed. Teora, 2000
6. 4. Knuth, D.E. – Arta programării calculatoarelor. Volumul II – Algoritmi seminumerici, Ed. Teora, 2000.
7. Knuth, D.E. – Arta programării calculatoarelor. Volumul III – Sortare şi căutare, Ed. Teora, 2002.
8. http://www.detect.utcluj.ro/~antaljr/downloads.html
9. http://193.226.7.179/~antaljr/

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Students can choose to apply their knowledge acquired in industry, research or to expand, through master's school and the skills acquired in undergraduate studies.
Regardless of their option, the acquired competencies will be necessary in case they will carry out their activity within the specialized companies on a certain field (robots, economics, machine building) or within the software companies oriented on the engineering programming field.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Verification of knowledge by solving problems presented in the course.	Written test - evaluation time 2 hours	60%
10.5 Applications	Development of applications in a required time.	Practical test - duration 2 hours	40%
10.6 Minimum standard of performance			
Grade >= 5 at exam and grade >= 5 at laboratory test.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof.dr.ing. ANTAL Tiberiu Alexandru	
	Teachers in charge of application	Prof.dr.ing. ANTAL Tiberiu Alexandru	
		Asist.dr.ing. Iuliana MOHOLEA	

Date of approval in the department	Head of department Prof.dr.ing. ANTAL Tiberiu Alexandru.
Date of approval in the faculty …………..	Dean Prof.dr.ing. Corina BIRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Automotive, Mechanics and Mechatronics
1.3	Department	Automotive and Transportation
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics (in English)/engineer
1.7	Form of education	Full time
1.8	Subject code	14.00

2. Data about the subject

2.1	Subject name			Technical Drawing and infographics			
2.2	Subject area			Technical Drawing and infographics			
2.2	Course responsible/lecturer			Conf.dr.ing. Andrei KIRALY			
2.3	Teachers in charge of seminars			Conf.dr.ing. Andrei KIRALY, S.l, dr.ing.Prodan Calin			
2.4 Year of study	1	2.5 Semester	2	2.6 Assessment	Colloquium		
2.7 Subject category	Formative category					DF	
	Optionality					DI	

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laborator	2	3.3 Proiect	-
3.4 Total hours in the curriculum	75	of which	3.5 Course	28	3.6 Seminar		3.6 Laborator	28	3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	6
(b) Supplementary study in the library, online and in the field	5
0(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	2
(d) Tutoring	4
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	19
3.9 Total hours per semester (3.4+3.8)	75
3.10 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	High school
4.2	Competence	3D Spatial view

5. Requirements (where appropriate)

5.1	For the course	Drawing tools, A3 Sheets
5.2	For the applications seminarului / laboratorului / proiectului	Drawing tools, A3 Sheets

6. Specific competences

Professional competences	- Identifying the concepts, basic principles of technical drawing. - Use of rendering techniques to enhance the representation of objects and environments. - apply appropriate conventions and standards in producing and interpreting drawings. - adopt a planned and ordered approach to drawing. - use sketches to assist in problem solving and in the visualization of spatial relationships to interpret graphical information. - evaluate the design of objects, visual messages, and environments. - Use of drawings in the process of design. Interrelate Technical Drawing with other aspects of the curriculum. - work cooperatively with others. - Elaboration of professional technical drawings
Cross compete	- The student will be able to use the tools, equipment, and supplies necessary to produce mechanical drawings. - The student will be able to understand and interpret mechanical drawings. - The student will be able to produce, to a minimum established standard, mechanical drawings.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	The students will be able to use the tools, equipment, and supplies necessary to produce mechanical drawings.
7.2	Specific objectives	The students will be able to understand and interpret mechanical drawings.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
The representation of joints. Removable joints (threaded joints, keys and joints, splined joints)	2	Exposure by computer and PowerPoint. Live or across the MS Teams application	
Permanent joints (riveted joints, welded joints)	2		
The ensemble. Rules in the representation and dimensioning of the ensembles. Position lines. Parts list. Machine design of the detail from an assembly.	2		
General information's about dimensional and geometrical precision. Tolerancing. Surface texture. Notation of dimensional and geometrical tolerances. Parameters of surface texture. AutoCAD - Interface	2		
The representation and the dimensioning of shafts, tooth wheels and gears using AutoCAD. Basic commands	2		
The representation of bearings. Sealing sleeves. Coupling using AutoCAD – Drawing Commands	2		
AutoCAD - Assembly Drawing	2		
Assembly Drawing Cont. using AutoCAD	2		
Cont. Rules of representation of views and sections. Hatching using AutoCAD - Editing Commands	2		
Dimensioning. Putting dimensions on drawings using AutoCAD	2		
Thread representation, representation of threaded parts using AutoCAD	2		

Representation and quotation of parts with flanges using AutoCAD	2		
Parts with flanges representation using AutoCAD	2		
Shafts - Representation, Dimensioning using AutoCAD	2		

Bibliography

1. ***, - http://www.desen.utcluj.ro
2. Morling K., Geometric and Engineering Drawing, Routlege, 2012
3. Kiraly A., - Grafica pe Calculator, UTPRES Cluj-Napoca, 2003, ISBN 973-35153-0-0.
4. Kiraly A., - Grafica inginereasca, Editura UTPRES, Cluj-Napoca, 2003, ISBN 973-8396-72-3.
5. Kiraly A.,Bălcău, M. SolidWorks –Îndrumător de lucrări Cluj-Napoca ISBN 973-3526-72-1
6. Rhodes, R.S., Cook. L.B., Basic engineering Drawing, Pitmanpublishing Limited, London, 1978
7. Pickup, F., Parker, M.A., Engineering Drawing 1 and 2 with worked examples, Hutchinson Ltd, London 1992

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Threaded assemblies (screws and bolts) + working shop drawings of the parts			
Riveted assemblies + working shop drawings of the parts		Practical applications solved manually using drawing tools And Computer software AutoCAD	
Key assemblies (3 types+ shop drawings of parts)			
Welded assemblies (detailed and simplified representation of a welded assembly			
LC 1 – Welded, with keys and threaded assemblies			
AutoCAD - Representation and dimensioning of shafts Geometric and dimensional tolerances inscription			
AutoCAD - Representation of gears and geared transmissions, Inscription of roughness and tolerances on the workshop drawings			
AutoCAD - Assembly drawing – Parts sketches			
AutoCAD -			
AutoCAD - Assembly drawing – Assembly drawing - sketch			
AutoCAD - Assembly drawing – Assembly drawing, positioning, Bill of materials, dimensioning tolerances			
AutoCAD - Part extraction drawing			
LC 2 – AutoCAD - Assembly drawing			
Files handling Final grades.			

Bibliography

1. ***, - http://www.desen.utcluj.ro
2. Morling K., Geometric and Engineering Drawing, Routlege, 2012
3. Kiraly A., - Grafica pe Calculator, UTPRES Cluj-Napoca, 2003, ISBN 973-35153-0-0.
4. Kiraly A., - Grafica inginereasca, Editura UTPRES, Cluj-Napoca, 2003, ISBN 973-8396-72-3.
5. Kiraly A., Bălcău, M. SolidWorks – Îndrumător de lucrări Cluj-Napoca ISBN 973-3526-72-1
6. Rhodes, R.S., Cook. L.B., Basic engineering Drawing, Pitman publishing Limited, London, 1978
7. Pickup, F., Parker, M.A., Engineering Drawing 1 and 2 with worked examples, Hutchinson Ltd, London 1992

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Technical Drawing is one course of study within the area of Industrial education. Industrial education aims to develop the individual through the provision of experiences directly related to society. It promotes an understanding of various aspects of industry, technology and the broader environment, while developing in student's specific manipulative and cognitive skills.

Technical Drawing seeks to encourage a sense of purpose, enjoyment and personal satisfaction and aims to provide information and experience.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	There is no lecture assessment		
10.5 Seminars /Laboratory/Project	When determining a grade at the end of each semester and the final grade for the completion of the course of study, the teacher will collect a portfolio of accumulated student work that should be reviewed and factored into the final grade.	The grade for the midterm exam(M) The grade for the final exam (F) The grade for the portfolio (P)	M - 33% F - 34% P - 33%
10.6 Minimum standard of performance			
The grade for the midterm exam (M), the final exam (F) and the portfolio (P) should be at least 5, each.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Assoc prof. PhD. eng. Andrei KIRALY	
	Teachers in charge of application	Assoc prof. PhD. eng. Andrei KIRALY	
		as. PhD. eng. Calin Prodan,	

Date of approval in the department .... ________________________	Head of department Prof.dr.ing.
Date of approval in the faculty .... ________________________	Dean Prof.dr.ing.

SYLLABUS

1. **Data about the program of study**

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Fabrication Engineering
1.4	Field of study	Engineering and Management
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/engineer
1.7	Form of education	Full time
1.8	Subject code	15.00

2. **Data about the subject**

2.1	Subject name	Materials Science and Engineering II				
2.2	Course responsible/lecturer	Associate professor Bogdan Viorel Neamtu, Bogdan.Neamtu@stm.utcluj.ro				
2.3	Teachers in charge of seminars	Associate professor Bogdan Viorel Neamtu, Bogdan.Neamtu@stm.utcluj.ro				
2.4 Year of study	1	2.5 Semester	2	2.6 Assessment		E
2.7 Subject category	Formative category					DD
	Optionality					DI

3. **Estimated total time**

3.1 Number of hours per week	2	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laboratory	1	3.3 Project	0
3.4 Total hours in the curriculum	28	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laboratory	14	3.6 Project	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	15
(b) Supplementary study in the library, online and in the field	15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	9
(d) Tutoring	5
(e) Exams and tests	3
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	47
3.9 Total hours per semester (3.4+3.8)	75
3.10 Number of credit points	3

4. **Pre-requisites (where appropriate)**

4.1	Curriculum	General knowledge in Physics, Chemistry and Materials Science and Engineering
4.2	Competence	To synthesise their knowledge concerning the correlation structure-property to solve problems concerning the selection and use of materials and technologies.

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications (laboratory)	Presence at Technical University of Cluj-Napoca at Materials Science and Engineering Department is mandatory

6. Specific competences

Professional competences	- Characterization of materials used in industry, from a mechanical point of view; - Knowledge of the technological possibilities of obtaining semi-finished products and finished parts; - Ability to design manufacturing technologies in advantageous economic conditions; - Establishing the conditions and technologies for reconditioning some parts. After completing the discipline students will be able to: • Use the equipment for technological characterization of materials; • Establish the conditions for determining the technological characteristics in relation to the requirements imposed by the specifications; • Analyse the execution drawings of the piece and to establish the shape and dimensions of the starting semi-finished product; • To establish the optimal manufacturing technology related to the application possibilities; • To know how to establish the succession of operations and technological phases; • To know the technological possibilities of reconditioning used parts; • To know how to interpret the experimental results, the characteristics of the obtained pieces and to draw the necessary conclusions.
Cross competences	• Applying, in a responsible manner, the principles, norms and values of professional ethics in carrying out professional tasks and identifying the objectives to be achieved, the available resources, the work progression, the durations of execution, the related deadlines and the related risks. • Identifying roles and responsibilities in a multidisciplinary team and applying effective communication and work techniques within the team.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Understand the connection between manufacturing technology, material properties, quality of the finished product and relate them to the possibilities of application in industry.
7.2	Specific objectives	• To be able to establish the optimal manufacturing technology and relate it to the application possibilities. • Acquiring theoretical knowledge regarding: • choosing the appropriate materials for certain applications. • determining the mechanical and technological properties of the materials, the technological manufacturing possibilities;

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Technology object. The structure of industrial production processes.	2	Lecture PowerPoint presentation Interactive teaching mode Dialogue - conversation professor - student	Multimedia Blackboard
2. Elaboration of ferrous and nonferrous alloys. Principles.	2		
3. Parts manufacturing through casting. Principles, processes, applications.	3		
4. Parts manufacturing through plastic deformation. Principles, processes, applications.	3		
5. Parts manufacturing via powder technology. Principles, processes, applications.	2		
6. Welding. Principles, processes, applications.	2		

Bibliography

[1]. Mikell P. Groover, Fundamentals of Modern Manufacturing. Materials, Processes, and Systems, 4th edition, Willey, 2010
[2]. KALPAKJAN, S. - Manufacturing Processes for Engineering Materials, Addison –Wesley Publ.Co, NY, 1993.
[3]. AMZA, Gh. - Tehnologia materialelor. EDP, Bucureşti, 1997.
[4]. NANU, A. - Tehnologie mecanică, Ed. III, EDP, Bucureşti, 1997.
[5]. CONSTANTINESCU, V., ORBAN, R. - Tehnologia materialelor, UTC-N, 1991.
[6]. CONSTANTINESCU, V., ORBAN, R. - Prelucrarea metalelor prin deformare plastică, CCŞ, Cluj- Napoca, 2004.
[7]. B.V. Neamtu – Lecture notes 2022

8.2. Laboratory	Number of hours	Teaching methods	Notes
1. Tensile and compression test of materials	2	Explication, conversation, Case Study.	Blackboard, computer, specialized software
2. Shear, bending and Charpy impact test	2		
3. Determination of the materials hardness	2		
4. Sand casting	2		
5. Technological properties of metallic powders.	2		
6. Determination of workability by plastic deformation of metallic materials	2		
7. Non-destructive testing of materials.	2		

Bibliography

1. BRANDUŞAN, L., PAVEL, C., MUREŞAN, R. - Îndrumător pentru lucrări de laborator la Tehnologia materialelor, UT Pres, 1994.
2. Different national and international standards.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Skills will be required for employees who will work as technological engineers. The acquired competencies will be used by those who will carry out their activity within departments whose activity

is the elaboration, characterization and testing of materials, as well as within the departments that are authorized to certify the quality of a material.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Understanding of the topic. Ability to solve problems. Final verification of knowledge.	Written test (C) - 2 hours	80%
10.5 Laboratory	Achievement of the practical tasks. Tests during the semester	Reports, Written test - L	20%
10.6. Minimum standard of performance			
$M = 0.8*C + 0.2*L$; Mandatory $C \geq 5$ and $L \geq 5$.			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Assoc.prof. Bogdan Viorel NEAMTU	
	Teachers in charge of application	Assoc.prof. Bogdan Viorel NEAMTU	

Date of approval in the department	Head of department Prof.dr.eng. Calin NEAMTU
Date of approval in the faculty	Dean Prof.dr.eng. Corina Julieta BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Facultaty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Robotics/engineer
1.7 Form of education	Full time
1.8 Subject code	16.00

2. Data about the subject

2.1 Subject name	Basics of robotics				
2.2 Course responsible	*Not applicable*				
2.3 Teachers in charge of seminars	*Asis. drd. Ing. Vasile Dragoş Bartoş – dragos.bartos@muri.utcluj.ro*				
2.4 Year of study	1	2.5 Semester	2	2.6 Assessment	C
2.7 Subject area	Subject category				DD
	Optional				DI

3. Estimated total time

3.1 Number of hours per week	1	3.2 of which, course:	0	3.3 applications:	1
3.4 Total hours in the curriculum	14	3.5 of which, course:	0	3.6 applications:	14

Individual study	ore
Manual, lecture material and notes, bibliography	0
Supplementary study in the library, online and in the field	4
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	6
Tutoring	0
Exams and tests	1
Other activities	0

3.7 Total hours of individual study	11
3.8 Total hours per semester	25
3.9 Number of credit points	1

4. Pre-requisites (where appropriate)

4.1 Curriculum	Not necessary
4.2 Competence	Not necessary

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Laboratories with automation systems and industrial robots

6. Competenţele specifice acumulate

Professional competences	C1.1. Defining the fundamental notions of mathematics, physics, chemistry, material resistance, mechanisms, machine parts and computer programming C1.2. Explaining the concepts specific to technological processes and the gradual solving of specialized engineering problems based on mathematical computational algorithms and fundamental knowledge of physics and chemistry C.1-3. Using schematics and organizational charts in developing dedicated computer applications, numerical and matrix calculus methods in solving equations and equation systems and in comparative analysis of possible solutions C.1-4. Assessing the quality of mechatronic and robotic systems according to the characteristics of the materials and components used C2.1. Description of standardized symbols for structural and operating diagrams and diagrams in mechanics, electrotechnics, electronics, informatics, optics, pneumatics and hydraulics C2.2. Explaining and interpreting technical design standards and conventional engineering graphics in design drawings, technology film sheets, product manuals and test manuals
Cross competences	CT1. Completion of the professional tasks with exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working time and the related implementation deadlines CT2. Responsible execution of multidisciplinary work tasks with assuming roles on different hierarchical levels CT3. Identification of the need for continuous training and efficient use of information sources and communication resources and assisted training (Internet portals, specialized software applications, databases, on-line courses, etc.) both in Romanian and in a international language

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	Familiarization of students with industrial robotics and related technologies
7.2 Specific objectives	- To understand architecture of an industrial robot - To understand the operation and integration in practice of industrial robots - To have an idea about programming languages of industrial robots To better understand the multi-disciplinary character of robotics

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
Not applicable		

8.2. Applications/Seminars	Teaching methods	Notes
Architecture of industrial robots and comparative analyses	Onsite: Visits to companies in Cluj-Napoca, Alba-Iulia, Oradea and Bistrita that use industrial robots. Practical demonstrations with	
Integration of industrial robots within manufacturing cells (sensors, end effectors, PLCs etc.)		
Analysis of a manipulation robotic cell (ABB robot, conveyor, end-effector, control, PLC)		
Analysis of a translation intelligent axis driven by electric motor and the master-slave architecture for control		
Analysis of a rotational intelligent axis driven by electric motor and internet-based control		
Integration of end effectors within the robotic system: pneumatic, electric with 2 fingers, electric with 3 fingers and torque control		

Introduction into industrial robot programming	laboratory equipment (manipulation cell, electric arc welding cell, contouring cell, assembly cell). Online: Demonstrations with laboratory equipment using media materials. Introduction to offline programming of ABB robots, using RobotStudio.	
Bibliography User manuals from Kuka, Fanuc, ABB, Siemens, ABB, Motoman		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

This discipline has a profound practical character. Student come in touch with industrial robotic technologies widely spread in companies from Romania.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4Course	Not applicable	Not applicable	0%
10.5 Applications	Involvement in labs Quality of answers Quality technical report Quality oral presentation	Arithmetical mean from lab Assessment of the technical report Assessment oral presentation	50% 30% 20%
10.6 Minimum standard of performance			
Technical report 50% from lab tests			

Date of filling in:	Teachers	Title Surname NAME	Signature
	Lecturer	Not applicable	
	Teachers in charge of application	Asist.drd. ing. Vasile Dragoş BARTOŞ	

Date of approval in the IPR department	Head of IPR department Prof. dr. ing. Călin Neamţu
Date of approval in the IIRMP Faculty Council	Dean Prof.dr.ing. Corina BÎRLEANU

FISA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	Inginerie Industrială, Robotică şi Managementul Producţiei
1.3 Departamentul	Ingineria Proiectării şi Robotică
1.4 Domeniul de studii	Mecatronică şi Robotică
1.5 Ciclul de studii	Licenţă
1.6 Programul de studii / Calificarea	Robotică
1.7 Forma de învăţământ	IF – învăţământ cu frecvenţă
1.8 Codul disciplinei	17.0

2. Date despre disciplină

2.1 Denumirea disciplinei	Comunicare						
2.2 Aria de conţinut	Sociologie						
2.3 Responsabil de curs	Conf. dr. Ruxanda Literat ruxandra.literat@lang.utcluj.ro						
2.4 Titularul activităţilor de seminar /	Asist. Carmen Muresan carmen.muresan@lang.utcluj.ro						
2.5 Anul de studiu	1	2.6 Semestrul	2	2.7 Tipul de evaluare	C	2.8 Regimul disciplinei	DC/DO

3.Timpul total estimat

An/ Sem	Denumirea disciplinei	Nr. săpt.	Curs [ore/săpt.]	Aplicaţii S [ore/săpt.]	L	P	Curs [ore/sem.]	Aplicaţii S [ore/sem.]	L	P	Stud. Ind.	TOTAL	Credit
I/2	Comunicare	14	-	-	-	-	14	14	-	-	22	50	2

3.1	Număr de ore pe săpt.	2	3.2	din care curs	1	3.3	aplicaţii 1
3.4	Total ore din planul de înv.	50	3.5	din care curs	14	3.6	aplicaţii 14

Studiul individual	Ore
Studiul după manual, suport de curs, bibliografie si notiţe	10
Documentara suplimentara in biblioteca, pe platformele electronice si pe teren	2
Pregătire seminarii/laboratoare, teme, referate, portofolii, eseuri	7
Tutoriat	-
Examinări	3
Alte activităţi	-

3.7	Total ore studiul individual	22
3.8	Total ore pe semestru	50
3.9	Număr de credite	2

4. Precondiţii (acolo unde este cazul)

4.1	De curriculum	
4.2	De competenţe	

5. Condiţii (acolo unde este cazul)

5.1	De desfăşurare a cursului	Tablă albă interactivă, conexiune internet.
5.2	De desfăşurare a aplicaţiilor	Tablă albă interactivă, conexiune internet.

6. Competenţele specifice acumulate

Competenţe profesionale	• Fluenţa verbală în activităţi comunicative de echipă sau individuale, legate de procesul de angajare şi de susţinerea / analizarea unei expuneri; • Elaborarea documentelor de angajare; • Analiza unor oferte de loc de muncă; • Elaborarea şi susţinerea unei expuneri: documentarea, realizarea suportului vizual, prezentarea în faţa auditoriului, iniţierea şi participarea la discuţii, susţinerea argumentată a propriului punct de vedere; • Strategii de punere în valoare în cadrul procesului de angajare (autoprezentarea eficientă în faţa recrutorilor şi la nivelul documentelor de angajare).

Competenţe transversale	**CT1.** Îndeplinirea sarcinilor profesionale cu identificarea exacta a obiectivelor de realizat, a resurselor disponibile, condițiilor de finalizare a acestora, etapelor de lucru, timpului de lucru si termenelor de realizare aferente. **CT2**. Executarea responsabila a unor sarcini de lucru in echipa pluridisciplinara cu asumarea de roluri pe diferite paliere ierarhice. **CT3**. Identificarea nevoii de formare continua si utilizarea eficienta a resurselor informaționale si a resurselor de comunicare si formare profesionale asistata (portaluri, internet, aplicații software de specialitate, baze de date, cursuri online) atât in lb. romana cat si într-o limba de circulație internaționala.

7. Obiectivele disciplinei (reieşind din grila competenţelor specific acumulate)

7.1	Obiectivul general al disciplinei	Comunicarea performativă în limba română în situaţii cu caracter profesional (procesul de angajare, elaborarea şi susţinerea unei expuneri).
7.2	Obiectivele specifice	Abordarea teoretică a comunicării verbale şi non-verbale; Abordarea teoretică a specificităţii discursului tehnico-ştiinţific; Formarea deprinderii de exprimare în faţa unui public (susţinerea şi argumentarea punctului de vedere personal, prezentarea favorabilă a propriei persoane în contextul căutării unui loc de muncă); Exersarea protocolului expunerii (documentare, elaborare, susţinere, analiza critică a propriei performanţe sau a performanţei colegilor).

8. Conţinuturi

8.1. Curs		Metode de predare	Observaţii
1	Comunicarea. Definiţie. O tipologie a comunicării. Câteva repere istorice.	Strategii comunicative şi interactive expunere, discuţii	
2	Elementele relaţiei de comunicare.		
3	Nonverbal şi paraverbal în comunicare.		
4	Comunicarea verbală. Registrul oral / Registrul scris. Nivelurile limbii. Stilurile funcţionale		
5	Expunerea (prezentarea) ca deprindere profesională: cadrul, auditoriul, materialul, prezentatorul. Evaluarea impactului expunerii.		
6	Comunicarea în domeniul ştiinţei şi tehnicii. Caracteristici. Acte de limbaj:definirea, descrierea, clasificarea, compararea. Tipuri de discurs.		
7	Test scris.		
8.2. Aplicaţii (seminar/lucrări/proiect)		Metode de predare	Observaţii
1	In căutarea unui loc de muncă: procesul de angajare şi etapele lui. Documente necesare angajării: redactarea CV-ului şi a scrisorii de intenţie.	Deprinderi integrate expunere, exerciţii, problematizae,,dezbateri, joc de rol	
2	Interviul de angajare – capcane şi ponturi. Vizionare de materiale video, urmată de dezbateri.		
3	Simularea interviului de angajare. Activitate pe echipe (candidaţi, recrutori, comentatori-evaluatori).		
4	Expunerea - aspectul scris: documentare, structurare, elaborare slide-uri. Prezentarea şi discutarea unor modele reuşite / nereuşite de slide-uri (plan, bibliografie, slide-uri cu asociere text-imagine).		
5	Expunerea - aspectul oral: structurarea discursului care însoţeşte prezentarea slide-urilor, interacţiunea cu auditoriul.		
6	Susţinerea expunerilor realizate de studenţi.		
7	Susţinerea expunerilor realizate de studenţi.		

Bibliografie

1. Ioani, M., Vlaicu, R., Grănescu M - *Tehnici de comunicare pentru ingineri*, UTPRES; Cluj-Napoca, 2002
2. Literat, R., *Dimensiuni ale comunicării*, Ed. Casa Cărţii de Stiinţă, Cluj-Napoca, 2004
3. Bulgaru Teşculă, C., *Comunicarea în domeniul tehnico-ştiinţific,* Ed. Casa Cărţii de Ştiinţă, Cluj-Napoca, 2016
4. Bulgaru Teşculă, C., *Comunicarea în domeniul tehnico-ştiinţific- aplicaţii,* Ed. Casa Cărţii de Ştiinţă, Cluj-Napoca, 2016.

9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor, profesionale şi angajatori din domeniul aferent programului

Cunoştinţele de comunicare permit cursanţilor să intervină şi să participe în mod sistematic şi inteligent la viaţa socială şi profesională. Comunicarea asertivă, comportamentul comunicaţional flexibil şi adaptativ, experimentarea cooperării în echipă constituie premise reale pentru integrarea în structurile organizaţionale.

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Ponderea din nota finală
10.4 Curs	Rezolvarea unor situatii de comunicare diferite	Test scris	30%
10.5 Aplicaţii	Calitatea suportului vizual al prezentării, prestaţia prezentatorului	Proba practică(susţinerea prezentării) Implicarea în activitatea de seminar	50% 20%
10.6 Standard minim de performanţă: N = Ts + PP + AS Condiţie de obţinere a creditelor: nota se calculează dacă fiecare componentă este realizată minimum 60%.			

Data completării:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	curs	Conf. dr. Ruxanda LITERAT	
	seminar	Asist. Carmen MURESAN	

Data avizării în Consiliul Departamentului	Director Departament Conf.dr. Ruxanda Literat
Data aprobării în Consiliul Facultăţii IIRMP	Decan Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics (Instruction in English)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	18.10

2. Data about the subject

2.1	Subject name	Foreign Languages II English					
2.2	Subject area	Foreign Languages					
2.3	Course responsible/lecturer	N/A					
2.4	Teachers in charge of seminars	Assistant Lecturer Carmen Muresan, Ph. D. Carmen.Muresan@lang.utcluj.ro Assistant Lecturer Delia Rusu, Ph. D. Delia.Rusu@lang.utcluj.ro					
2.5 Year of study	1	2.6 Semester	2	2.7 Assessment	C	2.8 Subject category	DC/DO

3. Estimated total time

3.1 Number of hours per week	2	3.2 of which, course: 0		3.3 seminars:	2
3.4 Total hours in the curriculum	50	3.5 of which, course: 0		3.6 seminars:	28

Individual study	hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	8
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	6
Tutoring	
Exams and tests	
Other activities	

3.7	Total hours of individual study	22
3.8	Total hours per semester	50
3.9	Number of credit points	2.0

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general English minimum B1 CEFR

5. Requisites (where appropriate)

5.1. for the course	N/A
5.2. for the seminars	According to university regulations, class attendance is compulsory

	Printed resources, laptop, printer, tablet, interactive whiteboard, Internet.

6. Specific competences

Professional competences	Acquisition of basic knowledge in the major fields of science and technology. Acquisition of linguistic and communication conventions used in technical English.
Cross competences	CT1. The fulfillment of professional tasks with the exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the time frame and the relevant deadlines. CT2. The responsible execution of some work tasks within a multidisciplinary team with the undertaking of roles on different hierarchical levels. CT3. The identification of the need for continuous training and the efficient use of information resources and communication resources and assisted professional training (portals, internet, specialized software applications, databases, online courses) both in Romanian as well as in an international language.

7. Discipline objectives (as results from the *key competences gained*)

7.1 General objective	The students should develop skills to communicate effectively in a foreign language in professional contexts
7.2 Obiectivele specifice	Developing the ability to use oral and written technical English

8. Contents

8.1Seminars (syllabus)	Teaching methods	Notes
1. Technical language and the use of derivation with prefixes and suffixes	Interactive exercices reflected in written/speaking exercises such as: conversation, debating, team work, problem-solving.	
2. Robots and artificial intelligence		
3. Modal verbs. Medical robots.		
4. Modal verbs. Surveillance robots.		
5. Modal verbs. Industrial robots.		
6. The adjective. Types and adjectives and degrees of comparison.		
7. Using the relative clause in technical contexts.		
8. The technical discourse. Nominalisation and concice expression.		
9. Ethics and robotics. Expressing an argumented opinion. The debate.		
10. Verbal tenses. Virtual reality.		
11. Verbal tenses. The future of artificial intelligence.		
12. Direct and indirect speech. Research accomplishments in the field of robotics.		
13. Predictions. Trends in the technical field. Use of adverbials.		
14. Final written test		

Bibliography:

Eisenbach, Iris (2011). *English for Materials Science and Engineering.* Exercises, Grammar, Case Studies. Viewveg+Teubner Verlag.

Glendinning, E. (2007). *Technology I*. Student's Book. Oxford: Oxford University Press.

Lansford, Lewis (2009). *Tech Talk*. Workbook. Oxford: Oxford University Press.
Remacha Esteras, Santiago (2012). *Infotech. English for Computer Users*. Cambridge: Cambride University Press
Rogers, L. and J. Wilkin (2013). *Skillful Reading and Writing*. Student's Book. Oxford: Macmillan. English for Science and Engineering.
William, I. (2007). *English for Science and Engineering*. Thomson ELT.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The improvement of the students' ability to communicate in English in technical contexts is to ensure a successful adjustment to multicultural work environments.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course			
10.5 Seminar	Continuous assessment of speaking+Final written test	Continuous assessment of speaking+Final written test	Continuous assessment of speaking: 30% Final written test: 70%
10.6 Minimum standard of performance: completion of at least 50% of each component of assessment			

Date of completion:	**Instructors in charge**	**Rank name SURNAME**	**Signature**
	Lecture	N/A	
	Seminars	Assistant Lecturer Carmen MURESAN, Ph.D.	
		Assistant Lecturer Delia RUSU, Ph. D.	

Date of approval in the department

Head of department
Assoc. Prof. Ruxanda Literat, Ph. D.

Date of approval in the Faculty Council

Dean
Prof. Corina Bîrleanu, Ph. D.

____

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics (Instruction in English)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics (in English) / Engineer
1.7	Form of education	Full time
1.8	Subject code	18.20

2. Data about the subject

2.1	Subject name			Modern Languages II French			
2.2	Subject area			Modern Languages			
2.3	Course responsible/lecturer						
2.4	Teachers in charge of seminars			Assoc. Prof. Dr. Cristiana Bulgaru, Cristiana.Bulgaru@lang.utcluj.ro			
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DC, DO

3.Estimated total time

3.1 Number of hours per week	1	3.2 of which, course:		3.3 applications:	1
3.4 Total hours in the curriculum	50	3.5 of which, course:		3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	4
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	8
Tutoring	
Exams and tests	2
Other activities	

3.7	Total hours of individual study	22
3.8	Total hours per semester	50
3.9	Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general French minimum A2(CEFR)

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Class attendance, individual study and homework completion

6. Specific competences

Professional competences	●Improving the skills of using French in academical and technical context; ● Increasing the students' awareness in terms of the rules that govern effective communication in French; ●Developing the students' ability to work in teams
Cross competences	● **CT1** The application of the values and ethics of the engineering profession and the responsible completion of professional tasks under conditions of limited autonomy and qualified assistance. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-assessment in decision-making. **Responsible performance of professional tasks.** ●**CT2** Carrying out activities and exercising the specific roles of teamwork on different hierarchical levels. Promoting the sense of initiative, dialogue, cooperation, positive attitude and respect for others, diversity and multiculturalism, and continuous improvement of one's own activity. **Communication and teamwork.** ●**CT3** Objective self-assessment of the need for continuous professional training in order successfully apply for a position in one's area of specialization and to adapt to the dynamics of labour market requirements, and for personal and professional development. Effective use of language skills and knowledge of information and communication technology. **Aware of the need for continuous training.**

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	● Developing the competence of written and oral communication academic and professional contexts.
7.2	Specific objectives	●Learning basic vocabulary related to the students' specialization and the fields related to science and engineering. ●Effective use of the linguistic and communication skills in a foreign language

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
8.2 Applications / Seminars	Teaching methods	Notes
1. Mathematics: arithmetic operations, powers, fractions, a number of mathematical symbols 2.Mathematics: geometric shapes and forms, shapes and dimensions 3. Physics – types of forces 4. Physics – the principle of action and reaction 5. Chemistry - Elements and symbols. Metals and non-metals. 6. Computer science and its areas of use. 7. The computer – computer architecture. 8. The internet– a huge virtual library. 9. Professional aspects. Work safety procedures and regulations. 10. A number of domestic appliances. The user manual. How to present a domestic appliance.	-presenting new contents (vocabulary, grammar); -textual analysis; -practising through exercises; - listening to audio material; -conversation, monologue, role-playing game	

11. A short presentation of a domestic appliance, based on the student's choice, according to the pattern provided-I (oral evaluation). 12. A short presentation of a domestic appliance, based on the student's choice, according to the pattern provided-I (oral evaluation). 13. Revision. 14. Written test.		

Bibliography

1. Teşculă, C., *Le français de la technique: lexique,grammaire et structures du discours*, Ed. UTPRES, Cluj-Napoca, 2005
2.Ioani, M., *Le français de la communication scientifique et technique,*Ed. Napoca Star, Cluj-Napoca,2002
3.Pãun, C., *Limba franceză pentru ştiinţă şi tehnică*, Ed. Niculescu, Bucureşti, 1999
4. Parizet, M.L., Grandet, E., Corsain, M., *Activités pour le Cadre Européen Commun de Référence – Niveau B1*, Ed. Clé International, 2005
5. Miquel, C., *Grammaire en dialogues – niveau intermédiaire*, Ed. Clé International, 2007

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The development of the students' ability to communicate in French in scientifical contexts is to ensure a successful adjustment to multicultural study and work environments

10.Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course			
Applications	Completing the tasks of the written test, having a conversation or holding a monologue, seminar activity + homework	A written test Oral evaluation + seminar activity (active participation, homework completed)	Final test: 40 % Oral examination: 30%, Seminar activity 30%
10.4 Minimum standard of performance:			
M= FT +OE +SA Each component of the mark is granted if the tasks have been solved correctly in a proportion of min. 60%			

Date of filling in :	Teachers in charge	Title, Name	Signature
	Lectures		
	Seminars	Assoc. Prof. Dr. Cristiana Bulgaru	

Date of approval in the Department's Board	Head of Department Assoc. Prof. Dr. Ruxanda Literat
Date of approval in the IIRMP Faculty Council	Dean Prof. Dr. Eng. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics (in English Language)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	18.30

2. Data about the subject

2.1	Subject name			Modern Languages II German			
2.2	Subject area			Foreign Languages			
2.3	Course responsible/lecturer			N/A			
2.4	Teachers in charge of seminars			Lect.dr. Mona Tripon, Tripon.Mona@lang.utcluj.ro			
2.5 Year of study	1	2.6 Semester	2	2.7 Assessment	C	2.8 Subject category	DC/DO

3. Estimated total time

3.1 Number of hours per week	2	3.2 of which, course: 0		3.3 seminars:	2
3.4 Total hours in the curriculum	50	3.5 of which, course: 0		3.6 seminars:	28
Individual study					hours
Manual, lecture material and notes, bibliography					8
Supplementary study in the library, online and in the field					8
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					6
Tutoring					
Exams and tests					
Other activities					

3.7	Total hours of individual study	22
3.8	Total hours per semester	50
3.9	Number of credit points	2.0

4. Pre-requisites (whereappropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general German minimum A2 CEFR

5. Requisites (whereappropriate)

5.1. for the course	N/A
5.2. for the seminars	According to university regulations, class attendance is compulsory

	Printed resources, laptop, printer, tablet, interactive whiteboard, Internet.

6. Specific competences

Professional competences	Acquisition of basic knowledge in the major fields of science and technology.Acquisition of linguistic and communication conventions used in German.
Cross competences	Identification of the role and of the responsibilities within a team, decision-making, development of critical thinking and of the students' ability to apply communication techniques in German within a team.

7. Discipline objectives (as results from the *key competences gained*)

7.1 General objective	The students should develop skills to communicate effectively in a foreign language in professional contexts
7.2 Obiectivelespecifice	Developing the ability to use oral and written German in professional contexts

8. Contents

8.1Seminars (syllabus)	Teaching methods	Notes
1. Mathematics: arithmetical operations, mathematical symbols	Interactive exercicesreflected in written/speakingexercisessuch as: conversation, debating, team work, problem-solving.	
2. Geometrical figures, dimensions, symbols		
3. Notions of physics – types of forces		
4. Physics: The principles of action and reaction		
5. Chemistry: Elements and symbols		
6. Informatics and its applications		
7. The computer and its architecture		
8. The internet - a huge virtual library		
9. Professional details and safety procedures/norms		
10. Home appliances. The users guide.		
11. Presentation of a home appliance at a student's choice I (oral).		
12. Presentation of a home appliance at a student 's choice II (oral).		
13. Revision.		
14. Written test		

Bibliography:

1. Maria Steinmetz Heiner Dintera, Deutsch für Ingenieure *Ein DaF-Lehrwerk für Studierende ingenieurwissenschaftlicher Fächer,* Springer Fachmedien Wiesbaden, 2014
2. Dengler, Rusch, Schmitz, Sieber, *Netzwerk, Deutsch als Fremdsprache, Kurs- und Arbeitsbuch,* Klett Langenscheidt, 2011, Berlin
3. Hans Földeak, *Sag's besser, Teil 1,* Hueber Verlag, 2011
4. Rusch, Schmitz, *Einfach Grammatik-Übungsgrammatik A1-bis B1,* Klett Langenscheidt, Berlin,

2007 5. Dinsel, Geiger, *Grosses Übungsbuch Grammatik,* Hueber Verlag, 2009, Ismaning

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The improvement of the students' ability to communicate in German in technical contexts is to ensure a successful adjustment to multicultural work environments.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course			
10.5 Seminar	Continuous assessment of language competences during the seminars; Completing the written/oral tasks from the final test.	Continuous assessment Final oral assessment + Final written test	Continuous assessment: 20% Final oral test: 40% Final written test: 40%
10.6 Minimum standard of performance: completion of at least 50% of each component of assessment			

Date of completion:	Instructors in charge	Rankname SURNAME	Signature
	Lecture		
	Seminars	Lecturer Mona TRIPON, Ph.D.	

Date of approval in thedepartment	Head of department Assoc. Prof. RuxandaLiterat, Ph. D.
Date of approval in theFaculty Council _________________________	Dean

SYLLABUS

Semester I and II

2022-2023

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	Sem. I - 9.00 / Sem. II - 19:00

2. Data about the subject

2.1	Subject area				Physical Education and Sport			
2.2	Course responsible/lecturer				-			
2.3	Teachers in charge of seminars				Şef lucr.dr. Radu Sabău: Radu.Sabau@mdm.utcluj.ro			
2.4 Year of study		I	2.5 Semester	I	2.6 Assessment			DC/DI
2.7 Subject category		Formative Category						
		Optional						

3. Estimated total time

3.1 Number of hours per week	1/2	3.2 of which, course:		3.3 applications:	1/2
3.4 Total hours in the curriculum	25/50	3.5 of which, course:		3.6 applications:	14/28
Individual study					hours
Manual, lecture material and notes, bibliography					
Supplementary study in the library, online and in the field					
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					
Tutoring					
Exams and tests					
Other activities					6/12

3.7	Total hours of individual study	11/22
3.8	Total hours per semester	14/28
3.9	Number of credit points	1 / 2

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	physically fit, necessary skills, knowledge, skills and abilities gained in classes I-XII

5. Requirements (where appropriate)

5.1	For the course	-
5.2	For the applications	Muncii Blvd, no.103-105, Cluj-Napoca, Politehnica Swimming Complex Sports Hall, Muncii Blvd, no.103-105, Cluj-Napoca Outdoor and Fitness - Complex Polytechnic

6. Specific competences

Professional competences	- knowledge, skills and movement skills - means and methods for harmonious and balanced physical development - fair play in sport and social activity The capacity and the habit of practicing physical activities for formative, compensatory and recreational purposes: - formative, by maintaining health, harmonious physical development and body resistance, to combat sedentarism; - compensatory, to alleviate the stress created by professional obligations, to restore the body after physical or intellectual effort - Skills for gaining strength and physical strength Organizing and leading a team - the applicability in everyday life and in future professional practice of the knowledge, skills and abilities of body activities; - improving mental attributes: imagination, anticipation, referral, timely and efficient action, responsible independence, altruism.
Cross competences	**CT2 –** Identifying, describing and conducting processes in the projects management field, assuming different roles inside the team and clearly and concisely describing, verbally or in writing, in Romanian and in an international language, the own results from the activity field. Identify the objectives, the available resources, the conditions for their completion. Realization of projects under co-ordination, under conditions of deontological norms, as well as health and safety at work.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	- ensure the maintenance and improving of health by using exercise in combination with natural quenching factors (air, water, sun, etc.) in order to increase the physical and intellectual work potential and to form personality and character; - ensures normal and harmonious physical development; - ensures recreation, restoration, recovery of the body of students; - increases the body capacity for resistance to illness; - assures the acquisition of skills and skills of general and sport-specific movement; - ensures the development of psychomotor skills and moral and willing skills; - ensures the formation of the habit of exercise of physical exercises in leisure time.
7.2	Specific objectives	- extending the core of basic movements, application-utilitarian

		and elementary motor skills, and developing related motor skills - Independent practice of physical exercise, games and various sports - manifestation of team spirit and competition, depending on a system of accepted rules

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
Legend: a=basketball b=football c=swimming d=table tennis e=voleyball 1 - Information on the requirements of students. - Testing the level of physical ability of the students. - Accommodating of the students with physical effort. 2 a. Exercises, relays and accommodation games with the ball. b. The appropriation of the technical elements without the ball. c. Accommodation with water. d. Learning how to hold a table tennis racket. e. Fundamental positions, squatting and motion in the field, rotating. 3. a. Basic types of dribbling; rules violations: traveling. b. Learning how to kick the ball with top and side of the foot. c. Getting used with horizontal position in the water. d. Learning the fundamental position. e. Passing the ball overhead with two hands . 4. a. Stops. Pivoting skills. Shooting from standing and from dribbling. b. Learning how to kick the ball with ristul (interior, full, exterior). c. Learning how to breath in the water. d. Learning the specific movements. e. Get the ball thrown (service type). 5. a. Fundamental position. Basic moves or steps without the ball. b. Learning how to kick the ball with the knee and with the hell. c. Learning the floatation on the water. d. Learning the middle-game with the forehand. e. Learning the front service up (distance 4 – 5 m). 6. a. Crossover with and without the ball. b. Learning how to kick the ball with the head. c. Learning the slip in water. d. Simple means learning game with backhand.	interactive	

e. The game without the ball with the simulation of the skills learned. 7. a. Complex technical structures: dribbling, stop, pivot, pass. b. Learning processes driving the ball. c. Learning floatation and slipping on the back. d. Learning middle-game cut with forehand. e. Pick up service with two hands above the head. 8. a. Relationship 1x1. b. Learning the receiving of the ball (damping, relocation, counter-hit) c. Front crawl - learning the legs movement. d. Learning the middle-game cut with the backhand. e. Organization of 3 hits, top pickup. 9. a. Jump shot. b. Learning deceptive movements. c. Learning the legs movement in the same time with breath. d. Learning the middle-game from semi-flight with forehand. e. High lift for attack from zone 3 and 4. 10. a. Games by theme: improving the passing. b. Learning to put the ball back in play. c. Learning the arms movement. d. Learning the middle-game from semi-flight with backhand. e. e. Attack shot in the direction of attack using elk from zone 4. 11. a. Relationship 1x1(overcoming). b. Learning opponent ball dispossession. c. Coordinating the movement of arms and legs. d. Learning the serve with forehand. e. Game 6x6 with simplified rules. 12. a. Complex technical structures: catching, dribbling, stop. b. Learning goalkeepers technical procedures. c. Front crawl on 25-50 m distance. d. Learning the serve with backhand. 13. a. Dribbling with different processes: change of direction, pass. b. Learning free kicks practical maneuvers. c. Start learning and return on one side to front crawl. d. Learning the serve return. e. Lifting for attack from zone 2 and 3 (high, medium, forward). 14. a. Protecting the ball. b. Learning of demarcation, penetration and overcoming. c. Breaststroke - learning the movement of the legs.		

d. Learning how to return with forehand in line. e. Taking the ball from down with two hands.		
Improvement and maintenance of health, athletic ability and fitness		
Improving tehnical exercises learned before using tactic tasks		
Automatization of technical and tactics in game conditions (competition).		
Learning regulations of different sports, to be able to practice and organize leisure-time sport activity.		
Necessary skills to practice independent physical activity		
Improving the drills, combinations, schemes in different sport games		
Close the school situation by passing physical test		
Bibliography 1. Curs de Educaţie fizică – Litografiat UTC-N 2. Dezvoltare fizică generală pentru studenţi – UTC-N 3. Cultură fizică pentru tineret - UTPRES		

8.2. Applications/Seminars	Teaching methods	Notes
Bibliography		

9. **Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

The acquired skills will be required for employees who work in environments that require physical activity.

10. **Evaluation**

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	-	-	
10.5 Applications	Medical Exemptions: Minimum 5 attendance to	The theme for the essay is chosen from the exposed topics	

	support the essay (assessment). At least 5 attendance to support control samples	in the first month of the semester. Presentation of the essay. Initial testing at the beginning of the semester (applied sports route). Attendance at hours and sustaining of control samples. At the trial tracks progress on initial testing. Control samples: - Applied sports route -	100% 100%
	Online – Microsoft Teams Platform	In case of online teaching activity: Essay with two topics on the Microsoft Teams platform	100%
10.6 Minimum standard of performance			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	-	
	Teachers in charge of application	Șef lucr.dr. Radu Sabău	

Date of approval in the department …….. _________________________	Head of department Prof.dr.ing.
Date of approval in the faculty …………… _________________________	Dean Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Facultaty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Robotics/engineer
1.7 Form of education	Full time
1.8 Subject code	20.00

2. Data about the subject

2.1 Subject name	Domain practice I (2 weeks)				
2.2 Course responsible	*Responsible*				
2.3 Teachers in charge of seminars	*Responsible*				
2.4 Year of study	1	2.5 Semester	2	2.6 Assessment	C
2.7 Subject area	Subject category				DD
	Optional				DI

3. Estimated total time

3.1 Number of hours per week	30	3.2 of which, course:	0	3.3 applications:	30
3.4 Total hours in the curriculum	75	3.5 of which, course:	0	3.6 applications:	75

Individual study	ore
Manual, lecture material and notes, bibliography	
Supplementary study in the library, online and in the field	
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	
Tutoring	
Exams and tests	
Other activities	

3.7 Total hours of individual study	15
3.8 Total hours per semester	75
3.9 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1 Curriculum	Not necessary
4.2 Competence	Not necessary

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	N/A

6. Competenţele specifice acumulate

Professional competences	C.2.1 Define the principles and methods in the basic sciences of industrial engineering associated with graphic representations - technical drawing C2.2. Using knowledge from basic engineering sciences to explain and interpret the theoretical and experimental results, executive and overall drawings, and industrial engineering phenomena and processes. 2-3. Applying principles and methods from the basic sciences of the industrial engineering field and their association with graphical representations - technical design, for resistance calculations, sizing, establishing technical conditions, establishing the correspondence between the prescribed features and the functional role etc., in applications specific to industrial engineering , under the conditions of qualified assistance. 2-4. Appropriate use of standard criteria and methods of assessment in basic engineering sciences to identify, model, experiment, analyze and qualitatively and quantitatively assess defining aspects, phenomena and parameters, as well as data collection and the processing and interpretation of results from processes industrial engineering 2-5. Development of industrial projects specific to industrial engineering based on the selection, combination and use of knowledge, principles and methods in the basic sciences of industrial engineering and their association with graphical representations - technical design C.4.4 Appropriate use of the theoretical and practical evaluation methods for assessing the constructive-functional performance of machine tool assemblies - medium complexity tools.
Cross competences	CT1. Applying the values and ethics of the engineering profession and the responsible execution of professional tasks under restricted autonomy and qualified assistance. Promoting logical, convergent and divergent reasoning, practical applicability, assessment and self-assessment in decision-making CT2. Performing activities and exercising the roles specific to teamwork on different hierarchical levels. Promoting the spirit of initiative, dialogue, cooperation, positive attitude and respect for others, diversity and multiculturalism, and continually improving their own activities

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	To acquire knowledge and skills in the field of specialization
7.2 Specific objectives	To adopt the rules of the work safety technique in mechanical enterprises; To acquire knowledge and skills in the field of specialization; To assimilate primary technologies from industrial practice (mechanical machining, locksmithing, etc.); Know how to organize workshops and manufacturing departments; To know the technological equipments and equipment in the industrial units; After completing the practice, students will be able to: - recognize the types of semifinished products and technological processes for the production of metallic semifinished products; - identify the machinery and SSDs used in the manufacture; - measure the dimensional accuracy, shape and position of the surfaces, knowing the methods and the control equipment for the quality of the production; - recognize the main types of universal equipment and machining

	technology of mechanical parts to know the organization of metalworking workshops

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
Not applicable		
8.2. Applications/Seminars	Teaching methods	Notes
Norms of the work safety technique in mechanical processing, locksmithing;		
Knowledge of technological processes for the production of metallic semifinished products.		
Knowledge of apparatuses and procedures used in testing laboratories and plant analyzes.		
Knowledge of control methods and equipment to track the quality of production.		
Knowledge of machinery and processes used in mechanical processing.		
Knowledge of the organization of workshops and metalworking sections.		
Bibliography		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

In making the program and the content we consulted:
- representative societies in Bistrita and surrounding areas such as Comelf, RAAL, Leoni, RomBAT, C&I, ...
level education from similar specializations in the country and abroad

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4Course	Not applicable	Not applicable	0%
10.5 Applications	Colloquium (note C); Practice(note P)	N 0,6C + 0,4P; Conditions for obtaining credits: N> 5; C> 4; P> 4;	100%
10.6 Minimum standard of performance			
Technical report 50% from lab tests			

Date of filling in:	Teachers	Title Surname NAME	Signature
	Lecturer		
	Teachers in charge of application		

Date of approval in the IPR department	Head of IPR department Prof. dr. ing. Călin Neamţu
Date of approval in the IIRMP Faculty Council	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	IPR
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	21

2. Data about the subject

2.1	Subject name			Strength of Materials			
2.2	Subject area			Mechanics			
2.2	Course responsible/lecturer			Prof.dr.ing Mircea Cristian Dudescu			
2.3	Teachers in charge of seminars			S.l.dr.ing Simion Mihaela			
2.4 Year of study	2	2.5 Semester	1	2.6 Assessment			EXAM
2.7 Subject category	Formative category						DD
	Optionality						DI

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laborator	1	3.3 Proiect	-
3.4 Total hours in the curriculum	125	of which	3.5 Course	28	3.6 Seminar	-	3.6 Laborator	14	3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	28
(b) Supplementary study in the library, online and in the field	14
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	28
(d) Tutoring	4
(e) Exams and tests	8
(f) Other activities	3

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	83
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Math, physics, mechanics (statics), technical drawing
4.2	Competence	Computer skills

5. Requirements (where appropriate)

5.1	For the course	N/A

5.2	For the applications	Presence is compulsory

6. Specific competences

Professional competences	**C1.1.** Identifying the concepts, principles, basic theorems and mathematical methods, physics, chemistry, technical drawing, computer programming. **C1.2.** Using basic knowledge in the fundamental disciplines for theoretical explanation and interpretation of results, theorems, phenomena, or specific processes of industrial engineering. **C1.3.** Applying the theorems, principles, and basic methods of fundamental disciplines, for basic engineering calculations in design and operation of technical systems specific to industrial engineering, under qualified assistance **C2.1.** Defining the principles and the methods of basic science industrial engineering field associated with graphics – technical drawing. **C2.2.** Using the knowledge from the basic engineering sciences to explain and interpret the theoretical and experimental results, the drawings and the specific industrial engineering phenomena and processes. **C2.3.** Applying the principles and methods from basic science of industrial engineering domain and associated with graphics - technical drawing, for strength calculations, sizing, establishing the technical conditions, establishing correspondence between features and functional role prescribed, and so on, in specific applications of industrial engineering under qualified help.
Cross competences	Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	• To understand the basics of strength of materials, to know simple and composed loadings of the materials. • To understand that the discipline it's a practical one, connected to the engineering calculations. • To know how to interpret the results of different calculations about practical applications
7.2	Specific objectives	• To know how to solve strength calculations based on theoretical skills and engineering handbooks. • To know how to reduce practical problems to theoretical calculation models used in strength of materials. • To know how to interpret the calculation results and to propose engineering solutions to optimize it. • To know how to measure experimentally displacement, strains and stresses in mechanically loaded components or structures.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Introduction in Strength of Materials. Strain & Stresses.	2	Classical methods, practical elements,	Web site:
Axially loaded members	2		

Statically indeterminate problems axially loaded	2	presentations, educational software for mechanics of materials (MDSolids)	https://sites.google.com/site/rezmatcluj/ PPT presentation- Lecture notes in Strength of Materials – available in MS Teams
Shear: internal forces, strains and stresses	2		
Calculus of detachable joints (screw joints, bolt joints, key joints, groove joints)	2		
Calculus of fixed joints (riveted joints, welded joints)	2		
Plane stress	2		
Bending of beams. Reaction's calculus. Shear force & bending moment calculation.	2		
Bending of beams. Shear force & bending moment diagrams. Examples	2		
Normal stresses in beams. Flexure formula (Navier).	2		
Shear stresses in beams. Shear stress formula (Jouravski).	2		
Equal strength beams. Composed beams.	2		
Deflection of beams.	2		
Torsion of circular bars. Torsion of non-prismatic bars.	2		

Bibliography

1. Dudescu, M.C., *Lecture notes in Strength of Materials*, available online
2. Dudescu, M.C., *Rezistenţa materialelor. Noțiuni fundamentale.* Editura U.T.Pres, Cluj-Napoca, 2013.
3. Gere, J., Goodno, B., *Mechanics of Materials*. *Brief Edition*, Cengage Learning, Toronto, 2012.
4. Philpot, T., *Mechanics of Materials: An Integrated Learning System*, Wiley, 2012.
5. Hibbeler, R.C, *Mechanics of Materials* , Pearson, (10^{th} edition), 2016
6. Păstrav I., *Rezistenţa materialelor şi teoria elasticităţii.* Lito U.T.C.N., 1993.
7. Şomotecan, M., Hărdău, M., Bodea, S. *Rezistenţa materialelor*. Editura U.T.PRES, Cluj – Napoca, 2005

8.2. Laboratory	Number of hours	Teaching methods	Notes
1. Determination of stress concentration factor for an axially loaded member by photoelasticity.	2	Lab works: measurements on experimental stands	Web site: https://sites.google.com/site/rezmatcluj/
2. Measurement of shear force in a beam subjected to plane bending	2		
3. Measurement bending moment in a beam subjected to plane bending	2		
4. Stresses in beams measurement by strain gauge technique.	2		
5. Study of bars with circular cross-section subjected to torsion	2		
6. Mechanical tests: tensile, bending, torsion, impact.	2		
7. Review and recover activities	2		

Bibliography

1. Hardau, M., Dudescu, M.C. Suciu, M., Simion, M., Chiorean, C., Rad, I., Metode experimentale in *Rezistenta Materialelor. Indrumator de lucrari de laborator*. Editura U.T.Press, Cluj-Napoca, 2018 / available on-line
3. MDsolids – Educational Software for Mechanics of Materials, www.mdsolids.com
4. Structures – software for experimental works (TecQuipment, UK)

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The course contains theoretical aspects and applications from industrial environment that develops the student's skills to solve practical problems of engineering calculations based on analytical models and references in the field of mechanics of materials.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Understanding and application of the theory presented at courses	Writing exam	2/3
10.5 Seminars /Laboratory/Project	Ability to solve problems / Laboratory activity	Writing exam	1/3
10.6 Minimum standard of performance			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof.dr.ing Mircea Cristian Dudescu	
	Teachers in charge of application	S.l.dr.ing. Mihaela Simion	

Date of approval in the department .... _________________________	Head of department Prof.dr.ing. Calin Neamtu
Date of approval in the faculty .... _________________________	Dean Prof.dr.ing. Corina Birleanu

SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Industrial Engineering, Robotics and Production Management
1.3 Department	Mechanical Systems Engineering
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Robotics
1.7 Form of education	FT – Full time
1.8 Subject code	22.00

2. Data about the subject

2.1 Subject name	Mechanics II					
2.2 Course responsible	*Assoc.Prof. Adina Veronica Crișan – adina.crisan@mep.utcluj.ro*					
2.3 Seminar / **Laboratory applications** / Project applications responsible	Assoc.Prof. Adina Veronica Crișan – adina.crisan@mep.utcluj.ro					
2.4 Year of study	2	2.5 Semester	1	2.6 Method of assessment		E
2.7 Subject	Category					DD
	Type					DI

3. Estimated total time

3.1 Number of hours per week	3	of which:	3.2 Course	2	3.3 Seminars	1	3.3 Laboratory	0	3.3 Project	0
3.4 Number of hours per semester	42	of which:	3.5 Course	28	3.6 Seminars	14	3.6 Laboratory	0	3.6 Project	0

3.7 Distribution of time (hours per semester) for:	
(a) Study after the textbook, course support, bibliography, and course notes	20
(b) Supplementary study in the library, on specialty electronic platforms and in the field	14
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	
(e) Exams and tests	4
(f) Other activities:	6

3.8 Total hours of individual study (sum of (3.7(a)…3.7(f))	58
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 of curriculum	
4.2 of competences	

5. Requirements (where appropriate)

5.1. for the course	N/A
5.2. for the seminar / laboratory applications / project applications	N/A

6. Specific competences

Professional competences	The students will acquire the following: • Notions about the dynamics of absolute and relative motion of material point; • Notions and fundamental theorems in dynamics of systems; • Notions of analytical mechanics. After this course, the students will be capable: 1) To apply the fundamental theorems and principles of analytical mechanics; 2) To use software applications concerning dynamics of systems; 3) To analyze and synthesize the data concerning dynamics of systems.
Cross competences	Identify the need for continuous training and the effective use of informational and communication as well as training assistance (Internet portals, specialized software, data bases, online courses, etc..) both in Romanian and in an international language

7. Subject objectives (as result from the key competency grid)

7.1 General objective	To master the fundamental principles and general theorems that rules the motion of mechanical systems
7.2 Specific objectives	Application of the general theorems of dynamics and principles of analytical mechanics for the solving technical problems

8. Contents

8.1 Course	No. of h.	Teaching methods	Notes
1. Fundamental notions and theorems in the dynamics of the material point. The momentum of a material point. The theorem of momentum.	2	Classical teaching methods combined with use of technology (Laptop – Graphical tablet – multimedia presentations) -	The course activities are two hours long and kept one time/week.Students are encouraged to ask questions related to the discussed topics.
2. The theorem of movement of mass center. The angular momentum for a material point and for a discrete system of material points. The König theorem for angular momentum.	2		
3. The theorem of angular momentum for a material point. The central movement. Determination of Binet's equation. The theorem of angular momentum for a discrete system of material points. The theorem of angular momentum with respect to the mass center.	2		
4. The elementary work. The finite work. The work of the internal forces. The kinetic energy for a material point and for a discrete system of material points. The theorem of kinetic energy for a material point and a discrete system of material points.	2		

5. The dynamics of relative motion in case of a material point. The law of composing the velocities. The law of composing the accelerations.The fundamental equation in the dynamics of relative motion.	2		
6. The mechanical moments of inertia. Expressions of definition. Variation of mechanical inertia moments with respect to parallel axes (Steiner's theorem).	2		
7. The variation of mechanical inertia moments with respect to concurrent axes. The inertial tensor.	2		
8. The dynamics of a rigid body. The kinematic, mass distribution and forces study, necessary for the general dynamics. Fundamental notions and theorems in the dynamics of a rigid body. The momentum of a rigid body. The theorem of movement of mass center for the rigid body.	2		
9. The angular momentum of a rigid body. The theorem of angular momentum for a rigid body. Work performed by the forces that act on a rigid body.	2		
10. Mechanical power. Mechanical efficiency. The kinetic energy for a rigid body. König's theorem and the theorem of kinetic energy for a rigid body.	2		
11. The dynamics of a rigid body with fixed axis. The kinematic and dynamic study.	2		
12. The dynamics of a rigid body with fixed axis. The balancing of rotors. The dynamics of a rigid body with fixed point. The kinematic and dynamic study.	2		
13. Analytical mechanics. The inertia force. D'Alembert principle.	2		
14. Linkages (mechanical links) and displacements in analytical mechanics. The principle of D'Alembert – Lagrange. Lagrange's equations of first type. Lagrange's equations of second kind.	2		

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1. Awrejcewicz J. - Classical mechanics. Kinematics and Statics, Springer-Verlag N.Y., 2012.
2. Bălan, Şt., Probleme de Mecanică, Editura Didactică şi Pedagogică, Bucureşti, 1977.
3. Bratu, P.P., *Mecanica Teoretică*- Editura IMPULS-Bucuresti-2006.
4. Ceaușu, V., Enescu, N., Probleme de mecanică, Corifeu, ISBN 973-85983-0-3, 2002.
5. Hibbeler, R.C., Engineering Mechanics – Dynamics, 14th edition, Pearson Prentice Hall, 2016.
6. Ispas, V., ş.a., Mecanica, Editura Dacia, Cluj-Napoca, 1998.
7. Meriam J. L., . Kraige L. G, Engineering Mechanics - Dynamics, Wiley, 2018
8. Negrean, I., Mecanică – Teorie şi aplicaţii, UT Press, ISBN 978-973-662-523-7, 2012.

9. Tenenbaum, R. A., Fundamentals of Applied Dynamics, Springer-Verlag New York, Inc. ISBN 0-387-00887-X, 2004
10. Williams, J. , Fundamentals of Applied Dynamics., John Wiley & Sons, ISBN: 9780471109372, 1995.

Internet resources:

1. https://www.youtube.com/watch?v=CPq87E1vD8k
2. https://www.sciencedirect.com/science/article/pii/S0968090X21000449
3. https://ieeexplore.ieee.org/abstract/document/8460600
4. https://blog.praxilabs.com/2021/02/24/applications-of-newtons-laws-of-motion-in-daily-life/
5. https://opentextbc.ca/openstaxcollegephysics/chapter/further-applications-of-newtons-laws-of-motion/

8.2 Seminars / **laboratory applications** / project applications	No. of h./week	Teaching methods	Notes
1. Fundamental notions and theorems regarding the dynamics of material systems;	1	Classical+ Laptop, Graphical tablet, multimedia presentations	The seminary activity is two hours long and can be attended once every two weeks.
2. Fundamental theorems regarding the dynamics of a free material point / material point subjected to mechanical bounds;	1		
3. The dynamics of relative motion of a material point.	1		
4. The dynamics of a rigid body with fixed axis. The dynamics of a rigid body in plane parallel motion.	1		
5. The dynamics of a rigid with a fixed point.	1		
6. D'Alembert Principle.	1		
7. The principle of virtual mechanical work. Lagrange's Equations of first and second kind.	1		

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1. Hibbeler, R.C., Engineering Mechanics – Dynamics, 14th edition, Pearson Prentice Hall, 2016.
2. Negrean, I., Mecanică – Teorie şi aplicaţii, UT Press, 2012, ISBN 978-973-662-523-7, 476p.
3. Negrean, I., Mechanics – Theory and Applications, UT Press, ISBN 978-606-737-061-7, 2015.
4. Ripianu A, Popescu P , Dinamica – Culegere de probleme, Institutul Politehnic Cluj – Napoca, 1985.
5. Vlase S. & all, Cinematică și Dinamică. Culegere de probleme, INFOMARKET, Brașov, ISBN 978-973-1747-16-3, 2009.

9. Bridging course contents with the expectations of the representatives of the community, professional associations, and employers in the field

It is acquired through periodic discussions scheduled by the faculty with employers' representatives.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The level of understanding dynamic's notions and theorems studied during the semester and the capability to apply these notions/ theorems in practice	two hours long, written examination. The exam is evaluated by a mark between 2 and 10	80%
10.5 Seminar /**Laboratory appl.** /Project appl.	The level of understanding and the ability to apply dynamic's notions and theorems in solving different applications.	Evaluation of seminary activities – a mark between 2 and 10	20%
10.6 Minimum standard of performance • E = 4/5 * C + 1/5 * S. Condition for obtaining the credits: E≥5; C≥5; (E – final grade, C – written examination grade, S –mark obtained at seminary evaluation)			

Date of filling in:	**Responsible**	**Title, First name LAST NAME**	**Signature**
	Course	Assoc. Prof. Adina - Veronica CRIȘAN, Ph.D.	
	Seminary	Assoc. Prof. Adina - Veronica CRIȘAN, Ph.D.	

Department of Design Enginering and Robotics

Head of department,
Prof. Eng. Calin NEAMȚU, Ph.D.

____

Faculty IIRMP

Dean,
Prof. Eng. Corina BÎRLEANU, Ph.D.

____

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	23.00

2. Data about the subject

2.1	Subject name			Basic of automation systems			
2.2	Subject area			DI-DD			
2.3	Course responsible/lecturer			Professor PhD Eng. Claudiu Ratiu - claudiu.ratiu@muri.utcluj.ro			
2.4	Teachers in charge of seminars			Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro			
2.5 Year of study	2	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 applications:	2
3.4 Total hours in the curriculum	42	3.5 of which, course:	14	3.6 applications:	28
Individual study					hours
Manual, lecture material and notes, bibliography					14
Supplementary study in the library, online and in the field					14
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					14
Tutoring					6
Exams and tests					4
Other activities					6

3.7	Total hours of individual study	58
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Promotion to disciplines: Material science and engineering, Mechanics, Basics of robotics,Physics, Descriptive Geometry and Technical Drawing, Electrical drives

5. Requirements (where appropriate)

5.1	For the course	Tableroom and video projector
5.2	For the applications	Laboratory room for pneumatic and hydraulic drives.

6. **Specific competences**

Professional competences	• Know the existence, role and areas of use of modern automated systems used in the economic environment. • Understand the construction and operation of automation devices. • Know the architecture and the component of an automated system. • To know the structure of modern systems with automatic regulation and to understand the operation of the specific schemes represented symbolically.
Cross competences	• Know new modern automated systems. • Calculate the basic parameters of an automated system. • To identify the devices used in the field of adutomatizations after symbolism. • Intuition of the functioning of the automated systems according to the devices that compose them. • Design modern systems with automatic operation modes. • Properly incorporate the assimilated knowledge into the structure of automated systems.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Understand, conceive and use new, modern automated systems with high yields and reduced costs.
7.2	Specific objectives	Be able to develop and implement new automated solutions in production processes with high economic and technical efficiency.

8. **Contents**

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Sensors, field-specific transducers and electronic circuits for processing the signals provided by them.	Exposure, interactive course	Video projector
2.	Actuators specific to the proportional and servo technique: Torsional motor, proportional electromagnet, magneto-strictive motor, piezo-electric motor. Electronic circuits associated with actuators studied.		
3.	Electronic regulators associated with proportional hydraulic devices. Criteria of static performance and dynamics that they have to meet.		
4.	Specific notions of automatic regulation theory.		
5.	Hydraulic proportional devices for pressure and flow control.		
6.	Elaboration of functional cycles, sizing criteria and design of applications.		
7.	Examples of robot domain specific applications.		

Bibliography
1. C. Ratiu, I. Chis – Actionari hidraulice si penumatice, note de curs.
2. A. Cotentiu – Hidraulica aplicata.
3. I. Cristian – Actionarea hidraulica a robotilor industriali.
4. A. Manring - Hydraulic control systems.
5. Deacu L., Ratiu C. ş.a., Tehnica hidraulicii proporţionale,
6. Ratiu C. Axe electro-hidraulice liniare,
7. Deacu L. Ratiu C. Complemente de electro-pneumatica, format electronic.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Presentation of the laboratory and study topics. Labor Preotection.	Interactive discussions, apparatus analysis, case studies	Hydraulic and pneumatic laboratory
2.	Symbols used in the development of servo-hydraulic schemes. Examples.		
3.	Determination of force / displacement characteristics for a proportional electromagnet.		
4.	Regulatory proportional, integral, derivative. Determination of P, I, and D constants		
5.	Determination of static characteristic, Q = f (p), for droplets and proportional flow regulators.		
6.	Determination of the step signal response for the proportional pressure limiting valve.		
7.	Determination of pressure-flow characteristics for a pressure limiting valve.		
8.	Determination of the positioning precision of a linear electro-hydraulic axis correlated with the displacement speed.		
9.	Determination of positioning precision and static rigidity for a linear electro-pneumatic axis.		
10.	Hydraulic systems with closed circuit operation. Case Study.		
11.	Dimensioning of hydraulic power sources. Sizing of pumps and hydraulic reservoirs.		
12.	Use of hydraulic accumulators. Criteria for use.		
13.	Servo-hydraulic circuits with robot-specific linear motors. Case Study.		
14.	Servo-hydraulic servo-hydraulic circuits with robotic swing / rotary motors. Case Study.		

Bibliography
1. M. Manescu – Probleme rezolvate si propuse.
2. C. Ratiu, I. Chis – Actionari hidraulice si penumatice, indrumator de laborator.
3. I. Cristian – Actionarea hidraulica a robotilor industriali.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The competences gained during the course of the Basic of automation systems course will require the

students to be involved in the automation and robotization of certain processes in the industry in order to increase the technical and economic efficiency of these processes.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Exam written with questions from the lessons learned.	Written test	40%
Applications	Designing an application with one of the devices studied in the laboratory.	Written test	60%
10.4 Minimum standard of performance			
Calculation mode final grade NF = 0.4 * NT + 0.6 * NA Nf - final note; NT - Theory; NA - Laboratory application note. It is necessary to get a minimum grade of 5 for the NT and NA examination to pass the exam.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Professor PhD Eng. Claudiu Ratiu	
	Teachers in charge of application	Lecturer PhD Eng. Ionut Chis	

Date of approval in the department …….. ________________________	Head of department Prof.dr.ing.
Date of approval in the faculty …………… ________________________	Dean Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design and Robotics
1.4	Field of study	Industrial Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/engineer
1.7	Form of education	Full time
1.8	Subject code	*24.00*

2. Data about the subject

2.1	Subject name			Tolerances and Dimensional Control	
2.2	Course responsible/lecturer			Prof. dr. ing. Crișan Liviu - Liviu.Crisan@muri.utcluj.ro	
2.2	Teachers in charge of applications			Conf. dr. ing. Pop Grigore Marian - Grigore.pop@muri.utcluj.ro	
2.4 Year of study	2	2.5 Semester	1	2.6 Evaluation	E
2.7 Type	Formative category				DD
	Opțional				DI

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28
3.7 Distribution of time (hours per semester) for:					hours
Manual, lecture material and notes, bibliography					24
Supplementary study in the library, online and in the field					10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					8
Tutoring					0
Exams and tests					2
Other activities					0

3.8	Total hours of individual study	44
3.9	Total hours per semester	100
3.10	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basic knowledge of dimensional and geometrical tolerancing
4.2	Competence	Basic knowledge of technical drawings and geometry

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	The practical applications are mandatory

6. Specific competences

Professional competences	C2. Combining the knowledge, principles and methods of the technical field with graphical representations in order to solve specific tasks C2.2 Use of software applications for assisted design of complex products. C.6. Planning, managing and quality assurance of the manufacturing processes
Cross competences	CT1. Promoting logical, convergent and divergent reasoning, practical applicability, assessment and self-evaluation in decision-making.

7. Discipline objectives (as results from the *key competences gained*)

7.1 General objective	Developing new skills in metrology, dimensional measurements, geometrical verification, interpretation and representation of geometrical and dimensional tolerances on technical drawings according to the ISO standards.
7.2 Specific objectives	The engineers will learn how to choose the correct measuring device to measure the given geometrical or dimensional tolerance. They will learn how to handle new devices such as 3D measuring and scanning devices.

8. Contents

8.1. Lecture (syllabus)	Hrs	Teaching methods	Notes
Introduction. The development of dimensional metrology. The place and importance of measurements and control in quality assurance	2	Video projector	Examples and discussions regarding the technical design and its impact on the finished product
Forms and dimensions.	2		
ISO system of limits and fits.	2		
Fit systems. Choosing the right fit. Tolerance Classes and recommended fits.	2		
Geometrical Tolerances. Tolerances of form	2		
Datums. Tolerances of orientation.	2		
Tolerances of location. Tolerances of runout	2		
Maximum and minimum material requirements	2		
Roughness, waviness and primary profile	2		
Measurement errors. Measurement uncertainty.	2		
General Toleranecs	2		
Chain of dimensions	2		

Coordinate measurements	2		
Surface Scanning	2		

Bibliography

1. Liviu Adrian Crișan, Mihai Tripa, Grigore Marian Pop "***Toleranțe și Ajustaje***", editura U.T. PRESS, ISBN 978-606-737-325-7, 2018, http://www.utcluj.ro/editura/;

2. Crisan, L.*Metode moderne de măsurare. Specificaţii geometrice ale produselor* – Editura DACIA, Cluj Napoca, 2004, ISBN 973-35-1840-9
3. Itu,T.,Tripa, M. – Tolerante si ajustaje – Editura U.T.PRESS, Cluj Napoca, 2008, ISBN 978-973-662-426-1
4. F. Charpentier, Handbook for the geometrical specification of products. The ISO-GPS standards, Edit. Réseau Canopé, ISBN : 978-2-240-03973-6, 2016
5. L. Mathieu, A. Ballu, "GPS card": A Tool for Univocal Expression of Geometrical Specifications, Proceedings of the 10th CIRP Seminar on Computer Aided Tolerancing, 2007, 1-10
6. Henzold, G.: Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection, A handbook for Geometrial Product Specification using ISO and ASME standards, second edition, 2010, ISBN 978-0-7506-6738-8.
7. Prof. Dr.-Ing. Bernd Klein, Toleranzmanagement Dimensionelle und Geometrische Produktspezifizierung durch, Universität Kassel
8. MUVOT- Blended Learning course on Measurement Uncertainty for advanced vocational training, Project Coordinator, Wojciech Plowucha, www.muvot.ath.eu.
9. Humienny, Z., s.a. - Geometrical Product Specifications. Course for Technical Universities, 2001

ISO GPS STANDARDS ***

8.2. Applications/Seminars	Hrs	Teaching methods	Notes
Introduction	2	Video projector	Choosing the right device for correct measurement
Gauge Blocks	2		
Dimensional measurements using calipers	2		
Dimensional measurements using micrometers	2		
Dimensional measurements using dial gauges	2		
Measurements of angles and cones	2		
Surface roughness measurement	2		
Calculation of ISO fits	2		
Geometrical dimensioning and Tolerances. 3D measurements	2		
Coordinate measurements I	2		
Coordinate measurements II	2		
3D Scanning. The use of 3D Scanning Machine.	2		
Chains of dimensions. Problem solving	2		
Final Test	2		

Bibliography

1. Liviu Crisan, Mihai Tripa, Pop Grigore, Control Dimensional, îndrumător pentru lucrări de laborator", editura U.T. PRESS, ISBN 978-606-737-027-0, 2014
2. Itu, T. ; Crişan, L.; Breazu, E. ; Pavel, C. -Toleranţe si măsurări tehnice. Lucrări de laborator. Lito IPCN 1990.
3. Itu, T. ; Crişan, L.; Ogrean, O. ; Pay, G. - Tolerante si control dimensional. Lucrări de laborator. Culegere de probleme. Lito Univ. Baia Mare 1993.
4. Itu,T.,Tripa, M. – Tolerante si ajustaje – Editura U.T.PRESS, Cluj Napoca, 2008, ISBN 978-973-662-426-1
5. Itu, T; Crisan, L.,s.a - *Toleranţe si măsurări tehnice*. Lucrări de laborator. Lito IPCN 1990.

ISO GPS STANDARDS ***

9. Bridging course contents with the expectations of the representatives of the community, professional associations, and employers in the field

The competences gained will be necessary for the engineers that work in companies having an activity domain in industrial engineering, mechanical engineering and design.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Theoretical problem solving	Written test	60%
Applications	Final Test	Practical test	40%
10.4 Minimum standard of performance: To solve the problems according to a grade of 5			

Data completãrii:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	Curs	Prof. dr. ing. Crișan Liviu Adrian, liviu.crisan@muri.utcluj.ro	
	Aplicații	Conf. Dr. Ing. Pop Grigore Marian, grigore.pop@muri.utcluj.ro	

Data avizãrii în Consiliul Departamentului	Director Departament .... Prof.dr.ing. Calin Neamtu
Data aprobãrii în Consiliul Facultãții …………..	Decan Prof.dr.ing. Corina Barleanu

SYLLABUS

1. Information about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor
1.6 Program of study / Qualification	Robotics / Mechanical engineer
1.7 Form of education	FT – Full time
1.8 Subject code	25.00

2. Information about the subject

2.1 Subject name	Computer-Aided Graphics				
2.2 Course responsible	Assoc.prof.dr.eng. Ștefan BODI – stefan.bodi@muri.utcluj.ro				
2.3 Seminar / **Laboratory applications** / Project applications responsible	Lect.dr.eng. Zsolt Levente BUNA – zsolt.buna@muri.utcluj.ro				
2.4 Year of study	2	2.5 Semester	1	2.6 Method of assessment	C
2.7 Subject category	Formative category				DF
	Optionality				DI

3. Estimated total time

3.1 Number of hours per week	5	of which:	3.2 Course	2	3.3 Seminars	0	3.3 Laboratory	2	3.3 Project	1
3.4 Number of hours per semester	70	of which:	3.5 Course	28	3.6 Seminars	0	3.6 Laboratory	28	3.6 Project	14
3.7 Distribution of time (hours per semester) for:										
(a) Study after the textbook, course support, bibliography, and course notes										6
(b) Supplementary study in the library, on specialty electronic platforms and in the field										8
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										12
(d) Tutoring										2
(e) Exams and tests										2
(f) Other activities:										0

3.8 Total hours of individual study (sum of (3.7(a)…3.7(f))	30
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 of curriculum	Descriptive Geometry and Technical Drawing and Infographics
4.2 of competences	Understanding and interpreting technical drawings

5. Requirements (where appropriate)

5.1. for the course	It’s not necessary
5.2. for the seminar / laboratory applications / project applications	The attendance to the laboratory applications is mandatory.

6. Specific competences

Professional competences	C2.3. Development of schematics (kinematic, pneumatic, hydraulic, etc.), technical drawings, technological plan, product manual and test manual for mechatronic and robotic subsystems. C5.4. The use of 2D/3D assisted design methods, parameterized 3D modeling and assisted simulation of the operation of industrial robots, feeding systems, transport, transfer, peri-robotic systems, and related systems to evaluate the performance of these subsystems, in order to optimally implement them in robotic applications for different technological processes
Cross competences	CT1. Fulfilling the professional tasks with exact identification of the objectives, of the available resources, of the conditions for their completion, of the working stages, of the working time and of the related accomplishment deadlines. CT3. Identifying the need for continuous training and the effective use of information sources and communication resources and assisted professional training (internet portals, specialized software applications, databases, online courses, etc.), both in Romanian and in an international language.

7. Subject objectives (as result from the key competency grid)

7.1 General objective	Designing and creating partial assemblies through mid-level 2D and 3D aided design tools, explaining and interpreting operating procedures in common 2D and 3D CAD work environments.
7.2 Specific objectives	Students learn the following aspects: - the basic principles of 2D design in AutoCAD; - the basic principles of 3D modeling in SolidWorks; - general aspects regarding the design of components in the context of the assembly; - the basic principles regarding drafting drawings for individual components and assemblies.

8. Contents

8.1 Lecture (syllabus)	No. of h	Teaching methods	Notes
1. Basic concepts of computer-aided graphics: From 2D to 3D.	2	- Presentations with media/video - Case studies and exercises; - Discussions on concepts and documents specific to the field - Q&A session;	
2. AutoCAD: Introducing the interface, the command tab for creating basic geometric shapes and the command tab for editing existing geometrical elements.	2		
3. AutoCAD: Defining and using layers in 2D drawings. Annotating technical drawings.	2		
4. AutoCAD: Using parametric constraints in 2D drawings. Presenting the “Parametric design” capabilities.	2		
5. SolidWorks: Introducing the interface and the command tab for generating solid bodies – basic methods.	2		
6. SolidWorks: Generating solid bodies – advanced modeling methods.	2		
7. SolidWorks: Inserting and assembling existing 3D SW components / models. Importing non-SW models.	2		
8. SolidWorks Motion: Animating the assembling and motion of 3D assemblies	2		
9. SolidWorks: Generation of 2D documentation – Technical drawings for individual components and assemblies.	2		
10. SolidWorks Evaluate: Measuring dimensions and mass of existing components. Geometry analysis.	2		
11. SolidWorks Toolbox: Using and editing existing SW models from the toolbox.	2		

12. SolidWorks Simulation: Completing a finite elements analysis for an existing 3D model. Improving the design of an existing 3D model and comparing results of the initial and final finite element analyzes.	2		
13. SolidWorks Plastics: Simulating the injection molding process for an existing 3D model.	2		
14. SolidWorks PhotoView 360 & Render tools: Creating and defining rendering scenes, editing the default visuals of components and using background elements. Rendering models / assemblies	2		

Bibliography:

1. Popescu Daniela, Popișter Florin, Neamțu Călin – AutoCAD 2013, Laboratory guide, ISBN 978-606-543-357-1, Mega Publishing, 2013.
2. Neamțu Călin, Popescu Daniela, Curta Răzvan, Comes Radu, Bodi Ștefan, – SolidWorks 2016 – Student's guide, ISBN 978-606-543-907-8, Mega Publishing, 2017.

Internet resources:

1. Online learning resources developed by Autodesk, provided through the Autodesk Education community (https://www.autodesk.com/education/home).
2. The official courses of SolidWorks developed by Dassault Systemes, provided through the Dassault Systemes Resource Center and the 3DSAcademy platform (academy.3ds.com).

Other:

1. Lecture notes

8.2 Seminars / **laboratory applications** / project applications	No. of h	Teaching methods	Notes
1. AutoCAD: Accommodating with the software's interface. Configuring the workspace.	2	- Practical exercises in 3D media - 3D models and their analysis - Use of IT&C elements	
2. AutoCAD: Basic commands regarding the creation and editing of technical drawings.	2		
3. AutoCAD: Recreating 2D drawings using layers. Annotating technical drawings.	2		
4. AutoCAD: Parametric design.	2		
5. SolidWorks: Accommodating with the software's interface. Configuring the workspace.	2		
6. SolidWorks: Using commands to generate profiles and 2D sketches.	2		
7. SolidWorks: Basic commands for generating 3D solids.	2		
8. SolidWorks: Modeling in the context of an assembly.	2		
9. SolidWorks. Assembling existing SW components. Importing, editing and assembling non-SW components.	2		
10. SolidWorks: Creating technical drawings based on existing 3D models.	2		
11. SolidWorks: Creating technical drawings for assemblies.	2		
12. SolidWorks: Simulations (Finite Element Analysis)	2		
13. SolidWorks: Simulations (SolidWorks Plastics)	2		
14. SolidWorks: Rendering 3D models and assemblies	2		

Bibliography:

1. Popescu Daniela, Popișter Florin, Neamțu Călin – AutoCAD 2013, Laboratory guide, ISBN 978-606-543-357-1, Mega Publishing, 2013.
2. Neamțu Călin, Popescu Daniela, Curta Răzvan, Comes Radu, Bodi Ștefan, – SolidWorks 2016 – Student's guide, ISBN 978-606-543-907-8, Mega Publishing, 2017.

Internet resources:

1. Online learning resources developed by Autodesk, provided through the Autodesk Education community (https://www.autodesk.com/education/home).

2. The official courses of SolidWorks developed by Dassault Systemes, provided through the Dassault Systemes Resource Center and the 3DSAcademy platform (academy.3ds.com). Other: 1. Lecture notes

9. Bridging course contents with the expectations of the representatives of the community, professional associations, and employers in the field

AutoCAD is the most widespread CAD program at the moment, and perhaps the most widely used. In the context of digitization and virtualization, every mechanical engineer should know and be able to use this software program. In the current labor market, knowing how to use this program is often the minimum requirement imposed for a graduate to be accepted to an interview by most employers. SolidWorks is the low-cost 3D modeling solution used on a large scale in Romania for modeling parts and assemblies. 3D modeling is a clear requirement in almost all enterprises that specifically focus on the production of industrial equipment and installations, whether they are created in-house or manufactured under license.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The ability to reproduce a 2D technical drawing in AutoCAD, correct in terms of lines used, dimensions, hashes used and annotations on the drawing. The work technique is also be evaluated. The ability to 3D model a workpiece, starting from a 2D drawing. Correctness of sketches and geometric and dimensional constraints. The correctness of the technical drawing created for the modeled workpiece. The ability to correctly assemble an assembly based on its geometrical features.	2,5-hour practical exam with the following topics: a drawing in AutoCAD, modeling a 3D part in SolidWorks, generating its technical drawing and assembling existing components of an assembly (C).	66.7%
10.5 Seminar /**Laboratory appl.** /Project appl.	Classroom activity during the semester. Complexity and correctness of drawings and 3D models created during home work.	Grade on laboratory activity (L)	33.3%
10.6 Minimum standard of performance • G = 0,667* C + 0,333 * L Condition for obtaining the credits: G≥5; C≥5; L≥5			

Date of filling in:	Responsible	Title First name LAST NAME	Signature
	Course	Assoc.prof.dr.eng. Ștefan BODI	
	Applications	Lect.dr.eng. Zsolt Levente BUNA	

Date of approval in the department council	Head of department, Prof.dr.eng. Călin NEAMȚU
Date of approval in the faculty council	Dean, Prof.dr.eng. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of INDUSTRIAL ENGINEERING, ROBOTICS AND PRODUCTION MANAGEMENT
1.3	Department	Design Engineering and Robotics
1.4	Field of study	MECHATRONICS AND ROBOTICS
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	ROBOTICS (IN ENGLISH LANGUAGE)/Engineer
1.7	Form of education	Full time
1.8	Subject code	26.00

2. Data about the subject

2.1	Subject name			Electronics and Automation			
2.2	Subject area			Robotics			
2.2	Course responsible/lecturer			Conf.dr.ing. Rusu-Both Roxana – roxana.both@aut.utcluj.ro			
2.3	Teachers in charge of seminars			Conf.dr.ing. Rusu-Both Roxana – roxana.both@aut.utcluj.ro			
2.4 Year of study	2	2.5 Semester	1	2.6 Assessment	C		
2.7 Subject category	Formative category					DD	
	Optionality					DI	

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	100	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	14
(b) Supplementary study in the library, online and in the field	14
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Physics, Electrotechnics
4.2	Competence	• control principles torque / speed for DC and AC motors, • electrical circuits supply problem

5. Requirements (where appropriate)

5.1	For the course	• Study of the bibliographic materials
5.2	For the applications	• The attendance at the laboratory is compulsory • Laboratory preparation

6. Specific competences

Professional competences	C3.1. Description of the specific technical terminology and the basic conceptual elements of the systems (mechanical, pneumatic hydraulic, electrical, electronics, optical, informatics, etc.) used in mechatronics and robotics for the implementation of local automation systems C3.2. Explaining and interpreting and using the operating principles of the subsystems (mechanical, hydraulic, electrical, optical pneumatic, etc.) in the design and implementation of block and operating schemes for local automation systems used in mechatronics and robotics C3.5. Elaboration of technical execution projects for basic partial assemblies (mechanical, pneumatic, hydraulic, electrical, etc.) used in mechatronics and robotics for local automation
Cross competences	CT1. Completion of the professional tasks with exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working time and the related implementation deadlines CT2. Responsible execution of multidisciplinary work tasks with assuming roles on different hierarchical levels

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Development of skills for design, implementation, testing and integration of electrical subsystems in complex control loops used in automated robotic applications and correct use of automation concepts
7.2	Specific objectives	• Knowing the structure, characteristics and operation modes for semiconductor devices • Knowing the structure, characteristic, function and applications of specific fundamental electronics circuits • Integration of the fundamental electronic circuits in a complex control loop for robotic applications • Identification of the control engineering related concepts • Interpreting the automation problems for different types of processes • Solving the tuning problem for different types of controllers • Evaluating the closed loop performance • Configuration and implementation of controllers

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes

C1. Introductory notions. Elements of electronic circuits. Passive circuit elements. Semiconductor devices	2	Systematic presentation, Conversation, Discussions Proof	
C2. Families of semiconductor devices. Bipolar, Monopolar and hybrid semiconductor devices. Characteristics, behavior, functional elements, possibilities of control	2		
C3. DC and AC amplifiers. Structure, operating principle, polarization problem. Determination of the steady-state operating point for amplifiers.	2		
C4. Differential amplifier. Operational amplifier. Applications of the integrated operational amplifier	2		
C5. Sinusoidal and non-sinusoidal oscillators	2		
C6. Uncontrolled and controlled rectifiers	2		
C7. Digital Integrated Circuits. Fundamental Logic Gates. Combinational Logic Circuits: analysis and synthesis	2		
C8. Specific electronic circuits in robotic control applications	2		
C9. Control systems. Structure. Properties. Equivalent schemes. Continuous, discrete and random signals in automatic control systems. Transfer function and system stability	2		
C10. System Identification	2		
C11. Analog and digital controllers. Structure, advantages and disadvantages	2		
C12. Analog control system design	2		
C13. Digital control system design	2		
C14. Case studies, applications in industrial robotics	2		

Bibliography
1. Festila, Cl., Both, R. – Electronica - Indrumator de lucrari - , Cluj Napoca, 2009
2.C. Feştilă, E. Szakaks, J. Ciura, Power electronics in automatic control, Ed. Mediamira, Cluj-Napoca, 1999, ISBN 973-9358-26-8, 339 pag.
3. Cl.Feştilă, M. Abrudean, Eva Dulf, *Electronică de putere în automaticã*, Mediamira, 2004.
4. JOHNSON Michael A., editor MORADI Mohammad H., editor, PID control : new identification and design methods, London, 2005
5. DORF, Richard C., BISHOP, Robert H., Modern control systems, 12th ed., international edition, Upper Saddle River, NJ : Pearson Education, 2011
6. OGATA, K., Matlab for Control Engineers, Prentice Hall, 2007

8.2. Seminars /Laboratory/Project	Numbe r of hours	Teaching methods	Notes
L1. NTS rules. Presentation of the laboratory works. Study of rectifier diodes, stabilizing diodes, photodiodes, LED, etc.	2	Conversation Individual experimentation Brainstorming	
L2. Study of the bipolar transistor and thyristor	2		
L3. Uncontrolled/ controlled rectifiers			

L4. Small signal A.C. amplifiers with bipolar transistor	2	Case studies	
L5. Oscillators	2		
L6. DC Voltage stabilizers	2		
L7. Integrated circuits. Logic gates	2		
L8. Introduction to Matlab/SIMULINK software. Transfer functions. System response	2		
L9. Performance measures for control systems	2		
L10. Stability analysis using Matlab	2		
L11. System identification methods using Matlab	2		
L12. Analog controller design using Matlab	2		
L13. Digital controller design using Matlab	2		
L14. Robot control loop design	2		

Bibliography

1. Festila, Cl., Both, R. – Electronica - Indrumator de lucrari - , Cluj Napoca, 2009
2.C. Feştilă, E. Szakaks, J. Ciura, Power electronics in automatic control, Ed. Mediamira, Cluj-Napoca, 1999, ISBN 973-9358-26-8, 339 pag.
3. Cl.Feştilă, M. Abrudean, Eva Dulf, *Electronică de putere în automatică*, Mediamira, 2004.
4. JOHNSON Michael A., editor MORADI Mohammad H., editor, PID control : new identification and design methods, London, 2005
5. DORF, Richard C., BISHOP, Robert H., Modern control systems, 12th ed., international edition, Upper Saddle River, NJ : Pearson Education, 2011
6. OGATA, K., Matlab for Control Engineers, Prentice Hall, 2007

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The course content was discussed with representatives of prestigious companies in the field in Romania, Europe and the United States and reviewed repeatedly by Government Agencies in Romania (CNEAA ARACIS).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Cumulative knowledge	Written final exam	70%
10.5 Seminars /Laboratory/Project	Laboratory tests	Grading of the laboratory tests and/or reports and oral evaluation	30%
10.6 Minimum standard of performance			
N=0.7*C+0.3*L, N>5, C>5, L>5			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Conf.dr.ing. Roxana Rusu-Both	
	Teachers in charge of application	Conf.dr.ing. Roxana Rusu-Both	

Date of approval in the department ....

____

Head of department
Prof.dr.ing.

Date of approval in the faculty ....

____

Dean
Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	27.00

2. Data about the subject

2.1	Subject name	Driving systems					
2.2	Subject area	DD					
2.3	Course responsible/lecturer	Lecturer PhD Engg. Mircea MURAR mircea.murar@muri.utcluj.ro Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro					
2.4	Teachers in charge of seminars	Lecturer PhD Engg. Mircea MURAR Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro					
2.5 Year of study	II	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DOB

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	14
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	6
Tutoring	0
Exams and tests	2
Other activities	0

3.7	Total hours of individual study	30
3.8	Total hours per semester	86
3.9	Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Electric machines, Electronics and Automation, Basics of automation systems, Mechanics.
4.2	Competence	Programming languages, English language

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre or classroom with video projector

5.2	For the applications	Class room equipped with computers, programs and platforms that are specific to the discipline. Presence is mandatory.

6. Specific competences

Professional competences	• Understand the operating principles of electrical machines and their operating modes. • Develop the ability to design and select the equipment of a driving system. • Ability to understand electrical and technological diagrams. • Develop the skills required to integrate, configure and parameterize process equipment with equipment specific to driving systems.
Cross competences	• Ability to identify the functionality of electric drives and their parts. • Ability to identify from datasheets the most important characteristics and features of the driving systems. • Develop communication skills in teamwork activities with professionals from related fields.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Understand the concepts specific to the design and automation of driving systems.
7.2	Specific objectives	• Understand the electrical and technological diagrams of driving systems. • Ability to select the control and protection equipment that meet the requirements of electrical drives working loads. • Interface drive systems with control units and develop control programs.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Electric drives for DC and AC motors.	Presentation, Slideshow, Hands-On, Demonstrations, Discussions Questions and Answers	
2.	Protection, control and command of electrical driving systems.		
3.	The operating principle and integration of motor soft-starter.		
4.	The operating principle and integration of variable frequency drives.		
5.	Selecting the electric motors and the driving equipment considering working loads.		
6.	Design of electric drive systems.		
7.	Automation of electrical drive systems using industrial control units.		
8.	Hydraulic power sources. Pumps.		
9.	Pressure regulating apparatus.		
10.	Flow rate control device.		
11.	Distribution equipment		
12.	Hydraulic linear / oscillating / rotary motors		

13.	Development and dimensioning of hydraulic schemes.		
14.	Hydraulic drive systems for industrial robots. Case studies.		

Bibliography

- Rockis, G.; Mazur, G.A.; Electrical Motor Controls for Integrated Systems 5th Edition (2013), ISBN-13: 978-0826912268, Amer Technical Pub.
- Hughes, A.; Drury, B.; Electric Motors and Drives: Fundamentals, Types and Applications, 4th Edition (2013), ISBN-13: 978-0080983325, Newnes
- Laughtonm, M.A.; Warne, D.F.; Electrical Engineer's Reference Book, Sixteenth Edition 16th Edition (2002), ISBN-13: 978-0071762328, McGraw-Hill Education.
- Kelemen, A; Actionari electrice (1979), Editura Didactica si Pedagogica.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Reading electrical symbols and execution of electric diagrams of electrical driving systems.	Driving systems and control of a pumping station. Driving system and control for a blower using a VSD Driving system and control of a motor with soft-starter Measuring equipment	
2.	DC drives control – starting, breaking, speed and direction control.		
3.	AC drives control – direct control, start-delta starting, parametrization and control of soft-starters.		
4.	Frequency convertors parametrization and control of induction motors – start, direction and speed control, closed-loop PID control		
5.	Automation of electric drive systems – interconnection of drive equipment with intelligent relay control units.		
6.	Automation of electric drive systems – development of automation systems applications for driving systems.		
7.	Automation of electric drive systems – control units control and parameters visualization using mobile devices.		
8.	Determination of force / displacement characteristics for a proportional electromagnet.		
9.	Regulatory proportional, integral, derivative. Determination of P, I, and D constants		
10.	Determination of static characteristic, Q = f (p), for droplets and proportional flow regulators.		
11.	Determination of the step signal response for the proportional pressure limiting valve.		
12.	Determining pressure-flow characteristics for a pressure limiting valve.		
13.	Determining the positioning precision of a linear electrohydraulic axis correlated with the displacement speed.		
14.	Robot Servo-Hydraulic Circuits. Case Study.		

Bibliography

- Rockis, G.; Mazur, G.A.; Electrical Motor Controls for Integrated Systems 5th Edition (2013), ISBN-13: 978-0826912268, Amer Technical Pub.
- Hughes, A.; Drury, B.; Electric Motors and Drives: Fundamentals, Types and Applications, 4th Edition (2013), ISBN-13: 978-0080983325, Newnes
- Laughtonm, M.A.; Warne, D.F.; Electrical Engineer's Reference Book, Sixteenth Edition 16th Edition

(2002), ISBN-13: 978-0071762328, McGraw-Hill Education.
- Kelemen, A; Actionari electrice (1979), Editura Didactica si Pedagogica.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Identify specific requirements of companies in the field of driving systems for equipment and processes and update the lectures and applications.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Understand the principles exposed and experienced in the classes.	Written assessment at the end of semester.	40 %
Applications	Development of applications during applications classes.	Results of individual subjects in application classes	60 %
10.4 Minimum standard of performance			
• Final grade must be over 6			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Lecturer PhD Eng. Mircea MURAR Lecturer PhD Eng. Ionut Chis	
	Teachers in charge of application	Lecturer PhD Eng. Mircea MURAR Lecturer PhD Eng. Ionut Chis	

Date of approval in the department .... ________________________	Head of department Prof. PhD. Eng. Claudiu Raţiu
Date of approval in the faculty .... ________________________	Dean Prof. PhD. Eng. Nicolae Balc

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Industrial Design and Robotics
1.4	Field of study	Industrial engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	28.20

2. Data about the subject

2.1	Subject name				Creativity and inventics		
2.2	Subject area						
2.2	Course responsible/lecturer				Lecturer dr.eng. Emanuela Pop, emanuela.pop@muri.utcluj.ro		
2.3	Teachers in charge of seminars				Lecturer dr.eng. Emanuela Pop, emanuela.pop@muri.utcluj.ro		
2.4 Year of study		2	2.5 Semester	3	2.6 Assessment	C	
2.7 Subject category		Formative category					DC
		Optionality					DO

3. Estimated total time

3.1 Number of hours per week	2	of which	3.2 Course	1	3.3 Seminar	1	3.3 Laborator		3.3 Proiect	
3.4 Total hours in the curriculum	28	of which	3.5 Course	14	3.6 Seminar	14	3.6 Laborator		3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	8
(b) Supplementary study in the library, online and in the field	6
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	5
(d) Tutoring	1
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	22
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	

	seminarului / laboratorului / proiectului	

6. Specific competences

Professional competences	C1.2.
Cross competences	CT1. CT2.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Developing general technical skills, creativity, ethics and intellectual property in the context of the development of technical civilization
7.2	Specific objectives	Assimilation of general technical knowledge. Obtaining creativity skills. Applying ethics and respecting intellectual property.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Achievements and technologies that have changed the world. General considerations. Early metallurgy. Drive systems. Engines. Electric current - light and force. Communication systems.	2	exposure + conversation	
Evolution of machine tools and manufacturing systems. Chronological landmarks. From tools to machine tools.	2		
Methods and techniques to stimulate creativity. General aspects. Creativity models.	2		
Intuitive techniques of creativity. Logic-intuitive methods of creativity.	2		
General Aspects of Ethics in Scientific Research	2		
Industrial property. Protection of inventions, trademarks, designs and industrial designs	2		
Case studies of counterfeiting in intellectual property	2		

Bibliography

1. Ciupan, C. Creativitate tehnică, Editura Dacia, Cluj-Napoca, 1999.
2. Ciupan, C., Julean D., Galiş M. Istoria tehnicii şi design în context. Elemente de referinţă. Editura UT PRES, Cluj-Napoca, 2002.

3. Ciupan, C., Ciupan E. Proprietate intelectuală. Editura UT PRES, Cluj-Napoca, 2014.

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Logic-intuitive methods and techniques of creativity. Case Study	2	Reports, debates	
Concept of new products. Case Study. Product and market analysis. Design specifications	2		
Concept of new products. Case Study. Conceptual solutions	2		
Copyright. Plagiarism and auto-plagiarism.	2		
Inventions. The patent documentation	2		
Protection of industrial designs and designs. Brand protection. Case Study	2		
Case study. Counterfeiting in industrial property	2		
Bibliography			

9. **Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

10. **Evaluation**

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	the correctness and completeness of knowledge; logical coherence interest for individual study	Written paper – 2h Active participation	40% 10%
10.5 Seminars /Laboratory/Project	the ability to operate with assimilated knowledge interest in practical applications	Report Active participation	40% 10%
10.6 Minimum standard of performance			
Basic knowledge of the evolution of manufacturing equipment. The main violations from ethics in scientific research. Knowledge of intellectual property objects.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Lecturer dr.eng. Pop Emanuela	
	Teachers in charge of application	Lecturer dr.eng. Pop Emanuela	

Date of approval in the department ....

Head of department
Prof.dr.ing.

Date of approval in the faculty ....

Dean
Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Robotics (Instruction in English)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	28.10

2. Data about the subject

2.1	Subject name			Modern Languages III English			
2.2	Subject area			Foreign Languages			
2.3	Course responsible/lecturer			N/A			
2.4	Teachers in charge of seminars			Lect. dr. Cecilia Policsek Cecilia.Policsek@lang.utcluj.ro			
2.5 Year of study	2	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DC/DO

3. Estimated total time

3.1 Number of hours per week	2	3.2 of which, course:	1	3.3 applications:	1
3.4 Total hours in the curriculum	28	3.5 of which, course:	14	3.6 applications:	14
Individual study					hours
Manual, lecture material and notes, bibliography					6
Supplementary study in the library, online and in the field					
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					5
Tutoring					
Exams and tests					
Other activities					

3.7	Total hours of individual study	11
3.8	Total hours per semester	28
3.9	Number of credit points	2.0

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general English minimum B1 CEFR

5. **Requirements (where appropriate)**

5.1	For the course	N/A
5.2	For the applications	Class attendance, individual study and homework completion

6. **Specific competences**

Professional competences	A good command of the relevant vocabulary used in professional contexts; development of the ability to understand written technical English
Cross competences	Development of the students' ability to process academic information and prepare for their career; improved written communication competence, which is to grant a better adjustment to a multicultural work environment; development of the students' intercultural communication competence

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	The students should develop skills to communicate effectively in a foreign language in professional contexts
7.2	Specific objectives	At the end of this seminar, the students will be able to: --prove better ability to write about topics related to their specialization --use key terms that belong to branches of technology of relevance to their specialization --prove better ability to listen for detail in relation to conversations and talks on technical topics

8. **Contents**

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	General introduction	Interactive teaching, student projects	
2.	The Importance of writing for scientists and engineers. Types of documents		
3.	Types of communication. Academic and professional English		
4.	Readability. The formal register		
5.	Fundamentals of technical writing		
6.	The stages of the writing process		
7.	The writing process. Remarks regarding vocabulary		
8.	Reference to graphs, diagrams and statistics		
9.	The writing process. Remarks regarding grammar		

10.	The sentence, the compound sentence and the paragraph. Paragraph development		
11.	Punctuation. Common spelling mistakes		
12.	Avoiding plagiarism. Paraphrazing. Working with sources		
13.	Citation styles and working with sources		
14.	Writing and critical thinking		
8.2 Seminar (syllabus)			
1.	Exercises to identify types of audience and rhetorical situations		
2.	Exercises to illustrate the characteristics of professional English		
3.	Nouns, verbs, adjectives, and adverbs used in academic English		
4.	The use of formal register		
5.	Exercises to illustrate the characteristics of technical documents		
6.	Exercises regarding the stages of the witing process		
7.	The use of synonyms, paronyms and British English vs. American English		
8.	The use of verbal tenses		
9.	The use of connectors, paragraph writing and paragraph development		
10.	Spelling exercises		
11.	Summary writing and working with sources		
12.	Presentation of student projects and feedback		
13.	Presentation of student projects and feedback		
14.	Test		

Lecture bibliography:

Hewings, M. (2011). *Advanced Grammar in Use*. Cambridge: Cambridge University Press.

Grănescu, M. and E. Adam (2010). *Effective Academic and Technical Writing*. Cluj-Napoca: UTPRESS.

“Online Writing Lab—Purdue University”, https://owl.purdue.edu/owl/purdue_owl.html

“British Council—Learn English Online”, https://learnenglish.britishcouncil.org/

Seminar bibliography:

Boyle, M. and L. Warwick (2018). *Skillful Reading & Writing 4.* Student’s Book. London: Macmillan.

Downes, C. (2015). *Cambridge English for Job-hunting*. Cambridge: Cambridge University Press.

McCarthy, Michael and Felicity O'Dell (2019). *Academic Vocabulary in Use*. Cambridge: Cambridge University Press.

McCarthy, Michael and Felicity O'Dell (2019). *English Vocabulary in Use*. Cambridge: Cambridge University Press.

“Online Writing Lab—Purdue University”, https://owl.purdue.edu/owl/purdue_owl.html “British Council—Learn English Online”, https://learnenglish.britishcouncil.org/

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The improvement of the students’ ability to communicate in English in technical contexts is to ensure a successful adjustment to multicultural work environments.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Lecture		Final test	50%
Applications		Student projects	50%
10.4 Minimum standard of performance: defence of the project and satisfactory completion of at least 50% of the final test			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Senior Lecturer Cecilia Policsek, Ph. D.	
	Teachers in charge of application		

Date of approval in the department	Head of department Associate Prof. Ruxanda Literat, Ph. D.
Date of approval in the faculty	Dean Prof. eng. Corina Julieta Bârleanu, Ph. D.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics (Instruction in English)
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics (in English) / Engineer
1.7	Form of education	Full time
1.8	Subject code	28.20

2. Data about the subject

2.1	Subject name	Modern Languages III French					
2.2	Subject area	Modern Languages					
2.3	Course responsible/lecturer						
2.4	Teachers in charge of seminars	Assoc. Prof. Dr. Cristiana Bulgaru, Cristiana.Bulgaru@lang.utcluj.ro					
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DC, DO

3.Estimated total time

3.1 Number of hours per week	2	3.2 of which, course:	1	3.3 applications:	11
3.4 Total hours in the curriculum	50	3.5 of which, course:	14	3.6 applications:	14

Individual study	hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	4
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	8
Tutoring	
Exams and tests	2
Other activities	

3.7	Total hours of individual study	22
3.8	Total hours per semester	50
3.9	Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of general French minimum A2-B1(CEFR)

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Class attendance, individual study and homework completion

6. Specific competences

Professional competences	●A good command of the relevant vocabulary used in professional contexts, a special focus being placed on reading and wrtiting activities; ● Development of the ability to understand spoken and written technical French; ● Use of French in conversations and talks on technical topics; ●Iimprovement of the ability to work in teams.
Cross competences	● **CT1** The application of the values and ethics of the engineering profession and the responsible completion of professional tasks under conditions of limited autonomy and qualified assistance. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-assessment in decision-making. **Responsible performance of professional tasks.** ●**CT2** Carrying out activities and exercising the specific roles of teamwork on different hierarchical levels. Promoting the sense of initiative, dialogue, cooperation, positive attitude and respect for others, diversity and multiculturalism, and continuous improvement of one's own activity. **Communication and teamwork.** ●**CT3** Objective self-assessment of the need for continuous professional training in order successfully apply for a position in one’s area of specialization and to adapt to the dynamics of labour market requirements, and for personal and professional development. Effective use of language skills and knowledge of information and communication technology. **Aware of the need for continuous training.**

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	● Developing the competence of written and oral communication in scientific and technical contexts.
7.2	Specific objectives	●Learning basic vocabulary related to the students’ specialization and the fields related to science and engineering. ●Effective use of the linguistic and communication skills in a foreign language

88.Contents

8.1 Lecture	Teaching methods	Observaţii
1**. From general foreign language to specialized one.** Vocabulary, grammar and style characteristics 2. **The industrial material.** Origin, manufactuing, characteristics, typical discourse-related structures. Methods of enriching vocabulary: the use of suffixes and prefixes (1). The use of reflexive structures. 3. **Machining operations. Presenting the stages of a process**. Typical discourse-related structures. Methods of enriching vocabulary: the use of suffixes and prefixes (2). Common connectors. 4. **Industrial equipment. Description. Uses**. Typical discourse-related structures. Methods of enriching vocabulary: word formation and abbreviation. **5. Parts, devices, elements – description, uses**. The Passive Structure. **6. Revision.**	-presenting new contents (vocabulary, grammar); -textual analysis; -practising through exercises; - listening to audio material; -conversation, monologue, role-playing game	

7. Written test.		
8.2 Seminar	Teaching methods	Notes
1. The titanium – physical and chemical properties; industrial, aerospatial and medical applications. The comparison of the Adjective, Noun, Adverb and Verb. **2. The Robot and Robotics. A short history**. Expressing the past. **3. The medical robot : applications, functions**.The stages of a process. **4. Domestic robots**. Instructions.The Infinitive with the value of The Imperative. Word formation. **5. The industrial robot and its applications.** The use of suffixes and prefixes. **6. Nanorobots, nanotechnologies. Applications. Trends.** The use of suffixes and prefixes..Expressing the future. **7. Oral assessmen**t (a short monologue, on a topic chosen by the student the first seminar by drawing lots, from a number of topics on the instructor's list).	-presenting new contents (vocabulary, grammar); -textual analysis; -practising through exercises; - listening to audio material; -conversation, monologue, role-playing game	

Bibliography

1. Teşculă, C., *Le français de la technique: lexique,grammaire et structures du discours*, Ed. UTPRES, Cluj-Napoca, 2005
2.Ioani, M., *Le français de la communication scientifique et technique,*Ed. Napoca Star, Cluj-Napoca,2002
3.Pãun, C., *Limba franceză pentru ştiinţă şi tehnică*, Ed. Niculescu, Bucureşti, 1999
4. Parizet, M.L., Grandet, E., Corsain, M., *Activités pour le Cadre Européen Commun de Référence – Niveau B1*, Ed. Clé International, 2005
5. Miquel, C., *Grammaire en dialogues – niveau intermédiaire*, Ed. Clé International, 2007

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The improvement of the students' ability to communicate in French in technical contexts is to ensure a successful adjustment to multicultural work environments.

10.Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course			
Applications	Completing the tasks of the written test, having a conversation or holding a monologue, seminar activity + homework	A written test Oral evaluation + seminar activity (active participation, homework completed)	Final test: 40 % Oral examination: 30%, Seminar activity 30%
10.4 Minimum standard of performance:			
M= FT +OE +SA Each component of the mark is granted if the tasks have been solved correctly in a proportion of min. 60%			

Date of filling in :	Teachers in charge	**Title, Name**	**Signature**
	Lectures	Assoc.Prof.Dr. Cristiana Bulgaru	
	Seminars	Assoc. Prof. Dr. Cristiana Bulgaru	

Date of approval in the Department’s Board	Head of Department Assoc. Prof. Dr. Ruxanda Literat
Date of approval in the IIRMP Faculty Council	Dean Prof. Dr. Eng. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Modern Languages and Communication
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics (in English Language)
1.7	Form of education	Full time
1.8	Subject code	28.50

2. Data about the subject

2.1	Subject name			Modern Languages III German			
2.2	Subject area			Foreign Languages			
2.3	Course responsible/lecturer			Lect.dr. Mona Tripon, Tripon.Mona@lang.utcluj.ro			
2.4	Teachers in charge of seminars			Lect.dr. Mona Tripon, Tripon.Mona@lang.utcluj.ro			
2.5 Year of study	2	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DC/DO

3. Estimated total time

3.1 Number of hours per week	1	3.2 of which, course:	1	3.3 applications:	1
3.4 Total hours in the curriculum	50	3.5 of which, course:	14	3.6 applications:	14
Individual study					hours
Manual, lecture material and notes, bibliography					6
Supplementary study in the library, online and in the field					6
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					8
Tutoring					
Exams and tests					2
Other activities					

3.7	Total hours of individual study	22
3.8	Total hours per semester	50
3.9	Number of credit points	2.0

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Knowledge of German minimum B1 CEFR

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Class attendance, individual study and homework completion

6. Specific competences

Professional competences	A good command of the relevant vocabulary used in professional contexts; development of the ability to understand written technical German
Cross competences	Development of the students' ability to process academic information and prepare for their career; improved written communication competence, which is to grant a better adjustment to a multicultural work environment; development of the students' intercultural communication competence

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	The students should develop skills to communicate effectively in a foreign language in professional contexts
7.2	Specific objectives	At the end of this seminar, the students will be able to: --prove better ability to write about topics related to their specialization --use key terms that belong to branches of technology of relevance to their specialization --prove better ability to listen for detail in relation to conversations and talks on technical topics

8. Contents

8.1.Lecture (syllabus)		Teaching methods	Notes
1.	From general language to language for specific purposes.	Interactive teaching, student projects	
2.	Lexical and grammatical characteristics of written texts. Stylistic aspects of technical texts.		
3.	Industrial materials. Source, processing, characteristics; specific discursive structures. Ways to enrich vocabulary: suffixing and prefixing (1). Reflective construction.		
4.	Industrial operations. Specific discursive structures. Ways of enriching vocabulary: (2). Specific connectors.		
5.	Industrial equipment. Description. Functionality. Specific discursive structures. German compound nouns, neologisms and Anglicisms		

6.	Describing devices and operations. Passive construction.		
7.	Written test.		
8.2 Seminar (syllabus)			
1.	Materials and their properties. Comparison of adjectives. Verbal constructions		
2.	Robots and robotics. Expressing the past. The sequence of tenses		
3.	Medical robots: applications, functionalities. Expressing the stages of a process.		
4.	Home appliance robots. The user´s manual. Imperative forms. The infinitive with the value of imperative.		
5.	Industrial robots. Describing a device. Derivation with suffixes and prefixes.		
6.	Nanorobots, nanotechnologies. Applications. Expressing the future.		
7.	Oral presentations		

Bibliography:

1. Arbeitskreis Schuhmann: Moderieren-Projektieren-Präsentieren: Methoden trainieren. Verlag Europa Lehrmittel, zweite Auflage, 2012. (Biblioteca UTCN, nr. inv- 541.521/2013)
2. Fearns, A./Buhlmann R.: Technisches Deutsch für Ausbildung und Beruf. Lehr- und Arbeitsbuch. Verlag Europa-Lehrmittel, 2013.
3. Murdcheva, S./Mandcheva, K.: Allgemeiner Maschinenbau für die Hochschule, Niveau B1-B2, https://idial4p-center.eu/ro/module/viewdownload/31-maschinenbau1/79-daf-allgemeiner-maschinenbau-fuer-die-hochschule
4. Steinmetz, M./Dintera, H.: Deutsch für Ingenieure. Ein DaF – Lehrwerk für Studierende ingenieurwissenschaftlicher Fächer. Springer Vieweg, 2018.
5. Tripon, Mona: Faszination Technik. Sprachtrainer Deutsch für Studenten technischer Universitäten. Editura Napoca Star, Cluj-Napoca, 2012.
6. Zimmermann, Günther: Texte schreiben-einfach, klar, verständlich. Berichte, Präsentationen, Referate, Anleitungen, Dokumentationen. Edition Praxis. Wissen, Verlag BusinessVillage, 2010

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The improvement of the students’ ability to communicate in English in technical contexts is to ensure a successful adjustment to multicultural work environments.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course			

Applications	Continuous assessment of language competences during the seminars; Completing the written tasks from the final test; Satisfactory defence of the project	Final test + student projects+ Continuous assessment	Final test: 30 % Student projects: 50% Continuous assessment : 20%
10.4 Minimum standard of performance: defence of the project and satisfactory completion of at least 50% of the final test			

Date of completion

Instructors in charge of the lecture
Lect. Mona Tripon, Ph. D.

Instructors in charge of the seminar
Lect. Mona Tripon, Ph. D.

Date of approval in the department

Head of department
Assoc. Prof. Ruxanda Literat, Ph. D.

Date of approval in the Faculty Council,

Dean
Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Information about the program

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics an Manufacturing Management
1.3 Department	Engineering and Design of Robots
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/ Qualification	Robotics / Engineer
1.7 Form of education	Full Time
1.8 Discipline code	28.60

2. Information about the discipline

2.1 Name of discipline	Ethics and academic integrity				
2.2 Content area					
2.3 Professor	Associate Professor, Ph.D. Căpraru Angelica Angelica.Capraru@lang.utcluj.ro				
2.4 Teaching Assistant for seminar/laboratory/project	-				
2.5 Academic year		2.6 Semester		2.7 Type of evaluation	C
2.8 Discipline classification	Formative category				DC
	Optional category				DI

3. Time allocated

3.1 Number of hours per week	1	including:	3.2 Lecture	1	3.3 Seminar		3.3 Laboratory		3.3 Project		
3.4 Number of hours per semester	14	including:	3.5 Lecture	14	3.6 Seminar		3.6 Laboratory		3.6 Project		

3.7 Distribution total time (hours per semester) of individual learning activities	
(a) Study (manual, course support, bibliography, course notes)	10
(b) Supplementary study (library, e-platforms, field study)	10
(c) Preparation of homework, practical assignments, exercises	16
(d) Tutorials	
(e) Examination	2
(f) Other:	

3.8 Total number of hours of individual study (sum of (3.7(a)…3.7(f)))	36
3.9 Total number of hours per semester (3.4+3.8)	14
3.10 Number of credits	2

4. Preconditions (where appropriate)

4.1 Curriculum	Not applicable
4.2 Competencies	Not applicable

5. Teaching facility (when it applies)

5.1. Course progress	

5.2. Applications progress (seminar/laboratory/project)	

6. Specific competencies

Professional comeptencies	Knowledge of the fundamental notions in the field of academic ethics, understanding, internalization and their application in academic activities; Knowledge of the explicit or implicit norms that regulate the academic conduct of the intellectual work of the students of UTCN; Use of conceptual "tools" to solve ethical and moral dilemmas; The ability to analyze ethical dilemmas and identify possible solutions; Identification of interdisciplinary connections.
Transversal competencies	TC1 Applying the values and ethics of the engineering profession, knowing the strategies and techniques / tactics of oral and written communication, promoting the argumentative, convergent and divergent logical reasoning in the knowledgeable and responsible execution, of the professional tasks. TC2 Responsible execution of work tasks in a multidisciplinary team, assuming roles at different hierarchical levels.

7. Course objectives (based on the grid of specific competencies)

Overall objective of the course	The course aims to analyze the fundamental problems, at the theoretical and applicative level, related to the academic ethics, in order to develop the ethical competence of the students, to form an upright behavior from the academic point of view, which will be the basis of a responsible professional career.
Specific objectives	Development of skills needed to identify and solve ethical problems; Development and formation of scientific research skills in the field of engineering; Knowledge and assimilation of the legislation that regulates the academic conduct; Compliance and application of knowledge gained in the academic work.

8. Content

8.1 Course	Hours	Teaching methods	Observations
1. The object and issues of ethics: conceptual delimitations Interdisciplinary approaches *Defining and interpreting the basic concepts of academic ethics. Glossary of terms*	2	Lecture, exposition, heuristic conversation, debate	
2. Academic responsibilities and rights *University code of the rights and obligations of the student from UTCN.* *Social effects of lack of academic honesty* *Case studies*	2		

3. The ethics of scientific research. Principles, problems, solutions *Standards and regulations of the academic environment regarding good conduct in scientific research* *Copyright and related rights*	2		
4. Good practice in writing a scientific paper *Citation rules* *Corrections of fair conduct regarding the use of data* *Criteria for establishing originality in research*	2		
5. Plagiarism and self-plagiarism *Types of plagiarism* *Plagiarism procedures. Electronic means of identifying plagiarism*	2		
6. Other forms of academic dishonesty: consequences and sanctions *Data forgery, ghostwriting, honorary authorship, etc.* *Counterproductive behaviors and attitudes*	2		
7. Case studies: dilemmas and problems Discussion topic: examples of "bad practices" in research	2		

Bibliography

Learning materials and bibliography will be available on MSTeams class.

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*** Legea 206/2004 privind buna conduită în cercetarea științifică, dezvoltarea tehnologică și inovare. Disponibil la https://lege5.ro/Gratuit/gu3donrv/legea-nr-206-2004-privind-buna-conduita-in-cercetarea-stiintifica-dezvoltarea-tehnologica-si-inovare Accesat la data de 5 septembrie 2018.

9. Correlation between syllabus and needs and expectations of the professional associations and business community

The content of the discipline corresponds to the thematic areas in the field approached nationally and internationally at this level of studies.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation type	10.3 Proportion of the final grade (%)
10.4 Course		Written test	100%
10.5 Seminar/Laboratory/ Project			
10.6 Minimum performance standards A minimum grade 5 is required.			

Filling date:	Holders	Title First Name Surname	Signature
	Course	Associate Professor, Ph.D. Căpraru Angelica	
	Applications	-	

Date of validation in the Department Council	Head of departament Assoc. Prof., Ph.D. Ruxanda Literat
Date of validation in the Faculty Council	Dean Professor eng., Ph.D. Corina Julieta BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronic and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/ Engineering
1.7	Form of education	Full time
1.8	Subject code	29

2. Data about the subject

2.1	Subject name	Mechanisms and Machine Elements I			
2.2	Subject area	Mechanisms and Machine Elements			
2.2	Course responsible/lecturer	*Prof.PhD.Eng. Pustan Marius, Marius.Pustan@omt.utcluj.ro*			
2.3	Teachers in charge of seminars	*Lec.PhD.Eng. Crisan Horea, Horea.Crisan@omt.utcluj.ro* *Lec.PhD.Eng. Ştefan Crăciun, Stefan.Crăciun@omt.utcluj.ro*			
2.4 Year of study	II	2.5 Semester	4	2.6 Assessment	E
2.7 Subject category	Formative category				DD
	Optionality				DI

3. Estimated total time

3.1 Number of hours per week	7	3.2 of which, course:	3	3.3 applications:	4
3.4 Total hours in the curriculum	125	3.5 of which, course:	42	3.6 applications:	56

Individual study	hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	0
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
Tutoring	0
Exams and tests	5
Other activities	0

3.7	Total hours of individual study	27
3.8	Total hours per semester	125
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Passing the courses: Descriptive Geometry and Mechanical Drawing, Material Science, Computer Programming, Mechanics, Strength of Materials, Tolerances and Dimensional Control
4.2	Competence	Specific professional development of industrial engineering

		projects based selection, combination and use of knowledge, principles and methods from the field of basic sciences of industrial engineering domain and their association with drawing –technical graphics.

5. Requirements (where appropriate)

5.1	For the course	Projector multi-media, blackboard
5.2	For the applications	Equipment from the laboratory “Machine Elements and Tribology”

6. Specific competences

Professional competences	**C2.1.** Defining the principles and the methods of basic science industrial engineering field associated with graphics – technical drawing. **C2.2.** Using the knowledge from the basic engineering sciences to explain and interpret the theoretical and experimental results, the drawings and the specific industrial engineering phenomena and processes **C2.3.** Applying the principles and methods from basic science of industrial engineering domain and associated with graphics - technical drawing, for strength calculations, sizing, establishing the technical conditions, establishing correspondence between features and functional role prescribed, and so on, in specific applications of industrial engineering under qualified help. **C2.4.** Appropriate use of the standard assessment criteria and methods from basic engineering sciences, for identification, modeling, experimentation, analysis and assessment of the qualitative and quantitative aspects, phenomena and definitive parameters as well as gathering data, processing and interpretation of the results from specific industrial engineering trials. **C2.5.** Elaboration of professional projects specific to industrial engineering on the basis of combining and usage of knowledge, principles and methods from the field of basic sciences of industrial engineering domain and their association with graphics –technical graphics **C5.1.** Defining the concepts, theories, methods and basic principles of designing the manufacturing equipment, their components and the industrial logistics specific to the mechanical area.. **C5.2.** Using basic knowledge to explain and interpret different types of technological equipment and their components specific to the mechanical area. **C5.3.** Applying basic principles and methods for designing the manufacturing equipment and their components specific to the mechanical area. **C5.4.** Proper use of standard evaluation criteria and methods to appreciate the quality, advantages and limitations of the manufacturing equipment and / or their components specific to mechanical area. **C5.5.** Elaborating professional projects for manufacturing equipment specific to the mechanical area.
Cross competences	**CT1.** Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. **CT3.** Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Mechanical design principles. Design, manufacture & assembly of basic machine elements.
7.2	Specific objectives	To know the machine components (mechanisms and general machine elements, respectively) from the construction, calculus end design point of view. To know the fundamental design principles used in machine building field. To understand the functional role of the machine elements, the movement and load transmitting modality, and their calculus principles, respectively. To evaluate correctly the loading of the machine elements and the influence factors

8. Contents

8.1. Lecture (syllabus)		Time allocation	Teaching methods	Notes
1.	Mechanisms structure. Structural and geometrical cinematic study of mechanisms. Introduction. Free Point in space. Free rigid body. Degrees of freedom. Cinematic element. Cinematic pairs. Cinematic chain. Mechanisms	3 hours	Oral presentation, notes on blackboard and multimedia presentation, Completing the course with helpful lecture notes	Students are encouraged to ask questions, interactive course
2.	Planar, spherical and spatial mechanisms. Mobility of the mechanisms. Families of mechanisms. Classification of mechanisms based on the concept of cinematic group. Substitute or equivalent mechanism. ASSUR groups.	3 hours		
3.	Kinematics analysis of mechanisms. Graphical methods. The positions of dyads. Velocities and acceleration distribution to the elements of a mechanism. Analytical calculation of velocities and accelerations using transmission functions.	3 hours		
4.	Kinematic analysis of screw mechanisms. Synthesis of mechanisms. Study of the mechanisms with intermittent moving. Maltese-cross (Geneva-wheel). Kinematical analyze of Maltese-cross mechanism Kinematic analysis of spatial mechanisms. Kinematic analysis of universal – joint drive (Cardanic transmission).	3 hours		
5.	Kineto-statics of mechanisms. Forces acting on mechanism elements and their characteristics. Determination of reactions in the mechanism pairs (without taking into consideration the frictional forces). Elements of mechanism and machine equilibration.	3 hours		
6.	Machine elements. Design of mechanical systems. Machine elements. Classification. Threaded fasteners (assemblies with screws). Basic terms and definitions. Forces and torques in threaded assemblies Additional loaded in screws. Efficiency of the threaded assemblies.	3 hours		
7.	Main mechanical stress in the screw and nut. Prestress assembly (the issue of initial tightening). Thread-locking devices.	3 hours		

8.	The telescopic screws (Differential screws). Ball screws. Shaft – hub assembly. Keys assembly. Assembly with parallel key. Stress in key and keyway. Woodruff key assembly. Feather key. Taper key.	3 hours		
9.	Splined assembly. Pins assemblies. Construction and functioning. Bolts assemblies. Construction and functioning.	3 hours		
10.	Elastic bracelet assembly. Self-tightening assemblies. Press joints. Springs	3 hours		
11.	Machine elements for rotational motion. Axles, Spindles and Shafts.	3 hours		
12.	Transmission with toothed wheels. Gears. Introduction. The fundamental law of gearing. Geometry of the involute gear. Spur gear.	3 hours		
13.	The gearing of shift wheels. The continuity of gearing. Contact ratio. Causes of destruction gear	3 hours		
14.	Calculation of cylindrical spur gears. Forces in the cylindrical spur gear. Strength of cylindrical gears with straight teeth (Spur gear). Contact stress. Bending stress.	3 hours		

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8. Mott Robert (2004) – Machine Elements in Mechanical Design, Pearson, Prentice Hall

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16. Belcin, O., Pustan, M. (2008) ORGANE DE MAŞINI. RULMENŢI. ANGRENAJE –Probleme rezolvate. Ed. Risoprint, Cluj-Napoca, ISBN 978-973-751-871-2

8.2. Applications/Seminars		Teaching methods	Notes
1.	Work safety measures. Kinematic couplings	Practical work in the laboratory, Interpretation of experimental results, Calculation examples	Students are asked and encouraged to ask questions, interactive activity
2.	Structural analysis of planar mechanisms		
3.	Kinematic analysis of planar mechanisms using transfer functions		
4.	Determining the friction coefficients of screw assemblies		
5.	The efficiency of threads in motion; Determining the efficiency of ball screws		
6.	Assemblies with parallel keys		
7.	Spline assemblies		
8.	Studies regarding elastic bracelets assemblies		
9.	Experimental study of press joints		
10.	Reestablishing the dimensional parameters of external spur gear trains		
11.	Reestablishing the dimensional parameters of external helical gear trains		
12.	Reestablishing the dimensional parameters of bevel gear trains; Reestablishing the dimensional parameters of worm gear trains		
13.	Friction losses in bearings		
14.	Finalizing the lab works		
8.3 Design project: Design of the screw-nut mechanism from a robotic structure for the following dates: - maximum working load F = _________ N, - maximum stroke h = ________ mm The project will include: 1. Technical memo 2. Computation memo 3. Drawings: Assembly drawing (scale 1: 1) and execution drawing for screw and nut		Project work, computing and graphical part	Interactive activity
Introduction to design methodology. The theme of the project. Stages of work. Choosing constructive solutions for the project theme. Choosing constructive solutions for screw, nut, body, etc. Choice of materials Determining the forces that load the elements of the mechanism and establish the coupling reactions (the distribution diagram of the forces and moments on the mechanism elements). Calculation of the motion screw Calculation of the nut. Preliminary assembly drawing Calculation of the body (the dimensions of the body are adopted constructively). Calculation of drive mechanism. Cup Calculation. Continue the overall drawing Calculation of efficiency. Complete the drawing. Execution drawings Final written test for examination of the project work			

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1. Sucala F., Antal A., Belcin O., Birleanu C., Bojan S. s.a. (2008) – Organe de Masini, Mecanisme si Tribologie, Studii de caz, ed. Todesco Cluj-Napoca, 2008, ISBN- 978-973-7695-65-9

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9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The tools and sciences, skills are acquired in this course, constitute the foundation for the practice of engineering. And so, at this stage of undergraduate education, it is appropriate to introduce some professional aspects of engineering. These professional studies should integrate and use the tools and the sciences in the accomplishment of an engineering objective.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The ability to answer to theoretical questions and to solve practical problems. All the subjects from the exam are mandatory.	The exam consists in solving some applications in "open book" method	Exam (mark E); 70% E
10.5 Seminars/ Laboratory/Project	The presence at laboratory is compulsory (100%). The activity during project and lab classes is appreciated	Lab will be completed with providing a portfolio of works and ends with a mark. The project work will be accompanied by a final written test and it's have separated mark.	Lab mark (mark L); Project mark (mark P); 5% L 25% P
10.6 Minimum standard of performance **Final grade: N = 0.7E + 0.05L + 0.25P** The final credit can be received only if each of the mark's components is fulfilled: Passing the exam if: N≥5; E≥5; P≥5; L≥5.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof.PhD.Eng. Pustan Marius	
	Teachers in charge of application	Prof.PhD.Eng. Pustan Marius	
		Lec.PhD.Eng. Crăciun Ștefan	
		Lec.PhD.Eng. Crisan Horea	

Date of approval in the department ______________________	Head of department Prof.dr.ing.
Date of approval in the faculty IIRMP ______________________	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	30

2. Data about the subject

2.1	Subject name			Fluid Mechanics			
2.2	Course responsible/lecturer			Dr.ing. Corina Giurgea			
2.3	Teachers in charge of seminars			Dr.ing. Corina Giurgea			
2.4 Year of study	II	2.5 Semester	IV	2.6 Assessment	Exam		
2.7 Subject category	Formative category					DI	
	Optionality					-	

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laboratory	1	3.3 Project	-
3.4 Total hours in the curriculum	42	of which	3.5 Course	28	3.6 Seminar	-	3.6 Laboratory	14	3.6 Project	-

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	7
(b) Supplementary study in the library, online and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
(d) Tutoring	3
(e) Exams and tests	3
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	33
3.9 Total hours per semester (3.4+3.8)	75
3.10 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Mandatory: Basics in physics, mathematics (mathematical analysis, special mathematics) and mechanics
4.2	Competence	Mathematical understanding, Calculus (derivative and integral of a function), good understanding of the basic principles of physics and mechanics and ability to apply them to solve simple practical problems; ability to plot and interpret graphs

5. Requirements (where appropriate)

5.1	For the course	Internet access, Multi-media projector, , Blackboard
5.2	For the applications	Internet access, Laptop/Computers as the Laboratory worksheets/tests should be filled in for each laboratory class

6. Specific competences

Professional competences	C2.2. Using the knowledge concerning the fluid mechanics and other basic engineering sciences to explain and interpret the theoretical and experimental results, the drawings and the specific manufacturing engineering, designing and robotics phenomena and processes C2.3. Applying the principles and methods from fluid mechanics and other basic science of engineering domain for strength calculations, sizing, establishing the technical conditions, establishing correspondence between features and functional role prescribed, and so on, in specific applications of manufacturing engineering, designing and robotics under qualified help. C2.4. Appropriate use of the standard assessment criteria and methods from basic engineering sciences, for: identification, modeling, experimentation, analysis and assessment of the qualitative and quantitative aspects, phenomena and definitive parameters as well as gathering and processing data, analysis of the results from manufacturing engineering, designing and robotics trials
Cross competences	CT1. Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. CT3. Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Acquiring knowledge of the fundamental concepts, principles and equations of fluid mechanics and practicing them through solving some problems / technical applications
7.2	Specific objectives	After the completion of this course, students will be able: • to measure fluid/fluid flow parameters • to use the laboratory equipment • to analyse and solve a variety of problems involving fluid flows as well as to explain and discuss the results. • to calculate/design a simple flow loop

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Introduction. The concept of fluid. Forces in fluid mechanics.	2	Interactive Lectures	

Properties of the fluids I. Mass, Density, Specific Gravity and Pressure definition	2	(on site and/or on Teams Platform) Selected additional problems will be solved	Exploit the movies,images and medias (reference to [6] and [7])
Properties of the fluids II. Compressibility of fluids. The State Equation.	2		
Properties of the fluids III. Viscosity. Newtonian and non-Newtonian fluids	2		
Properties of the fluids IV. Vapor pressure and cavitation phenomenon. Surface tension	2		
Fluid statics I. Pressure variation in a fluid at rest. Pascal Law. Measurement of pressure. Manometry	2		
Fluid statics II. Hydrostatic force on plane surfaces. Hydrostatic force on curved surfaces	2		
Fluid statics III. Buoyancy. Stability of immersed and floating bodies	2		
Fluids in motion. Velocity field. Pathlines and Streamlines. Classification of flows. The flowrate. Instruments and methods for measurement of flowrates	2		
Inviscid flows. The continuity equation. Bernoulli equation and applications	2		
Inviscid flows. Linear momentum equation. Application of the linear momentum equation	2		
Viscous flow in pipes. Major and minor losses in pipes flow	2		
Dimensionless groups, Similarity and Model Development in Fluid Mechanics	2		
Trends in fluids engineering	2		

Bibliography

1. Giurgea C., Lecture Notes in Fluid Mechanics (e-version), UTPRESS Cluj Napoca, 2016, ISBN 978-606-737-176-5
2. http://www.slideshare.net/ArchieSecorata/fluid-mechanicsfundamentals-and-applications-by-cengel-cimbala-3rd-c2014-txtbk
3. Munson B.R., Young D.F., Okiishi T.H., Fundamentals of Fluid Mechanics, Fifth edition, John Wiley &son, 2006
4. Munson B.R., Young D.F., Okiishi T.H., Fundamentals of Fluid Mechanics. Student Solutions Manual and Study Guide, Fifth edition, John Wiley &son, 2006
5. Evett J.B., Cheng Liu, 2500 Solved Problems in Fluid Mechanics and Hydraulics, McGraw-Hill, 1989
6. Homsy G.M. et all, Multimedia Fluid Mechanics (DVD), Second edition, Cambridge
7. Different documents posted to Teams Platform

8.2. Laboratory	Number of hours	Teaching methods	Notes
Dimensions and units. Dimensional Homogeneity and units. Systems of units. Unit conversion	2	Short presentation of the theoretical aspects/method and procedure	
Establishing the compressibility factor and the bulk modulus of one fluid	2		

Measuring the viscosity of fluids by using the Hoppler apparatus and the Rheotest apparatus. Understanding the effect of temperature on the viscosity	2	Experimental work Assignments (quiz/test + lab worksheet)	
Observation of the cavitation phenomenon in a liquid	2		
Measuring the energy losses in pipes and bends. Investigating the effects of laminar and turbulent flow regimes	2		
Measurement of flow rates	2		

1. Banyai D., Giurgea C., Marcu L., Nascutiu L., Opruta D., Vaida L., *Mecanica Fluidelor – Lucrari Practice*, U.T. Press, Cluj Napoca, 2014, ISBN 978-973-662-934-1
2. Armfield _ Engineering Teaching&Research Equipment Instruction Manual
3. Gunt Laboratory Guide and Equipment Instruction Manual
4. Munson B.R., Young D.F., Okiishi T.H., Fundamentals of Fluid Mechanics. Student Solutions Manual and Study Guide, Fifth edition, John Wiley &son, 2006
5. Evett J.B., Cheng Liu, 2500 Solved Problems in Fluid Mechanics and Hydraulics, McGraw-Hill, 1989
6. Laboratory classes material posted on Teams

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Nowadays the presence of fluids in technological devices is ubiquitous, starting from power systems to artificial heart. In order to predict the fluids motion, a future engineer not only should be familiar with the basic principles of fluid mechanics but should also have a deeper physical insight into the behaviour of fluids. In particular, "the majority of engineers who are not fluid dynamicists still will need to interact, on a technical basis, with those who are quite frequently;and a basic competence in fluid dynamics will make such interactions more productive"(J.McDonough, Lectures in Elementary Fluid Dynamics: Physics,Mathematics and Applications, University of Kentucky, 2009)

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The ability to answer the theoretical questions and the practical problem-solving skills	Written final test (FT)	30%
	The familiarity and ability to work on a Fluid Mechanics subject. The ability to work in team (groups of 4-5 students) and to make a presentation and a report on a subject related with Fluid Mechanics	Homework (H): Written report Oral presentation Q&A session	40%
10.5 Laboratory	The ability to answer to questions regarding the instruments and procedures used in laboratory classes +	Laboratory sheet filling (LS)+ activity during laboratory classes appreciation (LA) L=0.7(LS) +0.3 (LA)	30%

	Activity during the lab classes		
10.6 Minimum standard of performance			
The final mark N=0.4 (FT)+0.3·(H)+0.3·(L) will be determined using the weighting above. The final credit can be received only if each of the mark's components is fulfilled: $N \geq 5$; $FT \geq 5$; $H \geq 5$; $L \geq 5$. Mandatory requirement: A pass mark (of minimum 5) at each Laboratory activity (LT and LA) is compulsory for taking the final written test.			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	dr. Ing. Corina Maria Giurgea	
	Teachers in charge of application	dr.ing. Corina Maria Giurgea	

Date of approval in the department ……..	Head of department IPR Prof.dr.eng. Călin NEAMŢU
Date of approval in the faculty ……………	Dean Prof.dr.eng. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	31.00

2. Data about the subject

2.1	Subject name	Applied electronics for robotics					
2.2	Subject area	DS					
2.3	Course responsible/lecturer	Lec. PhD Engg. Mircea Murar – mircea.murar@muri.utcluj.ro					
2.4	Teachers in charge of seminars	Asist. Drd. Ing. Bartos Dragos – Dragos.Bartos@muri.utcluj.ro					
2.4 Year of study	II	2.5 Semester	2	2.6 Assessment	E		
2.7 Subject category	Formative category						DS
	Optionality						DOB

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	42	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study	hours
(a) Manual, lecture material and notes, bibliography	3
(b) Supplementary study in the library, online and in the field	3
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	0
(d) Tutoring	0
(e) Exams and tests	2
(f) Other activities	0

3.7	Total hours of individual study	8
3.8	Total hours per semester	50
3.9	Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	Computer Programming, Introduction to Robotics, Electronics, Mechanics.
4.2	Competence	English language

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre or classroom with video projector
5.2	For the applications	Class room equipped with computers, programs and platforms that are specific to the discipline. Presence is mandatory.

6. Specific competences

Professional competences	• Develop the abilities required to configure and use the programming environment Arduino. • Develop the configuration and programming skills for usage with 8-bit microcontrollers' architecture. • Understand the characteristics of hardware resources available on the Zumo32U4 mobile robotic platform • Develop the programming skills required to make use of the functionalities provided by hardware resources to develop robotic applications control algorithms. • Understand how to integrate adjacent electronic components to solve applications goals. • Strengthen electronics skills by applying theoretical background.
Cross competences	• Ability to identify from datasheets the most important characteristics and features of the mobile platform resources (sensors, actuators, etc.). • Identify the requirements of a robotic system in terms of performance of the integrated system, sensor types, actuators and functionalities. • Apply the values and ethics of the engineering profession and responsible execution of professional tasks. • Promote logical, convergent and divergent reasoning, practical applicability of know-how, assessment and self-assessment in decision-making.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Development of algorithms able to integrate, process data and control the resources from the Zumo32U4 mobile robotic platform.
7.2	Specific objectives	• Development of control algorithms to manage the hardware resources of the mobile robot platform. • Learn to make use of the embedded systems programming environment Arduino. • Strengthen the programming and electronics skills by using a practical approach.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
Introduction to applied electronics. Basic concepts. The principle of operation of the transistor. Microcontrollers and Microprocessor.	Presentation, Slideshow, Hands-On, Demonstrations, Discussions	
Arduino programming environment. The operating principle of analog-digital converters. Processing analog quantities for usage in control algorithms.		

Digital and analogic sensors operating principle. Integration and information processing.	Questions and Answers	
Sizing of control circuits specific to electrical loads.		
Functional principle and control techniques of the DC motor. Operating principle of encoders with Hall sensors.		
Operating Principle and Control Techniques for RC Servomotors.		
Operating principle and step-by-step motor control techniques.		

Bibliography

- Horowitz, P.; Hill, W.; The Art of Electronics - 3rd edition (2015), ISBN-13: 978-0521809269. Cambridge University Press
- Floyd, T.; Electronic Devices (2012), ISBN-13: 978-0132549868 Prentice Hall.
- Zurawski, R.; Embedded Systems Handbook, Second Edition: Embedded Systems Design and Verification (2009), ISBN-13: 978-1439807552, CRC Press.
- Banzi, M., Final, M.S.; Getting Started with Arduino 3rd Edition (2014), ISBN: 978-1-4493-6333-8, Maker Media, Inc.

8.2. Applications/Seminars	Teaching methods	Notes
Install the Arduino programming environment, connect the mobile platform Zumo32U4 to the PC and install the USB serial driver. Test connectivity between Arduino and Zumo32U4. Learn how to use the Arduino Simulator.	Zumo32U4 mobile robotic platforms, Arduino Simulator	
Develop applications to control LEDs and monitor buttons status. Monitoring and control of robotic platform resources using the USB serial interface.		
Develop an application to interface microcontrollers IOs to the on-board motor drivers and control the DC motors. Modify the speed and directions of the DC motors.		
Develop a software library to process information from DC motors encoders. Use the library to move the robot a specific distance.		
Configure the analogue to digital convertor to process the information from marker detection sensors. Develop a control algorithm to make the robot follow the marker.		
Control IR LEDs beam energy using the pulse width modulation technique. Develop an algorithm to approximate the distance of proximity objects.		
Understand timer-counter units and develop time base applications.		
Configure hardware interrupts to asynchronously trigger the execution of procedures when an object is detected. Understand how interrupt vector works, nested interrupts and what is the goal of masking interrupts.		
Develop an application to control the electric DC motors to track a marker, detect objects using proximity sensors and avoid collisions.		

Use and process information from gyroscope, accelerometer and magnetometer to achieve stability and balance of a vertically running mobile platform – part 1.		
Use and process information from gyroscope, accelerometer and magnetometer to achieve stability and balance of a vertically running mobile platform – part 2.		
Develop an algorithm capable to create a virtual map of a maze and find the shortest path to the exit – part 1.		
Develop an algorithm capable to create a virtual map of a maze and find the shortest path to the exit – part 2.		
Individual applications. Questions and answers.		

Bibliography

- Arduino; Arduino reference book (https://www.arduino.cc/en/Reference/HomePage)
- Pololu; Pololu Zum 32U4 Robot user's Guide, (https://www.pololu.com/docs/0J63).
- Polulu; Zumo 32U4 schematic diagrams, (https://www.pololu.com/file/0J862/zumo-32u4-schematic-diagram.pdf)

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Identify specific requirements of companies in the field of service robotics and update the lectures and applications.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Understand the principles exposed and experienced in the classes.	Written assessment at the end of semester.	50 %
Applications	Development of applications during applications classes.	Results of individual subjects in application classes	50 %

10.4 Minimum standard of performance

The evaluation procedure for the theoretical part takes place physically or in exceptional situations online using Teams platform according to the following grades-competences distribution:

- 5: Mastery of the subject: Architecture of microcontrollers and microprocessors
- 6 – 7: Topic mastery: GPIO configuration, working principle of analog to digital converter
- 8 – 9: Mastering the subject: PWM signal characteristics
- 9 – 10: Mastering the subject: Timer-counter units and Interruptions.

The evaluation procedure for the practical part takes place physically or in exceptional situations online using Teams platform according to the following grades-competences distribution:

- 3 – 4: Application development for LED control
- 5 – 6: Application development involving the control of an LCD
- 7 – 8: The use of timer-counter units and interruptions in making applications more efficient.
- 9 – 10: Development of an application to avoid obstacles.

Date of filling in:		Title Surname Name	Signature
	Lecturer	S.L. dr. ing. Mircea Murar	
	Teachers in charge of application	Asist. Drd. Ing. Bartoș Dragoș	

Date of approval in the department IPR _________________________	Head of department Prof. dr. ing. Calin Neamțu
Date of approval in the Faculty of Industrial Engineering, Robotics and Production Management _________________________	Dean Prof. dr. ing. Corina Julieta Bîrleanu

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	32.00

2. Data about the subject

2.1	Subject name	Electrical drives for industrial robots					
2.2	Subject area	DS					
2.3	Course responsible/lecturer	Lec. PhD Eng. Mircea MURAR – mircea.murar@muri.utcluj.ro					
2.4	Teachers in charge of seminars	Lec. PhD Eng. Mircea MURAR – mircea.murar@muri.utcluj.ro Asist. Drd. Ing. Bartos Dragos – Dragos.Bartos@muri.utcluj.ro					
2.4 Year of study	II	2.5 Semester	2	2.6 Assessment	C		
2.7 Subject category	Formative category					DS	
	Optionality					DOB	

3. Estimated total time

3.1 Number of hours per week	2	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laborator	1	3.3 Proiect	0
3.4 Total hours in the curriculum	28	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laborator	14	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	15
(d) Tutoring	0
(e) Exams and tests	2
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	47
3.9 Total hours per semester (3.4+3.8)	75
3.10 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Driving systems, Applied electronics in robotics, Mechanical construction of industrial robots, Basics of automation systems, Electric machines, electrical engineering.
4.2	Competence	Programming languages, English language.

5. **Requirements (where appropriate)**

5.1	For the course	Amphitheatre or classroom with video projector
5.2	For the applications	Class room equipped with computers, programs and platforms that are specific to the discipline. Presence is mandatory.

6. **Specific competences**

Professional competences	• Develop the abilities required to drive industrial robots and auxiliary equipment using electric drives. • Develop the skills needed to interface industrial robots with control systems driven by programmable logic controllers. • Strengthen the skills necessary to configure and parametrize stepper motor drive units. • Strengthen the skills required to configure and parametrize servomotor motor drive units.
Cross competences	• Ability to interface the electrical drives of industrial robots into robotic cells. • Develop the basic skills to implement safety loops in robotic systems. • Ability to understand and interpret electrical diagrams of electrical panels of control systems. • Apply the values and ethics of the engineering profession and responsible execution of professional tasks. • Promote logical, convergent and divergent reasoning, practical applicability of know-how, assessment and self-assessment in decision-making.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Understand the techniques of electric actuation and closed loop control of industrial robots and equipment.
7.2	Specific objectives	• Control and command of industrial robots using electric machines drive units. • Understand closed loop control. • Configuration of safety systems in robotic systems driven by electric systems.

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Introduction to electric drive of industrial robots. Electric motors used to drive industrial robots.	2	Presentation, Slideshow, Hands-On, Demonstrations, Discussions Questions and Answers	
The architecture of an industrial robot controller and the role of programmable logic controllers. Industrial communication protocols.	2		
Programming instructions for programmable logical controllers and integration with robotic systems. Using the simulation tool.	2		
Operating principle and architecture of stepper motors drive units. Open loop control systems.	2		

Operating principle and architecture of servomotors drive units. Close loop control systems.	2		
Integrating stepper motor and servomotor control units with programmable logic controllers.	2		
Safety systems in the electric drive of industrial robots and robotic cells.	2		

Bibliography

- Athani, V. V.; Stepper Motors: Fundamentals, Applications and Design (1997), ISBN-13: 978-8122410068, New Age.
- Scarpino, M.; Motors for Makers: A Guide to Steppers, Servos, and Other Electrical Machines (2015), ISBN-13: 978-0134032832, Que Publishing.
- Hanselman, D.; Brushless motors: magnetic design, performance, and control of brushless dc and permanent magnet synchronous motors (2012), ISBN-13: 978-0982692615, E-Man Press LLC.
- Navani, J.P.; Electrical Machines and Automatic Control (2017).
- Siemens; Sinamics servodrive control units and motors reference manual and applications.

8.2. Applications/Seminars	Number of hours	Teaching methods	Notes
Configuration and preparation of the ABB IRB1600 industrial robot control unit for discrete gripper control.	2	Prezentare power-point Industrial equipment simulator: ABB IRB1600. Servodrive Simens Simatic V90, SMC electric gripper, PLC safety Software: SMC LEC-W2 Sinamics V-Assistant, ABB RAPID, TIA Portal, PLC SIM	
Robot joints control procedure, robot position saving and programming robot for simple pick'n'place jobs.	2		
Conveyor belt drive using a stepper motor controlled in open loop using a programmable logic controller.	2		
Electrical interconnection of the robot control unit with the programmable logic controller.	2		
Connect programmable logic controller with industrial robot using a communication protocol.	2		
Development of human-machine interface for command and monitoring of the robotic cell	2		
Programming the robotic cell for handling and storage operations in matrix organizers.	2		

Bibliography

- Athani, V. V.; Stepper Motors: Fundamentals, Applications and Design (1997), ISBN-13: 978-8122410068, New Age.
- Scarpino, M.; Motors for Makers: A Guide to Steppers, Servos, and Other Electrical Machines (2015), ISBN-13: 978-0134032832, Que Publishing.
- Hanselman, D.; Brushless motors: magnetic design, performance, and control of brushless dc and permanent magnet synchronous motors (2012), ISBN-13: 978-0982692615, E-Man Press LLC.
- Navani, J.P.; Electrical Machines and Automatic Control (2017).
- Siemens; Sinamics servodrive control units and motors reference manual and applications.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Identify specific requirements of companies in the field of electrical drives of industrial robots and robotic systems and update the lectures and applications.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Understand the principles exposed and experienced in the classes.	Written assessment at the end of semester.	40 %
Applications	Development of applications during applications classes.	Results of individual subjects in application classes	40 %
10.4 Minimum standard of performance			

The evaluation procedure for the theoretical part takes place physically or in exceptional situations online using Teams platform according to the following grades-competences distribution:

- 5: Mastery of the subject: Architecture of programmable logic controllers and robotic cells
- 6 – 7: Mastering the subject: PLC programming instructions
- 8 – 9: Mastering the subject: The stepper motor and open-loop control
- 9 – 10: Mastering the subject: Servomechanisms, control units and feedback equipment.

The evaluation procedure for the practical part takes place physically or in exceptional situations online using Teams platform according to the following grades-competences distribution:

- 3 – 4: Creation of robot program and configuration of interaction signals with the external environment
- 5 – 6: Application development program for pick-n-place application. Gripper control.
- 7 – 8: Program application development for the logic programmable automaton.
- 9 – 10: Development of human-machine interface for the control of the robotic cell. Development of the Smart Component type component.

Date of filling in:		Title Surname Name	Signature
	Lecturer	Lecturer PhD Eng. Mircea MURAR	
	Teachers in charge of application	Lecturer PhD Eng. Mircea MURAR	
		Asist. Drd. Ing. Dragos Bartos	

Date of approval in the department IPR ________________________	Head of department Prof. dr. ing. Calin Neamțu
Date of approval in the Faculty of Industrial Engineering, Robotics and Production Management ________________________	Dean Prof. dr. ing. Corina Julieta Bîrleanu

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	33.00

2. Data about the subject

2.1	Subject name			Control systems in robotics			
2.2	Subject area			DD			
2.3	Course responsible/lecturer			Lecturer PhD Engg. Mircea MURAR mircea.murar@muri.utcluj.ro Lecturer PhD Eng. Ionut Chis ionut.chis@muri.utcluj.ro			
2.4	Teachers in charge of seminars			Lecturer PhD Engg. Mircea MURAR Lecturer PhD Eng. Ionut Chis			
2.5 Year of study	II	2.6 Semester	2	2.7 Assessment	C	2.8 Subject category	DOB

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	2	3.3 applications:	1
3.4 Total hours in the curriculum	42	3.5 of which, course:	28	3.6 applications:	14

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	6
Tutoring	0
Exams and tests	4
Other activities	0

3.7	Total hours of individual study	30
3.8	Total hours per semester	72
3.9	Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Electric machines, Electronics and Automation, Basics of automation systems, Mechanics.
4.2	Competence	Programming languages, English language

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre or classroom with video projector
5.2	For the applications	Class room equipped with computers, programs and platforms that are specific to the discipline. Presence is mandatory.

6. Specific competences

Professional competences	• Ability to identify the main components of an industrial robot controller. • Understanding the operating principles of industrial robot control systems. • Develop the skills required to properly design and choose the equipment of an artificial vision control system. • Ability to integrate, configure, and parameterize control systems based with imaging processing.
Cross competences	• Develop image processing algorithms. • Transfer robot positioning coordinates from image processing algorithm. • Develop communication skills in teamwork activities with professionals from related fields.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Understand the techniques used in robot controlling systems.
7.2	Specific objectives	• Ability to integrate artificial vision systems into industrial robot control systems. • Select, configure and develop image processing algorithms for artificial vision systems.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Architecture of an industrial robot controller.	Presentation, Slideshow, Hands-On, Demonstrations, Discussions Questions and Answers	
2.	Techniques for tracking the movement of robots.		
3.	Control algorithms for the movement of robots.		
4.	Robot systems equipped with artificial vision.		
5.	Calibration of camera-robot systems and create the models of scene-object, robot-object, gripper-scene.		
6.	Image processing software		
7.	Image processing algorithms		
8.	Data transmission from and to robot controllers. Data processing and the generation of motion trajectories.		
9.	Techniques for tele-control of industrial robots		
10.	Software environment for modeling a pneumatic system. AutoSIM 200.		
11.	Modeling and simulation of a pneumatic system with linear axes		
12.	Modeling and simulation of a pneumatic system with oscillating / rotating axes		
13.	Run Cycles for Modular Assembly Systems.		
14.	Programming environment used for SMC controllers.		

Bibliography
• Richard, C.D.; Bishop, R.H.; Modern Control Systems 13th Edition (2016), ISBN-13: 978-0134407623, Pearson. • Nise, N.S.; Control Systems Engineering 7th Edition (2015), ISBN-13: 978-1118170519, Wiley. • Baggio, D., L.; s.a. Mastering OpenCV 3 - Second Edition (2017), ISBN-13: 978-1786467171, Packt Publishing.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Open Computer Vision: Install, configure and connection with video cameras.	Interactive discussions, apparatus analysis, case studies	Hydraulic and pneumatic laboratory
2.	Open Computer Vision: image processing, object detection and coordinates calculation.		
3.	Coordinates transmission to robot controller and Coordinates processing.		
4.	Driving the robot and objects manipulation.		
5.	Dynamic image processing and obstacle avoidance.		
6.	Modeling and simulation of a pneumatic circuit with linear axes.		
7.	Modeling and simulation of a pneumatic circuit with oscillating axes.		

Bibliography
• Richard, C.D.; Bishop, R.H.; Modern Control Systems 13th Edition (2016), ISBN-13: 978-0134407623, Pearson. • Nise, N.S.; Control Systems Engineering 7th Edition (2015), ISBN-13: 978-1118170519, Wiley. • Baggio, D.L.; s.a. Mastering OpenCV 3 - Second Edition (2017), ISBN-13: 978-1786467171, Packt Publishing.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Identify specific requirements of companies in the field of control systems in robotics and artificial vision and update the lectures and applications.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Understand the principles exposed and experienced in the classes.	Written assessment at the end of semester.	50 %
Applications	Development of applications during applications classes.	Results of individual subjects in application classes	50 %
10.4 Minimum standard of performance			
• Final grade must be over 6			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Lecturer PhD Eng. Mircea MURAR Lecturer PhD Eng. Ionut Chis	
	Teachers in charge of application	Lecturer PhD Eng. Mircea MURAR Lecturer PhD Eng. Ionut Chis	

Date of approval in the department ……..

Head of department
Prof. PhD. Eng. Claudiu Raţiu

____

Date of approval in the faculty ……………

Dean
Prof. PhD. Eng. Nicolae Balc

____

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Design Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	34.00

2. Data about the subject

2.1	Subject name			*Computer aided design*			
2.2	Subject area			DID			
2.3	Course responsible/lecturer			Assoc. Prof. eng. Florin POPIŞTER PhD.florin.popister@muri.utcluj.ro			
2.4	Teachers in charge of seminars			Assoc. Prof. eng. Florin POPIŞTER PhD.florin.popister@muri.utcluj.ro			
2.5 Year of study	2	2.6 Semester	2	2.7 Assessment	C	2.8 Subject category	DD/DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 applications:	2
3.4 Total hours in the curriculum	75	3.5 of which, course:	14	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
Tutoring	3
Exams and tests	3
Other activities	

3.7	Total hours of individual study	33
3.8	Total hours per semester	75
3.9	Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Descriptive Geometry and Technical Drawing I and II.
4.2	Competence	General knowledge of PC operation.

5. Requirements (where appropriate)

5.1	For the course	Multimedia package with video projector
5.2	For the applications	The attendance at the seminar is obligatory.

6. Specific competences

Professional competences	After passing the discipline students will be able to: Explained and interpreted, how to work in custom CAD 2D (advanced level) work environment, for parameterized 3D modeling (medium level) and for CAE optimization in robotics (beginner level), applying the operating limits of mechanical components and actuators of RI and the elaboration, according to them, of the technology of manufacturing of mechanical parts and of robotic partial assemblies.
Cross competences	

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Design and realization of partial assemblies in the field of robotics through assisted 2D and 3D assisted design, explanation and interpretation of the mode of operation in common CAD 2D and 3D work environments. Elaboration of the complete documentation for the CAD2D technical execution project and 3D parameterized modeling for robotic partial assemblies.
7.2	Specific objectives	After passing the discipline students will: - knows the principles of 3D design of solids in general and in Catia V5 in particular. - will be able to model 3D a medium complex mechanical component in the structure of a robot - will know the principle of assembling in the 3D environment in general and in Catia V5 in particular - will be able to assemble with a geometric constraint a mechanical assembly - will be able to generate executive and overall drawings in accordance with the regulations and standards.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	C1: Presentation of the interface and working concepts in Catia V5	The teaching-learning process uses: exposures, discussions, exercises, case studies. The exposition is done interactively, with multimedia means, and students are	
2.	C2: Particularities and procedures specific to 3D modeling using Catia software package.		
3.	C3: Solids Modeling in Catia V5: Part I		
4.	C4: Solids Modeling in Catia V5: Part II		
5.	C5: Modeling in the context of an anamble.		

6.	C6: Assembling the landmarks in Catia.	encouraged to ask questions and raise real problems with the 3D modeling they face in their work. Exercises and case studies, both individual and team, are designed to build knowledge and acquire skills.	
7.	C7: Generate 2D documentation		
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Bibliography

Calin Neamtu, Daniela Popescu, Florin POPISTER Module CAD/CAM în Catia V5,EDITURA MEGA 2013, Cluj-Napoca,Romania ISBN: 978-606-543-361-8, nr pg. 410

2. Neamţu Călin, ş.a, , Proiectarea asistată vol.II ISBN 973-35-3456-1, UT Press, 2006.

3. Cursurile oficiale Catia V5 dezvoltate de catre Dassault Systemes furnizate prin intermediului Centrului Dassault Systemes si a platformei 3DSAcademy (academy.3ds.com)

4. Opruţa Daniela - Grafică asistată-curs universitar, Editura Quo Vadis, 1997, ISBN 973-98003-9-4.

5. Opruţa Daniela, Proiectarea asistată de calculator, vol.1, ISBN 973-35-1138-2, Editura Dacia, 2000.

8.2. Applications/Seminars		Teaching methods	Notes
1.	S1. Presentation and arrangement with the program interface. 3D Model Handling Commands. Specific settings.	Learning by doing	
2.	S2: Presentation of Sketcher mode and 2D sketches using basic commands.		
3.	S3: Using 2D sketches using advanced commands. Editing sketches and sizing them. Geometric constraints.		
4.	S4: Solids generation using basic commands - I		
5.	S5: Generating solid bodies using basic commands - II		
6.	S6: Generate solid bodies using advanced commands		
7.	S7: Presentation of Assembly Design. Insert parts as a whole. Catia V5 specific handling commands.		
8.	S8: Modeling in the context of an assembly. Editing components.		
9.	S9: Assembling components in Catia V5 using geometric constraints - I		
10.	S10: Assembling components in Catia V5 using geometric constraints - II. Preserving and breaking the bindings between components. File management.		
11.	S11: Using the V5 chassis libraries and advanced assembly functions.		
12.	S12: Generate drawing drawings.		
13.	S13: Generate overall drawings		
14.	S14: Interactive Drawing. Generative Drafting. Generate component tables.		

Bibliography

1. Calin Neamtu, Daniela Popescu, Florin POPISTER Module CAD/CAM în Catia V5,EDITURA MEGA 2013, Cluj-Napoca,Romania ISBN: 978-606-543-361-8, nr pg. 410

2. Neamţu Călin, ş.a, , Proiectarea asistată vol.II ISBN 973-35-3456-1, UT Press, 2006
3. Florin Popișter - Suport de curs Catia V5 - engleza - ONLINE https://didatec-my.sharepoint.com/personal/florin_popister_campus_utcluj_ro/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fflorin%5Fpopister%5Fcampus%5Futcluj%5Fro%2FDocuments%2FSuport%20de%20curs%5FProiectare%5FAsistata%5Fde%5FCalculator%5FI%2FCourse%5Fsupport%20%5F%20Grafica%20Asistata%20de%20Calculator%20%2D%20Englez%C4%83%5FFinal%2Epdf&parent=%2Fpersonal%2Fflorin%5Fpopister%5Fcampus%5Futcluj%5Fro%2FDocuments%2FSuport%20de%20curs%5FProiectare%5FAsistata%5Fde%5FCalculator%5FI&ga=1 - 2021

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

3D design is a tool that almost completely replaced classic design, so it is essential that a future engineer master such a tool. Catia V5 along with Delmia V5 and Simulia is a complete solution for designing and simulating robotic manufacturing systems and their components. The market signals indicate that the Catia V5 is used in the area of influence of our university both in production area and in design and simulation for both manufacturing systems and the automotive industry.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	3D modeling ability of a reference starting from a 2D drawing. Correctness of sketches and geometric and dimensional constraints. The ability to achieve a geometrically constrained geometry. Correctness of the design / assembly executed for the part / assembly	Colloquium - 3-hour work with three subjects: 1. Modeling a piece starting from a 2D drawing. 2. Assembling using geometric constraints of a mechanical assembly 3. Generate the execution drawing \ assembly	3/4
Applications	Activity during the semester		1/4
10.4 Minimum standard of performance			
E = 3/4* nota la proba de lucru + 1/4 nota la laborator : E>4; L>4			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Assoc. Prof. eng. Florin POPIŞTER PhD	
	Teachers in charge of application	Assoc. Prof. eng. Florin POPIŞTER PhD	

Date of approval in the department .... ________________________	Head of department Prof. Eng. Calin NEAMTU
Date of approval in the faculty .... ________________________	Dean Prof. Eng. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	36.20

2. Data about the subject

2.1	Subject name			Pneumatic drives			
2.2	Subject area			DO-DS			
2.3	Course responsible/lecturer			Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro			
2.4	Teachers in charge of seminars			Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro			
2.5 Year of study	2	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DO

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
Tutoring	4
Exams and tests	2
Other activities	4

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Promotion to disciplines: Materials Engineering, Mechanics, Resistance, Physics, Descriptive Geometry and Technical Drawing

5. Requirements (where appropriate)

5.1	For the course	Tableroom and video projector
5.2	For the applications	Laboratory room for pneumatic and hydraulic drives.

6. Specific competences

Professional competences	• To know the existence, role and areas of use of modern systems in pneumatic drives. • Understand the construction and operation of pneumatic appliances. • Know the symbolism of pneumatic devices. • To know the structure of modern pneumatic systems and to understand the operation of specific schemes represented symbolically.
Cross competences	• Know new systems of modern pneumatic drives. • Calculate the basic parameters of a pneumatic system. • Identify pneumatic devices after symbolism. • Intuition of the functioning of the pneumatic systems according to the devices that compose them. • Design modern drive systems using specific symbols. • Properly include the assimilated knowledge in the structure of the drive systems.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Understand, conceive and use new modern hydraulic / pneumatic systems with high yields and reduced costs.
7.2	Specific objectives	Be able to develop and innovate new hydraulic / pneumatic solutions with high economic and technical efficiency.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Introduction to air pressure technology.	Exposure, interactive course	Video projector
2.	Units of measurement. Pressure. Properties of compressed air. Status equations and simple transformations. Continuity equations. Equation of energy.		
3.	Production and distribution of compressed air. Compressors. Batteries.		
4.	Dehumidifiers. Filters. Lubricators.		
5.	Pressure regulators.		
6.	Compressed air distribution networks		
7.	Horse and flow control equipment. distributors		
8.	Linear pneumatic actuators. Selection and dimensioning of linear actuators in applications.		
9.	Swing and rotary pneumatic actuators. Choice and sizing.		
10.	Pneumatic prehensive devices. Characteristics. classifications		
11.	Prehensive devices using the vacuum technique.		
12.	Synoptic theory of automatic regulation. Servopneumatic notions.		

13.	Pneumatic proportional valves. Pneumatic linear actuators.		
14.	Industrial pneumatic systems specific to industrial robots.		

Bibliography

M. Manescu – Probleme rezolvate si propuse.
C. Ratiu, I. Chis – Actionari hidraulice si penumatice, note de curs
Blaine W. Andersen - The analysis and design of pneumatic systems
Ashraf Saleem, Junsheg Pu, Chi-Biu Wong - Servo-pneumatic systems : component-based modelling, simulation, and control

8.2. Applications/Seminars		Teaching methods	Notes
1.	Presentation of the laboratory and study topics.	Interactive discussions, apparatus analysis, case studies	Hydraulic and pneumatic laboratory
2.	Notions about pneumatic actuators and systems. Graphic Symbolization.		
3.	Determining the load time for the piston compressor.		
4.	Determination of pressure losses in distribution networks.		
5.	Determination of axial force and velocity for a linear pneumatic motor.		
6.	Distributors. Structure. Operation. Applications.		
7.	Pressure control valves. Operation. Applications.		
8.	Determination of pressure-flow characteristics for a pressure limiting valve.		
9.	Pneumatic grapples. Applications.		
10.	Flow control valves. Structure. Operation. Applications.		
11.	Determination of flow-rate and pressure-moment characteristics for a rotary pneumatic motor		
12.	Servo-pneumatic axles. Operation. Applications.		
13.	Determination of the Ui / P diagram for a proportional reduction valve.		
14.	Circuits for controlling pneumatic motors.		

Bibliography

M. Manescu – Probleme rezolvate si propuse.
C. Ratiu, I. Chis – Actionari hidraulice si penumatice, indrumator de laborator
Blaine W. Andersen - The analysis and design of pneumatic systems
Ashraf Saleem, Junsheg Pu, Chi-Biu Wong - Servo-pneumatic systems : component-based modelling, simulation, and control

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The competences gained during the Pneumatic Action course will be required by the students involved in the automation and robotization of certain processes in the industry in order to increase the fence of the technical and economic efficiency of these processes.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Exam written with questions from the lessons learned.	Written test	60%
Applications	Designing an application with one of the devices studied in the laboratory.	Written test	40%
10.4 Minimum standard of performance			
Calculation mode final grade NF = 0.6 * NT + 0.4 * NA Nf - final note; NT - Theory; NA - Laboratory application note. It is necessary to get a minimum grade of 5 for the NT and NA examination to pass the exam.			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Lecturer PhD Eng. Ionut Chis	
	Teachers in charge of application	Lecturer PhD Eng. Ionut Chis	

Date of approval in the department ....

Head of department
Prof.dr.ing.

____

Date of approval in the faculty ....

Dean
Prof.dr.ing.

____

SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Facultaty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Robotics/engineer
1.7 Form of education	Full time
1.8 Subject code	37.00

2. Data about the subject

2.1 Subject name	Domain practice II (4 weeks)				
2.2 Course responsible	*Responsible*				
2.3 Teachers in charge of seminars	*Responsible*				
2.4 Year of study	2	2.5 Semester	2	2.6 Assessment	C
2.7 Subject area	Subject category				DD
	Optional				DI

3. Estimated total time

3.1 Number of hours per week	30	3.2 of which, course:	0	3.3 applications:	30
3.4 Total hours in the curriculum	125	3.5 of which, course:	0	3.6 applications:	125

Individual study	ore
Manual, lecture material and notes, bibliography	
Supplementary study in the library, online and in the field	
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	
Tutoring	
Exams and tests	
Other activities	

3.7 Total hours of individual study	5
3.8 Total hours per semester	125
3.9 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Not necessary
4.2 Competence	Not necessary

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	N/A

6. Competenţele specifice acumulate

Professional competences	CP6.1 Description of theories, methods and fundamental principles of the design of technological processes specific to machine construction technology CP6.2 Use of basic knowledge to explain and interpret different types of technological manufacturing processes specific to machine building technology CP6.3 The application of basic principles and methods for the design of manufacturing technological processes, on classical and/or CNC machines with well-defined input data, under conditions of qualified assistance. CP6.4 Appropriate use of standard evaluation criteria and methods, to appreciate the quality, advantages and limitations of technological manufacturing processes on classical and/or CNC machines and flexible manufacturing systems CP6.5 Elaboration of professional projects of technological manufacturing processes specific to machine construction technology, including using specific CAM programs CP6.6 Definition of the concepts, theories, methods and basic principles of the design of technological manufacturing equipment, their components and industrial logistics, specific to machine building technology. CP6.7 Use of basic knowledge to explain and interpret different types of technological manufacturing equipment and their elements, specific to machine building technology CP6.8 Adequate use of standard evaluation criteria and methods to assess the quality, advantages and limitations of technological manufacturing equipment and/or their components, specific to machine building technology CP6.9 Defining basic concepts, theories, methods and principles regarding the planning, management and operation of manufacturing processes and systems, as well as quality assurance and product inspection CP6.10 Use of basic knowledge to explain and interpret problems that arise in the planning, management and operation of manufacturing processes and systems on classical and/or CNC machines, as well as in quality assurance and product inspection. CP6.11 Apply basic principles and methods for planning, managing and operating manufacturing processes and systems, as well as for quality assurance and product inspection, under conditions of qualified assistance. CP6.12 Appropriate use of standard evaluation criteria and methods to assess the quality, advantages and limitations of methods for planning, managing and operating manufacturing processes and systems, as well as quality assurance and product inspection, including programs dedicated software. CP6.13 Development of professional projects using established principles and methods in the field of planning, management and exploitation of manufacturing processes and systems, as well as quality assurance and product inspection.

Cross competences	CT1. Applying the values and ethics of the engineering profession and the responsible execution of professional tasks under conditions of limited autonomy and qualified assistance. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-evaluation in decision-making CT2. Carrying out the activities and exercising the specific roles of teamwork on different hierarchical levels. Promoting the spirit of initiative, dialogue, cooperation, positive attitude and respect for others, diversity and multiculturalism and the continuous improvement of one's own activity CT3. The objective self-assessment of the need for professional training continues for the purpose of insertion on the labor market and adaptation to the dynamics of its requirements and for personal and professional development. Effective use of language skills and knowledge of information and communication technology

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	• To acquire knowledge and skills in the field of specialization; • To assimilate technologies implemented in industrial practice; • To know how to organize workshops and manufacturing sections; • To know the machinery and technological equipment in the endowment of industrial units; • To know how to prepare the technological and constructive documentation; • To analyze the research - design activity.
7.2 Specific objectives	After completing the practical activity, students will be able to: • to recognize the processing procedures by cutting and cold pressing; • to identify the machines and S.D.V.s used in manufacturing; • to measure the dimensional accuracy, shape and mutual position of the surfaces, knowing the methods and control equipment for tracking the production quality; • to know the methods of adjusting the machine-tool; • to know the main organs of machines; • to know the design principles of machine parts; • to know the innovative technologies of manufacturing parts.technology of mechanical parts to know the organization of metalworking workshops

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
Not applicable		
8.2. Applications/Seminars	Teaching methods	Notes

The practice book will include the following information: - Details about the company where the practice was carried out (management, number of employees, the company's field of activity, what equipment they have, other relevant aspects); - Assembly methods (removable and/or non-removable); - Tools used for machining (lathe knives, metal carbide inserts, milling cutters, drills, taps, dies, grinding bodies, etc.); - Types of machine tools used in mechanical workshops (Classification, working principles, etc.); - Methods of obtaining parts from plastic materials (injection, blowing, etc.); - Modern technologies for manufacturing parts (Additive Manufacturing: 3D printing, SLS, SLM, etc.); - Principles of designing the shape of parts in the construction of machine tools; - Gear applications; - Possibilities for bearing moving machine parts (axles, shafts, etc.)		
Bibliography		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

In making the program and the content we consulted: - representative societies in Cluj-Napoca and surrounding areas. - education level from similar specializations in the country and abroad

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4Course	Not applicable	Not applicable	0%
10.5 Applications	Colloquium (note C); Practice(note P)	N 0,6C + 0,4P; Conditions for obtaining credits: N> 5; C> 4; P> 4;	100%
10.6 Minimum standard of performance			
Technical report 50% from lab tests			

Date of filling in:	Teachers	Title Surname NAME	Signature
	Lecturer		
	Teachers in charge of application		

Date of approval in the IPR department	Head of IPR department Prof. dr. ing. Călin Neamţu
Date of approval in the IIRMP Faculty Council	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronic and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/ Engineering
1.7	Form of education	Full time
1.8	Subject code	38

2. Data about the subject

2.1	Subject name				Mechanisms and Machine Elements II	
2.2	Subject area				Mechanisms and Machine Elements	
2.2	Course responsible/lecturer				*Prof.PhD.Eng. Pustan Marius, Marius.Pustan@omt.utcluj.ro*	
2.3	Teachers in charge of seminars				*Prof.PhD.Eng. Pustan Marius, Marius.Pustan@omt.utcluj.ro*	
2.4 Year of study		III	2.5 Semester	5	2.6 Assessment	E
2.7 Subject category		Formative category				DD
		Optionality				DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	3	3.3 applications:	0
3.4 Total hours in the curriculum	75	3.5 of which, course:	42	3.6 applications:	0

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	0
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
Tutoring	0
Exams and tests	3
Other activities	0

3.7	Total hours of individual study	33
3.8	Total hours per semester	75
3.9	Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Passing the courses: Descriptive Geometry and Mechanical Drawing, Material Science, Computer Programming, Mechanics and Machine Element I, Strength of Materials, Tolerances and Dimensional Control

4.2	Competence	Specific professional development of industrial engineering projects based selection, combination and use of knowledge, principles and methods from the field of basic sciences of industrial engineering domain and their association with drawing – technical graphics.

5. Requirements (where appropriate)

5.1	For the course	Projector multi-media, blackboard
5.2	For the applications	Equipment from the laboratory "Machine Elements and Tribology"

6. Specific competences

Professional competences	**C2.1.** Defining the principles and the methods of basic science industrial engineering field associated with graphics – technical drawing. **C2.2.** Using the knowledge from the basic engineering sciences to explain and interpret the theoretical and experimental results, the drawings and the specific industrial engineering phenomena and processes **C2.3.** Applying the principles and methods from basic science of industrial engineering domain and associated with graphics - technical drawing, for strength calculations, sizing, establishing the technical conditions, establishing correspondence between features and functional role prescribed, and so on, in specific applications of industrial engineering under qualified help. **C2.4.** Appropriate use of the standard assessment criteria and methods from basic engineering sciences, for identification, modeling, experimentation, analysis and assessment of the qualitative and quantitative aspects, phenomena and definitive parameters as well as gathering data, processing and interpretation of the results from specific industrial engineering trials. **C2.5.** Elaboration of professional projects specific to industrial engineering on the basis of combining and usage of knowledge, principles and methods from the field of basic sciences of industrial engineering domain and their association with graphics –technical graphics **C5.1.** Defining the concepts, theories, methods and basic principles of designing the manufacturing equipment, their components and the industrial logistics specific to the mechanical area.. **C5.2.** Using basic knowledge to explain and interpret different types of technological equipment and their components specific to the mechanical area.. **C5.3.** Applying basic principles and methods for designing the manufacturing equipment and their components specific to the mechanical area. **C5.4.** Proper use of standard evaluation criteria and methods to appreciate the quality, advantages and limitations of the manufacturing equipment and / or their components specific to mechanical area. **C5.5.** Elaborating professional projects for manufacturing equipment specific to the mechanical area.
Cross competences	**CT1.** Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. **CT3.** Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Mechanical design principles. Design, manufacture & assembly of basic machine elements.
7.2	Specific objectives	To know the machine components (mechanisms and general machine elements, respectively) from the construction, calculus end design point of view. To know the fundamental design principles used in machine building field. To understand the functional role of the machine elements, the movement and load transmitting modality, and their calculus principles, respectively. To evaluate correctly the loading of the machine elements and the influence factors

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Bevel gears with straight teeth: Kinematical and geometrical particularities. Equivalent gears. Strength calculation of bevel gears. Dimensioning of bevel gear based on contact.	Oral presentation, notes on blackboard and multimedia presentation, Completing the course with helpful lecture notes	Students are encouraged to ask questions, interactive course
2.	Dimensioning of bevel gear based on bending stress. Worm gears: geometry. Sliding speed. Equivalent gears. Forces in worm gear.		
3.	Strength calculation of worm gears, contact pressure and bending stress		
4.	Thermal calculation of worm gear. Dimensioning of worm gear based on contact stress, bending and thermal stress.		
5.	Rolling bearings: Basics, classification, advantages-disadvantages, materials. Kinematics relations in the rolling contact bearings. Friction in rolling contact bearings. The causes of the rolling bearing replacement. Symbolization.		
6.	Lubrication and sealing. Mounting and dismounting of bearings.		
7.	Rolling bearings design: operating conditions, design principles. The determination of the rolling contact bearing dimensions: The base load and the rolling bearings durability. The equivalent dynamic bearing load.		
8.	Functions of bearings. First class functions: Typical assemblies with bearings Examples.		
9.	Transmissions with belts. General terms. Design aspects. Calculus.		
10.	Transmissions with chains. General terms. Design aspects. Calculus.		
11.	Elastic couplings. Overview. Terminology. Classification. Fixed permanent couplings. Flanges Coupling. Claw couplings.		
12.	Permanent mobile couplings. Couplings with rigid elements for angular deviations, Coupling with elastic element (with bolts, Periflex).		

13.	Intermittent coupling (clutches). The coupling valve.		
14.	Elements of tribology. Applications: Model of Open book exam method.		

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2. Antal A, Birleanu C. (2000) - Mecanisme şi Organe de Maşini. Editura Todesco, Cluj-Napoca, 2000, ISBN 973 – 99659 – 6 – 2,
3. Sucală, F., Bîrleanu, C., Tătaru, O. (2000) - Mechanical Systems Engineering. Ingineria Sistemelor Mecanice. Vol. I, Cluj-Napoca, Editura RISOPRINT, ISBN 973-656-181-X, 2002
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13. Handra Luca V., Stoica A. (1982) – Intoducere in teoria mecanismelor, Ed. Dacia, Cluj-Napoca, 1982
14. Belcin, O., Turcu, I., Pustan, M., (2004) Organe de maşini. Asamblări demontabile – Probleme rezolvate, Ed. Risoprint, Cluj-Napoca, ISBN 973-656-552-1
15. Belcin, O., Pustan, M., Turcu, I., (2005) Organe de maşini. Osii şi arbori drepţi – Probleme rezolvate, Ed. Risoprint, Cluj-Napoca, ISBN 973-656-971-3
16. Belcin, O., Pustan, M. (2008) Organe de maşini. Rulmenţi. Angrenaje –Probleme rezolvate. Ed. Risoprint, Cluj-Napoca, ISBN 978-973-751-871-2

8.2. Applications/Seminars	**Teaching methods**	**Notes**
1. Presentation Laboratory of Machine Elements, the requirements of laboratory work. Work safety measures.	Practical work in the laboratory, Interpretation of experimental results, Calculation examples	Students are asked and encouraged to ask questions, interactive activity
2. Reestablishing the dimensional parameters of external bevel gear trains. Applications - the calculation of forces in bevel gears.		
3. Reestablishing the dimensional parameters of worm gear. Applications - the calculation of forces in worm gear.		
4. Friction losses in bearings. Applications - Bearing selection and calculus.		
5. Testing of friction disc clutches.		
6. Study of influence factors on the operation of belt transmissions.		
7. Static characteristics of elastic couplings. Applications - choice and verification of couplings.		

Bibliography:

1. Sucala F., Antal A., Belcin O., Birleanu C., Bojan S. s.a. (2008) – Organe de Masini, Mecanisme si Tribologie, Studii de caz, ed. Todesco Cluj-Napoca, 2008, ISBN- 978-973-7695-65-9,

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The tools and sciences, skills are acquired in this course, constitute the foundation for the practice of engineering. And so, at this stage of undergraduate education, it is appropriate to introduce some professional aspects of engineering. These professional studies should integrate and use the tools and the sciences in the accomplishment of an engineering objective.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	The ability to answer to theoretical questions and to solve practical problems. All the subjects from the exam are mandatory.	The exam consists in solving some applications in "open book" method	Exam (mark E); 100% E
10.4 Minimum standard of performance **Final grade: N =100% E**			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Prof.PhD.Eng. Pustan Marius	
	Teachers in charge of application	Prof.PhD.Eng. Pustan Marius	

Date of approval in the department

____

Head of department
Prof.dr.ing.

Date of approval in the faculty IIRMP

____

Dean
Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronic and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/ Engineering
1.7	Form of education	Full time
1.8	Subject code	39

2. Data about the subject

2.1	Subject name				Mechanisms and Machine Elements II - PROJECT	
2.2	Subject area				Mechanisms and Machine Elements	
2.2	Course responsible/lecturer				*Prof.PhD.Eng. Pustan Marius, Marius.Pustan@omt.utcluj.ro*	
2.3	Teachers in charge of seminars				*Prof.PhD.Eng. Pustan Marius, Marius.Pustan@omt.utcluj.ro*	
2.4 Year of study		III	2.5 Semester	5	2.6 Assessment	V
2.7 Subject category		Formative category				DD
		Optionality				DI

3. Estimated total time

3.1 Number of hours per week	2	3.2 of which, course:	0	3.3 applications:	2
3.4 Total hours in the curriculum	50	3.5 of which, course:	0	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	0
Supplementary study in the library, online and in the field	0
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
Tutoring	0
Exams and tests	2
Other activities	0

3.7	Total hours of individual study	22
3.8	Total hours per semester	50
3.9	Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	Passing the courses: Descriptive Geometry and Mechanical Drawing, Material Science, Computer Programming, Mechanics and Machine Element I, Strength of Materials, Tolerances and Dimensional Control

4.2	Competence	Specific professional development of industrial engineering projects based selection, combination and use of knowledge, principles and methods from the field of basic sciences of industrial engineering domain and their association with drawing – technical graphics.

5. Requirements (where appropriate)

5.1	For the course	Projector multi-media, blackboard
5.2	For the applications	Equipment from the laboratory "Machine Elements and Tribology"

6. Specific competences

Professional competences	**C2.1.** Defining the principles and the methods of basic science industrial engineering field associated with graphics – technical drawing. **C2.2.** Using the knowledge from the basic engineering sciences to explain and interpret the theoretical and experimental results, the drawings and the specific industrial engineering phenomena and processes **C2.3.** Applying the principles and methods from basic science of industrial engineering domain and associated with graphics - technical drawing, for strength calculations, sizing, establishing the technical conditions, establishing correspondence between features and functional role prescribed, and so on, in specific applications of industrial engineering under qualified help. **C2.4.** Appropriate use of the standard assessment criteria and methods from basic engineering sciences, for identification, modeling, experimentation, analysis and assessment of the qualitative and quantitative aspects, phenomena and definitive parameters as well as gathering data, processing and interpretation of the results from specific industrial engineering trials. **C2.5.** Elaboration of professional projects specific to industrial engineering on the basis of combining and usage of knowledge, principles and methods from the field of basic sciences of industrial engineering domain and their association with graphics –technical graphics **C5.1.** Defining the concepts, theories, methods and basic principles of designing the manufacturing equipment, their components and the industrial logistics specific to the mechanical area.. **C5.2.** Using basic knowledge to explain and interpret different types of technological equipment and their components specific to the mechanical area.. **C5.3.** Applying basic principles and methods for designing the manufacturing equipment and their components specific to the mechanical area. **C5.4.** Proper use of standard evaluation criteria and methods to appreciate the quality, advantages and limitations of the manufacturing equipment and / or their components specific to mechanical area. **C5.5.** Elaborating professional projects for manufacturing equipment specific to the mechanical area.
Cross competences	**CT1.** Applying the values and the ethics of the profession of engineer and the responsible execution of the professional duties under limited autonomy and qualified assistance. Promoting the logical reasoning, convergent and divergent, the practical applicability and the assessment and self-evaluation decisions. **CT3.** Objective self-evaluation of the need of continuous training for labor market insertion and the accommodation to its dynamic requirements and for personal and professional development. Effective use of language skills and knowledge of information technology and communication.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Mechanical design principles. Design, manufacture & assembly of basic machine elements.
7.2	Specific objectives	To know the machine components (mechanisms and general machine elements, respectively) from the construction, calculus end design point of view. To know the fundamental design principles used in machine building field. To understand the functional role of the machine elements, the movement and load transmitting modality, and their calculus principles, respectively. To evaluate correctly the loading of the machine elements and the influence factors

8. **Contents**

8.1. PROJECT II	Teaching methods	Notes
Project theme: Design a mechanical transmission for driving a robot arm, comprising a helical gear / bevel gear or worm gear and a V-belt transmission for the following dates: 1. The power of drive electric motor: P_m = __________[KW] 2. The speed of drive electric motor: n_m = ___________[rot/min]. 3. Total transmission ratio of the whole mechanical transmissions: i_{tot} =	Oral presentation, notes on blackboard and multimedia presentation, for each calculation or design step Completing the project classes with helpful lecture notes Students are encouraged to ask questions, Interactive classes, an also have to prepare each stage (homework) that will be checked weekly.	
1. The theme of the project. Transmission gear. (contains a step gears, V-belt transmission). 2. Documentation. Presentation of two variants on the theme. Justification of the chosen solution. 3. The distribution of the gear ratios on the stages reduction. 4. The calculation of speeds, powers and torques on the shafts. The choice of materials for shafts. Predimensioning of shaft ends. Selection of materials for gears. 5. Predimensioning gear. Preliminary assembly drawing. 6. Strenght calculation of the gear. Calculation of geometric elements and precision elements of gear. Calculation of forces in gear. he design configuration of shaft. Completion assembly drawing. 7. Calculation of belt drives. Sizing the pulleys. Completion assembly drawing. 8. Calculation of reaction forces on the shafts. Completion assembly drawing.		

9. The calculations to verify the gear input shaft. Completion assembly drawing. 10. The verification calculus of the bearings. 11. Completion assembly drawing. 12. The calculation of the other constructive elements of the transmission. Heating verification of the gear. Completion assembly drawing. 13. Complete assembly drawing. Complete execution drawings for the input shaft in gear and driven gear wheel. 14. Delivery project. Written support of the project (written test).	

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1. Antal A, ş.a. Reductoare. Atelierul de multiplicare al UTC-N, Cluj-Napoca 1994.
2. Antal A, Tătaru, O. Elemente privind proiectarea angrenajelor, Editura TODESCO, 2000
3. Crudu I,ş.a. Atlas de reductoare, Bucureşti. EDP, 1981
4. Horovitz B. Reductoare şi variatoare de turaţie. Bucureşti, ET, 1963
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6. Corina Birleanu (2004) Organe de masini, vol. II, Editura Risoprint, Cluj-Napoca, 2004,
7. O. Belcin, C. Birleanu, M. Pustan (2011) Organe de Masini, Elemente constructive in proiectare, Cluj-Napoca, 2011, Ed. Risoprint
8. O. Belcin, C. Birleanu, M. Pustan (2015) – Organe de Masini, Elemente de proiectare, Cluj-Napoca, 2015, Ed. Risoprint
9. Hamrock Bernard, s.a (2005) – Fundamentals of Machine Elements, McGraw – Hill Education,
10. Mott Robert (2004) – Machine Elements in Mechanical Design, Pearson, Prentice Hall
11. Shigley E., Mischke C. (1989) – Mechanical Engineering Design, McGraw – Hill Education
12. Pop D., s.a – Reductoare cu doua trepte, Calculul angrenajelor, Ed.Todesco, 2003
13. Haragas S. – Reductoare cu o treapta. Calcul si proiectare. Risoprint, 2014.
14. Spotts M.F., Shoup T.E., Hornberger L.E (2003) – Design of Machine Elements, Pearson, New Jersey
15. Uicker J., Gordon R., Shigley J. (2011) – Theory of Machines and Mechanisms, Oxford University Press, 2011
16. Handra Luca V., Stoica A. (1982) – Intoducere in teoria mecanismelor, Ed. Dacia, Cluj-Napoca, 1982
17. Belcin, O., Turcu, I., Pustan, M., (2004) Organe de maşini. Asamblări demontabile – Probleme rezolvate, Ed. Risoprint, Cluj-Napoca, ISBN 973-656-552-1
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19. Belcin, O., Pustan, M. (2008) Organe de maşini. Rulmenţi. Angrenaje –Probleme rezolvate. Ed. Risoprint, Cluj-Napoca, ISBN 978-973-751-871-2

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The tools and sciences, skills are acquired in this course, constitute the foundation for the practice of engineering. And so, at this stage of undergraduate education, it is appropriate to introduce some

professional aspects of engineering. These professional studies should integrate and use the tools and the sciences in the accomplishment of an engineering objective.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Project	The activity during project and lab classes is appreciated in each week	The project (NP) is accompanied by a written test (PS) and is scored separately with a grade between 1 and 10 (P).	Project mark (mark **P**); Project test (**PT**)
10.4 Minimum standard of performance **Final grade: NP = 0.65P + 0.35PT** The final credit can be received only if each of the mark's components is fulfilled: Passing the verification if: NP≥5; P≥5; PT≥5.			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Prof.PhD.Eng. Pustan Marius	
	Teachers in charge of application	Prof.PhD.Eng. Pustan Marius	

Date of approval in the department ________________________	Head of department Prof.dr.ing.
Date of approval in the faculty IIRMP ________________________	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics in English at Cluj-Napoca
1.7	Form of education	Full time
1.8	Subject code	40

2. Data about the subject

2.1 Subject name	Machine Tools and Manufacturing Equipment				
2.2 Course responsible/lecturer	Assoc.Prof.Eng. Bogdan Mocan, PhD ***bogdan.mocan@muri.utcluj.ro***				
2.3 Teachers in charge of seminars, lab, or project	Assoc.Prof.Eng. Bogdan Mocan, PhD ***bogdan.mocan@muri.utcluj.ro***				
2.4 Year of study	3	2.5 Semester	1	2.6 Assessment	E
2.7 Subject category	Formative category				DS
	Optional				-

3. Estimated total time (hours per semester of teaching activities)

3.1 Number of hours per week	5	of which, 3.2 course	2	3.3 Seminar	-	3.3 Lab	2	3.3 Project	1
3.4 Total hours in the curriculum	70	of which, 3.5 course	28	3.6 Seminar		3.6 Lab	28	3.6 Project	14

3.7 Distribution of time (hours per semester) for:	ore
(a) Study by textbook, course support, bibliography, and notes	15
(b) Additional documentation in the library, on specialized electronic platforms and in the field	25
(c) Preparation of seminars / laboratories, topics, papers, portfolios, and essays	15
(d) Tutoring	
(e) Examinations	3
(f) Other activities:	0

3.8 Total hours of individual study (sum (3.7(a)…3.7(f)))	55
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Not applicable
4.2 Competences	Not applicable

5. Requirements (where appropriate)

5.1. For the course	• ***Face-to-Face***: Classroom with videoprojector and internet access; ***On-line***: Teams Software Platform
5.2. For the seminar/laboratory/ project	• Laboratory with conventional machine tools (lathe, milling, cutting, etc.) and CNC machine tools • Laboratory attendance is mandatory • For the project it is needed a classroom with min. 15 calculators and SolidWorks software preinstalled

6. Specific competences

Professional competences	Design and realization of the general assembly of industrial robots (RI), peri robotic systems (SPRs) of transport and transfer systems (SAT) and related systems (SC) used in robotic applications, implementation, assisted 3D modelling and RI, SPR, SATT simulation , SC in applications specific to different technological processes
Cross competences	C5.1. Description of the 3D solids modelling methods in dedicated work environments and the principles of operation and exploitation of the individual technological equipment specific to the different technological processes in their correct selection C5.2. Explaining and interpreting, how to integrate the categories of end-effectors specific to the various robotic technological processes and the effects produced by the RI action within the different technological processes C5.3. Selection of the specific end-effectors for the different work tasks and the constructive variants of RI, SATT, SPR and SC corresponding to different technological processes as well as the parameterized 3D modelling of RI, SATT, SPR and SC assemblies specific for robotic applications C5.4. The use of 2D / 3D assisted design methods, parameterized 3D modelling and assisted simulation of RI, SATT, SPR and SC functionality to evaluate the performance of these subsystems for optimal implementation in robotic applications for different technological processes C5.5. Design of mechatronic interfaces for adaptation of the effectors to industrial robots and the realization of the 3D virtual prototype of the general assembly of RI, SATT, SPR, SC

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	Students familiarization with general and specific aspects regarding mechanical and electrical systems of different conventional and CNC machine tools and industrial/ non-industrial) automation manufacturing equipment
7.2 Specific objectives	• Description of standardized symbols for structural and operating diagrams of machinery and manufacturing equipment. • Elaboration and use of diagrams, structural and functional diagrams, graphical representations, and technical documents specific to the Manufacturing Equipment field. • Elaboration of kinematic schemes for various machinery and manufacturing equipment. • Familiarizing students with conventional unconventional machine tools, and CNC machine structure. • Familiarizing students with the logistics systems specific to industrial production facilities. • Elaboration of technical and technological projects for the execution of components of machinery and manufacturing equipment.

8. Contents

8.1 Lecture (syllabus) – Course	**No hours**	**Teaching methods**	**Notes**
Course 1. Structural-functional analysis of manufacturing systems Processing Subsystem; Logistics Subsystem; Subsystem of parts control; Command Subsystem. Generating surfaces on machine tools; Kinematic structure of Machine tool; Types of kinematic chains, their characteristics and composition;	2	**Face to face** **On-line** using MS Teams platform	Internet access for all students
***Course* 2**. Machine tools for turning, drilling, milling, boring, planning, mortising, finishing: description of the processing process; Kinematic, constructive and functional analysis of Machine tool.	2		

Course 3. Automatic machine tools, machining centres: description of the processing process; Kinematic, constructive, and functional analysis of MU.	2		
Course 4. Machine tools for plastic deformation, injection moulding, stamping description of the processing process; Kinematic, constructive and functional analysis of machine tool.	2		
Course 5. Plasma cutting machines, water jets, electro-erosion: description of the processing process; Kinematic, constructive, and functional analysis of machine tool.	2		
Course 6. Construction of pneumatically operated manipulators and logic of their control; supply and exhaust arms parts and tools from the structure of CNC machines	2		
Course 7. Construction of tool changers and magazines of CNC machine	2		
Course 8. Automated palletizing stations and automatic waste and scrap discharge systems	2		
Course 9. How to organize the technological flow in the production facility	2		
Course 10. Automatic technological lines	2		
Course 11. Systems and equipment for the storage, capture and ordering of parts, tools and materials; Gravity transport systems and equipment;	2		
Course 12. Transport systems and equipment (roller conveyors, chain conveyors, pneumatic conveyors) Delivery / evacuation equipment (industrial manipulators and robots)	2		
Course 13. AGVs and automatically guided vehicle - constructions, control systems, applications.	2		
Course 14. Logistics in other manufacturing sectors (food industry, chemical industry, cement industry, wood industry, pharmaceutical and cosmetics industry, textile industry)	2		

Bibliography

1. Course Notes, Mocan Bogdan, 2020
2. Richard Kibbe, Roland Meyer, Jon Stenerson, Kelly Curran, “Machine Tool Practices (What's New in Trades & Technology)”, ISBN-13: 978-0134893501, Publisher : Pearson; 11th Edition (2019)
3. Erik Oberg, Machinery's Handbook, Toolbox Edition, Industrial Press, Inc.; Thirtieth Edition (March 1, 2016)
4. Machine tools (link: https://www.britannica.com/technology/machine-tool/Basic-machine-tools)
5. Groover, Mikell P. (2017), "Theory of Metal Machining", Fundamentals of Modern Manufacturing (3rd ed.), John Wiley & Sons, Inc., pp. 491–504, ISBN 0-471-74485-9

Alternative sources of information

1. **Mobile apps** - Google Android: Industrial Automation Tutorial; Industrial Automation; Electrical Drives; Automation & Controls Today; Learn PLC SCADA

2. **Youtube**: The Robot Revolution: The New Age of Manufacturing; How industrial robot is made? ; Smart Factory; Internet of Things; IORT Internet of robotic things;

3. **Robotic Blogs**: Robotics Trends; Robot Facts That Everyone Should Know; Robotics within reach; Robotic News for the Factory; Smart Collaborative Robots; Powering the world's robots; Robotics; MIT Technology Review.

8.2 Laboratory	No hours	Teaching methods	Notes
1. Introduction. Safety training. Presentation of the themes and content of each laboratory work	2	**Face to face** **On-line** using MS Teams platform	Internet access for all students
2. Turning and universal lathe SNA 460; SNA 460 lathe kinematic chain, threading	2		
3. FUS 22 - description of the machine tool; kinematics and technological possibilities of console milling machine; Using the divisor head. Kinematic, constructive, and functional analysis of the FUS 25 milling machine; Auxiliary tools for milling machines.	2		
4. S425 C planner, construction, kinematic, and exploitation of the machine tool. AF 85 bore and milling machine, technological possibilities, operation. Correction and RPO200 plan grinding machine	2		
5. Description, cinematic and technological possibilities of the machine plasma cutting tools, water jet, electro-erosion: description of the processing process	2		
6. Description, cinematic and technological possibilities of Chalenger CNC machining center	2		
7. Analysis of the construction of pneumatically operated manipulators and the logic of their control; supply and exhaust arms parts and tools from the structure of CNC machines	2		
8. Description, kinematics and technological possibilities of automated palletizing stations and automatic waste and scrap discharge systems	2		
9. Visit to a company that develop automatic palletizing systems	2		
10. Analyse the construction of storage equipment (bunkers, accumulators, pallets, shops) and gravity transport equipment	2		
11. Analyse the construction of power injection transport equipment	2		
12. Construction analysis of AGVs and automatically guided vehicles; constructive variants, command systems, applications.	2		
13. Analysis and construction of automatic technological lines	2		
14. Visit to a machine tool workshop within a metal construction company	2		

Bibliography

1. Laboratory Notes, Mocan Bogdan, 2020
2. Erik Oberg, Machinery's Handbook, Toolbox Edition, Industrial Press, Inc.; Thirtieth Edition (March 1, 2016)
3. Machine tools (link: https://www.britannica.com/technology/machine-tool/Basic-machine-tools)

<table>
<tr><td>8.3 Project</td><td>No hours</td><td>Teaching methods</td><td>Notes</td></tr>
<tr><td colspan="4">The discipline also foresees a project development activity, for which 1 hour/ week x 14 weeks + individual study is allocated.
The theme of the project can be designing an AGV, designing an automated warehouse, designing an automated palletizing station, designing an Automatic Tool Changer (tool changer & magazine tool) for a CNC machine tool, designing a tool feed-exhaust manipulator from a CNC machine, designing an automatic waste disposal system.
The project report includes:
1. Introduction
2. Technical presentation memo;
3. Memorandum for the calculation:
- cinematic design/calculus
- organology design/calculus
4. Overall design (in the deployed section) of the projected equipment / device
5. Drawing of a component of the device / equipment.
OBS. The project is assisted by computer using AUTOCAD, SolidWorks, Catia (MATCAD), etc.

An example on Automatic Tool Changer is presented below:</td></tr>
<tr><td>8.3 Project</td><td>No hours</td><td>Teaching methods</td><td>Notes</td></tr>
<tr><td>1. Presentation of the project theme and requirements.</td><td>2</td><td rowspan="7">Face to face

On-line
using MS Teams platform</td><td rowspan="7">Internet access for all students</td></tr>
<tr><td>2. Each student must document himself on automatic tool changers and tool magazine for CNC machine tools. The completion of step 2 will be done with a synthetic presentation of the automatic tool changers or tool magazine models found in front of the colleagues.</td><td>2</td></tr>
<tr><td>3. Each student must document himself on automatic tool changers and tool magazine for CNC machine tools. The completion of step 2 will be done with a synthetic presentation of the automatic tool changers or tool magazine models found in front of the colleagues.</td><td>2</td></tr>
<tr><td>4. Identify the norms and standards that regulate the field of machine tools with an emphasis on those for operating safety</td><td>2</td></tr>
<tr><td>5. Define / identify modules and parts. Elaboration of the functional scheme of the product (detailed drawings up to the level of component parts, mechanisms). Explain how the product works.</td><td>2</td></tr>
<tr><td>6. Selection of electric/ pneumatic/ hydraulic motor(s) – see https://www.orientalmotor.com/; Selection of the chain for tool magazine – if applicable; Selection of the gearbox(s) – if applicable; Selection of necessary bearings; Selection of the Sensors.</td><td>2</td></tr>
<tr><td>7. Design the automatic tool changer or tool magazine (3D model).</td><td>2</td></tr>
</table>

Bibliography

1. Course Notes, Mocan Bogdan, 2020
2. Richard Kibbe, Roland Meyer, Jon Stenerson, Kelly Curran, “Machine Tool Practices (What's New in Trades & Technology)”, ISBN-13: 978-0134893501, Publisher : Pearson; 11th Edition (2019)
3. Erik Oberg, Machinery's Handbook, Toolbox Edition, Industrial Press, Inc.; Thirtieth Edition (March 1, 2016)
4. Machine tools (link: https://www.britannica.com/technology/machine-tool/Basic-

	machine-tools) 5. Groover, Mikell P. (2007), "Theory of Metal Machining", Fundamentals of Modern Manufacturing (3rd ed.), John Wiley & Sons, Inc., pp. 491–504, ISBN 0-471-74485-9 6. P H Joshi, Machine Tools Handbook: Design and Operation, McGraw Hill Education (India), 2007

9. Bridging course contents with the expectations of the representatives of the community, professional associations, and employers in the field

The competences developed in this course will be required by engineers involved in the integration of machine tools and manufacturing equipment and devices in various automated manufacturing processes and industrial robotic systems.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Answers to 50 questions from all courses (theory evaluation)	Written test - duration of assessment 1.5 hours	40%
10.5 Laboratory	Development of an average complexity application on a specific machine tool from the laboratory	Practice test - evaluation duration 15 min.	10%
10.5 Project	Design of an equipment/ device (technical report that meets the requirements outlined above)	Public presentation - duration 20 minutes including answer to project related questions (max. 10 min)	50%

10.6 Minimum performance standard
Theory evaluation (course)*:* correct answer to at least 25 questions in the written test.
Lab Evaluation*:* promoting laboratory activity with min.5 grade, according to the assessment method highlighted above.
Project Evaluation*:* Promoting project activity with min. 5 grade, according to the assessment method highlighted above.
Promotion of the MEF discipline exam: get the 5th grade at each above-mentioned test – theory evaluation, lab test, and project.

Date of filling in:	Lecturer	Title Surname Name	Signature
	Course	Assoc.Prof.Eng. Bogdan Mocan, PhD	
	Teachers in charge of application	Eng. Dragos Bartos, PhD student	
		Assoc.Prof.Eng. Bogdan Mocan, PhD	

Date of approval in the Council of IPR Department _________________________	Head of department, Prof.dr.ing. Calin NEAMTU
Date of approval in the FIIRMP _________________________	Dean, Prof.dr.ing. Corina BARLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Manufacturing Engineering
1.4	Field of study	Industrial Engineering
1.5	Cycle of study	Bachelor
1.6	Bachelor/Master Program of study/Qualification	Industrial Engineering / Engineer
1.7	Form of education	with frequency
1.8	Subject code	41.00

2. Data about the subject

2.1	Subject name			Manufacturing Technologies I			
2.2	Course responsible/lecturer			*Prof.dr.ing. Mircea Ancău, mircea.ancau@tcm.utcluj.ro*			
2.4	Teachers in charge of seminars						
2.5 Year of study	III	2.6 Semester	I	2.7 Assessment	E	2.8 Subject category	DS/DI

2.1 Subject name				Manufacturing Technologies I	
2.2 Course responsible/lecturer				*Prof.dr.ing. Mircea Ancău, mircea.ancau@tcm.utcluj.ro*	
2.3 Teachers in charge of seminars				*Conf.dr.ing. Radu Adrian, Adrian.Radu@tcm.utcluj.ro*	
2.4 Year of study	III	2.5 Semester	I	2.6 Assessment	E
2.7 Subject category	Formative category				DS
	Optional				DI

3. Estimated total time

3.1 Number of hours per week	2	3.2 of which, course:	1	3.3 applications:	1
3.4 Total hours in the curriculum	28	3.5 of which, course:	14	3.6 applications:	14

Individual study	hours
Manual, lecture material and notes, bibliography	14
Supplementary study in the library, online and in the field	14
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
Tutoring	14
Exams and tests	14
Other activities	2

3.7	Total hours of individual study	72
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. **Pre-requisites (where appropriate)**

4.1	Curriculum	Machine parts, Descriptive geometry and technical drawing
4.2	Competence	C2.5. Realization of projects specific to the field of industrial engineering, use and combination of knowledge, principles and basic methods in the field of industrial engineering and their association with the notions of technical drawing.

5. **Requirements (where appropriate)**

5.1	For the course	Multi-media projector
5.2	For the applications	TCM laboratory equipment

6. **Specific competences**

Professional competences	C4.1. Description of the theory, methods and basic principles for the design of technological processes specific to the field of machine construction. C4.2. Use basic knowledge to explain and interpret different types of processes specific to manufacturing technologies in machine building. C4.3. Application of basic principles and methods for designing manufacturing processes on classic and / or CNC machine tools, with well-defined input data, under qualified supervision. C4.4. Appropriate use of standardized evaluation criteria and methods for assessing the quality, advantages and limitations of manufacturing processes on conventional and / or CNC machine tools, or on flexible manufacturing systems. C4.5. Elaboration of projects of the manufacturing processes from the construction of machines, including the CAM programs. CT1. Application of ethical values within the engineering profession and responsible execution of professional duties, with limited autonomy and under qualified supervision. Promoting logical, convergent and divergent thinking, for evaluating one's own decisions. CT3. Objective self-assessment and the need for continuous training, in order to enter the labor market, according to the dynamic and respective requirements of personal and professional development. Efficient use of language skills in information and communication technology.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Obtaining knowledge in the field of manufacturing technologies, machine tools, respectively technological cutting processes.
7.2	Specific objectives	Knowledge of the theory, methods and fundamental principles of designing technological processes, specific to the field of industrial engineering. Use of basic knowledge to explain and analyze different manufacturing technologies in industrial engineering. Calculation of machining errors for different machining technologies. Determining the right orientation for a semi-finished product, choosing a specific device so that the manufacturing error is minimal.

		Determining the size of the cutting forces and the cutting moments, the state of tension, the power consumed, in order to choose the correct cutting technological parameters. Application of learned methods and working principles, to the design of technological manufacturing processes with or without CNC. Use of standardized criteria and methods for assessing the quality, advantages and limitations of machine tools with or without CNC, or flexible manufacturing systems. Be able to design technological manufacturing processes specific to the field of industrial engineering, including CAM programs.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
Introduction. Generalities related to manufacturing technologies. The main features of manufacturing technologies.	Teaching, problem solving	Laptop, Video Projector
The mechanics of chip formation. Orthogonal cutting. Cutting forces. Merchant's circle. Cutting speeds, tensions, specific energies.		
Manufacturing accuracy. Different types of errors.		
Manufacturing accuracy. The influence of the rigidity of the machine tool on the machining accuracy. Part rigidity.		
Manufacturing accuracy. The influence of the cutting tool on the machining accuracy. Thermal deformations. The influence of machine tool wear on machining accuracy.		
Manufacturing accuracy. Wear of the cutting tool. Case 1: wear on the rake surface; Case 2: wear on the end relief face.		
Manufacturing accuracy. Internal stress. Vibrations of the technological system.		
Manufacturing accuracy. Surface quality and integrity. Cutting fluids. Determination of the total processing error. Statistical interpretation of manufacturing errors.		

8.2 Laboratory / project	Teaching methods	Notes
Adjusting the cutting tool to size. Statistical interpretation of adjustment errors.	Laboratory plan	Individual or group solving of laboratory assignments,
Experimental determination of the static rigidity of the subassemblies of a universal lathe.		

Experimental determination of the dynamic rigidity of the subassemblies of a universal lathe.		under the supervision of the assistant teacher.
Experimental determination of cutting tool wear.		
Experimental determination of the influence of cutting tool temperature on machining accuracy.		
Analysis of the technological possibilities of processing on a universal lathe.		
Analysis of the technological possibilities of processing on a universal milling machine.		

Bibliography

1. Ancău, M. Manufacturing Technologies. Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2003.
2. DeGarmo, E.P. s.a. Materials and Processes in Manufacturing. Prentice-Hall, New York, 8th Ed., 1997.
3. Kalpakjian, S. Manufacturing Processes for Engineering Materials. Adison Wesley Longman Inc., 3rd Ed., 1997.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The assimilated knowledge is necessary for solving the year projects, the diploma project, as well as for solving the various future problems in the industrial practice.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Solving two theoretical topics	Writing - duration 1 hour	65%
10.5 Applications	Solving a problem	Writing - duration 0.5 hours	35%
10.6 Minimum standard of performance Each subject must be solved for minimum 5 point from ten.			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	*Prof.dr.ing. Mircea Ancău*	
	Teachers in charge of application	*Conf.dr.ing. Radu Adrian*	

Date of approval in the department IF	Head of department
Date of approval in the faculty IIRMP	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics in English / Robotics
1.7	Form of education	Full time
1.8	Subject code	42.00

2. Data about the subject

2.1	Subject name			Acquisition systems, interfaces and virtual instrumentation		
2.2	Subject area			Data Acquisition and Virtual Instrumentation		
2.2	Course responsible/lecturer			*Assoc. Prof. Dr. Eng. Dan Hurgoiu – dan.hurgoiu@muri.utcluj.ro*		
2.3	Teachers in charge of seminars			Lecturer Dr. Eng. Vasile Tompa – vasile.tompa@muri.utcluj.ro		
2.4 Year of study	3	2.5 Semester	1	2.6 Assessment		E
2.7 Subject category	Formative category					DID
	Optionality					DOB

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar		3.3 Laboratory	2	3.3 Project	
3.4 Total hours in the curriculum		of which	3.5 Course		3.6 Seminar		3.6 Laboratory	2	3.6 Project	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	14
(b) Supplementary study in the library, online and in the field	38
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	
(e) Exams and tests	3
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	69
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basics of automation systems, Electronics and automation, Sensors and sensing systems
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	Internet connected PC with Microsoft Teams software installed
5.2	For the applications seminars/ laboratories / projects	Laboratory attendance is mandatory. LabVIEW Academic/Student Edition with NI: Real-Time Module, FPGA Module, Robotics, Control Design and Simulation, Systemlink and Vision Development Module installed.

6. Specific competences

Professional competences	• Theoretical knowledge: – Notions of virtual instrumentation – Knowledge about the structure, choice and configuration of data acquisition systems – Studying the components of data acquisition systems – Notions of image acquisition and processing • Skills: – To use the LabVIEW programming environment To develop robotics-specific data acquisition applications
Cross competences	• Ability to communicate, teamwork and leadership • Structuring applications with medium complexity • Presenting own achievements and projects • Research-specific concepts are used

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Knowledge of virtual instrumentation, signal acquisition, processing, analysis and data representation in robotics;
7.2	Specific objectives	• Knowledge and configuration of data acquisition and control systems • Implementation of bio-instrumentation applications • Developing data acquisition applications specific to robotics • Developing image acquisition and processing applications

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Structure of data acquisition and control systems	2	Multimedia presentation	
Data acquisition and control devices	2		
Virtual Instrumentation and LabVIEW Integrated Development Environment	2		
Signals in data acquisition	2		
Signal conditioning and signal processing	2		
Industrial data communication interfaces	2		
Real Time applications and LabVIEW Robotics	2		
Smart industrial devices	2		

Digital image basics and formation	2		
Image acquisition techniques and devices	2		
Digital image transfer and compression technologies	2		
Image data processing, analysis and respresentation	2		
Machine Learning and Vision in Robotics	2		
Remote Control and Monitoring in Robotics	2		

Bibliography

1. Acquisition systems, interfaces and virtual instrumentation – course support
2. Hurgoiu D.: Monitorizarea şi Controlul Proceselor de Fabricaţie, Editura Casa Carţii de Ştiinţă, Cluj-Napoca, 2013, ISBN 978-606-17-0373-9;
3. ***: Data Acquisition Handbook, Third Edition, Measurement Computing Corporation, 2013.

8.2. Seminars /Laboratory/Project	No. of hours	Teaching methods	Notes
The structure of generic NI-LabVIEW applications	2	Software applications written using Integrated Development Environments, tested by simulation and emulation means given the remote access scenario.	
Configuration of Data Acquisition and Control Systems – DAQ Designer / NI-MAX	2		
Signals acquisition and sensor measurements on NI Elvis	2		
DC Motor Control Trainer Application – QNET DCMCT Speed Control	2		
DC Motor Control Trainer Application – QNET DCMCT Position Control	2		
Image acquisition in the industrial scene	2		
Optical sensor-based object detection applications	2		
Application for edge detection using optical sensors	2		
Application for dimensional measurements using image acquisition	2		
Application for image-based feature recognition	2		
Project-application with NI LabVIEW Robotics Starter Kit 2.0	4		
Individual work and application presentations	2		
Final evaluation for individual projects and applications	2		

Bibliography:

1. ***: LabVIEW Data Acquisition and Signal Conditioning Course Manual, National Instruments Corporation, February 2010 Edition.
2. ***: LabVIEW Data Acquisition and Signal Conditioning Exercises, National Instruments Corporation, February 2010 Edition.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Complex robotic applications involve the acquisition, analysis and representation of multiple data and of a different nature. Students learn to use proprietary research tools for robotic applications. The discipline curriculum corresponds to employers' requirements related to testing and analyzing systems that involve multiple process variables that need to be analyzed or controlled.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Theoretical knowledge of the structure and configuration of data acquisition systems; Theoretical knowledge related to the construction, the principle of functioning of the components of the data acquisition systems Theoretical knowledge related to the acquisition and processing of images.	Written Exam (C)	25%
10.5 Seminars /Laboratory/Project	Developing applications for acquisition, analysis and data processing in robotics; Develop a LabVIEW project	Presentation (P) Application development (L)	25% 50%
10.6 Minimum standard of performance: • E = ¼ * C + ¼ * P + 1/2 * L;			
Condition for obtaining the credits: E≥5; C≥5; L≥5;			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Assoc. Prof. Dr. Eng. Dan Hurgoiu	
	Teachers in charge of application	Lecturer Dr. Eng. Vasile Tompa	

Date of approval in the department …….. __________________________	Head of department Prof.dr.ing. Călin NEAMȚU, Ph.D.
Date of approval in the faculty …………… __________________________	Dean Prof.dr.ing. Corina BÎRLEANU, Ph.D.

SYLLABUS

1. Information about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor
1.6 Program of study / Qualification	Robotics / Mechanical engineer
1.7 Form of education	FT – Full time
1.8 Subject code	43.00

2. Information about the subject

2.1 Subject name	Computer Aided Design II				
2.2 Course responsible	Assoc.prof.dr.eng. Ștefan BODI – stefan.bodi@muri.utcluj.ro				
2.3 Seminar / **Laboratory applications** / Project applications responsible	Assoc.prof.dr.eng. Florin POPIȘTER – florin.popister@muri.utcluj.ro Lect.dr.eng. Zsolt Levente BUNA – zsolt.buna@muri.utcluj.ro				
2.4 Year of study	3	2.5 Semester	1	2.6 Method of assessment	C
2.7 Subject category	Formative category				DD
	Optionality				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	3.2 Course	2	3.3 Seminars	0	3.3 Laboratory	2	3.3 Project	0
3.4 Number of hours per semester	56	of which:	3.5 Course	28	3.6 Seminars	0	3.6 Laboratory	28	3.6 Project	0

3.7 Distribution of time (hours per semester) for:	
(a) Study after the textbook, course support, bibliography, and course notes	8
(b) Supplementary study in the library, on specialty electronic platforms and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	16
(d) Tutoring	6
(e) Exams and tests	4
(f) Other activities:	0

3.8 Total hours of individual study (sum of (3.7(a)…3.7(f))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 of curriculum	Descriptive Geometry, Technical Drawing and Infographics, Computer Aided Design I
4.2 of competences	Understanding and interpreting technical drawings

5. Requirements (where appropriate)

5.1. for the course	It's not necessary
5.2. for the seminar / laboratory applications / project applications	The attendance to the laboratory applications is mandatory.

6. Specific competences

Professional competences	C3.3 Creating the functional constructive model and the design of partial assemblies (mechanical, pneumatic, hydraulic, electrical, optical, etc.) integrated in mechatronic and robotic subsystems for local automation. C4.3 Development of the direct and inverse geometric, kinematic and dynamic model for the general assembly of industrial robots with different general architectures and the complete documentation of the technical project in parameterized 2D and 3D CAD modeling work environments for partial robotic assemblies. C4.4 The use of modern evaluation methods (computational assistance, modeling, simulation, optimization of operation) in the optimal design of robotic subsystems and hardware interfaces and virtual instrumentation software, specific for the acquisition, processing and interpretation of experimental data
Cross competences	CT1. Fulfilling the professional tasks with exact identification of the objectives, of the available resources, of the conditions for their completion, of the working stages, of the working time and of the related accomplishment deadlines. CT3. Identifying the need for continuous training and the effective use of information sources and communication resources and assisted professional training (internet portals, specialized software applications, databases, online courses, etc.), both in Romanian and in an international language.

7. Subject objectives (as result from the key competency grid)

7.1 General objective	Designing and creating industrial product designs in advanced CAD solutions
7.2 Specific objectives	Students learn the following aspects: - modeling the components of an industrial product in advanced CAD solutions; - designing in the context of the assembly; - simulating the kinematics of an assembly; - subjecting a product and an assembly through finite element analysis; - sheetmetal modeling; - simulating the machining process of metallic parts.

8. Contents

8.1 Lecture (syllabus)	No. of h	Teaching methods	Notes
1. Basic design principles	2	- Presentations with media/video - Case studies and exercises; - Discussions on concepts and documents specific to the field - Q&A session;	
2. Designing products using objective functions (DfX) (1)	2		
3. Designing products using objective functions (DfX) (2)	2		
4. Designing products using objective functions (DfX) (3)	2		
5. Kinematic modeling and simulation of a mechanism	2		
6. Kinematic optimization of a mechanism	2		
7. Validating a product using the finite element analysis (1) – single parts	2		
8. Validating a product using the finite element analysis (2) – assemblies	2		
9. Designing mechanical components in the context of the assembly;	2		
10. Modeling sheetmetal components (1)	2		
11. Modeling sheetmetal components (2)	2		
12. Simulating the manufacturing of metallic parts through lathe machining	2		

13. Simulating the manufacturing of metallic parts through milling (1)	2		
14. Simulating the manufacturing of metallic parts through milling (2)	2		

Bibliography:
1. Neamţu Călin, Dragomir Mihai, Șteopan Mihai; Computer Aided Design II, ISBN 978-973-662-269-4, UT Press, Cluj-Napoca, 2006, (277 pg.);
2. Bodi Ștefan, Virtual Quality Management in the Era of Industry 4.0, UTPress, Cluj-Napoca, 2020, ISBN 978-606-737-438-4, DOI: 10.13140/RG.2.2.34973.26084, pp. 172
3. Neamțu Călin, Popescu Daniela, Popișter Florin, CAD/CAM modules in CATIA V5, ISBN 978-606-543-361-8 Mega Publishing, Cluj-Napoca, 2013, (410 pg.);
4. Copot Daniel, Neamţu Călin, Popescu Daniela et. all, Handbook of Good practices in Smart manufacturing, Mega Publishing, e-ISBN: 978-606-543-928-3, 2017, (269 pg.)
Internet resources:
1. The official courses of CATIA developed by Dassault Systemes, provided through the Dassault Systemes Resource Center and the 3DSAcademy platform (https://www.3ds.com/cloud/3dexperience-education).
Other:
1. Lecture notes

8.2 Seminars / **laboratory applications** / project applications	No. of h	Teaching methods	Notes
1. CATIA: Part design	2	- Practical exercises in 3D media - 3D models and their analysis - Use of IT&C elements	
2. CATIA: Assembly design	2		
3. CATIA: Formulas – Parametric design – Defining and creating product parameters (1)	2		
4. CATIA: Formulas – Parametric design – Defining and creating product parameters (2)	2		
5. CATIA: Formulas – Parametric design – Editing the design of a product using defined parameters (3)	2		
6. CATIA: DMU Kinematics – Defining and creating basic joints	2		
7. CATIA: DMU Kinematics – Defining and creating complex joints. Simulating the functioning of mechanisms.	2		
8. CATIA: Generative structural analysis – Creating a finite element model for one component	2		
9. CATIA: Generative structural analysis – Creating a finite element model for assemblies	2		
10. CATIA: Generative sheetmetal design – Creating sheetmetal components using basic commands (1)	2		
11. CATIA: Generative sheetmetal design – Creating sheetmetal components using advanced commands (2)	2		
12. CATIA: Lathe machining – simulating the manufacturing of turned products	2		
13. CATIA: Prismatic machining – simulating the manufacturing of milled products (basic notions) (1)	2		
14. CATIA: Prismatic machining – simulating the manufacturing of milled products (advanced notions) (2)	2		

Bibliography:
1. Neamţu Călin, Dragomir Mihai, Șteopan Mihai; Computer Aided Design II, ISBN 978-973-662-269-4, UT Press, Cluj-Napoca, 2006, (277 pg.);
2. Bodi Ștefan, Virtual Quality Management in the Era of Industry 4.0, UTPress, Cluj-Napoca, 2020, ISBN 978-606-737-438-4, DOI: 10.13140/RG.2.2.34973.26084, pp. 172
3. Neamțu Călin, Popescu Daniela, Popișter Florin, CAD/CAM modules in CATIA V5, ISBN 978-606-543-361-8 Mega Publishing, Cluj-Napoca, 2013, (410 pg.);

4. Copot Daniel, Neamţu Călin, Popescu Daniela et. all, Handbook of Good practices in Smart manufacturing, Mega Publishing, e-ISBN: 978-606-543-928-3, 2017, (269 pg.) Internet resources: 1. The official courses of CATIA developed by Dassault Systemes, provided through the Dassault Systemes Resource Center and the 3DSAcademy platform (https://www.3ds.com/cloud/3dexperience-education). Other: 1. Lecture notes

9. Bridging course contents with the expectations of the representatives of the community, professional associations, and employers in the field

CATIA is currently one of the most advanced 3D modeling solutions. In the context of digitization and virtualization, every mechanical engineer should know and be able to use advanced 3D modeling and simulation solutions. In the current labor market, knowing how to use this software program is very well looked at and it could serve as a facilitator for fast access into companies that undertake design activities at the highest level in the automotive or in the industrial sector. 3D modeling is a clear requirement in almost all enterprises that specifically focus on the production of industrial equipment and installations, whether they are created in-house or manufactured under license.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The ability to reproduce a 3D model of a sheetmetal component using specific commands. The ability to reduce the weight of a component while reducing its displacement when subjected to a given load, using the finite element analysis. The ability to create and simulate the kinematic model of an assembly. The ability to simulate the milling process and its specific operations for a metallic workpiece.	2,5-hour practical exam in CATIA with the following topics: sheetmetal design, generative structural analysis, DMU kinematics and prismatic machining (C).	66.7%
10.5 Seminar **/Laboratory appl.** /Project appl.	Classroom activity during the semester. Complexity and correctness of 3D models and simulations created during home work.	Grade on laboratory activity (L)	33.3%
10.6 Minimum standard of performance • G = 0,667* C + 0,333 * L Condition for obtaining the credits: G≥5; C≥5; L≥5			

Date of filling in:	Responsible	Title First name LAST NAME	Signature
	Course	Assoc.prof.dr.eng. Ștefan BODI	
	Applications	Assoc.prof.dr.eng. Florin POPIȘTER	
		Lect.dr.eng. Zsolt Levente BUNA	

Date of approval in the department council	Head of department, Prof.dr.eng. Călin NEAMȚU
Date of approval in the faculty council	Dean, Prof.dr.eng. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Mechanical Systems Engineering
1.4	Field of study	Robotics and Mechatronics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/Engineer
1.7	Form of education	Full time
1.8	Subject code	44.00

2. Data about the subject

2.1	Subject name			Programming in Java			
2.2	Subject area			Computer Programming (DAP, DCA)			
2.3	Course responsible/lecturer			Prof. dr. ing. ANTAL Tiberiu Alexandru – antaljr@bavaria.utcluj.ro			
2.4	Teachers in charge of seminars			Prof. dr. ing. ANTAL Tiberiu Alexandru			
2.5 Year of study	3	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DS/DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 applications:	2
3.4 Total hours in the curriculum	42	3.5 of which, course:	14	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	22
Supplementary study in the library, online and in the field	5
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	5
Tutoring	2
Exams and tests	2
Other activities	

3.7	Total hours of individual study	33
3.8	Total hours per semester	75
3.9	Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basic algorithm knowledges; Java object oriented programming knowledge or experience.
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Attendance at the laboratory is mandatory.

6. Specific competences

Professional competences	After completing the discipline students will be able to: • identify the type of Java application and the conditions under which it can be run; • use JDeveloper to create and test a Java application • program in Java: • structured and object-oriented; • applications that handle code-level operating exceptions; • applications that operate with files; • applications that operate with networks; • client-server applications based on interaction with robots.
Cross competences	Applying the values and ethics of the engineering profession and responsible execution of complex professional tasks in conditions of professional autonomy and independence. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-evaluation in decision making. Planning your own work priorities, drawing up your own action plan.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Development of human-robot communication applications, integration and use of intelligent systems for interfacing industrial robots with the working environment.
7.2	Specific objectives	1. Planning and designing program applications in object-oriented programming languages for the realization of communication applications and human-robot interfaces; knowledge of objective programming environments, of client-server specific concepts, instructions and architectures, operation with files, databases, creation of graphical interfaces; understanding and using the concepts, paradigms and models of artificial vision applied in robotics, selection and use of artificial vision systems in robotics. 2. Use of specific development environments for creating and testing client-server applications in communication and interface with industrial robots and robotic systems in general, use of image processing environments in robotics. 3. Integrated application of advanced software environments for the development of intelligent human-robot interfaces, including interfaces based on artificial vision. 4. Critical, quantitative and qualitative evaluation based on methods of analysis, planning and selection of solutions for intelligent interfacing of operators with robots or robots with the working environment. 5. Elaboration of professional and / or research projects for the realization of human-robot, robot-robot, robot-work

		environment communication interfaces.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
1. Java basics. Comparison with C / C ++.	Use of TIC/blended learning resources, discussions, Internet.	Video projector, board and/or online meetings on MS Teams(Zoom)
2. Java language elements.		
3. Primitive data types.		
4. Operators and operands. Priority.		
5. Types of instructions. Sequence and decision.		
6. Cycling and jumping.		
7. Subroutines.		
8. Objects and classes.		
9. Object-oriented design in Java.		
10. Arrays.		
11. Exceptions. Multitasking elements.		
12. Input / output streams for console and files.		
13. Network input / output streams.		
14. Client-server systems for robots.		

Bibliography

1. Ştefan Tanasă, Cristian Olaru, Ştefan Andrei, Java de la 0 la expert, Polirom, 2003, ISBN: 973-681-201-4.
2. Peter Norton, William Stanek, Ghid de programare în Java, Teora, 1997, ISBN: 973-601-719-2.
3. Herber Schild, Java 2 - The Complete Reference, Fourth Edition, Osborne, 2001, ISBN: 0-07-213084-9.
4. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-7.
5. http://www.detect.utcluj.ro/~antaljr/downloads.html

8.2. Applications/Seminars	Teaching methods	Notes
1. Presentation of the JDeveloper environment. The steps of creating an application.	Use of TIC/blended learning resources, discussions, Internet.	Video projector, board and/or online meetings on Skype (or MS Teams)
2. Enter and display data in text mode. Output data formatting		
3. Applications with operators.		
4. Applications with if,?:, And switch. Specific errors.		
5. Applications with while, do, for, break and continue. Specific errors.		
6. Subroutine applications.		
7. Applications with class, new, public, private, protected.		
8. Applications with inheritance and polymorphism.		
9. Applications with interfaces, classes and abstract methods.		
10. Applications with arrays and strings.		
11. Handling exceptions in applications.		
12. Applications with data processing stored files.		
13. Network communication applications.		
14. Implementation of client-server applications for robots.		

Bibliography 1. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-7. 2. http://www.east.utcluj.ro/mb/mep/antal/downloads.html

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Master's students can choose to apply their knowledge acquired in industry, in research or in expanding, through a doctoral school, the skills acquired when completing a doctorate. Regardless of their option, the acquired competencies will be necessary in case they will carry out their activity within the specialized robot companies or within the software companies oriented on the field of robot programming, respectively when completing the doctorate.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Designing a client-server project in Java.	Presentation of the Java design (in written).	30%
10.5 Applications	Presentation of the running implementation JDeveloper design.	Showing the working implementation and answering questions about the project.	70%
10.6 Minimum standard of performance			
A running implementation of a simple Java JDeveloper project written by the student.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof.dr.ing. ANTAL Tiberiu Alexandru	
	Teachers in charge of application	Prof.dr.ing. ANTAL Tiberiu Alexandru	

Date of approval in the department	Head of department Prof.dr.ing. ANTAL Tiberiu Alexandru.
Date of approval in the faculty	Dean Prof.dr.ing. Corina BIRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/Engineer
1.7	Form of education	Full time
1.8	Subject code	45.00

2. Data about the subject

2.1	Subject name			Sensors and sensing systems			
2.2	Subject area			DD			
2.2	Course responsible/lecturer			Assoc. Prof. dr. ing. Dan Hurgoiu; dan.hurgoiu@muri.utcluj.ro			
2.3	Teachers in charge of seminars			Lecturer dr. ing. Vasile Tompa; vasile.tompa@muri.utcluj.ro			
2.4 Year of study	3	2.5 Semester	1	2.6 Assessment	C		
2.7 Subject category	Formative category					DD	
	Optionality					DI	

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar		3.3 Laborator	2	3.3 Proiect		
3.4 Total hours in the curriculum	100	of which	3.5 Course	28	3.6 Seminar		3.6 Laborator	28	3.6 Proiect		

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	14
(b) Supplementary study in the library, online and in the field	14
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Electronics and automation, Electrical drives, Hydraulic and pneumatic drives
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	

5.2	For the applications	Laboratory attendance is mandatory

6. Specific competences

Professional competences	• Theoretical knowledge: – To acquire knowledge about choosing and configuring a modern modern measurement system – Knowledge of static and dynamic performance of sensor systems – Study of the main sensors used in manufacturing processes and in robotic systems – Study of the specific robotic sensory systems • Skills: – To carry out measurement applications with sensors used in mechatronics – To experimentally determine the characteristics and performance of the sensors – To perform sensor calibration operations
Cross competences	• Conceptual design, configuring and building your own applications • Acquiring communication skills and teamwork • Solving tasks in a defined and limited time • Choose the right measuring systems in robotics applications

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Use of modern sensor systems, processing, analysis and representation of process size data
7.2	Specific objectives	• Knowing the characteristics and performance of sensor systems • Knowing the main sensors used in manufacturing processes and robotic systems • Building measuring applications of different process quantities

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Fundamentals of Measurements	2		
Signals used in measurement systems	2		
Static Characteristics and Performances	2		
Dynamic Characteristics and Performances	2		
Analog sensors for position and displacement measurement	2		
Digital sensors for position and displacement measurement	2		
Sensors for speed measurement	2		
Sensors for temperature measurement	2		
Sensors for mass, force and couple measurement	2		

Sensors for pressure measurement	2		
Sensors for flow measurement	2		
Sensors for level measurement	2		
Sensorial systems and smart sensors	2		
Communication interfaces of intelligent sensors	2		
Bibliography 1. Hurgoiu D., Popescu S.: Sensors and Data Acquisition - Course, Editura U.T. Press, Cluj-Napoca, 2013, ISBN 978-973-662-873-3 2. Ionescu G. s.a. – Traductoare pentru automatizari industrial vol. 1 si 2 3. Fraden, J.: Handbook of modern sensors, physics, designs, and applications, Springer Verlag, 2005.			

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Introduction in LabVIEW – basic functions	2	Practical applications on educational stands Multimedia	
Measurement of analog signals	2		
Measurement of digital signals	2		
Temperature measurement with thermocouple	2		
Temperature measurement with thermistors	2		
Measurement of displacements with the potentiometer	2		
Measurement of displacements with incremental rotation transducer	2		
Measurement of displacements with ultrasonic sensors	2		
Measurement of long displacements with optical sensors	2		
Measurement of short displacements with optical sensors	2		
Measurement of travels with Hall effect magnetic sensors	2		
Measurement of deformations with strain gauges	2		
Vibration measurement with piezoelectric sensors	2		
Measurement of pressures with piezoresistive sensors	2		
Bibliography			

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

In the automation of robotic manufacturing processes an important task is to determine the process variables using sensor based measurement systems. In this discipline we study the performance of the measurement systems, the sensor selection criteria, as well as a wide range of sensors. Data processing, analysis and representation is done through data acquisition systems. The curriculum of the discipline corresponds to the requirements of the employers due to the large variety of process variables studied theoretically and practically during the course and laboratory works.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade

10.4 Course	Theoretical knowledge of the characteristics and performance of sensor systems Theoretical knowledge related to construction, operating principle, mathematical models and electronic adapters of sensors for measuring different physical variables.	Written test	50%
10.5 Seminars /Laboratory/Project	Building applications for measuring various physical process variables Develop an application in the exam	Note each laboratory work application Exam application	25% 25%
10.6 Minimum standard of performance			
N=0,5E+0,25L+0,25A Conditions for obtaining credits: N> 5; E> 4; L> 4; A> 4 Exam (E); Laboratory (note L); Applications (note A)			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Assoc. Prof. Dr. Eng. Dan Hurgoiu	
	Teachers in charge of application	Lecturer Dr. Eng. Vasile Tompa	

Date of approval in the department .... _________________________	Head of department Prof.dr.ing.
Date of approval in the faculty .... _________________________	Dean Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	46.00

2. Data about the subject

2.1	Subject name			Robot Mechanics			
2.2	Subject area						
2.2	Course responsible/lecturer			Assoc. Prof. Ovidiu-Aurelian DETEȘAN, Ph.D.			
2.3	Teachers in charge of seminars			Assoc. Prof. Ovidiu-Aurelian DETEȘAN, Ph.D.			
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment			E
2.7 Subject category	Formative category						DS
	Optionality						DI

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	2	3.3 Laborator		3.3 Proiect	
3.4 Total hours in the curriculum	56	of which	3.5 Course	28	3.6 Seminar	28	3.6 Laborator		3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	25
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
(d) Tutoring	0
(e) Exams and tests	4
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	69
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Graduation of the subjects: Computer Programming and Programming Languages I and II, Mechanics I and II, Basics of Robotics, Mechanisms and Machine Elements I and II
4.2	Competence	Knowing the basic principles of Mechanics Knowing the representation of kinematic schemes

		Knowing the basic principles of algorithms and Computer Programming

5. **Requirements (where appropriate)**

5.1	For the course	Lecture room with a number of seats at least equal to the number of students Multimedia projector; Internet access; Notebook; MS Office; MATLAB Blackboard / Whiteboard and Blackboard / Whiteboard writing instruments
5.2	For the applications **seminar** / laboratory / project	Seminar room with a number of seats at least equal to the number of students Multimedia projector; Internet access; Notebook; MS Office; MATLAB Blackboard / Whiteboard and Blackboard / Whiteboard writing instruments

6. **Specific competences**

Professional competences	C2.1. Description of standardized symbols for structural and operating diagrams and diagrams in mechanics, electrotechnics, electronics, informatics, optics, pneumatics and hydraulics C2.2. Explaining and interpreting technical design standards and conventional engineering graphics in design drawings, technology film sheets, product manuals and test manuals C.2.3. Elaboration of schemes (kinematic, pneumatic, hydraulic, etc.), execution drawings, technological plan, product manual and test manual for mechatronic and robotic subsystems C.2.4. Using schemas, charts, and field-specific technical representations in benchmarking of products
Cross competences	CT3. Identification of the need for continuous training and efficient use of information sources and communication resources and assisted training (Internet portals, specialized software applications, databases, on-line courses, etc.) both in Romanian and in an international language

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Mastering the fundamental principles and general theorems that rule the motion of mechanical systems included in the structure of industrial robots
7.2	Specific objectives	The students must assimilate and understand important notions regarding industrial robots, such as: Mechanical structure of robot; The geometry and the mathematical modeling of robot mechanical structure; Matrix transformations; Forward geometry and kinematics (DGM), (DKM). They have to understand all phenomena, principles and algorithms that are specific to robot geometry and kinematics. The students must be able to evaluate the performance characteristics that define the geometry and kinematics of industrial robots. They have to understand all phenomena,

		principles and algorithms that are specific to robot dynamics, to evaluate the performance characteristics that influence the dynamic behavior of any robot mechanical structure and finally, to synthetize all knowledge regarding the dynamics of industrial robots that are implemented in different industrial processes.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Introduction in Robot Mechanics. Human / Robot Parallel. Robot Mechanical Structure (RMS): joints, actuators, end-efectors. Course Objective. Course Structure. The Generalized Algorithm. The Subject Contents. References	2	- Exposing; - Discussions; IT&C / Blended Learning educational resources	Video projector, internet, MATLAB, MS Teams
2. Robot Mechanical Structure. Industrial robot. Classification. Mechanical constraints. Base components of RMS. Kinematics schemes	2		
3. Matrix transformations in the advanced mechanics. The location concept. Simple rotation matrices	2		
4. Matrix transformations in the advanced mechanics. The resultant rotation matrix. The Orientation Algorithm. The Direct Model of Orientation	2		
5. Matrix transformations in the advanced mechanics. The Inverse Model of Orientation. Synthesis About Matrix Transformations. Homogeneous Transformations	2		
6. Geometric modeling of RMS. The Geometric Model Equations. The Direct Geometric Model (DGM). The Inverse Geometric Model (IGM). The Algorithm of the Location Matrices	2		
7. Kinematic modeling of RMS. The Kinematic Model Equations. Matrices of the Input Data. Mechanical Sequence. Linear Velocity and Acceleration. Angular Velocity and Acceleration	2		
8. Kinematic modeling of RMS. Iterative Kinematic Parameters for Each Kinetic Assembly. The Iterative Algorithm to DKM	2		
9. Kinematic modeling of RMS. The Algorithm of Transfer Matrices. Angular Transfer Matrices. Linear Transfer Matrices. The Algorithm of the Jacobian Matrix. The Inverse Kinematic Model	2		
10. Mass distribution. The Mass. The Position of the Mass Center. Inertia Tensor. Pseudo Inertia Tensor. The Algorithm of MD-type Properties	2		

11. Modeling of static forces. The Static Equilibrium. Complex Frictions from the Driving Joints. Iterative Algorithm for Static Forces. Generalized Active Forces. Generalized Gravitational Forces. The Generalized Manipulating Forces. Friction Forces. The Inverse Model of SF. The Direct Model of SF. The Generalized Algorithm of Static Forces	2		
12. Dynamic Modeling. Model Equations. The First Variant. The Second Variant. Matrices of Input Data. Matrix and Differential Transformations. Notions and Theorems in Robot Dynamics. The Iterative Algorithm in Dynamics (IDM)	2		
13. Dynamic Modeling. Generalized Inertia Forces. Generalized Friction Forces. Matrix Equations in Dynamics. Matrix Equations of Dynamics in Configuration Space. Generalized Algorithm in Robotics	2		
14. Quaternion Applications In Robotics. Hypercomplex numbers. Quaternions. Octonions (Cayley numbers)	2		

Bibliography

1. Negrean, I., Duca, A., Negrean, D. C., Kacso, K., Mecanică avansată în Robotică, ISBN 978-973-662-420-9, UT Press, Cluj-Napoca, 2008
2. Negrean, I., Vușcan, I., Haiduc, N., Robotics. Kinematic and Dynamic Modeling, ISBN 973-30-5958-7, EDP, București, 1998
3. Negrean, I., Kinematics and Dynamics of Robots. Modeling – Experiment – Accuracy, ISBN 973-30-9313-0, EDP, București, 1999
4. R. Kelly, V. Santibáñez and A. Loría, Control of Robot Manipulators in Joint Space, Springer-Verlag London Limited, ISBN: 978-1-85233-994-4, 2005
5. Jorge Angeles, Fundamentals of Robotic Mechanical Systems - Theory, Methods, and Algorithms, Springer International Publishing Switzerland, ISBN 978-3-319-01850-8 , 2014
Internet resources:
1. Quaternion. Encyclopedia of Mathematics. URL: http://encyclopediaofmath.org/index.php?title=Quaternion&oldid=35148, accessed: 29/06/2022

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
1. Introduction to MATLAB. GUI. Basic elements. Classes. Applications to Robot Mechanics	2	- Presentation; - Discussions; - IT&C / Blended Learning educational resources; - Project-Based Learning; - interactive presentation; - applications.	Video projector, internet, MATLAB, MS Teams
2. Robot Mechanical Structure (RMS) - applications. Matrix of nominal geometry. Kinematics scheme	2		
3. Matrix transformations in the advanced mechanics. The position and orientation with respect to the previous frame. MATLAB script applications	2		
4. Matrix transformations in the advanced mechanics. Defining MATLAB functions for the simple rotation matrices. The resultant orientation matrix. The inverse of the resultant rotation matrix. Position vectors with respect to {0}	2		

5. Matrix transformations in the advanced mechanics. The orientation angles, based on the inverse model of orientation. Homogeneous Transformation Matrices	2		
6. Geometric modeling of RMS. The angular transfer matrix. Location matrices and their inverse	2		
7. Geometric modeling of RMS. The matrix of orientation. The location eqution of the end-effector. Kinematic modeling of RMS. Defining the MATLAB skew() and vect() functions	2		
8. Kinematic modeling of RMS. The Iterative Algorithm to DKM	2		
9. Kinematic modeling of RMS. The Algorithm of Transfer Matrices. Angular Transfer Matrices. Linear Transfer Matrices	2		
10. Kinematic modeling of RMS. The Algorithm of Transfer Matrices. Linear Transfer Matrices. MATLAB Live Code applications	2		
11. Kinematic modeling of RMS. The Algorithm of the Jacobian Matrix. Mass distribution. The Mass. The Position of the Mass Center	2		
12. Mass distribution. Inertia Tensor. Pseudo Inertia Tensor. The Algorithm of MD-type Properties	2		
13. Modeling of static forces. The Static Equilibrium. Complex Frictions from the Driving Joints. Iterative Algorithm for Static Forces. Generalized Active Forces. Generalized Gravitational Forces. The Generalized Manipulating Forces. Friction Forces. Applications	2		
14. Dynamic Modeling. Model Equations. The Iterative Algorithm in Dynamics (IDM). Quaternion Applications In Robotics. Hypercomplex numbers. Quaternions. MATLAB Functions Associated to Quaternions. Applications in Robot Geometry	2		

Bibliography

1. Negrean, I., Duca, A., Negrean, D. C., Kacso, K., Mecanică avansată în Robotică, ISBN 978-973-662-420-9, UT Press, Cluj-Napoca, 2008
2. Negrean, I., Vușcan, I., Haiduc, N., Robotics. Kinematic and Dynamic Modeling, ISBN 973-30-5958-7, EDP, București, 1998
3. Negrean, I., Kinematics and Dynamics of Robots. Modeling – Experiment – Accuracy, ISBN 973-30-9313-0, EDP, București, 1999
4. R. Kelly, V. Santibáñez and A. Loría, Control of Robot Manipulators in Joint Space, Springer-Verlag London Limited, ISBN: 978-1-85233-994-4, 2005
5. Jorge Angeles, Fundamentals of Robotic Mechanical Systems - Theory, Methods, and Algorithms, Springer International Publishing Switzerland, ISBN 978-3-319-01850-8 , 2014
Internet resources:
1. Quaternion. Encyclopedia of Mathematics. URL: http://encyclopediaofmath.org/index.php?title=Quaternion&oldid=35148, accessed: 29/06/2022

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The skills developed in this course will be required by engineers involved in the modeling, simulation and design of robotic solutions and their implementation.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Knowledge test (C)	Written assessment / Quiz	60%
10.5 Seminars /Laboratory/Project	Project solving (S)	Presentation of the project, answers to questions	40%
10.6 Minimum standard of performance			
E = 0.6 * C + 0.4 * S Condition for obtaining the credits: C≥5; S≥5			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Assoc. Prof. Ovidiu-Aurelian DETEȘAN, Ph.D	
	Teachers in charge of application	Assoc. Prof. Ovidiu-Aurelian DETEȘAN, Ph.D	

Date of approval in the department …….. _________________________	Head of department Prof.dr.ing. Călin NEAMȚU
Date of approval in the faculty …………… _________________________	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Manufacturing Engineering
1.4	Field of study	Industrial Engineering
1.5	Cycle of study	Bachelor
1.6	Bachelor/Master Program of study/Qualification	Industrial Robots / Engineer
1.7	Form of education	With frequency
1.8	Subject code	41.00

2. Data about the subject

2.1	Subject name			Manufacturing Technologies II			
2.2	Course responsible/lecturer			*Prof.dr.ing. Mircea Ancău, mircea.ancau@tcm.utcluj.ro*			
2.4	Teachers in charge of seminars			*Conf.dr.ing. Radu Adrian*			
2.5 Year of study	III	2.6 Semester	II	2.7 Assessment	E	2.8 Subject category	DS/DI

2.1 Subject name	Manufacturing Technologies II				
2.2 Course responsible/lecturer	*Prof.dr.ing. Mircea Ancău*				
2.3 Teachers in charge of seminars					
2.4 Year of study	III	2.5 Semester	II	2.6 Assessment	E
2.7 Subject category	Formative category				DS
	Optional				DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	2	3.3 applications:	1
3.4 Total hours in the curriculum	42	3.5 of which, course:	28	3.6 applications:	14

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	-
Tutoring	10
Exams and tests	3
Other activities	-

3.7	Total hours of individual study	33
3.8	Total hours per semester	75
3.9	Number of credit points	3

4. Pre-requisites (where appropriate)

4.1	Curriculum	Machine parts, Descriptive geometry and technical drawing
4.2	Competence	C2.5. Realization of projects specific to the field of industrial engineering, use and combination of knowledge, principles and basic methods in the field of industrial engineering and their association with the notions of technical drawing.

5. Requirements (where appropriate)

5.1	For the course	Multi-media projector
5.2	For the applications	TCM laboratory equipment

6. Specific competences

Professional competences	C4.1. Description of the theory, methods and basic principles for the design of technological processes specific to the field of machine construction. C4.2. Use basic knowledge to explain and interpret different types of processes specific to manufacturing technologies in machine building. C4.3. Application of basic principles and methods for designing manufacturing processes on classic and / or CNC machine tools, with well-defined input data, under qualified supervision. C4.4. Appropriate use of standardized evaluation criteria and methods for assessing the quality, advantages and limitations of manufacturing processes on conventional and / or CNC machine tools, or on flexible manufacturing systems. C4.5. Elaboration of projects of the manufacturing processes from the construction of machines, including the CAM programs. CT1. Application of ethical values within the engineering profession and responsible execution of professional duties, with limited autonomy and under qualified supervision. Promoting logical, convergent and divergent thinking, for evaluating one's own decisions. CT3. Objective self-assessment and the need for continuous training, in order to enter the labor market, according to the dynamic and respective requirements of personal and professional development. Efficient use of language skills in information and communication technology.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Obtaining knowledge in the field of manufacturing technologies, machine tools, respectively technological cutting processes.
7.2	Specific objectives	Knowledge of the theory, methods and fundamental principles of designing technological processes, specific to the field of industrial engineering. Use of basic knowledge to explain and analyze different manufacturing technologies in industrial engineering. Calculation of machining errors for different machining technologies. Determining the right orientation for a semi-finished product, choosing a specific device so that the manufacturing error is minimal. Determining the size of the cutting forces and the cutting moments, the state of tension, the power consumed, in order to choose the correct cutting technological parameters. Application of learned methods and working principles, to the

		design of technological manufacturing processes with or without CNC. Use of standardized criteria and methods for assessing the quality, advantages and limitations of machine tools with or without CNC, or flexible manufacturing systems. Be able to design technological manufacturing processes specific to the field of industrial engineering, including CAM programs.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
Lathe manufacturing technologies. Possible types of surfaces, operation productivity, precision, surface quality.	Teaching, problem solving	Laptop, Video Projector
Lathe manufacturing technologies. Types of cutting tools, types of tool material, turning devices.		
Milling manufacturing technologies. Possible types of surfaces, operation productivity, precision, surface quality.		
Milling manufacturing technologies. Types of cutting tools, types of tool material, milling devices.		
Manufacturing technologies on broaching machines. Possible types of surfaces, operation productivity, precision, surface quality.		
Manufacturing technologies on broaching machines. Types of cutting tools, types of tool material, broaching devices.		
Planer manufacturing technologies. Possible types of surfaces, operation productivity, precision, surface quality.		
Planer manufacturing technologies. Types of cutting tools, types of tool material, planers used in planing.		
Manufacturing technologies on drilling machines. Possible types of surfaces, operation productivity, precision, surface quality.		
Manufacturing technologies on drilling machines. Types of cutting tools, types of tool material, drilling devices.		
Manufacturing technologies on grinding machines. Possible types of surfaces, operation productivity, precision, surface quality.		
Manufacturing technologies on grinding machines. Types of cutting tools, types of tool material, devices used for grinding.		
	Teaching methods	Notes
Individual design of the technological process of manufacturing a specific part of machine construction.		

Bibliography

1. Ancău, M. Manufacturing Technologies. Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2003.

2. DeGarmo, E.P. s.a. Materials and Processes in Manufacturing. Prentice-Hall, New York, 8th Ed., 1997.
3. Kalpakjian, S. Manufacturing Processes for Engineering Materials. Adison Wesley Longman Inc., 3rd Ed., 1997.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The assimilated knowledge is necessary for solving the year projects, the diploma project, as well as for solving the various future problems in the industrial practice.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Solving two theoretical topics	Writing - duration 1 hour	65%
10.5 Applications	Solving a problem	Writing - duration 0.5 hours	35%
10.6 Minimum standard of performance Each subject must be solved for minimum 5 point from ten.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	*Prof.dr.ing. Mircea Ancău*	
	Teachers in charge of application	*Conf.dr.ing. Radu Adrian*	

Date of approval in the department IF	Head of department
Date of approval in the faculty IIRMP	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	License
1.6	Program of study/Qualification	Robotics
1.7	Form of education	IF – full-time education
1.8	Subject code	48.00

2. Data about the subject

2.1	Subject name			Flexible Manufacturing Systems I		
2.2	Subject area					
2.2	Course responsible/lecturer			Conf. dr. ing. Emilia Brad emilia.brad@muri.utcluj.ro		
2.3	Teachers in charge of seminars			Conf. dr. ing. Emilia Brad emilia.brad@muri.utcluj.ro		
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment		E
2.7 Subject category	Formative category					DS
	Optionality					DI

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	56	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	0
(e) Exams and tests	0
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	It's not necessary
4.2	Competence	It's not necessary

5. Requirements (where appropriate)

5.1	For the course	Lecture hall with a minimum of 30 seats, multimedia projector, computer, MS Power Point
5.2	For the applications	Workshop with at least 30 computer workstations, multimedia projector, computer, MS Power Point

6. **Specific competences**

Professional competences	Theoretical knowledge: - To understand the architecture of a flexible manufacturing system - To understand the structure of a flexible manufacturing process - To understand the operation of the logistics subsystem of the semi-finished products and the work subsystem - To know the main concepts of modern and future manufacturing systems Acquired skills: - To design the configuration of a flexible manufacturing system - To balance assembly lines - To optimize the arrangement of workstations in a flexible manufacturing system Acquired skills: - To use a CAD environment for SFF simulation, simulation of robotic manufacturing processes
Cross competences	• To apply the values and ethics of the engineering profession. • To responsibly perform complex professional tasks under conditions of professional autonomy and independence. • To promote logical reasoning, convergent and divergent, of practical applicability, evaluation and self-evaluation in decision-making. • To plan their own work priorities. • To self-control the learning and effective use of language skills and knowledge of information and communication technology.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Developing skills to plan, analyze and integrate flexible manufacturing processes within enterprises
7.2	Specific objectives	- Understanding the specific concepts of flexible manufacturing - Knowledge of specific flexible manufacturing planning tools - Development of logical and creative thinking, individual study, critical and self-critical analysis

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
The evolution of manufacturing systems: types of manufacturing systems; the need for flexible automation	2	Presentations using info-graphics, video materials, text Discussions based on examples and case studies Questions-answers-debates (teacher-student; student-teacher) Mini-exercises	
Flexibility of manufacturing systems: product flexibility; the flexibility of the product mix; process flexibility; the flexibility of the work environment	2		
Basic Concepts of Manufacturing Systems – Part I: JIT Manufacturing	2		
Basic Concepts of Manufacturing Systems – Part II: The Kanban System	2		
Fundamentals of Manufacturing Systems - Part III: Lean Production and Manufacturing	2		
The systemic approach to flexible manufacturing systems: the functional aspect; structural aspect; hierarchical aspect	2		

Structure of flexible manufacturing systems – part I: notations; the simplified descriptive model of the flexible manufacturing system	2		
The structure of flexible manufacturing systems – part II: the work subsystem	2		
The structure of flexible manufacturing systems – part III: the logistics subsystem of semi-finished products	2		
Structure of flexible manufacturing systems – part IV: parts transfer and feeding subsystem	2		
Part Material Flow Modeling – Part I: Model and Modeling Generalities; the structural matrix; coupling matrix	2		
Material flow modeling of parts – part II: structure-oriented description; function-oriented description	2		
Modeling the material flow of parts – part III: the dynamics of the parts flows; modeling methods	2		
Modeling the material flow of parts – part IV: dynamic decision laws; flexible manufacturing time scheduling procedures	2		

Bibliography

- Brad, E. Bazele Sistemelor Flexibile de Fabricaţie și Elemente de Fabricație Lean, Ed. UT Pres, 2013.
- Brad, E., Sisteme Flexibile de Fabricaţie. Lucrări de Laborator, Ed. UT Pres, ISBN 973-662-162-6, 2005.
- Brad, E., Fabricația Reconfigurabilă și Elemente de Proiectare a Echipamentelor de Fabricație Reconfigurabile, Ed. UT Pres, 2013.
- Păunescu, T., Celule Flexibile de Prelucrare, Ed. Univ. Transilvania Brasov, ISBN 973-98511-9-3, 1998.

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Optimal arrangement of workstations using the "From-To" diagram	2	Questions and answers Supervision of individual work Computer exercises (modeling and simulation)	
Architecture and operation of flexible SMC manufacturing cell	2		
Balancing assembly lines in flexible manufacturing systems using the Kilbridge-Wester method and the largest candidate method	2		
Flow chart of the process for realizing the manufacturing strategy	2		
Block diagram for analyzing the structure of an SFF configuration	2		
Elaboration of the handling flow within the logistics subsystem of semi-finished products in a CFF using the symbol technique	2		
Describing the static states of an SFF by applying the coupling matrix and the structural matrix	2		
Conceptual design of the configuration of an SFF by the MCMO method	2		
Resource modeling in Process Simulate (3D and kinematics)	2		
Designing robotic workstations in Process Simulate	2		
Discrete and continuous simulation of robotic processes in Process Simulate	2		
Placing robots on workstations, testing and editing robot simulation in Process Simulate	2		
Robot programming in Process Simulate – part I	2		
Robot programming in Process Simulate – part II	2		

Bibliography

- Brad, E. Bazele Sistemelor Flexibile de Fabricaţie şi Elemente de Fabricație Lean, Ed. UT Pres, 2013.
- Brad, E., Sisteme Flexibile de Fabricaţie. Lucrări de Laborator, Ed. UT Pres, ISBN 973-662-162-6, 2005.
- Brad, E., Fabricația Reconfigurabilă și Elemente de Proiectare a Echipamentelor de Fabricație Reconfigurabile, Ed. UT Pres, 2013.
- Păunescu, T., Celule Flexibile de Prelucrare, Ed. Univ. Transilvania Brasov, ISBN 973-98511-9-3, 1998.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline emphasizes the basic principles of designing SFFs

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Completeness Ingenuity and elegance (simplicity) in formulating answers	Written test	50%
10.5 Seminars /Laboratory/Project	Completeness The correctness of the solutions	Arithmetic average of marks for each laboratory paper	50%
10.6 Minimum standard of performance			
Minimum performance standard: All laboratory work must be addressed Written test solved min. 50%			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Conf. dr. ing. Emilia BRAD	
	Teachers in charge of application	Conf. dr. ing. Emilia BRAD	

Date of approval in the department IPR _______________________	Head of department Prof. dr. ing. Călin NEAMȚU
Date of approval in the faculty IIRMP _______________________	Dean Prof. dr. ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Machine Building
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics in English at Cluj-Napoca
1.7	Form of education	Full time
1.8	Subject code	50

2. Data about the subject

2.1 Subject name	**Robotization Manufacturing I**						
2.2 Subject area	DS						
2.3 Course responsible/lecturer	Assoc.Prof.Eng. Bogdan Mocan, PhD ***bogdan.mocan@muri.utcluj.ro***						
2.4 Teachers in charge of seminars, lab, or project	Assist.Prof.Eng. Marian Jac, ***marian.jac@muri.utcluj.ro***						
2.5 Year of study	3	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DI

3. Estimated total time (hours per semester of teaching activities)

3.1 Number of hours per week	3	of which, course	2	3.3 applications (~~project~~, lab)	1
3.4 Total hours in the curriculum	42	of which, course	28	3.6 applications (~~project~~, lab)	14

3.7 Distribution of time (hours per semester) for:	ore
(a) Study by textbook, course support, bibliography, and notes	10
(b) Additional documentation in the library, on specialized electronic platforms and in the field	10
(c) Preparation of seminars / laboratories, topics, papers, portfolios, and essays	13
(d) Tutoring	5
(e) Examinations	3
(f) Other activities:	0

3.8 Total hours of individual study	33
3.9 Total hours per semester	75
3.10 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1 Curriculum	Not applicable
4.2 Competences	Not applicable

5. Requirements (where appropriate)

5.1. For the course	***Face-to-Face***: Classroom with videoprojector and internet access; ***On-line***: Teams Software Platform
5.2. For the applications: lab	Classroom with at least 15 computers on which to install the RoboDK® software (off-line programming of different industrial robots) Laboratory attendance is mandatory

6. Specific competences

Professional competences	Explaining and interpreting, how to integrate the categories of effectors specific to the various robotic technological processes and the effects produced by the RI action within the different technological processes Selection of the specific effectors for the various work tasks and the constructive variants of RI, SATT, SPR and SC corresponding to different technological processes as well as the parameterized 3D modelling of RI, SATT, SPR and SC specific robotic application assemblies The use of 2D / 3D assisted design methods, parameterized 3D modelling and assisted simulation of RI, SATT, SPR and SC functionality to evaluate the performance of these subsystems for optimal implementation in robotic applications for different technological processes
Cross competences	Fulfilling the professional tasks with exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working time and the related implementation deadlines. Promoting logical, convergent and divergent reasoning, practical applicability, assessment and self-assessment in decision-making.

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	Familiarize students with various robotic industrial applications (manipulation, assembly, arc welding, spot welding, palletizing) and develop skills to design robotic industrial solutions.
7.2 Specific objectives	• Analysis and explanation of the robotic manipulation process • Highlighting the main types of end-effectors • Analysis and explanation of the robotic assembly process • Analysis and explanation of industrial robotic arc welding processes • Analysis and explanation of robotic industrial spot-welding processes • Analysis and explanation of robotic industrial palletizing processes • Analysis and explanation of robotic industrial packaging processes • Highlighting common errors in the design of robotic systems • Technical and Economic feasibility of industrial robotic systems

8. Contents

No	8.1 Lecture (syllabus) - Course	No hours	Teaching methods	Notes
1	Introduction to Production Robotics: Automation and Implementation Solutions; the need for robotization of production; architecture of industrial robots. Socio-economic impact of production robotization: the impact of robotization on labour costs; the impact of robotization on production capacity; the impact of robotization on capital costs; the impact of robotization in the relationship between production capacity and social-market elasticity; examples.	2	**Face to face** Exposure, interactive course **On-line** using MS Teams platform	Video-projector, multimedia/ Internet access for all students
2	Planning of robotic production processes: factors of influence; stages of the planning process; planning methods; ergonomics of robotic cells; examples.	2		
3	Sensors used in industrial robotics - types of sensors, the role of sensors in industrial processes, ways of integrating them into industrial processes, communicating sensors with the PLC.	2		
4	End effectors used in industrial robotics - types of final effectors, technical configurations, ways to drive the final effectors.	2		

5	Robotic arc welding processes - Part I: General aspects of electric arc welding; arc welding methods and implications for robotics, sensors for welding robots - for technological parameters, for geometric parameters, for monitoring.2	2		
6	Robotic arc welding processe2s - Part II: The architecture of a robotic arc welding system; components of a robotic arc welding system; selection of robots for electric arc welding; practical aspects of robotic arc welding; examples.	2		
7	Robotic spot-welding process - Part I: General aspects of point welding, point welding methods and robotic implications, architecture and components of a robotic point welding system.	2		
8	Robotic of spot-welding processes - Part II: robotic cell design for point welding, robot selection for spot welding, practical aspects of point welding robotics; implementation of robotic production inspection systems; examples; examples.	2		
9	Robotic Handling of Materials - Part I: Principles and Objectives in Designing a Material Handling System; components of a material handling system.	2		
10	Robot Handling of Materials - Part II: The steps of the process of designing and implementing a robotic cell for material handling planning of robotic cells for material handling; examples.	2		
11	Robotic Assembling of Products - Part I: principles and objectives in designing a system of robotic assembling of products; components of a robotic assembling system for products.	2		
12	Robotic Assembling of Products - Part II: The steps of the design and implementation process of a robotic cell for assembling products; robotic cell planning for assembling products; examples.	2		
13	Errors in the design of robot systems / robotic cells for handling, assembling, welding.	2		
14	Economic justification of robotizing an industrial process	2		

Bibliography

1. Mocan, B., Manufacturing Robotization I, course notes, 2020-2021.
2. Mocan, B., Brad, S., Fulea, M., *Automatizarea și Robotizarea Fabricației Structurilor Sudate*, Editura UTPress, ISBN 978-606-737-052-2, 290 pg., Cluj-Napoca, 2015
3. Mocan, B., *Sisteme Robotizate de Sudare cu Arc Electric – Proiectarea orientată şi îmbunătăţirea performanţelor sistemelor robotizate de sudare cu arc electric*, Editura UT Press, ISBN 978-973-662-881-8, 308 pg., Cluj-Napoca, 2013.
4. Pires, N., Loureiro, A. şi Bolmsjo, G., Welding Robots. Technology, System Issues and Applications, Springer, 2016.
5. Shimon Y. Nof, Handbook of Industrial Robotics vol. 1, John Wiley and Sons, 2019
6. Glaser A., Industrial Robotics: How to Implement the Right System for Your Plant, Ind. Press, 2008.
7. Ross L., Fardo S., Masterson J., Towers R., Robotics: Theory and Industrial Applications, Goodheart-Willcox; Second Edition, Laboratory Manual edition (April 19, 2020)

	Alternative sources of information 1. **Mobile apps** - Google Android: Industrial Automation Tutorial; Industrial Automation; Electrical Drives; Automation & Controls Today; Learn PLC SCADA 2. **Youtube**: The Robot Revolution: The New Age of Manufacturing; How industrial robot is made? ; Smart Factory; Internet of Things; IORT Internet of robotic things; 3. **Robotic Blogs**: Robotics Trends; Robot Facts That Everyone Should Know; Robotics within reach; Robotic News for the Factory; Smart Collaborative Robots; Powering the world's robots; Robotics; MIT Technology Review.

8.2 Laboratory		**No hours**	**Teaching methods**	**Notes**
1	Familiarize students with the RoboDK® work environment (menus, save, import, export CAD files). Create and modify objects in the RoboDK® work environment.	2	**Face to face** Individual work at a computer and / or in a team of max. 2 students **On-line** using MS Teams platform	Min. 15 computers to run RoboDK/ Internet access for all students
2	Creating and modifying the mechanisms and tools in the RoboDK® work environment.	2		
3	Initiating, defining, and building a robotic cell using the RoboDK® work environment.	2		
4	Integrate various CAD elements (robots, mechanisms, work tools, auxiliary devices) into a robotic cell using the RoboDK® work environment.	2		
5	Defining the auxiliary mechanisms of robotic cells in the RoboDK® work environment.	2		
6	Robot motion simulation (creating and modifying robot work points, creating, and modifying a robot trajectory, defining, and modifying reference systems) using the RoboDK® work environment.	2		
7	Basic ABB, Fanuc, Kuka, UR, etc. programming using the specific programming language in the RoboDK® environment.	2		

	Bibliography 1. Documentation of RoboDK® software 2. Mocan, B., Timoftei, S., Stan, A., Fulea, M., RobotStudio® - Simulation of industrial automation processes and offline programming of ABBs robots - Practical guide for students - Editura UTPress, ISBN 978-606-737-254-0, 140 pg., Cluj-Napoca, 2017. 3. Mocan, B. and Timoftei, S., Offline programming of industrial robots, laboratory notes, 2020. https://sites.google.com/view/clujrobotics/robotics-courses/robotization-manufacturing-i-rf_i/laboratory-offline-programming-of-industrial-robot?authuser=0 ***Alternative sources of information*** 1. **Mobile apps** - Google Android: Industrial Automation Tutorial; Industrial Automation; Electrical Drives; Automation & Controls Today; Learn PLC SCADA 2. **Youtube**: RoboDK, The Robot Revolution: The New Age of Manufacturing; How industrial robot is made? ; Smart Factory; Internet of Things; IORT Internet of robotic things; 3. **Robotic Blogs**: Robotics Trends; Robot Facts That Everyone Should Know; Robotics within reach; Robotic News for the Factory; Smart Collaborative Robots; Powering the world's robots; Robotics; MIT Technology Review.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The skills developed in this course will be required by engineers involved in the automation and robotization of various industrial process processes (from the planning stage to designing a robotic solution, design, off-line programming and implementation).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Answers to 50 questions from all courses (theory evaluation)	Written test - duration of assessment 90 min.	50%
10.5 Application/Lab/ ~~Project~~	Development of robotic applications (installation, welding, handling, inspection video) medium to high complexity in software RoboDK®	Practical test - duration 1 hour	50%
10.6 Minimum performance standard (knowledge required to get score 5)			
Theory evaluation (course)*:* correct answer to 25 questions in the written test. ***Lab Evaluation****:* correct identification and implementation of the necessary equipment and devices of the given robotic cell, making logic of automatic operation of the technological process (e.g. assembling, painting, etc.) and off-line programming and simulation of the robotic technological process using RoboDK® environment. ***Promotion of the RFI discipline exam: get the 5th mark at both above-mentioned tests – theory evaluation and lab test.***			

Date of filling in:	**Lecturer**	**Title Surname Name**	**Signature**
	Lecturer	Assoc.Prof.Eng. Bogdan Mocan, PhD	
	Teachers in charge of application	Assist. Prof. Eng. Sanda Timoftei	

Date of approval in the Council of IPR Department _________________________	Head of department, Prof.dr.ing. Calin NEAMTU
Date of approval in the Faculty of Machine Building _________________________	Dean, Prof.dr.ing. Corina BARLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Management and Economic Engineering
1.4	Field of study	Engineering and Management
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Industrial Economic Engineering/ Engineer
1.7	Form of education	Full time
1.8	Subject code	51.00

2. Data about the subject

2.1	Subject name			Production Systems Engineering			
2.2	Subject area						
2.2	Course responsible/lecturer			Lecturer ing. Ec. Dr. Claudiu Ioan Abrudan			
2.3	Teachers in charge of seminars			Lecturer ing. Dr. Gabriela Bacila			
2.4 Year of study	IV	2.5 Semester	2	2.6 Assessment			E
2.7 Subject category	Formative category						DS
	Optionality						DI

3. Estimated total time

3.1 Number of hours per week	2	of which	3.2 Course	1	3.3 Seminar		3.3 Laborator	1	3.3 Proiect	
3.4 Total hours in the curriculum	28	of which	3.5 Course	14	3.6 Seminar		3.6 Laborator	14	3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	15
(b) Supplementary study in the library, online and in the field	15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	5
(d) Tutoring	5
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	42
3.9 Total hours per semester (3.4+3.8)	60
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Promotion of the subjects: Basics of Systems Engineering - Operations Research - Manufacturing Technologies - MRESFF - ISP1
4.2	Competence	

5. **Requirements (where appropriate)**

5.1	For the course	Whiteboard, Video projector or Interactive whiteboard
5.2	For the applications seminarului / laboratorului / proiectului	Computer room

6. **Specific competences**

Professional competences	C4. Economic evaluation, planning and management of logistic and production processes and systems. C5. Management of organizational resources, production quality assurance and organizational development management C6. Techno-economic design and improvement of industrial products and processes
Cross competences	

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Students' knowledge of current trends in the design and organizational planning of modern production systems (flexible manufacturing systems). Students' assimilation of production planning and scheduling techniques and methods (mass, mass and unit production) Students' assimilation of techniques and methods for modelling and simulation of production systems
7.2	Specific objectives	After completing the subject students will be able to: – to design "in principle" a manufacturing system; – apply in practice modern methods of modelling and simulation of a manufacturing system (game theory, expectation theory, Petri nets, graph theory, etc.); – define the hierarchical production planning system; – determine the optimal manufacturing schedule for a given BOM; – determine the volume and value of unfinished production; – to determine the size of manufacturing batches for the parts; – to determine component requirements for series production; to order the production of a productive entity;

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Flexible manufacturing systems.	2		

2. Design of flexible manufacturing systems. Production load analysis.	2	Modern, interactive	
3. Static configuration of SFF. Modeling the operation of SFF using mathematical game theory.	2		
4. Service management. Service systems: definitions, parameters, classification. Identification of service systems parameters. Modelling and optimisation of service systems.	2		
5. Scheduling of series production. Production aggregation-disaggregation. Aggregate plan optimization.	2		
6. non-determined production. Planning of component requirements.	2		

Bibliography

Abrudan, I. and Cândea, D., - coordinators, Lungu, F., et.a. "Handbook of economic engineering. Engineering and management of production systems", Dacia Publishing House, Cluj-Napoca, 2002.
Cândea, D., Abrudan, I., "Organization and Management of Industrial Enterprises", Litografia of the Polytechnic Institute, Cluj-Napoca, 1984.
Abrudan, I., "Flexible Manufacturing Systems. Design and management concepts", Dacia Publishing House, Cluj-Napoca, 1996.
Abrudan, I., "The economics of designing flexible manufacturing systems", Lito UTC-N, 1994.

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
1. Production load analysis.			
2. Elements of expectancy theory. Calculation of the parameters of expectation systems.			
3. Elements of mathematical game theory. Modelling SFF with game theory.			
4. Aggregate plan optimization.			
5. Disaggregation of the aggregate plan. Planning component requirements.			
6. Ordering of manufacture.			

Bibliography

Abrudan, I. and Cândea, D., - coordinators, Lungu, F., et.a. "Handbook of economic engineering. Engineering and management of production systems", Dacia Publishing House, Cluj-Napoca, 2002.
Abrudan, I., "Flexible Manufacturing Systems. Design and management concepts", Dacia Publishing House, Cluj-Napoca, 1996.
Abrudan, I., "The economics of designing flexible manufacturing systems", Lito UTC-N, 1994.
Lungu Florin, Abrudan Ioan (coord.), *Production Systems Engineering - Laboratory Guide*, Todesco Publishing House, Cluj-Napoca, 2013

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Students will have the opportunity to learn how to plan, organize and coordinate production in an enterprise.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The exam consists of a written test to check your knowledge. The number of questions a student has to answer varies according to the work done in class (attendance, interactivity, etc.).	Written test Exam (grade E); Project (grade P); No. of correct answers (NC); No. of exam questions (NI); E = NC/NI;	70%
10.5 Seminars /Laboratory/Project	The laboratory is noted separately. The project grade takes into account the content of the project, the student's theoretical knowledge and the work in the related classes.	Project activity (Grade A); Project theoretical knowledge (Grade C); Project content (Grade CP).	30%
10.6 Minimum standard of performance			
- E≥5; P≥5.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Lecturer dr. ing., ec. Claudiu Abrudan	
	Teachers in charge of application	Lecturer dr. ing., Gabriela Bacila	

Date of approval in the department …….. _________________________	Head of department Prof.dr.ing.
Date of approval in the faculty …………. _________________________	Dean Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Industrial Engineering, Robotics and Product Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mecatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/Engineering
1.7	Form of education	Full time
1.8	Subject code	52.00

2. Data about the subject

2.1	Subject name				Industrial Informatics			
2.2	Subject area				Industrial Informatics			
2.2	Course responsible/lecturer				Assoc. Prof. Eng. PhD Delia-Alexandrina Mitrea – Delia.Mitrea@cs.utcluj.ro			
2.3	Teachers in charge of seminars				Assoc. Prof. Eng. PhD Delia-Alexandrina Mitrea; Eng. Cosmina Mendoiu			
2.4 Year of study		3	2.5 Semester	3	2.6 Assessment	Colloque		
2.7 Subject category		Formative category						
		Optionality						

3. Estimated total time

3.1 Number of hours per week	2	of which	3.2 Course	2	3.3 Seminar		3.3 Laboratory		3.3 Project	1
3.4 Total hours in the curriculum	50	of which	3.5 Course	14	3.6 Seminar		3.6 Laboratory		3.6 Project	14

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	10
(b) Supplementary study in the library, online and in the field	3
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	15
(d) Tutoring	2
(e) Exams and tests	4
(f) Other activities	2

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	36
3.9 Total hours per semester (3.4+3.8)	64
3.10 Number of credit points	2.0

4. Pre-requisites (where appropriate)

4.1	Curriculum	Special Mathematics, Mathematical Logic
4.2	Competence	Operating skills with fundamental scientific, engineering and information technology concepts and knowledge

5. **Requirements (where appropriate)**

5.1	For the course	No of attendancies ≥ 3
5.2	For the applications	Attendance compulsory

6. **Specific competences**

Professional competences	C1 – Application of fundamental knowledge of general and specialized technical culture to solve technical problems specific to the field of Mechatronics and Robotics C1.1. Definition of the fundamental notions of mathematics, physics, chemistry, resistance of materials, mechanisms, machine parts and computer programming C1.3. The use of schemes and organizational charts in the development of dedicated computer applications, numerical and matrix calculation methods in solving equations and systems of equations and in the comparative analysis of possible solutions. C1.5. The design of assisted computing algorithms and technological processes specific to the execution of mechatronic and robotic products.
Cross competences	CT1. The fulfillment of professional tasks with exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the work time, and related deadlines. CT2. Responsible execution of work tasks in a multidisciplinary team with the assumption of roles at different hierarchical levels.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Learning the C# language, as well as specific tools for building graphical user interfaces, respectively to facilitate communication with robotic systems.
7.2	Specific objectives	• Learning some basic concepts, specific to object-oriented programming • Learning the basic features of the C# language • Acquiring those means that allow the creation of graphic interfaces • Working with libraries that allow communication with robotic systems

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Introduction to Industrial Software and C#	2	Power-Point Slides, Projector, Blackboard or Whiteboard	The importance of students-teachers interaction
C# basics	2		
Encapsulation, Methods, Classes. Windows Forms Applications in C#.	2		
Advanced OO Concepts in C#	2		
Windows Forms Applications in C#			
Windows Forms Applications in C# - Data Binding	2		
Windows Presentation Foundations (WPF)	2		
Bibliography: [1] C. Nagel, „Professional C# and .Net", Wiley-Blackwell, 2021 [2] Jon Skeet, "C# in Depth, Fourth Edition", Manning, 2019			

8.2. Practical applications: Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Compiling and executing a C# program. Writing a Simple Program ("Hello World")	2	Power-Point Slides, Projector, Blackboard or Whiteboard	The importance of students-teachers interaction
Introductory problems	2		
Practicing C# Basics	2		
C# Classes. Windows Forms Applications in C#	2		
PC SDK. C# applications that communicate with robotic systems.	2		
Project – individual work	2		
Project – individual work. Assessment	2		

Bibliography:
[1] C# Programming, object-oriented programming", Copyright TutorialsPoint, 2014, http://www.tutorialspoint.com/csharp/csharp_tutorial.pdf
[2] Windows Form Programming with C#: https://imcs.dvfu.ru/lib.int/docs/Languages/C-Sharp/Windows%20Forms%20Programming%20With%20C%23.pdf
[3] WPF Tutorial: https://www.tutorialspoint.com/wpf/
[4] PC SDK, http://developercenter.robotstudio.com/pcsdk
[5] Connection to a database: https://readdy.net/Notes/Details/727?v=d

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline aims to make the students familiar with the fundamental notions of procedural and object-oriented programming, as well as to guide them in the direction of learning the C# language. Interdisciplinarity is also present, by making communication between software applications built in C# and systems based on industrial robots.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Acquiring specialized knowledge, the ability to solve specific problems in the field. Attendance, (inter)activity during class hours	Written Examination	50%
10.5 Seminars /Laboratory/Project	Solving problems specific to the field and explaining them	Oral and practical examination	50%
10.6 Minimum standard of performance			
The ability to write a C# program with a minimal GUI to communicate with a database or robotic system.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Assoc. Prof., Eng., PhD, Delia-Alexandrina Mitrea	
	Teachers in charge of application	Eng., PhD, Cosmina Mendoiu	

Date of approval in the department .... ______________________	Head of department Prof.dr.ing.
Date of approval in the faculty .... ______________________	Dean Prof.dr.ing.

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	53.10

2. Data about the subject

2.1	Subject name			Microcontrollers and microprocessors			
2.2	Subject area			DS			
2.3	Course responsible/lecturer			S.L. PhD Eng. Mircea MURAR mircea.murar@muri.utcluj.ro			
2.4	Teachers in charge of seminars			S.L. PhD Eng. Mircea MURAR mircea.murar@muri.utcluj.ro			
2.5 Year of study	III	2.6 Semester	2	2.7 Assessment	C		
2.7 Subject category	Formative category						DID
	Optionality						DOP

3. Estimated total time

3.1 Number of hours per week	5	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	1
3.4 Total hours in the curriculum	70	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	14

a) Individual study	hours
b) Manual, lecture material and notes, bibliography	10
c) Supplementary study in the library, online and in the field	10
d) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	6
e) Tutoring	0
f) Exams and tests	4
g) Other activities	0

3.7	Total hours of individual study	30
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Computer Programming, Introduction to Robotics, Electronics, Applied electronics in robotics, Mechanics.
4.2	Competence	English language

5. **Requirements (where appropriate)**

5.1	For the course	Amphitheatre or classroom with video projector
5.2	For the applications	Class room equipped with computers, programs and platforms that are specific to the discipline. Presence is mandatory.

6. **Specific competences**

Professional competences	• Acquiring the concepts and skills necessary to configure specific functionalities of microprocessor based programmable logic controllers. • Development of the necessary skills for creating software applications intended for automating processes using programmable logic controllers. • Development of the necessary skills for implementing of man-machine interfaces and their connection to programmable logic controllers. • Acquiring the necessary knowledge to design and develop control algorithms and intelligent equipment. • Develop the skills to identify and solve inefficient control algorithms. • Integrate programmable logic controllers in robotic cells • Strengthen electronics and programming skills.
Cross competences	• Ability to identify from datasheets the most important characteristics and features of microcontrollers and microprocessors required in design of embedded systems. • Ability to integrate embedded systems into a multitude of products and services. • Apply the values and ethics of the engineering profession and responsible execution of professional tasks. • Promote logical, convergent and divergent reasoning, practical applicability of know-how, assessment and self-assessment in decision-making.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Programming of microprocessor control and monitoring units for robotization and automation of processes.
7.2	Specific objectives	• Configuration and parameterization of microprocessors-based control units like programmable logic controller. • Use of programming instructions to implement control algorithms. • Development of graphical man-machine interfaces for interaction with the controlled process • Interfacing of command and monitoring units with equipment and sensors.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
C1. Introduction. Microcontrollers and Microprocessors in robotics and automation.	2	Presentation, Slideshow, Hands-On, Demonstrations, Discussions Questions and Answers	
C2. The architecture and operating principle of programmable logic controllers. IO modules.	2		
C3. Programmable logic controller configuration, preparation and commissioning.	2		
C4. Programming instructions of programmable logic controllers – Part 1	2		
C5. Programming instructions of programmable logic controllers – Part 2	2		
C6. Programming instructions of programmable logic controllers – Part 3	2		
C7. Connecting and developing human-machine interfaces to programmable logic controllers – Part 1	2		
C8. Connecting and developing human-machine interfaces to programmable logic controllers – Part 2	2		
C9. Integration of analog sensors and processing of unified analog signals	2		
C10. Usage of PID closed-loop control algorithm in programmable logic controllers.	2		
C11. Integration of equipment from various manufacturers through industrial communication protocols.	2		
C12. System clock and alarm management. Configuration and use of web server and OPC UA service.	2		
C13. Implementation of alarm history and data recording for long periods of time.	2		
C14. The watchdog mechanism and interruptions. Functions of the memory card.	2		

Bibliography

- Zurawski, R.; Embedded Systems Handbook, Second Edition: Embedded Systems Design and Verification (2009), ISBN-13: 978-1439807552, CRC Press.
- Berger, H.; (2016), Automating with SIMATIC: Hardware and Software, Configuration and Programming, Data Communication, Operator Control and Monitoring, ISBN-10: 3895784591.
- Siemens, S7-1200 Programmable controller: https://cache.industry.siemens.com/dl/files/129/109764129/att_974298/v1/s71200_system_manual_en-US_en-US.pdf
- Siemens, Programming Guideline: https://assets.new.siemens.com/siemens/assets/api/uuid:c7de7888-d24c-4e74-ad41-759e47e4e444/Programovani-S7-1200-1500-2018.pdf
- Siemens, HMI Devices: https://cache.industry.siemens.com/dl/files/678/31032678/att_25338/v1/hmi_basic_panels_operating_instructions_en-US_en-US.pdf

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes

L1. Create the configuration of an automated system with a programmable logic control and a human machine interface	2	Onsite: Slideshow presentation, Programming environments: • Factory IO, • TIA Portal PLC S7-1200, • TIA Portal HMI Basic, HMI Comfort.	
L2. Equipment layout for height sorting – Factory IO	2		
L3. Develop the control logic for height sorting process in TIA Portal – PLC	2		
L4. Develop the human machine interface for the height sorting process – TIA Portal – HMI	2		
L5. Equipment layout for the transportation system of the sorted part – Factory IO	2		
L6. Develop the control logic for the transportation system of sorted parts TIA Portal – PLC	2		
L7. Develop the human machine interface for the transportation system of sorted parts TIA Portal – HMI	2		
L8. Equipment layout for product storing and extracting process – Factory IO	2		
L9. Develop the control logic for product storing and extracting process in TIA Portal – PLC	2		
L10. Develop the human machine interface for product storing and extracting process – TIA Portal – HMI	2		
L11. Equipment layout for product palletizing process – Factory IO	2		
L12. Develop the control logic for product palletizing process in TIA Portal – PLC	2		
L13. Develop the human machine interface for product palletizing process – TIA Portal – HMI	2		
L14. Refinement of overall control logic between technological stages of the process	2		
P1. Technological process description	1		
P2. Automation solution argumentation	1		
P3. Control logic description	1		
P4. Control logic description	1		
P5. Description of human-machine interface	1		
P6. Creating a user manual – 1	1		
P7. Creating a user manual – 2	1		

Bibliography

- Monk, S.; (2012), Programming the Raspberry Pi: Getting Started with Python, ISBN-13: 978-0071807838, McGraw-Hill Education.
- Suehle, R., Callaway, T.; (2013), Raspberry Pi Hacks, ISBN-10: 1-4493-6234-6, O'Reilly Media.
- Bradski, G., Kaehler, A.; (2008), Learning OpenCV: Computer Vision with the OpenCV Library, ISBN-10: 0596516134, O'Reilly Media.
- Howse, J.; (2013), OpenCV Computer Vision with Python, ISBN-13: 978-1782163923, Packt Publishing.
- Wilmshurst, T.; Toulson, R.; (2012), Fast and Effective Embedded Systems Design: Applying the ARM mbed ISBN: 978-0-08-097768-3. Elsevier

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Identify specific requirements of companies in terms of competences in the field of integrated systems and update the lectures and applications.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Understand the principles exposed and experienced in the classes.	Written assessment at the end of semester.	50 %
10.5 Applications	Development of applications during applications classes.	Results of individual subjects in application classes	50 %
10.6 Minimum standard of performance			
The evaluation procedure for the theoretical part takes place physically or in exceptional situations online using Teams platform according to the following grades-competences distribution: • 2 – 3: Project content • 3 – 4: Mastering the subject: Architecture of microprocessor control and monitoring units. • 5 – 6: Mastery of the subject: PLC programming instructions. • 6 – 7: Mastering the subject: Industrial communication protocols. • 8 – 9: Mastering the subject: The watchdog protection mechanism and Interruptions. • 9 – 10: Mastering the subject: Alarm management and long-term recording of process values. The evaluation procedure for the practical part takes place physically or in exceptional situations online using Teams platform according to the following grades-competences distribution: • 2 – 3: Project content • 4: Configure and parameterize the automation system control units. • 5 – 6: Implementing product sorting and transport algorithm in TIA Portal and validate its functionality in Factory IO. • 7 – 8: Implementing product storing and extracting algorithm in TIA Portal and validate its functionality in Factory IO. • 9 – 10: Implementing product palletizing algorithm in TIA Portal and validate its functionality in Factory IO. BONUS: Integration of the operating manual of the system developed in human-machine interface as a support for the operation of the process control system.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Lec. PhD Eng. Mircea MURAR	
	Teachers in charge of application	Lec. PhD Eng. Mircea MURAR	

Date of approval in the department IPR ________________________	Head of department Prof. dr. ing. Calin Neamțu
Date of approval in the Faculty of Industrial Engineering, Robotics and Production Management ________________________	Dean Prof. dr. ing. Corina Julieta Bîrleanu

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	License
1.6	Program of study/Qualification	Robotics
1.7	Form of education	IF - full-time education
1.8	Subject code	53.2

2. Data about the subject

2.1	Subject name			Artificial Intelligence		
2.2	Subject area					
2.2	Course responsible/lecturer			Prof. dr. ing. Stelian Brad stelian.brad@staff.utcluj.ro		
2.3	Teachers in charge of seminars			Prof. dr. ing. Stelian Brad stelian.brad@staff.utcluj.ro		
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment		C
2.7 Subject category	Formative category					DID
	Optionality					DO

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	1
3.4 Total hours in the curriculum	70	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	14

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	10
(b) Supplementary study in the library, online and in the field	0
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
(d) Tutoring	0
(e) Exams and tests	0
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	30
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	OOP (Python)
4.2	Competence	Python programming

5. Requirements (where appropriate)

5.1	For the course	Lecture hall with the number of seats equal to the number of students; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments
5.2	For the applications	Room with computers equal to the number of students in the group; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments

6. Specific competences

Professional competences	• To know the main algorithms specific to AI (data analytics, machine learning, neural networks) • To use specialized libraries for AI in the Python programming language • Apply AI to robots
Cross competences	• To apply the values and ethics of the engineering profession • To responsibly perform complex professional tasks under conditions of professional autonomy and independence • To promote logical reasoning, convergent and divergent, of practical applicability, evaluation and self-evaluation in decision-making • To plan their own work priorities • To self-control the learning and effective use of language skills and knowledge of information and communication technology

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Developing skills and abilities to plan, analyze, make, test computer programs in the Python programming language of AI applications
7.2	Specific objectives	- Building on AI programs for robotics applications - Development of logical and creative thinking, individual study, critical and self-critical analysis

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Preparatory elements for artificial intelligence - I	2	Alternate theory with examples, class exercises, homework	
Preparatory elements for artificial intelligence - II	2		
Elements of data science for artificial intelligence - I	2		
Elements of data science for artificial intelligence - II	2		
Supervised learning - I	2		
Supervised learning - II	2		
Supervised learning - III	2		
Unsupervised learning	2		
Neural networks - the basics	2		

Introduction to TensorFlow and Keras for neural networks	2		
Deep learning I – convolutional neural networks	2		
Deep learning II – recurrent neural networks	2		
Deep learning III – competitive generative neural networks	2		
Deep learning IV - introduction to NLP	2		

Bibliography

- F. Covers, Artificial Intelligence for Robotics, 2018
- D. Poole, Python Code for Artificial Intelligence, 2018
- F. Chollet, Deep Learning with Python, 2018
- Tutorial Point, Artificial Intelligence with Python, 2016

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Lab			
Perceptron testing	2	Alternate theory with examples, class exercises, homework	
The confusion matrix	2		
Operations with .csv files for data science	2		
Data preparation for automatic learning with Pandas	2		
Regression models in automatic learning	2		
The decision tree and support vector machines in automatic learning	2		
Gradient descent and k-NN in automatic learning	2		
Unsupervised learning with K-means and PCA in machine learning	2		
The Multilayer Perceptron (MLP)	2		
TensorFlow and Keras for neural networks	2		
Convolutional Neural Networks (CNNs)	2		
Recurrent Neural Networks (RNNs)	2		
Generative Adversarial Networks (GANs)	2		
Natural Language Processing (NLP)	2		
Project: making an artificial intelligence application in robotics using NAO and Pepper robots to give an artificial personality to the robot (QiChat program is used)			
Application planning	2	Teamwork	
Development of human-robot interaction scenarios – part 1	2		
Development of human-robot interaction scenarios – part 2	2		
Code development – part 1	2		
Code development – part 2	2		
Code development – part 3	2		
Code development – part 4	2		

Bibliography
• F. Covers, Artificial Intelligence for Robotics, 2018 • D. Poole, Python Code for Artificial Intelligence, 2018 • F. Chollet, Deep Learning with Python, 2018 • Tutorial Point, Artificial Intelligence with Python, 2016

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

It is a course with a strong vocational-applicative character. Skills are developed with immediate applicability in practice.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Solution completeness Solution correctness Code simplicity Code clarity Ingenuity algorithms	Problem-based assessment	50%
10.5 Seminars /Laboratory/Project	Solution completeness Solution correctness Code simplicity Code clarity Ingenuity algorithms	Problem-based assessment	50%
10.6 Minimum standard of performance			
• Grade 5 average of laboratory works • Note 5 examination in the colloquium			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Prof. dr. ing. Stelian BRAD	
	Teachers in charge of application	Prof. dr. ing. Stelian BRAD	

Date of approval in the department IPR

____

Head of department
Prof. dr. ing. Călin NEAMȚU

Date of approval in the faculty IIRMP

____

Dean
Prof. dr. ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Facultaty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Robotics/engineer
1.7 Form of education	Full time
1.8 Subject code	54.00

2. Data about the subject

2.1 Subject name	Domain practice II (3 weeks)				
2.2 Course responsible	*Responsible*				
2.3 Teachers in charge of seminars	*Responsible*				
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment	C
2.7 Subject area	Subject category				DS
	Optional				DI

3. Estimated total time

3.1 Number of hours per week	30	3.2 of which, course:	0	3.3 applications:	30
3.4 Total hours in the curriculum	100	3.5 of which, course:	0	3.6 applications:	100

Individual study	ore
Manual, lecture material and notes, bibliography	
Supplementary study in the library, online and in the field	
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	
Tutoring	
Exams and tests	
Other activities	

3.7 Total hours of individual study	10
3.8 Total hours per semester	100
3.9 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Not necessary
4.2 Competence	Not necessary

5. Requirements (**where appropriate**)

5.1. For the course	N/A
5.2. For the applications	N/A

6. Competenţele specifice acumulate

Professional competences	C3.1. Description of the specific technical terminology and the basic conceptual elements of the systems (mechanical, pneumatic hydraulic, electrical, electronics, optical, informatics, etc.) used in mechatronics and robotics for the implementation of local automation systems C3.2. Explaining and interpreting and using the operating principles of the subsystems (mechanical, hydraulic, electrical, optical pneumatic, etc.) in the design and implementation of block and operating schemes for local automation systems used in mechatronics and robotics C3.3. Elaboration of constructive-functional model and design of partial assemblies (mechanical, hydraulic, electrical, optical, etc.) integrated into mechatronic and robotic subsystems for local automation C 3-4. Using methods to evaluate the performances of mechatronic and robotic subsystems in assessing the efficiency of their exploitation C3-5. Elaboration of technical execution projects for basic partial assemblies (mechanical, pneumatic, hydraulic, electrical, etc.) used in mechatronics and robotics for local automation
Cross competences	CT2. Responsible execution of multidisciplinary work tasks with assuming roles on different hierarchical levels

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	To acquire knowledge and skills in the field of specialization
7.2 Specific objectives	Learn about: - Supplying, collaborating, transporting and selling products in mechanical units; - Organization of classical and automated / robotic general production services and flow; - Main features, operation and adjustment of specialized machine tools. After passing the discipline students will be able to: - To assess the general aspects of organizing activities in productive units; - to respect and appreciate the importance of the working conditions to be ensured for the proper conduct of the production activity; - Know the main aspects of maintenance and repair of machinery, equipment, robots and flexible manufacturing systems.

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
Not applicable		
8.2. Applications/Seminars	Teaching methods	Notes

- Data on the production, service or institution; - Knowing the name and profile, specifying the products and services that they execute or can execute; - Connections with supply, cooperation and sales units; - Knowing the rules of the labor safety technique, of a general and specific nature of the work places; - Knowledge of the general production or service flow; - Tracking and characterizing the environment in which various operations are performed in terms of lighting, ventilation, noise level etc .; - Tracking of specialized machinery and equipment, knowledge of operation, regulation and their characteristics; - tracking transport processes and packing, packing and loading operations; - tracking and specifying maintenance and repair operations of machinery, equipment, robots and flexible manufacturing systems. - Data on the production, service or institution; - Knowing the name and profile, specifying the products and services that they execute or can execute; - Connections with supply, cooperation and sales units; - Knowing the rules of the labor safety technique, of a general and specific nature of the work places; - Knowledge of the general production or service flow;		
Bibliography		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

In making the program and the content we consulted:

- representative societies in Cluj-Napoca and surrounding areas.
- education level from similar specializations in the country and abroad

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4Course	Not applicable	Not applicable	0%
10.5 Applications	Colloquium (note C); Practice(note P)	N 0,6C + 0,4P; Conditions for obtaining credits: N> 5; C> 4; P> 4;	100%
10.6 Minimum standard of performance			
Technical report 50% from lab tests			

Date of filling in:	Teachers	Title Surname NAME	Signature
	Lecturer		
	Teachers in charge of application		

Date of approval in the IPR department	Head of IPR department Prof. dr. ing. Călin Neamţu
Date of approval in the IIRMP Faculty Council	Dean Prof.dr.ing. Corina BÎRLEANU

FIŞA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	Inginerie Industrială, Robotică și Managementul Producției
1.3 Departamentul	Ingineria Proiectării si Robotică
1.4 Domeniul de studii	Mecatronică și Robotică
1.5 Ciclul de studii	Licenţă
1.6 Programul de studii / Calificarea	Robotică / Inginer
1.7 Forma de învăţământ	IF – învăţământ cu frecvenţă
1.8 Codul disciplinei	**57.00**

2. Date despre disciplină

2.1 Denumirea disciplinei	**Comanda și Programarea Mașinilor Unelte cu Comandă Numerică**				
2.2 Titularul de curs	***Prof. Dr. Ing. Pisla Adrian – adrian.pisla@muri.utcluj.ro***				
2.3 Titularul activităţilor de seminar / laborator / proiect	***Conf. Dr. Ing. Covaciu Florin - Florin.COVACIU@muri.utcluj.ro***				
2.4 Anul de studiu	**IV**	2.5 Semestrul	**1**	2.6 Tipul de evaluare	**E**
2.7 Regimul disciplinei	Categoria formativă				**DS**
	Opționalitate				**DI**

3. Timpul total estimat

3.1 Număr de ore pe săptămână	**3**	din care: 3.2 curs	**2**	3.3 seminar / laborator	**1**
3.4 Total ore din planul de învățământ	**42**	din care: 3.5 curs	**28**	3.6 seminar / laborator	**14**
Distribuția fondului de timp					ore
Studiul după manual, suport de curs, bibliografie și notițe					**12**
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate și pe teren					**20**
Pregătire seminarii / laboratoare, teme, referate, portofolii și eseuri					**20**
Tutoriat					**2**
Examinări					**2**
Alte activități					**2**

3.7 Total ore studiu individual	**58**
3.8 Total ore pe semestru	**100**
3.9 Numărul de credite	**4**

4. Precondiții (acolo unde este cazul)

4.1 de curriculum	
4.2 de competențe	**Cunoștințe generale legate de calcul matriceal și geometrie euclidiană, programarea și utilizarea calculatoarelor, electrotehnică și mașini electrice, acționari electrice, senzori și achiziții de date, scule și procese de așchiere, mașini,-unelte, mecanica roboților**

5. Condiții (acolo unde este cazul)

5.1. de desfășurare a cursului	**Nr de locuri corespunzător cu numărul studenților din anul de studiu**
5.2. de desfășurare a seminarului / laboratorului / proiectului	**Datorită caracterului aplicațiilor, acestea se pot desfășura optim cu un număr de 7-10 studenți într-o semigrupă**

6. Competențele specifice acumulate

Competențe profesionale	• **Să cunoască limbajul G de programare manuală** • **Să cunoască tipuri și echipamente CNC specifice domeniului aplicabilitate;** • **Considerarea performanțelor de execuție ale unui CNC;** • **Cunoștințe de utilizare a setărilor optimale în programare;** • **Înțelegerea modului de alegerea strategiei de programare;** • **Capacitatea de verificare a programelor;** • **Posibilitatea de a realiza de programe de complexitate medie.**
Competențe transversale	• **Corelarea activității individuale cu munca în echipă;** • **Capacitatea de a realiza structurat prezentări, cu sintetizarea activității și a rezultatelor obținute;** • **Utilizarea instrumentelor și componentelor IT pentru studiu;** • **Dezvoltarea capacității de decizie și dezvoltarea spiritului antreprenorial.**

7. Obiectivele disciplinei (reieșind din grila competențelor specifice acumulate)

7.1 Obiectivul general al disciplinei	• **Cunoașterea tipurilor și structurilor CNC;** • **Identificarea performanțelor de prelucrare CNC;** • **Inițiere în programarea CNC.**
7.2 Obiectivele specifice	• **Să cunoască codul G de comandă numerică;** • **Să evalueze și să interpreteze programul sursa destinat unei mașini CNC;** • **Sa utilizeze interfețe de programare CNC.**

8. Conținuturi

8.1 Curs	Metode de predare	Observații
1. Prezentare generală a sistemelor CNC	**Expunere, conversație inducerea progresiva de aplicații, recapitulare cu exemple echivalente**	
2. Noțiuni și terminologie utilizată pentru sisteme CNC		
3. Forma și structura codului G de programare		
4. Prezentarea pașilor de procesare în sisteme CNC		
5. Orientarea produselor procesate CNC		
6. Definirea operațiilor de execuție pentru sisteme CNC		
7. Selectarea sculelor de procesare pentru sisteme CNC		
8. Determinarea parametrilor tehnologici de procesare		
9. Adaptarea parametrilor tehnologici la sistemul CNC		
10. Determinarea punctelor obligatorii de trecere		
11. Generarea codului sursă de procesare		
12. Verificarea codului sursă de programare CNC		
13. Optimizarea codului sursă de programare CNC		
14. Limbaje și tendințe în operarea CNC		

8.2. Aplicații (lucrări): seminar / laborator / proiect	Metode de predare	Observații
1. Protecția munci în condiții specifice de laborator CNC	**Expunere, conversație, exercițiu, rezolvarea în echipă a situațiilor impuse**	
2. Interfețe de operare și simulare CNC		
3. Setări de poziționare semifabricat și selecție scule		
4. Generarea codului sursă de poziționare TCP		
5. Determinarea și programarea parametrilor tehnologi		
6. Generarea codului sursă		
7. Verificarea și optimizarea codului sursă		

9. Coroborarea conținuturilor disciplinei cu așteptările reprezentanților comunității epistemice, asociațiilor profesionale și angajatorilor reprezentativi din domeniul aferent programului

- In domeniul CNC, există o comunitate bine formată ce poate fi considerată ca şi comunitatea epistemologică ce contribuie la dezvoltarea și evoluția domeniului, comunitate la care ne putem declara apartenența;
- Considerând asociațiile profesionale și reprezentanții firmelor angajatoare, întotdeauna a existat o deschidere spre dialog și în funcție de interesul manifestat și contribuția acestora s-a adaptat sau optimizat conținutul programului, raportat la resursa de timp alocată prin programa universitară.

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	**Grad de corespondență a răspunsurilor, cu materia predată**	**Proba scrisă/ verificare orală**	**0.7**
10.5 Seminar/Laborator	**Rezolvarea situațiilor impuse de teme de execuție**	**Proiect, cu urmărirea continuității, regularității și corectitudinii realizării**	**0.3**
10.6 Standard minim de performanță			
5 (cinci)			

Data completării:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
		Prof. Dr. Ing. Adrian PISLA	

Data avizării în Consiliul Departamentului	Director Departament **Prof. Dr. Ing. Călin NEAMŢU**
Data aprobării în Consiliul Facultății IIRMP	Decan **Prof.Dr.Ing. Corina BÎRLEANU**

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics in English at Cluj-Napoca
1.7	Form of education	Full time
1.8	Subject code	58

2. Data about the subject

2.1 Subject name	**Robotization manufacturing II**						
2.2 Subject area	DS						
2.3 Course responsible/lecturer	Assoc.Prof.Eng. Bogdan Mocan, PhD ***bogdan.mocan@muri.utcluj.ro***						
2.4 Teachers in charge of seminars, lab, or project	Assoc.Prof.Eng. Bogdan Mocan, PhD ***bogdan.mocan@muri.utcluj.ro***						
2.5 Year of study	4	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DI

3. Estimated total time (hours per semester of teaching activities)

3.1 Number of hours per week	2	of which, course	2	3.3 applications (project, ~~lab~~)	-
3.4 Total hours in the curriculum	28	of which, course	28	3.6 applications (project, ~~lab~~)	-

3.7 Distribution of time (hours per semester) for:	ore
(a) Study by textbook, course support, bibliography, and notes	7
(b) Additional documentation in the library, on specialized electronic platforms and in the field	5
(c) Preparation of seminars / laboratories, topics, papers, portfolios, and essays	10
(d) Tutoring	3
(e) Examinations	2
(f) Other activities:	0

3.8 Total hours of individual study	22
3.9 Total hours per semester	50
3.10 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1 Curriculum	Promoting the exam to the „**Robotisation manufacturing I**” discipline
4.2 Competences	Ability to understand the operation of an industrial robot, identify the category it belongs to and its type; The ability to integrate, through logical reasoning, robots into industrial processes. The ability to select the end-effectors with which the robots can perform different work tasks.

5. Requirements (where appropriate)

5.1. For the course	***Face-to-Face***: Classroom with videoprojector and internet access; ***On-line***: Teams Software Platform
5.2. For the applications: project	-

6. Specific competences

Professional competences	Design and development of the general assembly of industrial robots (RI), perirobotic systems (SPR) of transport and transfer systems (SAT) and related systems (SC) used in robotic applications, implementation, assisted 3D modeling and RI, SPR, SATT simulation, SC in specific applications of different technological processes. Use of modern assessment methods (assisted calculation, modeling, simulation, optimization of operation) in the optimal design of robotic subsystems and hardware interfaces and virtual instrumentation software specific for the acquisition, processing and interpretation of experimental data Elaboration of technical execution projects and virtual prototypes for robotic partial assemblies including drive systems and specific controling systems.
Cross competence	Fulfilling the professional tasks with exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working time and the related implementation deadlines. Promoting logical, convergent and divergent reasoning, practical applicability, assessment and self-assessment in decision-making.

7. Discipline objectives (as results from the key competences gained)

7.1 7.1 General objective	Increasing students' ability to design and develop complex robotic industrial applications (eg, manipulation, assembly, arc welding palletizing, spot welding, etc.).
7.2 Specific objectives	• Advanced features in robotic handling • Understanding the principles of automatic control of industrial processes • Familiarize students with the PLC structure • Familiarize students with the types and structure of collaborative robots • Familiarize students with standards and regulations regarding work safety and security in robotic systems

8. Contents

No	8.1 Lecture (syllabus) - Course	No hours	Teaching methods	Notes
1	General aspects of robotic manipulation; quality planning in the design of automated material handling systems	2	**Face to Face** Exposure **&** **On-line** using MS Teams platform	Internet access for all students
2	Robotic manipulation - principles of design of robotic handling systems	2		
3	Sensors used in robotic handling / assembly / welding cells	2		
4	Aspects of production planning in robotic handling systems - Part I	2		
5	Aspects of production planning in robotic handling systems - Part II	2		
6	Auxiliary feed equipment, grip and guidance devices in robotic systems - types of feeders, types of gripping devices and guidance used in robotic systems	2		
7	Aspects of the robotic production cell layout/ system layout - highlighting the importance of designing the layout of a production facility, layout optimization algorithms - ex. CRAFT, genetic algorithms, sworm intelligence	2		
8	User Interfaces in Industrial Robot Programming - User	2		

	Interface Types (ABB, KUKA, FANUC)			
9	PLC controlled robotised industrial processes	2		
10	Aspects regarding collaborative robots - types of collaborative robots, ways of programming them, ways to integrate into production processes	2		
11	Industrial safety and security requirements for industrial robots and industrial robotised applications	2		
12	Industrial safety and security requirements for collaborative robots and collaborative applications in industry	2		
13	Criteria for evaluating the performance of robotized production cells / systems	2		
14	Industrial and collaborative robotics in the context of IIoT (Industrial Internet of Things) and Industry 4.0	2		

Bibliography

1. Mocan, B., Robotization manufacturing II, course notes, 2020-2021.
2. Mocan, B., Brad, S., Fulea, M, Murar, M., Stan, A., Timoftei, S., Multidisciplinary Design of Industrial Robotic Automation Solutions - Practical Guide For Students - Editura UTPress, ISBN 978-606-737-246-5, 240 pg., Cluj-Napoca, 2018
3. ABB Safety Handbook - Machine Safety - Jokab Safety products, 2020
4. Siciliano, B., Khatib, O., Springer Handbook of Robotics, 2016.
5. Pires, N., Loureiro, A. şi Bolmsjo, G., Welding Robots. Technology, System Issues and Applications, Springer, 2006.
6. Keramas, J., Robot Technology. Fundamentals, Delmar Publ., 1999.
7. Wise, E., Applied Robotics II, Thomson Delmar Learning, 2017.
8. Nof, Y. (ed.), Handbook of Industrial Robotics, John Wiley & Sons, 2019.
9. Shell, R. şi Hall, E. (ed.), Handbook of Industrial Automation, Marcel Dekker, 2018.

Alternative sources of information

1. **Mobile apps** - Google Android: Industrial Automation Tutorial; Industrial Automation; Electrical Drives; Automation & Controls Today; Learn PLC SCADA

2. **Youtube**: The Robot Revolution: The New Age of Manufacturing; How industrial robot is made? ; Smart Factory; Internet of Things; IORT Internet of robotic things;

3. **Robotic Blogs**: Robotics Trends; Robot Facts That Everyone Should Know; Robotics within reach; Robotic News for the Factory; Smart Collaborative Robots; Powering the world's robots; Robotics; MIT Technology Review.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The skills developed within this course will be required by engineers involved in designing automation and robotic solutions for the various industrial process processes to increase the quality and productivity of the process. Also, in this course, skills are developed related to industrial robot programming (eg ABB) and control of automated processes with PLCs (eg Siemens S7-200,300,400).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Answers to 25 questions from all courses (theory evaluation)	Written test - duration of assessment 1 hour	100%
10.6 Minimum performance standard (knowledge required to get score 5)			

Theory evaluation (course): correct answer to 10 questions.

Date of filling in:	**Lecturer**	**Title Surname Name**	**Signature**
	Lecturer	Assoc.Prof.Eng. Bogdan Mocan, PhD	
	Teachers in charge of application	Assoc.Prof.Eng. Bogdan Mocan, PhD	

Date of approval in the Council of IPR Department ________________________	Head of department, Prof.dr.ing. Calin NEAMTU
Date of approval in the FIIRMP ________________________	Dean, Prof.dr.ing. Corina BARLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics in English at Cluj-Napoca
1.7	Form of education	Full time
1.8	Subject code	59

2. Data about the subject

2.1 Subject name	**Manufacturing robotization II (project)**						
2.2 Subject area	DS						
2.3 Course responsible/lecturer	Assoc.Prof.Eng. Bogdan Mocan, PhD ***bogdan.mocan@muri.utcluj.ro***						
2.4 Teachers in charge of seminars, lab, or project	Assoc.Prof.Eng. Bogdan Mocan, PhD bogdan.mocan@muri.utcluj.ro						
2.5 Year of study	4	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DI

3. Estimated total time (hours per semester of teaching activities)

3.1 Number of hours per week	2	of which, course	-	3.3 applications (project, ~~lab~~)	2
3.4 Total hours in the curriculum	28	of which, course		3.6 applications (project, ~~lab~~)	28

3.7 Distribution of time (hours per semester) for:	ore
(a) Study by textbook, course support, bibliography, and notes	7
(b) Additional documentation in the library, on specialized electronic platforms and in the field	5
(c) Preparation of seminars / laboratories, topics, papers, portfolios, and essays	10
(d) Tutoring	
(e) Examinations	4
(f) Other activities:	0

3.7 Total hours of individual study	22
3.8 Total hours per semester	50
3.9 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1 Curriculum	Promoting the exam to the „Robotisation manufacturing I" discipline
4.2 Competences	Ability to understand the operation of an industrial robot, identify the category it belongs to and its type; The ability to integrate, through logical reasoning, robots into industrial processes. The ability to select the end-effectors with which the robots can perform different work tasks.

5. Requirements (where appropriate)

5.1. For the course	-
5.2. For the applications: project	A classroom with at least 15 computers on which to run Microsoft Office software (or equivalent), 3D modeling applications - SolidWorks (or equivalent), RoboDK© (or equivalent) robot simulation and programming applications. Stand Siemens PLC range S7-300.

6. Specific competences

Professional competences	Design and development of the general assembly of industrial robots (RI), perirobotic systems (SPR) of transport and transfer systems (SAT) and related systems (SC) used in robotic applications, implementation, assisted 3D modeling and RI, SPR, SATT simulation , SC in specific applications of different technological processes. Use of modern assessment methods (assisted calculation, modeling, simulation, optimization of operation) in the optimal design of robotic subsystems and hardware interfaces and virtual instrumentation software specific for the acquisition, processing and interpretation of experimental data Elaboration of technical execution projects and virtual prototypes for robotic partial assemblies including drive systems and specific controling systems.
Cross competence	Fulfilling the professional tasks with exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working time and the related implementation deadlines. Promoting logical, convergent and divergent reasoning, practical applicability, assessment and self-assessment in decision-making.

7. Discipline objectives (as results from the key competences gained)

7.1 7.1 General objective	Increasing students' ability to design and develop complex robotic industrial applications (eg, manipulation, assembly, arc welding palletizing, spot welding, etc.).
7.2 Specific objectives	• Advanced features in robotic handling • Understanding the principles of automatic control of industrial processes • Familiarize students with the PLC structure • Familiarize students with the types and structure of collaborative robots • Familiarize students with standards and regulations regarding work safety and security in robotic systems

8. Contents

8.2 Project		**No Hours**	**Teaching methods**	**Notes**
1	***Project meeting 1***: Presentation of the project theme and project requirements.	2	**Face to face** Exposure and practical applications in the lab *or* **On-line** using MS Teams platform	
2	***Project meeting 2***: Critical analysis of the products illustrated in Annexes 1 and 2 in order to identify the technical, dimensional and geometric characteristics. The sketch of the product structure is highlighted; the diagram showing the inter-dependencies between the component parts is highlighted. A list of weaknesses will be generated to highlight the difficulties of handling and sorting those products.	2		
3	***Project meeting 3***: Documentation on automated/ robotic handling, sorting, packaging and palletizing systems. Identification of equipment, devices for feeding, transporting, orienting, etc., sensors, control equipment necessary for the process to be automated. The completion of this stage will be done with a synthetic presentation, in front of colleagues, of the identified solutions (= 10 slides).	2		
4	***Project meeting 4***: The needs of the process to be automated are defined. The objective function(s) is selected that are to be achieved through automation and the concrete ways in which the objective function(s) is to be achieved.	2		
5	***Project meetings 5, 6, 7, 8 and 9***: The conception of the automated	10		

	/ robotic production system 1. Identification of the functions of the robotic production system. 2. Elaboration of the flow chart of the entire robotic process. 3. Making the process / sub-process map (eg sorting, packing, palletizing, checking) 4. Elaboration of the scheme of location of the equipment within the space available and considering the functionalities of the robotic production system - 2 - 3 solutions - study of various solutions. 5. Generation of the location scheme (3D layout) of the equipment that will be part of the automated / robotic production system. The generated solution is evaluated according to the performance criteria for such systems highlighted in the course using the correlation matrix (MC).			
10	***Project meeting 10***: Identification of the types of final effectors (grippers) for the robots integrated in the developed solution.	2		
11	***Project meetings 11, 12 and 13***: Carrying out the risk analysis for the solution generated within this project (based on ISO 12100: 2010) 1. Determining the limits of equipment and robotic systems integrated into the generated solution, 2. Identification of potential hazards in the robotic production system (hazards may occur in the mechanical, electrical, thermal, noise, vibration, radiation, material or ergonomic areas); 3. Estimation of the identified risk (s).	6		
14	***Project meeting 14***: Simulation of at least one sub-process (e.g. handling and sorting, packaging, palletizing) within the robotic production system.	2		

Bibliography

1. Mocan, B., Robotization manufacturing II, course notes, 2020-2021.
2. Mocan, B., Brad, S., Fulea, M, Murar, M., Stan, A., Timoftei, S., Multidisciplinary Design of Industrial Robotic Automation Solutions - Practical Guide For Students - Editura UTPress, ISBN 978-606-737-246-5, 240 pg., Cluj-Napoca, 2018
3. ABB Safety Handbook - Machine Safety - Jokab Safety products, 2020
4. Siciliano, B., Khatib, O., Springer Handbook of Robotics, 2016.
5. Pires, N., Loureiro, A. şi Bolmsjo, G., Welding Robots. Technology, System Issues and Applications, Springer, 2006.
6. Keramas, J., Robot Technology. Fundamentals, Delmar Publ., 1999.
7. Wise, E., Applied Robotics II, Thomson Delmar Learning, 2017.
8. Nof, Y. (ed.), Handbook of Industrial Robotics, John Wiley & Sons, 2019.
9. Shell, R. şi Hall, E. (ed.), Handbook of Industrial Automation, Marcel Dekker, 2018.

Alternative sources of information

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2. **Youtube**: The Robot Revolution: The New Age of Manufacturing; How industrial robot is made? ; Smart Factory; Internet of Things; IORT Internet of robotic things;
1. **Robotic Blogs**: Robotics Trends; Robot Facts That Everyone Should Know; Robotics within reach; Robotic News for the Factory; Smart Collaborative Robots; Powering the world's robots; Robotics; MIT Technology Review.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The skills developed within this project will be required by engineers involved in the development of automation solutions by integrating industrial robots for the various industrial processes to increase the quality of the products and the productivity of the process.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	-	-	-
10.5 Project	*20% Results during the semester (A);* *20% Correct choice of equipment / devices / sensors / control equipment (B);* *20% Technical feasibility of the proposed solution – evaluate the 3D solution (C);* *30% Risk analysis for the automated / robotic production system generated (D);* *10% Oral presentation (E).* These criteria are associated with the project - ***Design of a robotic production system integrating handling, sorting, packaging, and palletizing activities for the given products.***	Public presentation - 10 minutes duration and answer to project questions (min. 2 questions)	100%
10.6 Minimum performance standard (knowledge required to get score 5)			
Successfully applying the stages in the project and developing the concept of a ***robotic production system integrating handling, sorting, packaging, and palletizing activities for the given products***; 3D concept of the robotic system developed within the project - assessed based on a highlighted criterion.			

Date of filling in:	**Lecturer**	**Title Surname Name**	**Signature**
	Teachers in charge of project	Assoc.Prof.Eng. Bogdan Mocan, PhD	

Date of approval in the Council of IPR Department _________________________	Head of department, Prof.dr.ing. Calin NEAMTU
Date of approval in the FIIRMP _________________________	Dean, Prof.dr.ing. Corina BARLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	License
1.6	Program of study/Qualification	Robotics
1.7	Form of education	IF – full-time education
1.8	Subject code	61.00

2. Data about the subject

2.1	Subject name			Flexible Manufacturing Systems II		
2.2	Subject area					
2.2	Course responsible/lecturer			Conf. dr. ing. Emilia Brad emilia.brad@muri.utcluj.ro		
2.3	Teachers in charge of seminars			Conf. dr. ing. Emilia Brad emilia.brad@muri.utcluj.ro		
2.4 Year of study	4	2.5 Semester	1	2.6 Assessment		E
2.7 Subject category	Formative category					DS
	Optionality					DI

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	56	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	0
(e) Exams and tests	0
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Flexible Manufacturing Systems I
4.2	Competence	It's not necessary

5. Requirements (where appropriate)

5.1	For the course	Lecture hall with a minimum of 30 seats, multimedia projector, computer, MS Power Point
5.2	For the applications	Workshop with at least 30 computer workstations, multimedia projector, computer, MS Power Point

6. Specific competences

Professional competences	Theoretical knowledge: • To know the design principles of flexible manufacturing systems • To know the types of equipment within a flexible manufacturing system Acquired skills: • After completing the course students will be able to design a flexible manufacturing system Acquired skills: • To use an intermediate level SFF simulation CAD environment • To operate with flexible manufacturing systems based on SMC technologies
Cross competences	• To apply the values and ethics of the engineering profession. • To responsibly perform complex professional tasks under conditions of professional autonomy and independence. • To promote logical reasoning, convergent and divergent, of practical applicability, evaluation and self-evaluation in decision-making. • To plan their own work priorities. • To self-control the learning and effective use of language skills and knowledge of information and communication technology.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Developing skills to plan, analyze and integrate flexible manufacturing processes within enterprises
7.2	Specific objectives	- Understanding the specific concepts of flexible manufacturing - Knowledge of specific flexible manufacturing planning tools - Knowledge of specific tools for flexible manufacturing analysis - Knowledge of specific tools for designing flexible manufacturing systems - Development of logical and creative thinking, individual study, critical and self-critical analysis

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Creating a manufacturing strategy – part I: defining objectives; determining action strategies	2	Presentations using info-graphics, video materials, text Discussions based on examples and case studies Questions-answers-debates (teacher-student; student-teacher) Mini-exercises	
Creating a manufacturing strategy – part II: defining competitive advantages; defining the optimal manufacturing method; process definition; providing manufacturing infrastructure	2		
Design principles of flexible manufacturing systems – part I: objectives; developing market plans; technical analysis	2		
Design principles of flexible manufacturing systems – part II: concept development	2		
Detailed design of flexible manufacturing systems – part I: decomposition; alternatives; equipment specification; preliminary setup	2		
Detailed Design of Flexible Manufacturing Systems – Part II: Control System Specifications; workforce specifications; unit design	2		

Detailed design of flexible manufacturing systems – part III: control system design; human factors in detailed design of flexible manufacturing systems; testing and final configuration	2		
Components of the structure of flexible manufacturing systems - part I: basic configurations of a flexible manufacturing system	2		
Components of the structure of flexible manufacturing systems – part II: technological equipment	2		
Components of the structure of flexible manufacturing systems - part III: equipment for material flow	2		
Components of the structure of flexible manufacturing systems - part IV: equipment for computer-controlled testing	2		
Components of the structure of flexible manufacturing systems - part V: equipment for information flow	2		
Trends in the development of flexible manufacturing systems: reconfigurable manufacturing systems – part I: the concept of reconfigurability; the need to develop reconfigurable manufacturing systems and equipment	2		
Trends in Flexible Manufacturing Systems Development: Reconfigurable Manufacturing Systems – Part II: Reconfigurable Manufacturing Systems Design Methodologies	2		

Bibliography

- Brad, E. Bazele Sistemelor Flexibile de Fabricaţie și Elemente de Fabricație Lean, Ed. UT Pres, 2013.
- Brad, E., Sisteme Flexibile de Fabricaţie. Lucrări de Laborator, Ed. UT Pres, ISBN 973-662-162-6, 2005.
- Brad, E., Fabricația Reconfigurabilă și Elemente de Proiectare a Echipamentelor de Fabricație Reconfigurabile, Ed. UT Pres, 2013.
- Păunescu, T., Celule Flexibile de Prelucrare, Ed. Univ. Transilvania Brasov, ISBN 973-98511-9-3, 1998.

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Evaluating events in an SFF simulation environment	2	Questions and answers Supervision of individual work Computer exercises (modeling and simulation)	
Modeling and simulating complex workspaces in an SFF simulation environment	2		
Synchronization of multi-robot zones in an SFF simulation environment	2		
Virtual commissioning in an SFF simulation environment – sensors and control devices	2		
Virtual commissioning in an SFF simulation environment – defining signals based on real data	2		
Virtual commissioning in an SFF simulation environment – simulation of internal resource logic	2		
Virtual commissioning in an SFF simulation environment – connecting the virtual model with the real system (PLC code)	2		
Functional analysis of the SMC modular flexible mounting system	2		
Setting up the SMC flexible modular assembly system	2		
Block Analysis of SMC Flexible Manufacturing System	2		
Electrical/Electronic System Analysis of SMC Flexible Manufacturing System	2		

Pneumatic System Analysis of SMC Flexible Manufacturing System	2		
Installation and calibration of the SMC flexible manufacturing system	2		
PLC Programming of SMC Flexible Manufacturing System	2		

Bibliography

- Brad, E. Bazele Sistemelor Flexibile de Fabricaţie și Elemente de Fabricație Lean, Ed. UT Pres, 2013.
- Brad, E., Sisteme Flexibile de Fabricaţie. Lucrări de Laborator, Ed. UT Pres, ISBN 973-662-162-6, 2005.
- Brad, E., Fabricația Reconfigurabilă și Elemente de Proiectare a Echipamentelor de Fabricație Reconfigurabile, Ed. UT Pres, 2013.
- Păunescu, T., Celule Flexibile de Prelucrare, Ed. Univ. Transilvania Brasov, ISBN 973-98511-9-3, 1998.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline emphasizes the basic principles of designing SFFs

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Completeness Ingenuity and elegance (simplicity) in formulating answers	Written test	50%
10.5 Seminars /Laboratory/Project	Completeness The correctness of the solutions	Arithmetic average of marks for each laboratory paper	50%
10.6 Minimum standard of performance			
Minimum performance standard: All laboratory work must be addressed Written test solved min. 50%			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Conf. dr. ing. Emilia BRAD	
	Teachers in charge of application	Conf. dr. ing. Emilia BRAD	

Date of approval in the department IPR _________________________	Head of department Prof. dr. ing. Călin NEAMȚU
Date of approval in the faculty IIRMP _________________________	Dean Prof. dr. ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Industrial Engineering, Robotics and Production Management
1.3 Department	Engineering Design and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Robotics
1.7 Form of education	Full time
1.8 Subject code	62.10

2. Data about the subject

2.1 Subject name	**Interfaces for human-robot interaction**				
2.2 Course responsible/lecturer	conf.dr.ing. Mircea Fulea, mircea.fulea@staff.utcluj.ro				
2.3 Teachers in charge of seminars	conf.dr.ing. Mircea Fulea, mircea.fulea@staff.utcluj.ro				
2.4 Year of study	4	2.5 Semester	1	2.6 Assessment	C
2.7 Subject category	Category				DS
	Optional				DO

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	100	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	8
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	24
Tutoring	2
Exams and tests	2
Other activities	0

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	
4.2 Competence	

5. Requirements (where appropriate)

5.1. For the course	Slide-show presentation, course support material in electronic format, additional materials on a web site
5.2. For the applications	Attending application classes is mandatory

6. Specific competences

Professional competences	C1.3 Usage of logical schemes for implementing the dedicated software applications, of numerical computation methods for solving equations and equation systems and comparative analysis of possible solutions C6.3 General layout design of robotised applications by identifying specific process parameters, development of specific logical flows, development of robotised manufacturing techniques, parametrized 3D modelling, control system integration
Cross competences	CT1. Completing the professional tasks by precisely identifying goals, available resources, constraints, work plan, time span, milestones and deadlines

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	To learn a systematic methodology for building human machine interfaces for robotised applications
7.2 Specific objectives	• to learn a specific approach of technical performance planning for robotised processes • to understand what a human machine interface means • to understand what usability means • to learn a specific approach / methodology for analysing, designing, and implementing software systems analysis, design and implementation

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Introduction on human-system interaction interfaces	Slideshows, examples, open dialogue Support platform: MS Teams	
2. Types of interfaces for human-system interaction		
3. Requirements for human-system interfaces		
4. Industrial software usability		
5. Basics of software development projects planning		
6. Requirement management for technical processes		
7. Performance planning for technical processes		
8. Function planning for processes		
9. Software design and development methodologies		
10. Requirement analysis for industrial software applications		
11. Usecases		
12. Wire-framing		
13. Interface implementation technologies		
14. Usability assessment for industrial software		

Bibliography

- MULTIDISCIPLINARY DESIGN OF INDUSTRIAL ROBOTIC AUTOMATION SOLUTIONS - Practical guide for students, Bogdan MOCAN, Stelian BRAD, Mircea FULEA, Mircea MURAR, Anca STAN, Sanda TIMOFTEI, U.T. PRESS, Cluj-Napoca, 2018, ISBN 978-606-737-246-5
- Îmbunătățirea Utilizabilității Aplicațiilor Software Industriale, Fulea, M., Ed. UTPress, Cluj-Napoca,

2015, 376 pagini, ISBN 978-606-737-053-9 (relevant chapters available in English) • Ingineria Dezvoltării Competitive a Produselor și Serviciilor Inovative, Fulea, M., Brad, S., Mocan, B., Murar, M., Editura UT Press, ISBN 978-606-737-066-9, 52 pg., Cluj-Napoca (relevant chapters available in English) • Tools and Methods of Competitive Design in Robotics, Brad, S., Brad, E., Mocan, B., Fulea, M., Editura UT Press, ISBN 978-606-737-067-6, 183 pg., Cluj-Napoca

8.2 Applications/Seminars	Teaching methods	Notes
1. Requirement identification for a robotised assembly process	Slideshows, examples, specific software tools and hardware platforms Support platform: MS Teams	
2. Requirements ranking with the AHP method		
3. Definition of performance characteristics for a robotised assembly process		
4. Performance planning with the QFD method		
5. Definition of functions for a robotised assembly process		
6. Use-cases for the computer-based process control application (1)		
7. Use-cases for the computer-based process control application (2)		
8. Wire-framing (1)		
9. Wire-framing (2)		
10. Computer-based process control application prototype implementation (1)		
11. Computer-based process control application prototype implementation (2)		
12. Computer-based process control application prototype implementation (3)		
13. Computer-based process control application prototype implementation (4)		
14. Usability assessment for the process control application		
Bibliography • MULTIDISCIPLINARY DESIGN OF INDUSTRIAL ROBOTIC AUTOMATION SOLUTIONS - Practical guide for students, Bogdan MOCAN, Stelian BRAD, Mircea FULEA, Mircea MURAR, Anca STAN, Sanda TIMOFTEI, U.T. PRESS, Cluj-Napoca, 2018, ISBN 978-606-737-246-5 • Tools and Methods of Competitive Design in Robotics, Brad, S., Brad, E., Mocan, B., Fulea, M., Editura UT Press, ISBN 978-606-737-067-6, 183 pg., Cluj-Napoca		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Answers to 3 theoretical questions	Written test - 90 minutes	20%
10.5 Applications	Aggregate technical report combining all application steps, as performed in the laboratory meetings	Technical report presentation	80%
10.6 Minimum standard of performance			
Two correct answers and completion of the technical report			

Date of filling in:		Title, Name, Surname	Signature
	Lectures, applications	conf.dr.ing. Mircea Fulea	

Date of approval in the Engineering Design and Robotics department

____

Head of department

Date of approval in the Faculty of IIRMP

____

Dean

SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	IIRMP
1.3 Department	Engineering Design and Robotics
1.4 Field of study	Industrial Engineering
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Robotics
1.7 Form of education	Full time
1.8 Subject code	62.20

2. Data about the subject

2.1 Subject name	**Development of intelligent industrial robotic systems**						
2.2 Subject area	DS DO						
2.3 Course responsible/lecturer	conf.dr.ing. Mircea Fulea, mircea.fulea@staff.utcluj.ro						
2.4 Teachers in charge of seminars	conf.dr.ing. Mircea Fulea, mircea.fulea@staff.utcluj.ro						
2.5 Year of study	4	2.6 Semester	1	2.7 Assessment	C	2.8 Subject category	DS DO

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	100	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	8
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	24
Tutoring	2
Exams and tests	2
Other activities	0

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	
4.2 Competence	

5. Requirements (where appropriate)

5.1. For the course	Slide-show presentation, course support material in electronic format, additional materials on a web site
5.2. For the applications	Attending application classes is mandatory

6. Specific competences

Professional competences	C1.3 Usage of logical schemes for implementing the dedicated software applications, of numerical computation methods for solving equations and equation systems and comparative analysis of possible solutions C6.3 General layout design of robotised applications by identifying specific process parameters, development of specific logical flows, development of robotised manufacturing techniques, parametrized 3D modelling, control system integration
Cross competences	CT1. Completing the professional tasks by precisely identifying goals, available resources, constraints, work plan, time span, milestones and deadlines

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	To learn representation of and inferences on key problems of artificial intelligence
7.2 Specific objectives	Fundamental search methods, usage of first-order logic in description and inference, elementary planning problems

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Introduction	Slideshows, examples, open dialogue	
2. Intelligent agents: behaviour, environment, structure		
3. Problem solving through searching		
4. Logical agents		
5. First order logic		
6. Inference in first order logic		
7. Planning, knowledge representation: ontology engineering		
Bibliography • Artificial intelligence on the world-wide-web		
8.2 Applications/Seminars	Teaching methods	Notes
1. Introduction. Study of the project documentation	Slideshows, examples, specific software tools and hardware platforms	
2. Exercises: Intelligent agents: behaviour, environment, structure		
3. Exercises: Problem solving through search		
4. Exercises: Logical agents		
5. Exercises: First order logic		
6. Exercises: Inference in fist order logic		
7. Exercises: Planning		
Bibliography • Artificial intelligence on the world-wide-web		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Answers to 3 theoretical questions	Written test - 90 minutes	20%
10.5 Applications	Aggregate technical report combining all application steps	Technical report presentation	80%
10.6 Minimum standard of performance			
Two correct answers and completion of the technical report			

Date of filling in:		Title, Name, Surname	Signature
	Lectures, applications	conf.dr.ing. Mircea Fulea	

Date of approval in the Engineering Design and Robotics department

____

Head of department
Prof.dr.ing.……...

Date of approval in the Faculty of IIRMP

____

Dean
Prof.dr.ing. ………………..

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	63.10

2. Data about the subject

2.1	Subject name			Applications with microcontrollers in industrial robotics			
2.2	Subject area			DS			
2.2	Course responsible/lecturer			Lec. PhD Eng. Mircea MURAR - mircea.murar@muri.utcluj.ro			
2.3	Teachers in charge of seminars			Lec. PhD Eng. Mircea MURAR - mircea.murar@muri.utcluj.ro			
2.4 Year of study	IV	2.5 Semester	1	2.6 Assessment	C		
2.7 Subject category	Formative category						DS
	Optionality						DOP

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	42	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	26
(b) Supplementary study in the library, online and in the field	20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
(d) Tutoring	2
(e) Exams and tests	
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	58
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Applied electronics in robotics, Microcontrollers and microprocessors, Mechanics, Introduction to Robotics.
4.2	Competence	Computer Programming, English language

5. **Requirements (where appropriate)**

5.1	For the course	Amphitheatre or classroom with video projector
5.2	For the applications seminarului / laboratorului / proiectului	Class room equipped with computers, programs and platforms that are specific to the discipline. Presence is mandatory.

6. **Specific competences**

Professional competences	• Develop the abilities to identify the electrical requirements for interfacing cyber-physical system with robot controllers. • Strengthen robot and cyber-physical systems programming skills and develop the knowledge required for interconnecting their software services and functionalities. • Develop the skills required to connect industrial robots to Internet of Things platforms using cyber-physical systems. • Ability to implement specific traceability procedures in industrial processes using RFID technology. • The ability to implement specific quality assurance procedures in industrial processes using video inspection systems. • Acquiring the principles specific to the concept of servitization and re-configuration. • The ability to develop and control a robotic structure using technological processors.
Cross competences	• Ability to identify from datasheets the most important characteristics and features of cyber-physical systems. • Apply the values and ethics of the engineering profession and responsible execution of professional tasks. • Promote logical, convergent and divergent reasoning, practical applicability of know-how, assessment and self-assessment in decision-making.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Integrate cyber-physical systems in industrial production systems and identify innovation niches.
7.2	Specific objectives	• Connecting robotic systems and cyber-physical systems to Internet of Things-type platforms. • Development of specific program applications for traceability and quality assurance in industrial processes. • Development of robotic systems and movement control

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Internet of Things in Industry	2		
Video inspection identification system. Quality assurance in industrial production systems.	2		

Radio frequency identification system. Traceability in industrial production systems.	2		
SCADA - Centralized monitoring and control systems of production facilities.	2		
Architecture and programming of Motoman industrial robots. Integration of cyber-physical systems in robotic cells.	2		
Motion control using technological processors.	2		
Development and control of industrial robots using technological processors	2		

Bibliography

- White, E.; Making Embedded Systems: Design Patterns for Great Software (2011), ISBN-13: 978-1449302146, O'Reilly Media
- Zhou, H.; The Internet of Things in the Cloud: A Middleware Perspective (2012), ISBN-13: 978-1439892992, CRC Press
- Jeschke, S., et. al.; Industrial Internet of Things: Cybermanufacturing Systems (2016), ISBN-13: 978-3319425580.
- Hoda, E.; Changeable and Reconfigurable Manufacturing Systems (2009), ISBN: 978-1-84882-066-1, Springer.
- Hans, B.; Automating with SIMATIC S7-1500: Configuring, Programming and Testing (2014), 978-3-89578-404-0, Publicis Erlangen
- Motoman Inform III Programming language: http://heim.ifi.uio.no/matsh/SIA20/inform.pdf

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Command and monitor frequency converter and motor parameters using IIoT platforms	4	Prezentare power-point. Sisteme cyber-fizice:IoT2040, ioBridge, mbed, Simatic S7-1500T, ET200-SP, MV440, RF240R Echipamente industriale: Robotiq gripper, Robot industrial Motoman SDA-10D, ABB IRB1600, SMC Electric gripper	
Quality assurance through video systems and their integration into robotic systems	4		
Ensuring traceability through RFID systems and their integration into robotic systems	4		
Command and monitoring of industrial processes through SMS messages	4		
Programming Motoman robots and integrating cyber-physical systems with the robot controller	4		
Servomotor control using technological processors. Speed control, position control and torque control.	4		
The construction of an industrial robot and its control by means of technological processors and servomotors	4		

Bibliography

- White, E.; Making Embedded Systems: Design Patterns for Great Software (2011), ISBN-13: 978-1449302146, O'Reilly Media
- Zhou, H.; The Internet of Things in the Cloud: A Middleware Perspective (2012), ISBN-13: 978-1439892992, CRC Press

- Jeschke, S., et. al.; Industrial Internet of Things: Cybermanufacturing Systems (2016), ISBN-13: 978-3319425580.
- Hoda, E.; Changeable and Reconfigurable Manufacturing Systems (2009), ISBN: 978-1-84882-066-1, Springer.
- Hans, B.; Automating with SIMATIC S7-1500: Configuring, Programming and Testing (2014), 978-3-89578-404-0, Publicis Erlangen
- Motoman Inform III Programming language: http://heim.ifi.uio.no/matsh/SIA20/inform.pdf.
- MV440 Instruction Manual
- RF240 Instruction Manual

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Identify specific requirements of companies in the field of service robotics and update the lectures and applications.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Understand the principles exposed and experienced in the classes.	Written assessment at the end of semester.	30%
10.5 Seminars /Laboratory/Project	Development of applications during applications classes.	Results of individual subjects in application classes	70%
10.6 Minimum standard of performance			

The evaluation procedure for the theoretical component takes place onsite or online within the Teams platform according to the following grade-competent distribution:

- 5 – 10: Presentation of a case study about a technology discussed in the course

The evaluation procedure for the practical component takes place onsite or online within the Teams platform according to the following grade-competent distribution:

- 5 – 10: Laboratory application development based on one of the laboratory stands:
  o Pick and place application development using Motoman robots.
  o Equipment control application development using IIoT platforms
  o Quality control application development using video inspection systems
  o Application development implementing traceability using RFID systems
  o Configuring and simulating an industrial robot model using technological processors.

Date of filling in:		Title Surname Name	Signature
	Lecturer	Lec. PhD Eng. Mircea MURAR	
	Teachers in charge of application	Lec. PhD Eng. Mircea MURAR	

Date of approval in the department IPR _________________________	Head of department Prof. dr. ing. Calin Neamțu
Date of approval in the Faculty of Industrial Engineering, Robotics and Production Management _________________________	Dean Prof. dr. ing. Corina Julieta Bîrleanu

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	License
1.6	Program of study/Qualification	Robotics
1.7	Form of education	IF - full-time education
1.8	Subject code	63.20

2. Data about the subject

2.1	Subject name			Programming languages in robotics		
2.2	Subject area					
2.2	Course responsible/lecturer			Prof. dr. ing. Stelian Brad stelian.brad@staff.utcluj.ro		
2.3	Teachers in charge of seminars			Drd.ing. Vlad Florian		
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment		C
2.7 Subject category	Formative category					DS
	Optionality					DO

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	42	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	8
(b) Supplementary study in the library, online and in the field	20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	30
(d) Tutoring	0
(e) Exams and tests	0
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	58
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	It's not necessary
4.2	Competence	It's not necessary

5. Requirements (where appropriate)

5.1	For the course	Lecture hall with the number of seats equal to the number of students; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments
5.2	For the applications	Room with computers equal to the number of students in the group; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments

6. Specific competences

Professional competences	• To make computer programs in the ROS programming language dedicated to robots • To master the concepts of object-oriented programming • To create computer programs with applicability in industrial robotics, social robotics
Cross competences	• To apply the values and ethics of the engineering profession • To responsibly perform complex professional tasks under conditions of professional autonomy and independence • To promote logical reasoning, convergent and divergent, of practical applicability, evaluation and self-evaluation in decision-making • To plan their own work priorities • To self-control the learning and effective use of language skills and knowledge of information and communication technology

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Development of skills and abilities to plan, analyze, realize, test computer programs in the ROS programming language
7.2	Specific objectives	- Create on programs for robotics applications - Development of logical and creative thinking, individual study, critical and self-critical analysis

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Introduction to ROS (packages, services, nodes, messages, topics)	2	Alternate theory with examples, class exercises, homework	
Basic operations in ROS (create packages, operate with topics, create and operate with nodes, add messages, etc.)	2		
Working with ROS for 3D modeling	2		
Robot simulation with ROS and Gazebo	2		
ROS Moved! and navigation with RViz	2		
Interfacing ROS with I/O boards for sensors and actuators	2		

Programming artificial vision sensors with ROS, OpenCV and PLC	2		
Bibliography • Joshep, L., Mastering ROS for robot programming, Packt, 2021. • Joshep, L., Learning robotics using Python, OpenCV, ROS, PLC, Packt, 2018.			

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Simulation of a mobile robot with ROS I	2	Alternate theory with examples, class exercises, homework	
Simulation of a mobile robot with ROS II	2		
Simulation of a mobile robot with ROS III	2		
Interfacing sensors and actuators with the controller I	2		
Interfacing sensors and actuators with the controller II	2		
Interfacing sensors and actuators with the controller III	2		
Interfacing artificial vision sensors with ROS I	2		
Interfacing artificial vision sensors with ROS II	2		
Interfacing artificial vision sensors with ROS III	2		
Robot command I	2		
Robot command II	2		
Robot command III	2		
ROS for Industrial Robots I	2		
ROS for Industrial Robots II	2		
Bibliography • Joshep, L., Mastering ROS for robot programming, Packt, 2021. • Joshep, L., Learning robotics using Python, OpenCV, ROS, PLC, Packt, 2018.			

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

It is a course with a strong vocational-applicative character. Skills are developed with immediate applicability in practice

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Solution completeness Solution correctness Code simplicity Code clarity Ingenuity algorithms	Problem-based assessment	50%
10.5 Seminars /Laboratory/Project	Solution completeness Solution correctness Code simplicity Code clarity	Problem-based assessment	50%

	Ingenuity algorithms		
10.6 Minimum standard of performance			
• Grade 5 average of laboratory works • Note 5 examination in the colloquium			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof. dr. ing. Stelian BRAD	
	Teachers in charge of application	Drd.ing. Vlad Florian	

Date of approval in the department IPR _________________________	Head of department Prof. dr. ing. Călin NEAMȚU
Date of approval in the faculty IIRMP _________________________	Dean Prof. dr. ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Engineering and Management
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics (English)
1.7	Form of education	Full time
1.8	Subject code	64.00

2. Data about the subject

2.1	Subject name				Quality Engineering and Management		
2.2	Subject area				Industrial Engineering		
2.2	Course responsible/lecturer				Assoc.prof.dr-ing.ec. Diana Dragomir diana.dragomir@muri.utcluj.ro		
2.3	Teachers in charge of seminars				Assoc.lect.dr-ing.ec. Diana Blagu diana.blagu@muri.utcluj.ro		
2.4 Year of study	4	2.5 Semester	2		2.6 Assessment		E
2.7 Subject category	Formative category						DS
	Optionality						DI

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar		3.3 Laborator	2	3.3 Proiect		
3.4 Total hours in the curriculum	56	of which	3.5 Course	28	3.6 Seminar		3.6 Laborator	28	3.6 Proiect		
3.7 Individual study:											
(a) Manual, lecture material and notes, bibliography											18
(b) Supplementary study in the library, online and in the field											16
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays											24
(d) Tutoring											6
(e) Exams and tests											3
(f) Other activities											2

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	69
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5.0

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basic knowledge of tolerances and measurements. Basic knowledge on management.
4.2	Competence	General knowledge of operating a PC;

5. Requirements (where appropriate)

5.1	For the course	Room M405, Bd. Muncii 103-105
5.2	For the applications seminarului / laboratorului / proiectului	Room M405, Bd. Muncii 103-105 The attendance to the laboratory activities is mandatory.

6. Specific competences

Professional competences	**C5.** Designing and manufacturing the general assembly of industrial robots (IR) peri robotic systems (PRS) feed, transport, transfer systems (FTTS) and related systems (RS) used in robotic applications, implementing, 3D assisted modelling and simulating the operation of IR, PRS, FTTS and RS in specific applications related to various technological processes.
Cross competences	**CT1.** Performing the professional activities by exactly identifying the objectives, the available resources, the conditions for their completion, the workflow phases and the working times and the corresponding implementation deadlines.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	The course is focused on the transfer of skills needed by students to address issues on product quality and quality of processes / systems in industrial organizations.
7.2	Specific objectives	To understand the fundamental concepts related to quality. To contribute to the realization and functioning of quality management systems. Knowledge on product quality assurance and control. Knowledge on process quality assurance and control. Correct application of algorithms for problem solving and continuous improvement.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. History and the evolution of approaches on quality.	3	Lectures with media/ video support Case studies and exercises Discussion and questions	
2-3. Basic concepts and fundamental principles regarding quality	3		
4-5. ISO 9001 model. Implementation of quality management systems.	3		
6-7. Quality of products.	3		
8-9. Management and control of processes.	3		
10-11. Algorithms for problem solving and continuous improvement.	3		
12. Advanced methods of quality engineering I.	3		

13. Advanced methods of quality engineering II.	3		
14. Other models of quality management in related domains.	4		

Bibliography

Dragomir Diana, Quality engineering and management, Lecture – Power Point, U.T.C-N., 2023
Dragomir Mihai, Blagu Diana, Dragomir Diana, Szabo Denisa, Introduction to Quality 4.0 - Course notes, ISBN 978-606-737-613-5, Editura UT PRESS, Cluj-Napoca, 2022, (92 pag.)
M. Dragomir, S. Popescu, Managementul calității în întreprinderile industriale. Curs universitar, Editura Mega, Cluj-Napoca, 2013
Weckenmann, A., Quality management, Course Erlangen-Nürenberg University, 2010
De Feo, J.A., Juran's Quality Handbook: The Complete Guide to Performance Excellence, Seventh edition, McGraw-Hill, 2016
Standards: SR EN ISO 9000:2015, SR EN ISO 9001:2015, ASRO

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Description of processes using flowchart	2	Online multimedia elements Case studies and exercises	
Problem solving techniques I	2		
Problem solving techniques II	2		
Kaizen improvement methods	2		
Identifying and prioritizing customer requirements	2		
Risk analysis in manufacturing processes - FMEA I	2		
Risk analysis in manufacturing processes - FMEA II	2		

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Diana Blagu, Quality engineering and management, Laboratory notes – Power Point, U.T.C-N., 2023
Dragomir Mihai, Blagu Diana, Dragomir Diana, Szabo Denisa, Introduction to Quality 4.0 - Course notes, ISBN 978-606-737-613-5, Editura UT PRESS, Cluj-Napoca, 2022, (92 pag.)
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De Feo, J.A., Juran's Quality Handbook: The Complete Guide to Performance Excellence, Seventh edition, McGraw-Hill, 2016
Standards: SR EN ISO 9000:2015, SR EN ISO 9001:2015, ASRO

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline is adapted to the requirements of the economic environment and to the specific staff certification schemes from the field of quality (e.g. EOQ, ASQ). Theoretical elements and applicative aspects are included in the discipline, that allow both the rapid integration of graduates into their work environments and the participation in advanced training programs from this field (e.g. master's program, professional certifications).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	- Solving case studies from the field of quality; - Applying the concepts within specific exercises.	Written examination (E)	66,66%
10.5 Seminars /Laboratory/Project	- Attendance during class - Activity during the lectures - Homework	Grade for activity during lectures (L)	33,33%
10.6 Minimum standard of performance			
Minimum marks for promotion: E≥5, L≥5; The two conditions must be cumulatively fulfilled.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Assoc.prof.dr-ing.ec. Dragomir Diana	
	Teachers in charge of application	Assist.lect.dr-ing.ec. Diana Blagu	

Date of approval in the department .... _________________________	Head of department Prof.dr.ing. Călin Neamțu
Date of approval in the faculty .... _________________________	Dean Prof.dr.ing. Bîrleanu Corina

FIŞA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	IIRMP
1.3 Departamentul	Ingineria Proiectarii si Robotica
1.4 Domeniul de studii	Mecatronica si Robotica
1.5 Ciclul de studii	Licenţă
1.6 Programul de studii / Calificarea	Robotica
1.7 Forma de învăţământ	IF – învăţământ cu frecvenţă
1.8 Codul disciplinei	65.00

2. Date despre disciplină

2.1 Denumirea disciplinei	Sisteme mecatronice						
2.2 Aria de conţinut	DS						
2.3 Responsabil de curs	Conf. Dr. Ing. Mihai STEOPAN – Mihai.steopan@muri.utcluj.ro						
2.4 Titularul activităţilor de seminar / laborator / proiect	Conf. Dr. Ing. Mihai STEOPAN – Mihai.steopan@muri.utcluj.ro						
2.5 Anul de studiu	IV	2.6 Semestrul	II	2.7 Tipul de evaluare	E	2.8 Regimul disciplinei	DO

3. Timpul total estimat

3.1 Număr de ore pe săptămână	4	din care: 3.2 curs	2	3.3 seminar / laborator	2
3.4 Total ore din planul de învăţământ	125	din care: 3.5 curs	28	3.6 seminar / laborator	28
Distribuţia fondului de timp					ore
Studiul după manual, suport de curs, bibliografie şi notiţe					30
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate şi pe teren					30
Pregătire seminarii / laboratoare, teme, referate, portofolii şi eseuri					10
Tutoriat					13
Examinări					2
Alte activităţi..................................					3

3.7 Total ore studiu individual	69
3.8 Total ore pe semestru	125
3.9 Numărul de credite	5

4. Precondiţii (acolo unde este cazul)

4.1 de curriculum	Mecanica, Organe de masini, Electronica, Electrotehnica, Constructia mecanica a robotilor industriali
4.2 de competenţe	Modelare 2/3 D

5. Condiţii (acolo unde este cazul)

5.1. de desfăşurare a cursului	Sala de curs, proiector multimedia, banci, scaune
5.2. de desfăşurare a seminarului / laboratorului / proiectului	Sala de lucrari, statii de lucru, echipamente mecatronice, componente mecanice

6. Competenţele specifice acumulate

Competenţe profesionale	Să dezvolte un concept de dispozitiv mecatronic Să evalueze conceptul din punct de vedere functional si economic Să înţeleagă procesul de proiectare a unui dispozitiv mecatronic După parcurgerea disciplinei studenţii vor fi capabili: - Utilizeze pachetul software Delmia pentru simularea si programarea unui dispozitiv mecatronic - Sa identifice, sa proiecteze si sa implementeze un dispozitiv mecatronic pentru o operatie data
Competenţe transversale	Utilizarea la nivel mediu a pachetului software Delmia pentru prototipizarea virtuală a proceselor de producţie robotizate şi programarea off-line a roboţilor industriali Proiectarea unui dispozitiv mecatronic Integrarea elementelor componente mecanice si electronice

7. Obiectivele disciplinei (reieşind din grila competenţelor specifice acumulate)

7.1 Obiectivul general al disciplinei	• Proiectarea conceptuala si constructiva a unui produs mecatronic
7.2 Obiectivele specifice	• Proiectarea constructiva a componentelor si integrarea mecanismelor unui dispozitiv mecatronic

8. Conţinuturi

8.1 Curs	Metode de predare	Observaţii
1. Recapitulare Ingineria roboticii I	Interactive Activ-participative Jigsaw Citirea corespunzatoare	Pentru exemplificari se vor folosi echipamente-le din dotarea laboratorului
2. Recapitulare Ingineria roboticii II		
3. Introducere in Microcontrolere		
4. Structura interna a microcontrolerelor programabile I		
5. Structura interna a microcontrolerelor programabile II		
6. Functionarea microcontrolerelor programabile		
7. Caracteristici functionale pe familii de microcontrolere		
8. Programarea microcontrolerelor programabile: scheme logice		
9. Programarea microcontrolerelor programabile: aritmetica binara		
10. Programarea microcontrolerelor programabile: logica booleana		
11. Programarea microcontrolerelor programabile: variabile/constant locale si globale, functii		
12. Programarea microcontrolerelor Arduino		
13. Echipamante auxiliare de comanda si control		
14. Subsistemele de comanda		

Bibliografie

1. Ispas, V., Robotizarea proceselor de producţie, note de curs, 2005.
2. Ispas, V., Robotics, Parallel robots, Service robots, UT PRESS, 2003
3. Nof, Y., Handbook of Industrial Robotics, John Wiley & Sons, 1999.
4. Blebea, I., Ispas, V. Calculul si Constructia Robotilor Industriali, Editura Dacia, Cluj-Napoca 1995
5. Blebea, I., Ispas, V.,Brad, S. Proiectarea Robotilor Industriali. UTPRES , Cluj-Napoca, 1997.
6. Suport de curs, Sisteme mecatronice, 2022

8.2 Seminar / laborator / proiect	Metode de predare	Observaţii
1. Prezentare mediul de programare Arduino	Interactive	
2. Programare: intrari/iesiri digitale		

3.	Programare: intrari/iesiri analogice	Activ-participative Jigsaw Citirea corespunzatoare	Pentru exemplificari se vor folosi echipamente-le din dotarea laboratorului
4.	Programare: senzori de proximitate/distanta		
5.	Programare: control motoare DC		
6.	Programare: control motoare pas cu pas		
7.	Programare: control motoare servo		

Bibliografie

1. Ispas, V., Robotizarea proceselor de producţie, note de curs, 2005.
2. Ispas, V., Robotics, Parallel robots, Service robots, UT PRESS, 2003
3. Nof, Y., Handbook of Industrial Robotics, John Wiley & Sons, 1999.
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5. Blebea, I., Ispas, V.,Brad, S. Proiectarea Robotilor Industriali. UTPRES , Cluj-Napoca, 1997.
6. Suport de curs, Sisteme mecatronice, 2022

9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor profesionale şi angajatorilor reprezentativi din domeniul aferent programului

In realizarea programei si a continutului s-au consultat:

- societati comerciale reprezentative din Bistrita si imprejurimi, precum Comelf, RAAL, Leoni, RomBAT, C&I, ...
- plane de invatamant de la specializari similare din tara si din strainatate

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	Lucrare scrisa	examinare	60%
10.5 Seminar/Laborator	Verificare lucrari	Evaluare orala a documentatie predate	40%
10.6 Standard minim de performanţă			
• Minim nota **5** la examen si la lucrari			

Data completării:	Titulari	Titlu Prenume NUME	Semnătura
	1	Conf.dr.ing. Mihai STEOPAN	

Data avizării în Consiliul Departamentului	Director Departament Prof.dr.ing. Calin NEAMTU
Data aprobării în Consiliul Facultăţii IIRMP	Decan Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. **Data about the program of study**

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Mechanical Systems Engineering
1.4	Field of study	Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	67.00

2. **Data about the subject**

2.1	Subject name			Robots with parallel structures and applications			
2.2	Subject area			DS			
2.3	Course responsible/lecturer			Prof. Dr. Ing. Doina Pisla doina.pisla@mep.utcluj.ro			
2.4	Teachers in charge of seminars			Prof. Dr. Ing. Doina Pisla doina.pisla@mep.utcluj.ro			
2.5 Year of study	4	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DI

3. **Estimated total time**

3.1 Number of hours per week	3	3.2 of which, course:	2	3.3 applications:	1
3.4 Total hours in the curriculum	125	3.5 of which, course:	28	3.6 applications:	14
Individual study					hours
Manual, lecture material and notes, bibliography					25
Supplementary study in the library, online and in the field					25
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					29
Tutoring					2
Exams and tests					2
Other activities					0

3.7	Total hours of individual study	83
3.8	Total hours per semester	125
3.9	Number of credit points	5

4. **Pre-requisites (where appropriate)**

4.1	Curriculum	
4.2	Competence	

5. **Requirements (where appropriate)**

5.1	For the course	N/A
5.2	For the applications	Attendance to laboratories is mandatory

6. **Specific competences**

Professional competences	To know the concepts of: programming methods, rigid balance and mechanical systems; kinematics and dynamics of mechanical systems; the theory of plane and spatial mechanisms; solving engineering problems through various mathematical methods (analytical methods, numerical methods); computer-aided design of mechanical systems, knowledge of robot mechanics After passing the discipline students will be able to: to acquire: aspects of the role of modelling and simulation of parallel robots used for various applications; methods and techniques used in the graphic modelling and simulation of serial and parallel industrial robots; socio-economic implications of using modelling and simulation in robot study. After passing the discipline students will be able to: - model and simulate graphs of multiple parallel robot structures - use different robot modelling and simulation programs - Different interfaces and parallel program command programs in the CESTER parallel robot laboratory to create programs and create a modelling and simulation interface for new robots
Cross competences	•team work; • autonomy in assuming responsibility; • adapting behaviour in relation to other members; • acceptance of assessment by others

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Familiarize students with modelling and simulation of robots
7.2	Specific objectives	Familiarize students with general notions about modelling and simulation of parallel robots • Making graphic modelling of parallel robot structures • Developing simulation and simulation programs for parallel robots • Creating different interfaces and programs for the parallel robot command in the parallel robot laboratory of CESTER

8. **Contents**

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	1. Introduction to robot modelling and simulation. Bibliography. General.	Exposure and discussions	Video-projector
2.	2. Classification of robots. Concepts of parallel structures. Comparative analysis between serial and parallel robots.		

	Evolution of parallel robots. Examples of robots and their applications.		
3.	Graphical modelling of industrial robots. Modelling transformations. Graphic modelling methods. Comparative analysis between the modelling robots of serial robots and parallel robots.		
4.	Simulation as an instrument in the study of robots. The need for a graphical simulation system. General requirements of a modeling and graphic simulation system.		
5.	Analysis and structural synthesis of parallel robots. Geometrical modeling and graphic simulation in planar parallel robots.		
6.	Geometrical modeling and graphic simulation at robots parallel to 3 and 4 degrees of mobility.		
7.	Geometrical modeling and graphic simulation at robots parallel to 5 and 6 degrees of mobility.		
8.	Kinematic modeling and graphic simulation in planar parallel robots.		
9.	Kinematic modeling and graphic simulation of spatial parallel robots.		
10.	Methods of modeling and graphical simulation of workspace and single configurations of parallel robots.		
11.	Dynamic modeling and simulation of parallel robots.		
12.	Modeling and graphic simulation of parallel and microrobots.		
13.	Graphic simulators for generating robot motion.		
14.	Graphic simulators for generating robot motion.		

Bibliography

In UTC-N library
Textbooks and courses, in publishing houses
Pisla, Doina, Modelarea cinematică si dinamică a roboţilor paraleli, Editura Dacia, 2005.
Gherman, B., Pisla, D., Vaida, C., Programare in limbajul C cu aplicatii in inginerie, Vol 2, Editura Mediamira, Seria Utilizarea si Programarea Calculatoarelor (Coordonator: Pisla D.), ISBN 978-973-713-305-2, 308 pagini, 2013.
In other libraries
1. Asada, H., Slotine, J.J., Robot Analysis and Control, John Wiley, 1986.
2. Coiffet, Ph., La Robotique: Principes at Applications, Hermes, Paris, 1986.
3. Ceccarelli, M., Fundamental of Mechanics of Robotic Manipulation, Kluwer, 2004.
4. Craig, J., Introduction to Robotics, Addison-Wesley, Amsterdam, 1989.
5. Fu, K., Gonzales, R., Lee, C., Robotics Control, Sensing, Vision and Intelligence, McGraw-Hill International Editions,1987.
6. Handra-Luca, V., Mătieş, V., Brişan, C., Roboţi, Editura Dacia, Cluj-Napoca,1996.

7. Handra-Luca,V., Brisan,C.,Bara,M., Brad, S.,Introducere în modelarea roboţilor cu topologie specială, Ed. Dacia, Cluj-Napoca, 2003.
8. Lewis, F.L.,Abdallah, C.T., Dawson,D.M., Control of Robot Manipulators, Mac Millan Publising Company, New-York, 1993.
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13. Tsai, L.-W., Robot Analysis, The Mechanics of Serial and Parallel Manipulators, John Wiley &Sons, Inc., 1999.
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16. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, Robot Modeling and Control,First Edition, JOHN WILEY & SONS, INC., 2005.
17. DELTALAB, Documentaţie tehnică platforma Stewart, 2004.
18. *** www.parallax.com.
19. *** www.lynxmotion.com/
20. *** Matlab, Mathworks Inc.
21. *** Solid Edge, Siemens PLM.
22. *** NX Siemens PLM.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Presentation of the theme of laboratory work. Presentation of computer hardware and software structures used for modelling and simulation of robots. Laboratory presentation, occupational safety measures	Exposure and applications	Computer, software and video-projector
2.	Making computational programs in Matlab for geometrical modelling of flat parallel robots. Establishing algorithms that are effective in terms of computing time. Numerical verification of computational algorithms. Motion graphics simulation.		
3.	Making computational programs in Matlab for geometrical modelling of some 3 and 4 DOF parallel robots. Establishing algorithms that are effective in terms of computing time. Numerical verification of computational algorithms. Motion graphics simulation.		
4.	Making computational programs in Matlab for geometrical modelling of some 3 and 4 DOF parallel robots. Establishing algorithms that are effective in terms of computing time. Numerical verification of computational algorithms. Motion graphics simulation.		

5.	Kinematic modelling and simulation of parallel robots and minibuses. Creating computing programs. Establishing algorithms that are effective in terms of computing time. Numerical verification of computational algorithms. Motion graphics simulation for different laws of speeds and accelerations.		
6.	Workspace modelling techniques for parallel robots. Generate and simulate the workspace. Identifying, modelling and simulating singularities in the workspace.		
7.	Dynamic modelling of parallel robots. Creating computing programs. Establishing algorithms that are effective in terms of computing time. Graphics simulation.		
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Bibliography

In UTC-N library

Textbooks and courses, in publishing houses

Pisla, Doina, Modelarea cinematică si dinamică a roboţilor paraleli, Editura Dacia, 2005.

Gherman, B., Pisla, D., Vaida, C., Programare in limbajul C cu aplicatii in inginerie, Vol 2, Editura Mediamira, Seria Utilizarea si Programarea Calculatoarelor (Coordonator: Pisla D.), ISBN 978-973-713-305-2, 308 pagini, 2013.

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2. Coiffet, Ph., La Robotique: Principes at Applications, Hermes, Paris, 1986.
3. Ceccarelli, M., Fundamental of Mechanics of Robotic Manipulation, Kluwer, 2004.
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11. Pîslă, Doina, Modelarea cinematică şi dinamică a roboţilor paraleli, Editura DACIA, 2005.
12. Pisla D., Bleuler, H., Rodic, A., Vaida, C., Pisla, A., New Trends in Medical and Service robots. Theory and Intergated Applications, Springer, Mechanisms and Machine Science, Vol 16, 2014, 238 pg.

13. Tsai, L.-W., Robot Analysis, The Mechanics of Serial and Parallel Manipulators, John Wiley &Sons, Inc., 1999.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Bachelor students will be prepared for a successful career in industry or for a master student position. The achieved competences regarding modelling of robots with parallel structures will be necessary for the employees working within robotics companies or mechanical and industrial engineering.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Final exam will consist of problem solving testing skills and theory (4 questions)	Written exam 1.5-2.2 hours	60 %
Applications	Making a synthesis material. Developing robot modelling and simulation applications in Matlab specialized software	Practical exam 2 hours	40%
10.4 Minimum standard of performance			
Resolved application and complete answer of two questions			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof.dr.ing.Doina Liana Pisla	
	Teachers in charge of application	Prof.dr.ing.Doina Liana Pisla	

Date of approval in the department ……..	Head of department Prof.dr.ing.
________________________	
Date of approval in the faculty …………..	Dean Prof.dr.ing.
________________________	

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics / Engineer
1.7	Form of education	Full time
1.8	Subject code	68.10

2. Data about the subject

2.1	Subject name			Virtual Reality	
2.2	Course responsible/lecturer			*Conf.dr.ing. Radu COMES – radu.comes@muri.utcluj.ro*	
2.3	Teachers in charge of seminars			*Conf.dr.ing. Radu COMES – radu.comes@muri.utcluj.ro*	
2.4 Year of study	4	2.5 Semester	2	2.6 Assessment	C
2.7 Subject category	Formative category				DS
	Optionality				DO

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	2	3.3 Seminar	1	3.3 Laborator		3.3 Proiect	
3.4 Total hours in the curriculum	42	of which	3.5 Course	28	3.6 Seminar	14	3.6 Laborator		3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	35
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	15
(d) Tutoring	10
(e) Exams and tests	5
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	83
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	

	seminarului / laboratorului / proiectului	

6. **Specific competences**

Professional competences	C4. The design of partial assemblies in the field of robotics through medium-level 2D and 3D assisted design, dimensioning and verification of components, choice and verification of actuation systems and integration of the necessary sensors and transducers. C4.5. The development of technical execution projects and virtual prototypes for robotic partial assemblies including actuation systems and specific driving systems.
Cross competences	CT3. Identifying the need for continuous training and the effective use of information sources and communication resources and assisted professional training (Internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in another language of international circulation.

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Development of virtual reality applications and their integration on different operating systems and equipment.
7.2	Specific objectives	Students' acquisition of the following aspects: - general aspects related to the development of virtual reality environments - the basic principles regarding the integration of sensors and equipment specific to virtual reality - making the interaction in the virtual environment between the user and 3D models

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. The Evolution of Virtual Reality. The main features and areas of applicability of virtual reality	2	Presentations, discussions, exercises, case studies. Online teaching scenario on Microsoft Teams , according to Senate decision 1226/10.09.2020	
2. Introducing the 3ds Max software application interface and modeling an introductory scene	2		
3. Definingg animations and interactions in 3ds Max	2		
4. Workflow regarding the defition of interactions and synchronizing animations in 3ds Max	2		
5. Workflow for texturing and transfering 3D models to virtual reality applications as well as to interactive 3D platforms (Sketchfab)	2		
6. Presentation of various aspects related to the lighting of the virtual environment.	2		
7. Configuring virtual reality systems (HTC Vive, Valve Index and Oculus Quest2)	2		

8. Creating virtual reality environments using Unity	2		
9. Creating virtual reality environments using Unreal Engine	2		
10. Input-output devices: gyro mouse, keyboard, VR gloves, glasses, LeapMotion sensors, Kinect)	2		
11. Aspects regarding the optimization of virtual reality applications.	2		
12. Compiling and porting virtual reality applications to different operating systems (Windows, Android and iOS).	2		
13. Trends in the use of virtual reality within the field of study	2		
14. Discussions on directions for the development of the field of virtual reality. Overview of Augmented Reality and Mixed Reality.	2		

Bibliography

1. Kelly L. Murdock, Autodesk 3ds Max 2021 Complete Reference Guide, Editura SDC Publications, 2020 ISBN: 9781630573348
2. Dorin Mircea Popovici, Mihai Polceanu, Grafică pe calculator, , Editura Matrix Rom, 2014, ISBN: 9786062500597
3. Rui Wang, Augmented reality with Kinect, Editura Packt Publishing, 2013, ISBN: 9781849694384
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6. Alan B. Craig, Understanding Augmented Reality: Concepts and Applications, Editura Morgan Kaufmann, 2013, ISBN: 9780240824086
7. Alex Okita, Learning C# Programming with Unity 3D Second Edition, Editura CRC Press, 2020, ISBN 9781138336810

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
1. Case studies to understand the application interface of 3ds Max, Unity and Unreal Engine	2	Case studies and individual exercises carried out under the guidance of the teaching staff Online teaching scenario on Microsoft Teams, according to Senate decision 1226/10.09.2020	
2. Case studies regarding the basics of modeling in 3ds Max (polygonal, NURBS and freeform modeling) and their texturing	2		
3. Case studies regarding the creation of 3D models animation and their transfer within virtual reality applications.	2		
4. Case studies for creating interactions in virtual reality environments (SteamVR)	2		
5. HTC Vive, Valve Index and Oculus Quest 2 virtual reality system setup case studies.	2		
6. Case studies on the integration of Kinect and Leap Motion sensors in virtual reality applications.	2		

7. Development of a virtual reality application and its integration on Valve Index (Microsoft Windows Operating System) and on Oculus Quest 2 (Android Operating System)	2		

Bibliography
1. Kelly L. Murdock, Autodesk 3ds Max 2021 Complete Reference Guide, Editura SDC Publications, 2020, ISBN: 9781630573348
2. Jeff W Murray, Building Virtual Reality with Unity and SteamVR Second Edition, Editura Taylor & Francis Group, 2020, ISBN: 9780367271305
3. Jonathan Linowes, Unity 2020 Virtual Reality Projects (Third Edition), Editura Packt Publishing Ltd, 2020, ISBN: 9781839214257

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline aims to develop the ability to integrate 3D modeling and animation skills to realize virtual reality applications.
3ds Max is one of the most widely used programs for modeling and animating 3D models. The program allows importing models from CAD applications such as SolidWorks and CATIA.
Unity is the most widespread software solution that enables the creation of virtual reality applications.
All the studied software application are provided free of charge to all users as long as the applications are made for educational purposes.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The assessment will check: - the ability to model and animate within the 3ds Max application. - the ability to texture 3D models as well as the realization of virtual reality environment lighting. - the ability to make virtual reality applications for different virtual reality systems	3-hour work test with 2 subjects: 1) modeling, texturing and animating 3D models 2) Development of a virtual environment using previously made models.	2/3
10.5 Seminars /Laboratory/Project	Activity during the semester. The complexity and correctness of the case studies carried out by the students during laboratory hours.	Checking the correctness of virtual reality applications made by students during laboratory hours.	1/3

10.6 Minimum standard of performance
• • E = 2/3* grade for the work test + 1/3 grade for the portfolio of laboratory hours. The condition for obtaining credits: E≥5; L≥5;

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Conf. dr. ing. Radu COMES	
	Teachers in charge of application	Conf. dr. ing. Radu COMES	

Data avizării în Consiliul Departamentului IPR	Director Departament IPR Prof.dr.ing. Calin NEAMȚU
Data aprobării în Consiliul Facultății IIRMP	Decan Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	87.20

2. Data about the subject

2.1	Subject name			Pneumatic actuation and control of robot manipulators			
2.2	Subject area			DO-DS			
2.3	Course responsible/lecturer			Professor PhD Eng. Claudiu Ratiu - claudiu.ratiu@muri.utcluj.ro			
2.4	Teachers in charge of seminars			Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro			
2.5 Year of study	4	2.6 Semester	2	2.7 Assessment	C	2.8 Subject category	DO

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 applications:	2
3.4 Total hours in the curriculum	42	3.5 of which, course:	14	3.6 applications:	28
Individual study					hours
Manual, lecture material and notes, bibliography					28
Supplementary study in the library, online and in the field					14
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					14
Tutoring					10
Exams and tests					7
Other activities					10

3.7	Total hours of individual study	83
3.8	Total hours per semester	125
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Promotion to disciplines: Robot mechanics, Sensors and sensing systems, Microcontrollers and microprocessors, Virtual manufacturing.

5. Requirements (where appropriate)

5.1	For the course	Tableroom and video projector
5.2	For the applications	Laboratory room for pneumatic and hydraulic drives.

6. Specific competences

Professional competences	• To know the existence, role and areas of using modern systems in pneumatic drives. • Understand the construction and operation of pneumatic appliances. • Know the symbolism of pneumatic devices. • To know the structure of modern pneumatic systems and to understand the operation of specific schemes represented symbolically.
Cross competences	• Knowing new modern pneumatic drives. • Calculate the basic parameters of a pneumatic system. • Identify pneumatic devices after symbolism. • To inspect the functioning of the pneumatic systems according to the devices that compose them. • Design modern drive systems using specific symbols. • Include appropriately the assimilated knowledge in the structure of the systems of action.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Understand, conceive and use new modern pneumatic systems with high yields and reduced costs.
7.2	Specific objectives	Be able to develop and innovate new pneumatic solutions with high economic and technical efficiency.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Air pressure technology. Synoptic recapitulative.	Exposure, interactive course	Video projector
2.	Pressure. Properties of compressed air. Status equations. Continuity equations. Equation of energy.		
3.	Production and distribution of compressed air. Compressors. Batteries. Filters. Dehumidifiers.		
4.	Pressure regulating valves.		
5.	Compressed air distribution networks.		
6.	Horse and flow control equipment. Distributors		
7.	Linear pneumatic actuators. Selection and dimensioning of linear actuators in applications.		
8.	Swing and rotary pneumatic actuators. Choice and sizing.		
9.	Pneumatic pretensioning devices. Characteristics. classifications		
10.	Prehensive devices using the vacuum technique.		
11.	Unconventional modern prehensive devices (pneumatic		

	muscles).		
12.	Synoptic theory of automatic regulation. Servo-pneumatic notions.		
13.	Pneumatic proportional valves. Pneumatic linear actuators.		
14.	Industrial pneumatic systems specific to industrial robots.		

Bibliography

1. M. Manescu – Probleme rezolvate si propuse.
2. C. Ratiu, I. Chis – Actionari hidraulice si penumatice, note de curs
3. Blaine W. Andersen - The analysis and design of pneumatic systems
4. Ashraf Saleem, Junsheg Pu, Chi-Biu Wong - Servo-pneumatic systems : component-based modelling, simulation, and control

8.2. Applications/Seminars		Teaching methods	Notes
1.	Dimensioning of a prehensive device (mechanical hand).	Interactive discussions, apparatus analysis, case studies	Hydraulic and pneumatic laboratory
2.	Dimensioning of a prehensive device using the vacuum technique (suction cupping devices).		
3.	Development of a cycling for a 3-axis linear pneumatic manipulator.		
4.	Development of a cycling for a swing axle pneumatic manipulator.		
5.	Accurate indexing of angular displacements for an oscillating motor. Case Study.		
6.	Applications with servo-pneumatic axes. Operation.		
7.	Circuits for controlling pneumatic motors.		

Bibliography

M. Manescu – Probleme rezolvate si propuse.
C. Ratiu, I. Chis – Actionari hidraulice si penumatice, indrumator de laborator
Blaine W. Andersen - The analysis and design of pneumatic systems
Ashraf Saleem, Junsheg Pu, Chi-Biu Wong - Servo-pneumatic systems : component-based modelling, simulation, and control

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The skills gained in the course of Pneumatic actuation and control of robot manipulators will be required by the students involved in the automation and robotization of certain processes in the industry in order to increase the fence of the technical and economic efficiency of these processes.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Exam written with questions from the lessons learned.	Written test	50%
Applications	Designing a pneumatically driven application for handling assembly components.	Written test	50%

10.4 Minimum standard of performance
Calculation mode final grade NF = 0.5 * NT + 0.5 * NA Nf - final note; NT - Theory; NA - Laboratory application note. It is necessary to get a minimum grade of 5 for the NT and NA examination to pass the exam.

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Professor PhD Eng. Claudiu Ratiu	
	Teachers in charge of application	Lecturer PhD Eng. Ionut Chis	

Date of approval in the department .... ________________________	Head of department Prof.dr.ing.
Date of approval in the faculty .... ________________________	Dean Prof.dr.ing.

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Industrial Engineering, Robotics and Production Management
1.3 Department	Engineering Design and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics / Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	69.00

2. Discipline data

2.1 Name of subject	Diploma project development
2.2 Content area	Robotics
2.3 Course leader	
2.4 Holder of seminar/lab/project activities	*Prof. dr. eng. dr. ec. Stelian Brad- stelian.brad@muri.utcluj.ro*

2.5 Year of study	4	2.6 Semester	2	2.7 Type of evaluation	V	2.8 Discipline regime	DS/DI

3. Total estimated time

3.1 Number of hours per week	4	of which: 3.2 course	0	3.3 draft	4
3.4 Total curriculum hours	56	of which: 3.5 course	0	3.6 draft	56

Distribution of time fund	hours
Study according to the textbook, course material, bibliography and notes	10
Further documentation in the library, on specialist electronic platforms and in the field	10
Preparation of seminars/labs, homework, papers, portfolios and essays	10
Tutorial	10
Reviews	4
Other activities..................................	-

3.7 Total individual study hours	44
3.8 Total hours per semester	100
3.9 Number of credits	4

4. Prerequisites (where applicable)

4.1 of curriculum	Not the case
4.2 competences	Not the case

5. Conditions (where applicable)

5.1. of the course	N/A
5.2. seminar / laboratory / project	Attendance at the laboratory is mandatory

6. Specific competences acquired

Professional skills	C4.1 Appropriate use in professional communication of knowledge, principles of methods and industrial design patterns in well-defined situations and the use of specific aesthetic language industrial. C4.2 Use basic knowledge of industrial design to harmonise functional - constructional, aesthetic, ergonomic and ecological of mechanical components, in retail and industrial products as a whole. C4.3. Apply basic principles and methods of industrial design to optimise form and solve problems of industrial aesthetics in the design of industrial products, with qualified assistance. C4.4 Use criteria and evaluation methods in the field of industrial design in order to harmonise functional, technological, industrial aesthetics, ergonomics and ecological criteria requirements in the design of industrial products. C4.5 Develop specific professional, industrial design projects based on selection, the combination and use of domain-specific principles, methods, techniques and models and their association with appropriate digital technologies and software tools.
Cross-cutting skills	CT I. Application of the values and ethics of the engineering profession, and responsible execution of tasks professional in conditions of restricted autonomy and qualified assistance. Promoting reasoning and divergent logic, practical applicability, evaluation and self-assessment in making decisions. Responsible execution of professional tasks. CT 2. Carrying out activities and exercising roles specific to teamwork on different hierarchical levels; Promoting initiative, dialogue, cooperation, positive attitude and respect for others, diversity and multiculturalism and continuous improvement of own work. Communication and teamwork. TC 3. Objective self-assessment of the need for continuing vocational training with a view to market integration work and adapting to the dynamics of its requirements and for personal and professional development. Effective use of language skills and information technology knowledge and communication. Aware of the need for continuous training.

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Acquiring scientific research skills, improving discipline competences in areas close to the dissertation, acquiring the ability to document and synthesize information;
7.2 Specific objectives	Acquiring the ability to work both in a team and individually; Acquiring the ability to solve different problems arising in the work research and communicate the results; Acquiring new knowledge and the ability to compare it with those already in existence as well as establishing relationships between them; Development of scientific materials based on experimental research or results from mathematical modelling with critical evaluation of the results obtained; Acquiring skills in the use of calculation methods and programs advanced, automated, complicated problem solving, unique to industrial engineering.

8. Content

8.1 Course	Teaching methods	Comments

8.2 Project	Teaching methods	Comments
Making an experimental program or mathematical model dedicated to the evaluation of the development of a phenomenon under imposed conditions;	Exposure, applications	Calculator, software, Excel
Processing and interpretation of the data obtained from the surveys experimental;		
Use of computer programs designed to simulate operation of a product; simulation of various operating scenarios having as result in obtaining the desired parameters;		

Bibliography
AND87 Andreasen, M.M.& L. Hein. *Integrated Product Development.* Berlin Springer, 1987
BLE07 Blebea, I., Dobocan, C. *Product design. From theory to practice.* UT Press, Cluj-Napoca, 2007.
BAX95 Baxter, M. *Product Design, A practical Guide to systematic methods of new product development.* Chapman & Hall, 1995.
BLE 2003 Blebea, I. *Fundamentals of Product Design - Course Notes.* University Technical University of Cluj-Napoca, 2003.
BLE 2004 Blebea, I. *Fundamentals of Product Design - Multimedia Course.* University Technical University of Cluj-Napoca, 2004.
BLE 2004 Blebea, I. *Fundamentals of Product Design - Laboratory Work.* University Technical University of Cluj-Napoca, 2004.
LEW89 Lewis, W.& A. Samuel. *Fundamentals of Engineering Design.* New York: Prentice Hall, 1989.
KAR 2000 Karl, T. U., Steven D. E. , *Product Design and Development,* Second Edition. Irwin McGraw - Hill, 2000.
OTI2001 Otto, K., Wood, K. *Product Design Tehniques in Reverse Engineering and New Product Developmen.* Prentice Hall, Inc. 2001
PAH 2001 Pahl, G. Beitz, W. *Engineering Design,* Spriger Verlag, 2001.
WRI98 Wright, I. C. *Design Methods in Engineering and Product Design.* The McGraw - Hill Companies, 1998.
WUC2000 Wucius, W. *Principles of Form and Design.* John Wiley Sons Inc. 2000.

9. Correlation of subject content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the programme.

The skills acquired will ensure that employees are able to successfully handle professional tasks in the field of industrial engineering

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight of final mark
10.4 Course	Solving two problems and answering 5 questions from the theory	Written test - assessment time 1.5 - 2 hours	75%
10.5 Seminar/Laboratory	Solving applications with a computer	Practical assessment	25%

10.6 Minimum performance standard
One problem solved and 3 questions answered correctly.

Date of completion:	**Headlines**	**Title Forename NAME**	**Signature**
		Prof.dr.eng.dr.ec. Brad Stelian	

Date of opinion in the IPR Department Council	Department Director Prof. dr. eng. Călin NEAMȚU
Date of approval in the IIRMP Faculty Council	Dean Prof.dr.eng. Corina BÎRLEANU

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics / Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	70.00

2. Discipline data

2.1 Name of subject	Practice for the diploma project				
2.2 Practice leader	*Title, first name, email address.*				
2.3 Holder of seminar/lab/project activities					
2.4 Year of study	4	2.5 Semester	2	2.6 Type of evaluation	V
2.7 Discipline regime	Formative category				DS
	Optional				DI

3. Total estimated time

3.1 Number of hours per week	5	of which: 3.2 course		3.3 seminar / laboratory	5
3.4 Total curriculum hours	70	of which: 3.5 course		3.6 seminar / laboratory	70

Distribution of time fund	hours
Study according to the textbook, course material, bibliography and notes	-
Further documentation in the library, on specialist electronic platforms and in the field	29
Preparation of seminars/labs, homework, papers, portfolios and essays	-
Tutorial	-
Reviews	1
Other activities	-

3.7 Total individual study hours	30
3.8 Total hours per semester	100
3.9 Number of credits	4

4. Prerequisites (where applicable)

4.1 of curriculum	General knowledge of industrial engineering specific to some subjects of the curriculum of the undergraduate programme
4.2 competences	Technical, managerial and digital technology skills. Achievement of competences and skills at undergraduate level (fully assisted subjects).

5. Conditions (where applicable)

5.1. of the course	

5.2. seminar / laboratory / project	Existence of properly equipped laboratories/research centres.

6. Specific competences acquired

Professional skills	CP6.1 Describe the specific technical terminology and basic conceptual elements of systems (mechanical, pneumatic, hydraulic, electrical, electronic, optical, computer, etc.) used in mechatronics and robotics for the realisation of local automation systems. CP6.2 Explain and interpret and use the operating principles of subsystems (mechanical, pneumatic, hydraulic, electrical, optical, etc.) in the design and implementation of block and block diagrams for local automation systems used in mechatronics and robotics CP6.3. Elaboration of the constructive-functional model and design of partial assemblies (mechanical, pneumatic-hydraulic, electrical, optical, etc.) integrated in mechatronic and robotic subsystems for local automation CP6.4 Use performance evaluation methods for mechatronic and robotic subsystems to assess their operational efficiency CP6.5 Develop technical execution projects for basic partial assemblies (mechanical, pneumatic, hydraulic, electrical, etc.) used in mechatronics and robotics for local automation
Cross-cutting skills	CT1. Completion of professional tasks with precise identification of the objectives to be achieved, the resources available, the conditions for their completion, the work stages, the working time and the related deadlines.

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Writing the bachelor thesis
7.2 Specific objectives	Writing a research report Bibliographic search in international databases Demonstration of the ability to identify a niche area of technical and economic utility in the field of specialisation Demonstrate the ability to search, analyse and systematise information from various sources and bibliographic references Demonstrating the ability to communicate a problem in writing Demonstrate the ability to critically analyse the current results and the results obtained from the project theme and to present them in a concise manner for quick and easy understanding by any reader Demonstrate mastery/knowledge of a minimum required amount of skills in the field of specialisation Demonstration of a minimum required volume of skills in the area of specialisation Demonstrate the ability to communicate an issue orally Demonstrating creativity/innovation Demonstration of the ability to go beyond a minimum required volume of sub-fields in the field of specialisation Editing software Internet browsing tools Specific software for analysis, testing, evaluation Specific equipment for experimental research within the framework of the bachelor thesis

8. Content

8.1 Course	Teaching methods	Comments
Design principles		

8.2. Applications (papers): seminar / laboratory / project	Teaching methods	Comments
Introduction, general aspects in the context of the bachelor thesis Current status in the field of undergraduate work The issue under consideration Specific objectives of the bachelor thesis Contributions Conclusions		
Bibliography To be determined by each project leader individually Appendices [e.g. listings of source files of programs, graphs, larger tables with experimental results, more laborious calculations, etc.]. Boards		

9. Correlation of subject content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field of the programme

- The content of the subject is integrated in the study programs associated with the Mechatronics and Robotics field of UTCN, being correlated with other study programs that apply the Bologna system.
- In the current context of industrial development in manufacturing sectors, potential employers are looking for engineering graduates who apply methods and techniques/principles of product design, manufacturing and maintenance.
- Students are provided with competences and skills through a scientific and technical training appropriate to the bachelor level, which allows for rapid integration into the labour market, but also the possibility of continuing studies through master or even doctoral programs.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight of final mark
10.4 Course			
10.5 Seminar/Laboratory	Summary material (MS note)	N=MS	100%
10.6 Minimum performance standard			
• minimum grade 5			

Date of completion:	Headlines	Title Forename NAME	Signature

Date of the opinion in the Department Council	Department Director Prof. dr. ing. Călin NEAMȚU
Date of approval in the IIRMP Faculty Council	Dean Prof.dr.ing. Corina BÎRLEANU

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics / Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	71.00

2. Discipline data

2.1 Name of subject	Diploma project support				
2.2 Practice leader	*Title, first name, email address.*				
2.3 Holder of seminar/lab/project activities					
2.4 Year of study	4	2.5 Semester	2	2.6 Type of evaluation	E
2.7 Discipline regime	Formative category				DS
	Optional				DI

3. Total estimated time

3.1 Number of hours per week		of which: 3.2 course		3.3 seminar / laboratory	
3.4 Total curriculum hours		of which: 3.5 course		3.6 seminar / laboratory	
Distribution of time fund					hours
Study according to the textbook, course material, bibliography and notes					-
Further documentation in the library, on specialist electronic platforms and in the field					-
Preparation of seminars/labs, homework, papers, portfolios and essays					-
Tutorial					-
Reviews					-
Other activities					-

3.7 Total individual study hours	-
3.8 Total hours per semester	-
3.9 Number of credits	10

4. Prerequisites (where applicable)

4.1 of curriculum	General knowledge of industrial engineering specific to some subjects of the curriculum of the undergraduate programme
4.2 competences	Technical, managerial and digital technology skills. Achievement of competences and skills at undergraduate level (fully assisted subjects).

5. Conditions (where applicable)

5.1. of the course	

5.2. seminar / laboratory / project	Existence of properly equipped laboratories/research centres.

6. Specific competences acquired

Professional skills	CP6.1 Perform process modelling, simulation and optimisation applications, advanced manufacturing technologies and finite element analysis of product and material behaviour. CP6.2 Integrated use of software applications for computer-aided design and manufacturing. CP6.3 Conceptual and detailed product design for manufacturing technologies. CP6.4 Management of new or improved manufacturing systems, including their logistics.
Cross-cutting skills	CT1. Responsibly apply the principles, rules and values of professional ethics in the performance of professional tasks and identify the objectives to be achieved, available resources, work stages, completion times, deadlines and associated risks.

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Training future specialists in the field of Industrial Engineering by: • to build on and complement the knowledge/skills acquired in college. • stimulating creativity and finding appropriate technical solutions. • developing students' teamwork skills. • training future engineers and matching their training with the requirements of the labour market.
7.2 Specific objectives	• Knowledge and especially understanding of the principles of organising industrial activities, be it new product design/development, testing/validation and execution. • Use and application of criteria, assessment methods, concepts and programmes, as well as practical skills training in the subject area. • Appropriate use of constructive and technological design principles (design of manufacturing technology, manufacturing of a high complexity reference mark, technological manufacturing route, operation/phase drawings, machining schemes).

8. Content

8.1 Course	Teaching methods	Comments
Design principles		
8.2. Applications (papers): seminar / laboratory / project	Teaching methods	Comments
Part 1. General aspects in the context of the chosen topic (maximum 25% of the volume of the diploma project); Introduction. The introduction will contain the motivation for choosing the topic, the degree of novelty of the topic, the problems to be analysed and solved in the project, etc. (max.	• Maximum presentation time: 15-20 minutes, or as judged by the Diploma Evaluation	

4 pages). The introduction is not numbered as a chapter. Chapter 1. Objectives of the diploma project (general objective and specific objectives - max. 2 pages). Chapter 2. Current status of achievements and developments in the field of the chosen topic. A brief history of the level reached in the field of the theme at national and international level, current solutions and research directions will be presented. In order to be able to make a complete presentation of the topic, a study of the literature on the subject must be carried out. **Part 2.** Personal contributions made in order to solve the topic; personal contributions are also found in aspects such as: complexity of solutions, engineering calculations, economic-managerial, to which various other elements are added, depending on the specific specialization, the topic addressed, etc. Personal contributions will be presented in a maximum of 6 chapters numbered ascending following those in the previous section, each having in the final part, a sub-chapter of conclusions, summarizing the information and/or results presented in that chapter.	Committee. • A systematic, clear and concise presentation highlighting the graduate's original contributions and relevant aspects of the degree project is recommended. • Presenting the current status should not exceed 10% of the time. • The presentation can be made in Power Point, but other applications (Prezi, videos, simulations, etc.) can also be considered;	
Bibliography It will contain a list of all sources of information used by the graduate to write the diploma project. A minimum of 15 bibliographical references from books and journals, brochures, catalogues, internet, etc. is recommended, and approximately 50% of the bibliographical references should be from the last 10 years.		

9. Correlation of subject content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the programme.

- The content of the subject is integrated in the curricula associated with the Industrial Engineering field at UTCN, being correlated with other curricula applying the Bologna system.
- In the current context of industrial development in manufacturing sectors, potential employers are looking for engineering graduates who apply methods and techniques/principles of product design, manufacturing and maintenance.
- Students are provided with competences and skills through a scientific and technical training appropriate to the bachelor level, which allows them to integrate quickly into the labour market, but also the possibility of continuing their studies through master or even doctoral programmes.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Course			
10.5 Seminar/Laboratory	- Research/design activities carried out during the semester. - Evaluation of the student's diploma project. - Assessment of the student's	Members of the committee ask the graduate questions on the subject of the	50% - Fundamental knowledge 50% - Diploma

	knowledge of the content of the diploma project and how they answer questions about their work.	diploma project	project presentation
10.6 Minimum performance standard			
• Carrying out the documentation for the diploma project, with the correct use of bibliographical sources, regulations, standards and specific methods, under conditions of autonomy and qualified assistance. • Identification of training need, with satisfactory analysis of own training activity and level of professional development, and appropriate use of communication and training resources.			

Date of completion:	Headlines	Title Forename NAME	Signature

Date of the opinion in the Department Council	Department Director Prof. dr. ing. Călin NEAMȚU
Date of approval in the IIRMP Faculty Council	Dean Prof.dr.ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3	Department	Mechanical Systems Engineering
1.4	Field of study	Robotics and Mechatronics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/Engineer
1.7	Form of education	Full time
1.8	Subject code	4.00

2. Data about the subject

2.1	Subject name			Computer Programming and Programming Languages 1			
2.2	Subject area			Computer Programming (DAP, DCA)			
2.3	Course responsible/lecturer			Prof. dr. ing. ANTAL Tiberiu Alexandru – antaljr@bavaria.utcluj.ro			
2.4	Teachers in charge of seminars			Prof. dr. ing. ANTAL Tiberiu Alexandru			
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DF/DI

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	30
Supplementary study in the library, online and in the field	20
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	4
Tutoring	0
Exams and tests	6
Other activities	

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Attendance at the laboratory is mandatory.

6. Specific competences

Professional competences	After completing the discipline students will be able to: • understand the principle of operation of PC computers and their physical structure; • operate under DOS, Windows and Linux operating systems, to implement security concepts related to their operation; • operate with text editors, spreadsheets and vector drawing; • connect computers to the network and the Internet; • make simple web pages; • understand the fundamental differences and similarities between compilers and interpreters; • to understand and describe fundamental numerical algorithms specific to applied engineering.
Cross competences	Applying the values and ethics of the engineering profession and responsible execution of complex professional tasks in conditions of professional autonomy and independence. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-evaluation in decision making. Planning your own work priorities, drawing up your own action plan.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Development of communication and interaction between the computing machine and man, understanding security in computing systems and description of fundamental numerical algorithms.
7.2	Specific objectives	1. Understanding the representation of numbers in the computer and its operation. 2. Operating under DOS, Windows and Linux. 3. The procedure for connecting a computer to the network. 4. Securing computer systems. 5. Making simple web pages. 6. Operation in Word, Excel and Draw in order to create technical documents. 7. Description and creation of fundamental numerical algorithms in pseudocode, logical or object-oriented schemes 8. Elaboration of professional and / or research projects for the realization of applications or human-computer interface, computer - computer.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
1. Brief history of the development of computer technology.	Use of TIC/blended	Video projector, board and/or
2. Hardware architecture of personal computers.		

3. Operating systems: concepts and architectures.	learning resources, discussions, Internet.	online meetings on MS Teams (Zoom)
4. Windows: architecture and implementation.		
5. Linux: architecture and implementation.		
7. WWW.		
8. Security concepts in computer systems.		
9. Data models. Imperative and declarative languages. Usual programming pradigms. Compilers and interpreters.		
10. Fundamental algorithms 1: Symbols of logic diagrams. Pseudo. Data. Data operations. Pseudocode instructions.		
11. Fundamental algorithms 2: Calculating the value of an expression. Calculating the values of a function in a range. The sum and product of the terms of an array. Maximum (or minimum) of an array. Swapping of two variables. In situ sorting of arrays.		
12. Fundamental Algorithms 3: Calculating the value of a function using a series. Solve an equation using the bisection and Newton methods.		
13. Fundamental Algorithms 4: Cycles. Matrix operations - sum, product.		
14. Concepts on microcontroller architecture and programming.		

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1. Andrew Tanenbaum , Organizarea structurată a calculatoatelor, Agora, 1999, ISBN: 973-97706-4-9.
2. David Solomon, Inside Winows NT, Microsoft Press, 1998, ISBN: 1-57231-677-2.
3. Andrew Tanenbaum, Reţele de calculatoare, Agora, 1998, ISBN: 973-977706-3-0.
4. Ştefan Tanasă, Cristian Olaru, Ştefan Andrei, Java de la 0 la expert, Polirom, 2003, ISBN: 973-681-201-4.
5. Leon Livovschi, Horia Georgescu, Sinteza şi analiza algoritmilor,Ed ştiinţifică şi enciclopedică, 1986
6. Peter Norton, William Stanek, Ghid de programare în Java, Teora, 1997, ISBN: 973-601-719-2.
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8. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-7.
9. Knuth, D.E. - Arta programării calculatoarelor. Volumul I – Algoritmi fundamentali, Ed. Teora, 2000
10. Knuth, D.E. – Arta programării calculatoarelor. Volumul II – Algoritmi seminumerici, Ed. Teora, 2000.
11. Knuth, D.E. – Arta programării calculatoarelor. Volumul III – Sortare şi căutare, Ed. Teora, 2002.

8.2. Applications/Seminars	Teaching methods	Notes
1. PC components and features. Standards for the representation in calculation systems of integers with and without a sign, of fixed and floating point numbers.	Use of TIC/blended learning resources, discussions, Internet.	Video projector, board and/or online meetings on Skype (or MS Teams)
2. Arithmetic operations in bases 2, 10 and 16. Conversions. ASCII.		
3. Windows. DOS commands.		
4. Operating under Linux (Ubuntu).		
5. Creating a web page using HTML.		
6. Word 2003: General. Equations.		

7. Word 2003: Tables. Drawings.		
8. Excel. Tables. Function values. Graphics. Solutions of equations.		
9. Test no. 1. Editing a technical text containing equations, tables and drawings. Calculating the value of a given function, its graphical representation and finding the solutions of an equation in Excel.		
10. Fundamental algorithms 1. Calculating the values of a function in an interval. Solving an equation with the bisection/tangent method.		
11. Fundamental algorithms 2: Calculation of some functions using series of powers. Calculation of defined integrals.		
12. Fundamental algorithms 3: Calculation of the values of the derivative of a given function. Minimum, maximum of a function.		
13. Fundamental algorithms 4: Determining the values of some means (arithmetic, geometric), under imposed conditions, in the case of matrices.		
14. Test no. 2. on fundamental algorithms in pseudocode and flowcharts.		

Bibliography

1. Andrew Tanenbaum , Organizarea structurată a calculatoatelor, Agora, 1999, ISBN: 973-97706-4-9.
2. David Solomon, Inside Winows NT, Microsoft Press, 1998, ISBN: 1-57231-677-2.
3. Andrew Tanenbaum, Reţele de calculatoare, Agora, 1998, ISBN: 973-977706-3-0.
4. Leon Livovschi, Horia Georgescu, Sinteza şi analiza algoritmilor,Ed ştiinţifică şi enciclopedică, 1986
5. Deitel H.M., Deitel P. J., Java - How to programm, Fith Edition, Prentice Hall, 2003, ISBN: 0-13-120236-
7. Knuth, D.E. - Arta programării calculatoarelor. Volumul I – Algoritmi fundamentali, Ed. Teora, 2000
7. Knuth, D.E. – Arta programării calculatoarelor. Volumul II – Algoritmi seminumerici, Ed. Teora, 2000.
8. Knuth, D.E. – Arta programării calculatoarelor. Volumul III – Sortare şi căutare, Ed. Teora, 2002.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Students can choose to apply their knowledge acquired in industry, research or to expand, through master's school and the skills acquired in undergraduate studies.

Regardless of their option, the acquired competencies will be necessary in case they will carry out their activity within the specialized companies on a certain field (robots, economics, machine building) or within the software companies oriented on the engineering programming field.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Verification of knowledge by solving problems presented in the course.	Written test - evaluation time 2 hours	60%
10.5 Applications	Development of applications in a required	Practical test - duration 2 + 2 hours	40%

	time.		
10.6 Minimum standard of performance			
Grade >= 5 at course and grade >= 5 at laboratory.			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof.dr.ing. ANTAL Tiberiu Alexandru	
	Teachers in charge of application	Prof.dr.ing. ANTAL Tiberiu Alexandru	
		Conf.dr.ing. Felicia CRISTEA	

Date of approval in the department	Head of department Prof.dr.ing. ANTAL Tiberiu Alexandru.
Date of approval in the faculty	Dean Prof.dr.ing. Corina BIRLEANU

FIŞA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	Construcții de Mașini
1.3 Departamentul	Ingineria Proiectării și Robotică
1.4 Domeniul de studii	Mecatronică și Robotică
1.5 Ciclul de studii	II, Licență
1.6 Programul de studii / Calificarea	Robotică /inginer
1.7 Forma de învăţământ	IF – învățământ cu frecvență
1.8 Codul disciplinei	103.00

2. Date despre disciplină

2.1 Denumirea disciplinei	Managementul inovarii						
2.2 Aria de conţinut	DS, DFac						
2.3 Responsabil de curs	Prof.dr.ing.dr.ec. Stelian Brad stelian.brad@muri.utcluj.ro						
2.4 Titularul activităţilor de seminar / laborator / proiect	Prof.dr.ing.dr.ec. Stelian Brad stelian.brad@muri.utcluj.ro						
2.5 Anul de studiu	2	2.6 Semestrul	1	2.7 Tipul de evaluare	C	2.8 Regimul disciplinei	DS DFac

3. Timpul total estimat

3.1 Număr de ore pe săptămână	3	din care: 3.2 curs	1	3.3 seminar / laborator	2
3.4 Total ore din planul de învăţământ	42	din care: 3.5 curs	14	3.6 seminar / laborator	28

Distribuţia fondului de timp	ore
Studiul după manual, suport de curs, bibliografie şi notiţe	2
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate şi pe teren	
Pregătire seminarii / laboratoare, teme, referate, portofolii şi eseuri	4
Tutoriat	1
Examinări	1
Alte activităţi.................................	

3.7 Total ore studiu individual	8
3.8 Total ore pe semestru	50
3.9 Numărul de credite	2

4. Precondiţii (acolo unde este cazul)

4.1 de curriculum	N/A
4.2 de competenţe	N/A

5. Condiţii (acolo unde este cazul)

5.1. de desfăşurare a cursului	Sală de curs cu minimum 30 locuri, multimedia proiector, tablet PC, MS Power Point, Media Player, acces internet
5.2. de desfăşurare a seminarului / laboratorului / proiectului	Sală de laborator cu minimum 30 locuri, multimedia proiector, tablet PC, MS Power Point, Media Player, acces internet

6. Competenţele specifice acumulate

Competenţe profesionale	C1.2. Explicarea conceptelor specifice proceselor tehnologice și rezolvarea etapizată a problemelor inginerești de specialitate pe baza algoritmilor de calcul matematic și a cunoștințelor fundamentale de fizică și chimie C2.2. Explicarea și interpretarea standardelor de desen tehnic si a reprezentărilor grafice convenționale inginerești in elaborarea de desene de execuție, fișe film tehnologice, manuale de produse si manuale de încercări C4.4. Utilizarea metodelor moderne de evaluare (calcul asistat, modelare, simulare , optimizare a funcționării) în proiectarea optimală a subsistemelor robotice și a interfețelor hardware și software-ului de instrumentație virtuală specific pentru achiziția, procesarea și interpretarea datelor experimentale C6.1. Descrierea tehnicilor de modelare a comportării și simulare a funcționării echipamentelor tehnologice în cadrul diferitelor aplicații industriale si simularea asistată a funcționării aplicațiilor industriale robotizate de tip celulă și sistem de fabricație flexibilă
Competenţe transversale	CT1. Îndeplinirea sarcinilor profesionale cu identificare exactă a obiectivelor de realizat, a resurselor disponibile, condițiilor de finalizare a acestora, etapelor de lucru, timpului de lucru și termenelor de realizare aferente CT2. Executarea responsabilă a unor sarcini de lucru în echipă pluridisciplinară cu asumarea de roluri pe diferite paliere ierarhice CT3. Identificarea nevoii de formare continuă și utilizarea eficientă a surselor informaționale și a resurselor de comunicare și formare profesională asistată (portaluri Internet, aplicații software de specialitate, baze de date, cursuri on-line, etc.) atât în limba română cât și într-o limbă de circulație internațională

7. Obiectivele disciplinei (reieşind din grila competenţelor specifice acumulate)

7.1 Obiectivul general al disciplinei	Dezvoltarea de competenţe şi aptitudini pentru a planifica, analiza, realiza, testa şi integra planuri de inovare în cadrul firmelor
7.2 Obiectivele specifice	-Utilizarea unor instrumente structurate în managementul inovării -Cunoașterea standardelor internaționale în managementul inovării -Dezvoltarea gândirii logice şi creative, a studiului individual, a analizei critice şi autocritice

8. Conţinuturi

8.1 Curs	Metode de predare	Observaţii
Competitivitatea economică și inovarea	Multi-media proiector Tablet PC şi aplicaţii software adecvate Smartboard Prezentare utilizând MS Power Point Întrebări-răspunsuri Mini-exerciţii	
Evoluţia direcţionată a sistemelor		
Inovaţia – definiţii, concepte		
Clasificarea inovației		
Procesul de inovare		
Concepte evoluate ale inovării		
Inovația la nivel strategic		
Inovația deschisă		
Inovația organizațională		
Inovația de proces		
Inovația de produs		
Ingineria inovării		
Transferul tehnologic		

Economia inovării		
Bibliografie 1. Brad, S. Ingineria şi Managementul Inovăriii, suport de curs în format electronic (.ppt) 2. Brad, S., ş.a. Ingineria şi Managementul Inovaţiei, Ed. Economică, Bucureşti, 2006. 3. Brad, S., Complex System Design Technique. A Systematic Approach of Innovation in a Complex World, Ed. Dacia, Cluj-Napoca, 2008. 4. Trott, P., Innovation Management and New Product Development, Prentice Hall, London, 2004. 5. Brad, S. Algoritmul σ-TRIZ pentru integrarea inovaţiei în metodologia DMAIC de îmbunătăţire a proceselor, Calitatea AS, ISSN 1582-2559, 2009. 6. Brad, S., Influence factor method (FAIN): An innovative tool for approaching sensitivity analysis, Acta Technica Napocensis, Series: Applied Mathematics and Mechanics, ISSN 1221-5872, 2008. 7. Brad, S., Equating Business Value of Innovative Product Ideas, CIRP Competitive Design, Cramfield, UK, 2009. 8. *** Platforma software Inovex: manual de utilizare, www.inovex.utcluj.ro. 9. *** Standardul european pentru managementul inovării CEN/TS 16555-1:2013		

8.2 Seminar / laborator / proiect	Metode de predare	Observaţii
Auditul inovării CEN/TS 16555-1:2013	Discuții cu firme din Cluj-Napoca sau Bistrița orientate pe inovația de produs Exemple Studii de caz din mediul industrial Supervizare muncă individuală	
Planul antreprenorial		
Modelul de afaceri		
Rezolvarea inovativă a problemelor (M-TRIZ)		
Reingineria proceselor complexe (sigma-TRIZ)		
Concepţia produselor/serviciilor inovative noi (ASIT-II)		
Evaluarea valorii de piata a unui brevet de inventie		
Bibliografie 10. Brad, S. Ingineria şi Managementul Inovăriii, suport de curs în format electronic (.ppt) 11. Brad, S., ş.a. Ingineria şi Managementul Inovaţiei, Ed. Economică, Bucureşti, 2006. 12. Brad, S., Complex System Design Technique. A Systematic Approach of Innovation in a Complex World, Ed. Dacia, Cluj-Napoca, 2008. 13. Trott, P., Innovation Management and New Product Development, Prentice Hall, London, 2004. 14. Brad, S. Algoritmul σ-TRIZ pentru integrarea inovaţiei în metodologia DMAIC de îmbunătăţire a proceselor, Calitatea AS, ISSN 1582-2559, 2009. 15. Brad, S., Influence factor method (FAIN): An innovative tool for approaching sensitivity analysis, Acta Technica Napocensis, Series: Applied Mathematics and Mechanics, ISSN 1221-5872, 2008. 16. Brad, S., Equating Business Value of Innovative Product Ideas, CIRP Competitive Design, Cramfield, UK, 2009. 17. *** Platforma software Inovex: manual de utilizare, www.inovex.utcluj.ro. 18. *** Standardul european pentru managementul inovării CEN/TS 16555-1:2013		

9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor profesionale şi angajatorilor reprezentativi din domeniul aferent programului

Conținutul este armonizat cu: standardul european pentru managementul inovării CEN/TS 16555-1:2013, poziția CE și OECD privind inovarea, orientările internaționale referitoare la inovare și competitivitate economică

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	Completitudinea	Test scris privind conceptele de bază în inovare	30%

	Ingeniozitatea şi eleganţa (simplitatea) în formularea răspunsurilor		
10.5 Seminar/Laborator	Completitudinea Numărul de aplicaţii rezolvate Corectitudinea soluţiilor Gradul de dificultate al aplicaţiilor rezolvate	Media aritmetică a notelor pentru aplicaţiile realizate la laborator şi în activitatea individuală	70%
10.6 Standard minim de performanţă			
Minimum 4 capitole din proiect rezolvate integral Testul scris rezolvat min. 50%			

Data completării:	Titulari	Titlu Prenume NUME	Semnătura
	Curs	Prof.dr.ing.dr.ec. Stelian Brad	
	Aplicații	Prof.dr.ing.dr.ec. Stelian Brad	

Data avizării în Consiliul Departamentului	Director Departament Prof.dr.ing. Calin NEAMTU
Data aprobării în Consiliul Facultății	Decan Prof.dr.ing. Corina Birleanu

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	License
1.6	Program of study/Qualification	Robotics
1.7	Form of education	IF - full-time education
1.8	Subject code	103.00

2. Data about the subject

2.1	Subject name				Innovation management		
2.2	Subject area						
2.2	Course responsible/lecturer				Prof. dr. ing. Stelian Brad stelian.brad@staff.utcluj.ro		
2.3	Teachers in charge of seminars				Prof. dr. ing. Stelian Brad stelian.brad@staff.utcluj.ro		
2.4 Year of study		2	2.5 Semester	1	2.6 Assessment		C
2.7 Subject category		Formative category					DC
		Optionality					DFac

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	42	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	8
(b) Supplementary study in the library, online and in the field	0
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	0
(d) Tutoring	0
(e) Exams and tests	0
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	8
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	It's not necessary
4.2	Competence	It's not necessary

5. Requirements (where appropriate)

5.1	For the course	Lecture hall with the number of seats equal to the number of students; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments
5.2	For the applications	Room with computers equal to the number of students in the group; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments

6. Specific competences

Professional competences	• Explaining the specific concepts of technological processes and the step-by-step solution of specialized engineering problems based on mathematical calculation algorithms and fundamental knowledge of physics and chemistry • Explanation and interpretation of technical drawing standards and conventional engineering graphic representations in the development of execution drawings, technological film sheets, product manuals and test manuals • Use of modern assessment methods (computational assistance, modeling, simulation, optimization of operation) in the optimal design of robotic subsystems and hardware interfaces and virtual instrumentation software specific to the acquisition, processing and interpretation of experimental data • Description of the techniques for modeling the behavior and simulating the operation of technological equipment in various industrial applications and the assisted simulation of the operation of robotic industrial applications of cell type and flexible manufacturing system
Cross competences	• Completing professional tasks with exact identification of the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the work time and related deadlines • Responsible execution of work tasks in a multidisciplinary team with the assumption of roles at different hierarchical levels • Identifying the need for continuous training and the effective use of information sources and communication resources and assisted professional training (Internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in a language of international circulation

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Developing skills and abilities to plan, analyze, realize, test and integrate innovation plans within companies
7.2	Specific objectives	-Using structured tools in innovation management -Knowledge of international standards in innovation management -Development of logical and creative thinking, individual study, critical and self-critical analysis

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Economic competitiveness and innovation	1	Multimedia projector Tablet PC and appropriate software applications SMART Presentation using MS Power Point Questions and answers Mini-exercises	
Directed evolution of systems	1		
Innovation - definitions, concepts	1		
Classification of innovation	1		
The innovation process	1		
Evolved concepts of innovation	1		
Innovation at the strategic level	1		
Open innovation	1		
Organizational innovation	1		
Process innovation	1		
Product innovation	1		
Innovation engineering	1		
Technological transfer	1		

The economy of innovation	1		

Bibliography

- Brad, S. Ingineria şi Managementul Inovăriii, suport de curs în format electronic (.ppt)
- Brad, S., ş.a. Ingineria şi Managementul Inovaţiei, Ed. Economică, Bucureşti, 2006.
- Brad, S., Complex System Design Technique. A Systematic Approach of Innovation in a Complex World, Ed. Dacia, Cluj-Napoca, 2008.
- Trott, P., Innovation Management and New Product Development, Prentice Hall, London, 2004.
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- Brad, S., Influence factor method (FAIN): An innovative tool for approaching sensitivity analysis, Acta Technica Napocensis, Series: Applied Mathematics and Mechanics, ISSN 1221-5872, 2008.
- Brad, S., Equating Business Value of Innovative Product Ideas, CIRP Competitive Design, Cramfield, UK, 2009.
- *** Platforma software Inovex: manual de utilizare, www.inovex.utcluj.ro.
- *** Standardul european pentru managementul inovării CEN/TS 16555-1:2013
- *** Standardul internațional pentru managementul inovării ISO 56002:2020

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
The international innovation management standard ISO 56002:2020	2	Alternate theory with examples, class exercises, homework	
Applying creative thinking techniques to facilitate cooperation in innovative business development	2		
Identifying the market need	2		
Generating ideas for new products and services	2		
Assessing the innovative potential of a new company	2		
The value proposed to the client	2		
Innovation: From Creativity to Entrepreneurship	2		
The entrepreneurial plan	2		
Management of ideas	2		
Creating value through business model innovation	2		
The innovation plan of a new company	2		
The value chain - design and planning	2		
Strategic Innovation: Building and Sustaining Innovative Companies	2		
Estimating trends using internet documentation and the 9W method	2		

Bibliography

- Brad, S. Ingineria şi Managementul Inovăriii, suport de curs în format electronic (.ppt)
- Brad, S., ş.a. Ingineria şi Managementul Inovaţiei, Ed. Economică, Bucureşti, 2006.
- Brad, S., Complex System Design Technique. A Systematic Approach of Innovation in a Complex World, Ed. Dacia, Cluj-Napoca, 2008.
- Trott, P., Innovation Management and New Product Development, Prentice Hall, London, 2004.
- Brad, S. Algoritmul σ-TRIZ pentru integrarea inovaţiei în metodologia DMAIC de îmbunătăţire a proceselor, Calitatea AS, ISSN 1582-2559, 2009.
- Brad, S., Influence factor method (FAIN): An innovative tool for approaching sensitivity analysis, Acta Technica Napocensis, Series: Applied Mathematics and Mechanics, ISSN 1221-5872, 2008.
- Brad, S., Equating Business Value of Innovative Product Ideas, CIRP Competitive Design, Cramfield, UK, 2009.
- *** Platforma software Inovex: manual de utilizare, www.inovex.utcluj.ro.
- *** Standardul european pentru managementul inovării CEN/TS 16555-1:2013
- *** Standardul internațional pentru managementul inovării ISO 56002:2020

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The content is harmonized with: the international standard for innovation management ISO 56002:2020, the EC and OECD position on innovation, the international guidelines on innovation and economic competitiveness

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Completeness Ingenuity and elegance (simplicity) in formulating answers	Written test on basic concepts in innovation	30%
10.5 Seminars /Laboratory/Project	Completeness The number of applications solved The correctness of the solutions The degree of difficulty of the solved applications	Arithmetic average of the grades for the applications made in the laboratory and in the individual activity	70%
10.6 Minimum standard of performance			
• Grade 5 average of laboratory works • Note 5 examination in the colloquium			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof. dr. ing. Stelian BRAD	
		Prof. dr. ing. Stelian BRAD	

Date of approval in the department IPR ________________________	Head of department Prof. dr. ing. Călin NEAMȚU
Date of approval in the faculty IIRMP ________________________	Dean Prof. dr. ing. Corina BÎRLEANU

FIŞA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	Construcţii de Maşini
1.3 Departamentul	Ingineria Proiectării şi Robotică
1.4 Domeniul de studii	Mecatronica si Robotica
1.5 Ciclul de studii	Licență
1.6 Programul de studii / Calificarea	Robotica/inginer
1.7 Forma de învăţământ	IF – învăţământ cu frecvenţă
1.8 Codul disciplinei	104.00

2. Date despre disciplină

2.1 Denumirea disciplinei	Antreprenoriat						
2.2 Aria de conţinut	DC, DFac						
2.3 Responsabil de curs	Sl. Dr. Ing. Filip Daniel – Daniel.Filip@mis.utcluj.ro						
2.4 Titularul activităţilor de seminar / laborator / proiect	Sl. Dr. Ing. Filip Daniel – Daniel.Filip@mis.utcluj.ro						
2.5 Anul de studiu	2	2.6 Semestrul	2	2.7 Tipul de evaluare	C	2.8 Regimul disciplinei	DC FAC

3. Timpul total estimat

3.1 Număr de ore pe săptămână	3	din care: 3.2 curs	1	3.3 seminar / laborator	2
3.4 Total ore din planul de învăţământ	42	din care: 3.5 curs	14	3.6 seminar / laborator	28

Distribuţia fondului de timp	ore
Studiul după manual, suport de curs, bibliografie şi notiţe	2
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate şi pe teren	2
Pregătire seminarii / laboratoare, teme, referate, portofolii şi eseuri	2
Tutoriat	
Examinări	2
Alte activităţi..................................	

3.7 Total ore studiu individual	8
3.8 Total ore pe semestru	50
3.9 Numărul de credite	2

4. Precondiţii (acolo unde este cazul)

4.1 de curriculum	N/A
4.2 de competențe	N/A

5. Condiţii (acolo unde este cazul)

5.1. de desfășurare a cursului	N/A
5.2. de desfășurare a seminarului / laboratorului / proiectului	Prezenta obligatorie

6. Competențele specifice acumulate

Competențe profesionale	CP1. Efectuarea de calcule, demonstrații si aplicații pentru rezolvarea de sarcini specifice ingineriei si managementului, pe baza cunoștințelor din științele fundamentale și inginerești; CP2. Elaborarea și interpretarea documentației tehnice, economice și manageriale; CP3. Utilizarea aplicațiilor software și a tehnologiilor informaționale pentru rezolvarea de sarcini specifice ingineriei și managementului; CP4. Evaluarea economică, planificarea și conducerea proceselor și a sistemelor logistice și de producție;
Competențe transversale	CT1. Identificarea rolurilor și responsabilităților într-o echipă pluridisciplinară și aplicarea de tehnici de relaționare și muncă eficientă în cadrul echipei;

7. Obiectivele disciplinei (reieșind din grila competențelor specifice acumulate)

7.1 Obiectivul general al disciplinei	Să cunoască modul în care se organizează și funcționează o întreprindere (viziune globală)
7.2 Obiectivele specifice	• Înțelegerea contextului în care o întreprindere își desfășoară activitatea; • Modul de organizare si gestionare a resurselor dintr-o întreprindere; • Gestionarea eficienta a timpului disponibil; • Dezvoltarea abilităților de management.

8. Conținuturi

8.1 Curs	Metode de predare	Observații
Înțelegerea contextului în care o întreprindere își desfășoară activitatea;	Curs interactiv. Expunere	Video-proiector + tabla
Modul de organizare și gestionarea resurselor;		
Responsabilitățile fiecărui departament;		
Lucrul in echipa și gestionarea eficienta a timpului de lucru;		
Realizarea machetei produsului finit;		
Aplicații practice;		
Concluzii și clarificări finale.		

Bibliografie:

1. Daniel, F – Suport de curs (in format electronic)
2. Filip D., Lungu F., The management of small and unique production series, LAP LAMBERT Academic Publishing, ISBN-13:973-3-659-31753-8, 2013
3. Condurache, G. Managementul întreprinderii simulate Romsim, Ed. Casa de Editura Venus, Iași, 2002.
4. www.europen.info.
5. Manuale „Asis 2000”

8.2 Seminar / laborator / proiect	Metode de predare	Observații
Simularea activității întreprinderii – Luna 1	• Aplicații practice pe calculator • Printare de machete	Realizarea de machete la scară din material plastic
Simularea activității întreprinderii – Luna 2 (include rotație pe posturi)		
Simularea activității întreprinderii – Luna 3 (include rotație pe posturi)		

Simularea activității întreprinderii – Luna 4 (include rotație pe posturi)		
Simularea activității întreprinderii – Luna 5 (include rotație pe posturi)		
Simularea activității întreprinderii – Luna 6 (include rotație pe posturi)		
Simularea activității întreprinderii – Luna 7 (include rotație pe posturi)		
Bibliografie: 1. Daniel Filip – Suport de curs (in format electronic) 2. Daniel Filip – Ghid laborator (in format electronic)		

9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor profesionale şi angajatorilor reprezentativi din domeniul aferent programului

- Simularea activităților din cadrul fiecărui departament se realizează conform activităților dintr-o întreprindere REALA;
- În procesul de simulare a activităților din cadrul unei întreprinderi se respectă legislația economica în vigoare.

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	Test pentru evaluarea cunoștințelor	Proba scrisa	50%
10.5 Seminar/Laborator	Evaluare Proiect	Interviu	50%
10.6 Standard minim de performanță			
• Nota minima 5(cinci) pentru fiecare proba			

Data completării

....

Titular de curs

...Sl. dr. ing. Daniel FILIP...

Titular de seminar / laborator / proiect

.... Sl. dr. ing. Daniel FILIP........

Data avizării în Departament

....

Director Departament
Prof.dr.ing. Calin NEAMTU

....

SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Industrial Engineering, Robotics and Production Management
1.3 Department	Engineering Design and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Robotics
1.7 Form of education	Full time
1.8 Subject code	105.00

2. Data about the subject

2.1 Subject name	**Project management**				
2.2 Course responsible/lecturer	conf.dr.ing. Mircea Fulea, mircea.fulea@staff.utcluj.ro				
2.3 Teachers in charge of seminars	conf.dr.ing. Mircea Fulea, mircea.fulea@staff.utcluj.ro				
2.4 Year of study	III	2.5 Semester	1	2.6 Assessment	C
2.7 Subject category	Category				DC
	Optional				Dfac.

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 applications:	2
3.4 Total hours in the curriculum	50	3.5 of which, course:	14	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	2
Supplementary study in the library, online and in the field	2
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	2
Tutoring	1
Exams and tests	1
Other activities	0

3.7	Total hours of individual study	8
3.8	Total hours per semester	50
3.9	Number of credit points	2

4. Pre-requisites (where appropriate)

4.1 Curriculum	
4.2 Competence	

5. Requirements (where appropriate)

5.1. For the course	Slide-show presentation, course support material in electronic format, additional materials on a web site
5.2. For the applications	Attending application classes is mandatory

6. Specific competences

Professional competences	-
Cross competences	CT1. Completing the professional tasks by precisely identifying goals, available resources, constraints, work plan, time span, milestones and deadlines

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	To learn a systematic methodology for building human machine interfaces for robotised applications
7.2 Specific objectives	• understanding theoretical concepts related to technical projects and project management • getting skills for coordinating technical projects and using software to manage projects • getting skills to write a successful project proposal

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Introduction to project management	Slideshows, examples, open dialogue Support platform: MS Teams	
2. State-of-the-art of the project domain. Goal, objectives, expected results		
3. Value engineering		
4. Tools in PM		
5. Project management methodologies		
6. Project sustainability		
7. Project proposal structure		
Bibliography • Project Management Institute, A Guide to the Project Management Body of Knowledge, ISBN 978-1-935589-67-9 (sixth edition - 2017)		
8.2 Applications/Seminars	**Teaching methods**	**Notes**
1-2. Formulating goals & specific objectives	Slideshows, examples, specific software tools and hardware platforms Support platform: MS Teams	
3-4. Problem analysis & vision generation		
5-6. Identifying similar approaches		
7-8. Defining WPs, activities and deliverables (1)		
9-10. Defining WPs, activities and deliverables (2)		
11-12. Writing a project proposal (1)		
13-14. Writing a project proposal (2)		
Bibliography • Project Management Institute, A Guide to the Project Management Body of Knowledge, ISBN 978-1-		

935589-67-9 (sixth edition - 2017)

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Answers to 3 theoretical questions	Written test - 90 minutes	20%
10.5 Applications	Aggregate technical report combining all application steps, as performed in the laboratory meetings	Technical report presentation	80%
10.6 Minimum standard of performance			
Two correct answers and completion of the technical report			

Date of filling in:		Title, Name, Surname	Signature
	Lectures, applications	conf.dr.ing. Mircea Fulea	

Date of approval in the Engineering Design and Robotics department ________________________	Head of department
Date of approval in the Faculty of IIRMP ________________________	Dean

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj Napoca
1.2	Faculty	Industrial Engineering, Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	License
1.6	Program of study/Qualification	Robotics
1.7	Form of education	IF - full-time education
1.8	Subject code	106.00

2. Data about the subject

2.1	Subject name			Object Oriented Programming (Python)		
2.2	Subject area					
2.2	Course responsible/lecturer			Prof. dr. ing. Stelian Brad stelian.brad@staff.utcluj.ro		
2.3	Teachers in charge of seminars			Prof. dr. ing. Stelian Brad stelian.brad@staff.utcluj.ro		
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment		C
2.7 Subject category	Formative category					DC
	Optionality					DFac

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laborator	2	3.3 Proiect	0
3.4 Total hours in the curriculum	42	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laborator	28	3.6 Proiect	0

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	8
(b) Supplementary study in the library, online and in the field	0
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	0
(d) Tutoring	0
(e) Exams and tests	0
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	8
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	It's not necessary
4.2	Competence	It's not necessary

5. Requirements (where appropriate)

5.1	For the course	Lecture hall with the number of seats equal to the number of students; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments
5.2	For the applications	Room with computers equal to the number of students in the group; Multimedia projector; Internet access; Notebook; Power point; Blackboard or flipchart; Blackboard writing instruments

6. **Specific competences**

Professional competences	• To make computer programs in the Python programming language • To master the concepts of object-oriented programming • To create computer programs with applicability in industrial robotics, social robotics or software robotics
Cross competences	• To apply the values and ethics of the engineering profession • To responsibly perform complex professional tasks under conditions of professional autonomy and independence • To promote logical reasoning, convergent and divergent, of practical applicability, evaluation and self-evaluation in decision-making • To plan their own work priorities • To self-control the learning and effective use of language skills and knowledge of information and communication technology

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Development of skills and abilities to plan, analyze, realize, test computer programs in the Python programming language
7.2	Specific objectives	- Create on programs for robotics applications - Development of logical and creative thinking, individual study, critical and self-critical analysis

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Introduction to the Python programming language: structure, syntax, IDLE, etc.	1	Alternate theory with examples, class exercises, homework	
Conditional statements, user inputs, functions, methods, modules, lists (I), dictionaries (I), loops (I)	1		
Lists (II), dictionaries (II), loops (II), flow control, built-in functions, encryption and decryption	1		
Lists (III), dictionaries (III), lambda function, bitwise operators	1		
Strings, libraries and working with libraries, custom libraries, working with file I/O	1		
Decorators, arrays, lists (IV), dictionaries (IV), tuples, sets, working with xlsx, csv files, quality of algorithms, own data structures	1		
Regular expressions	1		
Graphical user interfaces	1		
Image processing	1		
Communication via TCP/IP, requests via URL	1		
Working with XML and JSON files	1		
Object Oriented Programming	1		
Working with databases	1		
Python API with implementation in RoboDK	1		

Bibliografy • J. Hoekstra, Python for Engineers, TU Delft, 2017 • J. Kyusalaas, Numerical Methods in Engineering with Python 3, 2013 • H. Fanghor, Introduction to Python for Computational Science and Engineering, 2015 • A. Downey, Modelling and Simulation in Python, 2017 • B. Meier, Python GUI Programming Cookbook, 2015 • A. Robbins, Rapid GUI Programming with Python and Qt, 2007 • D. Love, Tkinter GUI Programming by Example, 2018 • S. Blank, Python Programming in OpenGL, 2009 • H. Sayama, Introduction to Modeling and Analysis of Complex Systems, 2015 • C. Severance, Python for Everybody, 2016 • T. Ziade, Expert Python Programming, 2008 • M. Lutz, Learning Python, 2013 • D. Hillard, Practice of the Python Programming, 2020 D. Kopec, Classic Computer Science Problems in Python, 2019

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Installing libraries, exercises with basic instructions	2	Alternate theory with examples, class exercises, homework	
Plugin for "fun": Music with Python	2		
Working with Python versions, .exe and .py files, exercises with .txt files	2		
Plugin for "fun": Email with Python	2		
Exercises with functions, encryption-decryption exercises	2		
Supplement for "fun": multi-threading	2		
OOP basics, classes and exercises with classes	2		
Add-on for "fun": view data in the browser	2		
Exercises with color palettes, conversions	2		
Supplement for "fun": math operations with specialized libraries	2		
2D graphic plotting	2		
Plugin for "fun": view web data	2		
3D graphics plotting, animation for engineering applications	2		
Supplement for "fun": operations with docx, pdf files	2		
Bibliography • RoboDK online manual • Python online tutorials • M. Andres, Python 3 Web Development, 2011 • J. Solem, Programming Computer Vision with Python, 2012 • B. Miles, Learning Python with a Raspberry Pi, 2016 • W. Donat, Learn Raspberry Pi Programming with Python, 2016 • J. Minichino, J. Howse, Learning OpenCV 3 Computer Vision with Python, 2015 • D. Baggio ș.a., Mastering OpenCV with Practical Computer Vision Projects, 2012 • P. Joshi, Opencv with Python by Example, 2015			

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

It is a course with a strong vocational-applicative character. Skills are developed with immediate applicability in practice.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade

10.4 Course	Solution completeness Solution correctness Code simplicity Code clarity Ingenuity algorithms	Problem-based assessment	50%
10.5 Seminars /Laboratory/Project	Solution completeness Solution correctness Code simplicity Code clarity Ingenuity algorithms	Problem-based assessment	50%
10.6 Minimum standard of performance			
• Grade 5 average of laboratory works • Note 5 examination in the colloquium			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Prof. dr. ing. Stelian BRAD	
	Teachers in charge of application	Prof. dr. ing. Stelian BRAD	

Date of approval in the department IPR _________________________	Head of department Prof. dr. ing. Călin NEAMȚU
Date of approval in the facultyIIRMP _________________________	Dean Prof. dr. ing. Corina BÎRLEANU

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Industrial Engineering , Robotics and Production Management
1.3	Department	Design Engineering and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics/Engineer
1.7	Form of education	Full time
1.8	Subject code	108.00

2. Data about the subject

2.1	Subject name			Medical Robotics			
2.2	Subject area			Robotics			
2.2	Course responsible/lecturer			*Prof. Dr. Ing. Doina Pîslă* doina.pisla@mep.utcluj.ro			
2.3	Teachers in charge of seminars			*Prof. Dr. Ing. Doina Pîslă* doina.pisla@mep.utcluj.ro			
2.4 Year of study	4	2.5 Semester	1	2.6 Assessment			C
2.7 Subject category	Formative category						DC
	Optionality						DFAc

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar		3.3 Laborator	2	3.3 Proiect	
3.4 Total hours in the curriculum	50	of which	3.5 Course	14	3.6 Seminar		3.6 Laborator	28	3.6 Proiect	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	2
(b) Supplementary study in the library, online and in the field	1
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	1
(d) Tutoring	2
(e) Exams and tests	2
(f) Other activities	0

3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))	8
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	Graduation of programming courses, Mathematics, Mechanics, Electronics, Sensors and Sensory Systems, Service robots
4.2	Competence	Elements of mathematical modeling Vector and matrix calculation Programming in MATLAB

5. **Requirements (where appropriate)**

5.1	For the course	N/A
5.2	For the applications seminarului / laboratorului / proiectului	Attendance to laboratory is mandatory

6. **Specific competences**

Professional competences	After completing the course, students will be able to: - correctly identify and define the particular elements of robotic systems for medical applications; - to understand the ethical norms related to invasive and non-invasive robotic systems; - correctly manage human-machine interfaces (HRI) in medical applications; - to model a robotic system for medical applications with the human as an integrated element in the robotic system.
Cross competences	• teamwork; • autonomy in assuming responsibility; • adaptation of behaviour in relation to other members; • accepting evaluation from others; • a continuous education and development

7. **Discipline objectives (as results from the *key competences gained*)**

7.1	General objective	Familiarizing students with the development of robotic systems for medical applications
7.2	Specific objectives	Knowledge of the architecture of robots for applications in medicine. Presentation and development of applications for robots used in medicine . Presentation of methods and techniques used in modelling, simulation and control of medical robots. Critical, quantitative and qualitative evaluation based on methods of analysis, planning and selection of robotic systems for medicine. Development of professional and/or research projects for the robotization of medical applications

8. **Contents**

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Course content. Concepts regarding medical robots. The structure of medical robots. Applications of	2		

medical robots (serial and parallel robotic structures). Terminology. Basic concepts. Ethics applied to medical robots. Modeling and simulation of medical robots. Bibliography.		Exposure Discussions projector Interactive exposure	
2. Innovative approaches in surgical robotics. Important stages in the evolution of surgical robotics. Past developments. Achievements from the present. What the future of surgical robotics looks like? Bibliography.	2		
3. The parallel medical robot PARAMIS. Structure. Characteristics. Workspace modeling. The experimental model. Bibliography.	2		
4. The medical robot PARAMIS 5M_P. Geometric modeling, singularity analysis and analytical workspace generation. The experimental model. Bibliography	2		
5. Medical robotics for cancer therapy. Interventional robots (diagnosis and treatment). The PARA-BRACHYROB medical robot. The BIO-PROS-1 medical robot. Bibliography	2		
6. New challenges in the field of medical recovery robots. Overview of medical robots used for upper and lower limb recovery. RAISE parallel medical robot RECOVER medical robot. Bibliography	2		
7. New challenges in the field of medical recovery robots. Overview of medical robots used for upper limb recovery. ASPIRE and ParReEx medical robots. Bibliography.	2		

Bibliography

1. Doina Pisla, Hannes Bleuler, Aleksandar Rodić, Calin Vaida, Adrian Pisla (eds.), New Trends in Medical and Service Robots, Theory and Integrated Applications, Springer, 2014, ISBN:978-3-319-01591-0, 238 pp
2. Aleksandar Rodić, Doina Pisla, Hannes Bleuler, New Trends in Medical and Service Robots, Challenges and Solutions ,Springer,2014, ISBN:978-3-319-05430-8, 384 pp.
3. Hannes Bleuler, Mohamed Bouri, Francesco Mondada, Doina Pisla, Aleksandar Rodić, Patrick Helmer, New Trends in Medical and Service Robots ,Assistive, Surgical and Educational Robotics,Springer, 2016, ISBN:978-3-319-23831-9, 254 pp.
4. Philippe Wenger ,Christine Chevallereau, Doina Pisla, Hannes Bleuler, Aleksandar Rodić, New Trends in Medical and Service Robots, Human Centered Analysis, Control and Design, Springer, 2016, ISBN: 978-3-319-30673-5,310 pp.
5. Vaida Calin., Gherman Bogdan, Pisla Doina, Programare în MATLAB cu aplicații în inginerie, Vol. 3, sub seria "Utilizarea și programarea calculatoarelor", Coordonator Doina Pisla, Mediamira, 2014, ISBN:978-973-713-312-0, 380 pp.
6. Glen GILLEN, Stroke Rehabilitation: A Function-Based Approach, 4th Edition, 2016, Elsevier
7. Laurie Lundy-Ekman, Neuroscience: Fundamentals for Rehabilitation, 4th Edition, 2015, Elsevier
8. Sood, M., Leichtle, S.W., Essentials of Robotic Surgery 1st Edition, Ed. Spry Publishing LLC, ISBN-13: 978-1938170126, pp. 224
9. Kim, K.C., Robotics in General Surgery 2014th Edition, Ed. Springer, ISBN-13: 978-1461487388, 2014, 511 pp

10. William S. Levine, The Control Handbook, Second Ed., CRC Press, 2011
11. Basteris, A., et al: Trening modalities in robot-mediated upper limb rehabilitation in stroke: a framework for classification based on a systematic review, Journal of NeuroEngineering and Rehabilitation 2014, vol. 11:111
12. www.pubmed.com
13. Calin Vaida "Medical robotic systems with application in surgery, oncology and rehabilitation"

8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
1. Laboratory work objectives. Presentation of the theme of the laboratory works. The structure of medical robots. Terminology. Laboratory presentation CESTER Research Center, labor protection measures. Establishing the degree of mobility of medical robots according to the requirements of the medical act.		Exposure Discussions projector Interactive exposure	
2. Presentation of hardware and software IT structures used for modeling and simulating medical robots. Basic concepts. Applications.			
3. The MATLAB environment. Basic concepts. MATLAB Applications in Medical Robotics.			
4. The MATLAB environment. Instructions and graphics. MATLAB Applications in Medical Robotics.			
5. PARASURG-5M parallel medical robot. Determination of the workspace and singularities Matlab programs. Description of the command interface. Practical operation of the robot for students.			
6. The parallel medical robot PARAMIS_5M_P. Matlab programs presented for determining the workspace and singularities. Modes of command and action. Description of the command interface. Practical operation of the robot for students.			
7. Modeling and experimental testing of the PARASURG-9M robotic system. 3D model of the PARASURG-9M robotic arm. Kinematic and dynamic modeling and simulation of the PARASURG-9M robotic system. Presentation of the order program. Experimental tests. Practical operation of the robot for the student.			
8. Presentation of medical robots for cancer therapy. Individual applications. Practical operation of the robot for the student.			

9. Presentation of medical robots for the diagnosis of prostate cancer. Individual application. Practical operation of the robot for the student.			
10. Presentation of Upper Limb Recovery Robots for Stroke Patients. Computer exposure and applications, software. Individual application. Practical operation of robots for the student.			
11. Presentation of lower limb recovery robots for stroke patients. Individual application. Practical operation of robots for the student.			
12. Kuka iiwa LBR 7 R800 collaborative robot with medical applications. Description of the components of the robotic system. Presentation of the robot's programming mode. Practical application.			
13. ABB YuMi collaborative robot with medical applications. Presentation of the components of the robotic recovery system. Presentation of the robot's programming mode. Practical application.			
14. PROHEP-LCT robotic system for laparoscopic treatment of liver cancer. Presentation of the kinematic structure. Presentation of the graphical interface and control system. Practical application.			

Bibliography

1. **Pisla, Doina**, Modelarea cinematica si dinamica a robotilor paraleli, Editura Dacia, 2005.
2. **Pîsla, Doina**, Programarea calculatoarelor. Limbajul C, Editura TODESCO, 2001.
3. Vaida, Calin., **Pisla, Doina**, Programarea calculatoarelor, Vol. I Utilizarea calculatoarelor. Aplicaţii, serie coordonată de Prof. D. Pisla, Ed. Mediamira, Cluj-Napoca, 2008, ISBN – 978-973-713-247-5
4. Gherman, Bogdan, Vaida, Calin, **Pisla, Doina**, Programarea calculatoarelor, Vol. II, Programare in C cu aplicații în inginerie, serie coordonată de Prof. D. Pisla, Ed. Mediamira, Cluj-Napoca, 2013, ISBN- 978-973-713-305-2
5. Vaida, Calin, Gherman, Bogdan, **Pisla, Doina**, Programarea calculatoarelor, Vol. III, Programare in MATLAB pentru ingineri, serie coordonată de Prof. D. Pisla, Ed. Mediamira, Cluj-Napoca, 2014, ISBN- 978-973-713-312-0
6. **Pisla, Doina** et al, Medical Robotics, Editura Academiei, în curs de publicare.

In alte biblioteci
1. Vanja Bozovic „Medical Robotics”, I-Tech Education and Publishing, Vienna, January 2008.
2. Rosen, Jacob; Hannaford, Blake; Satava, Richard M. (Eds.), Surgical Robotics, Systems Applications and Visions, 1st Edition., Springer, 2011.
3. Sajeesh Kumar, Jacques Marescaux, Telesurgery, Springer, 2008
4. Scweikard A, Ernst, F., Medical Robotics, Springer, 2015.
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9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Medical robotics, seen by some as a branch of robots for services, represents a pioneering field which, however, as all demographic studies show, will become an absolute necessity in various medical branches in the next 20 years. After passing the course, in addition to becoming familiar with the specific issues of medical applications, students will have the ability to integrate a robotic system in an environment with particular characteristics and adapt it to the imposed restrictions. Also, students will familiarize themselves with various human-machine interfaces and the special conditions of direct human-machine interaction.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The final colloquium consists of checking knowledge by solving written problems	Written exam 1.5- 2 hours	70%
10.5 Seminars /Laboratory/Project	Making a synthetic material. Realization of medical robot modeling and simulation applications in MATLAB	Practical test - duration 2 hours	30 %
10.6 Minimum standard of performance			
Completed application and answered 5 questions correctly			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Prof. Dr. Ing. Doina Pîslă	
	Teachers in charge of application	Prof. Dr. Ing. Doina Pîslă	

Date of approval in the department .... ________________________	Head of department Prof.dr.ing.
Date of approval in the faculty .... ________________________	Dean Prof.dr.ing.

FIŞA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	Inginerie Industrială, Robotică și Managementul Producției
1.3 Departamentul	*Departamentul de specialitate cu profil psihopedagogic*
1.4 Domeniul de studii	Modul psihopedagogic
1.5 Ciclul de studii	Licenţă
1.6 Programul de studii / Calificarea	
1.7 Forma de învăţământ	IF – învăţământ cu frecvenţă
1.8 Codul disciplinei	

2. Date despre disciplină

2.1 Denumirea disciplinei	Psihologia educatiei						
2.2 Aria de conţinut							
2.3 Responsabil de curs	Lector dr. Trif Gheorghe Florin – trif.gelu@dppd.utcluj.ro						
2.4 Titularul activităţilor de seminar / laborator / proiect	Lector dr. Trif Gheorghe Florin – trif.gelu@dppd.utcluj.ro						
2.5 Anul de studiu	1	2.6 Semestrul	1	2.7 Tipul de evaluare	E	2.8 Regimul disciplinei	DFac

3. Timpul total estimat

3.1 Număr de ore pe săptămână		din care: 3.2 curs	2	3.3 seminar / laborator	2
3.4 Total ore din planul de învăţământ	56	din care: 3.5 curs	28	3.6 seminar / laborator	28

Distribuţia fondului de timp	Ore
Studiul după manual, suport de curs, bibliografie şi notiţe	25
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate şi pe teren	14
Pregătire seminarii / laboratoare, teme, referate, portofolii şi eseuri	25
Tutoriat	
Examinări	5
Alte activităţi:	

3.7 Total ore studiu individual	69
3.8 Total ore pe semestru	125
3.9 Numărul de credite	5

4. Precondiţii (acolo unde este cazul)

4.1 de curriculum	
4.2 de competenţe	

5. Condiţii (acolo unde este cazul)

5.1. de desfăşurare a cursului	Sala de curs
5.2. de desfăşurare a seminarului / laboratorului / proiectului	Sala seminar

6. Competenţele specifice acumulate

Competenţe profesionale	- Stăpânirea conceptelor, teoriilor, metodelor şi principiilor psihologiei educației - Înțelegerea esenţei şi a particularităţilor procesului de învățare - Cunoaşterea şi înţelegerea metodelor şi tehnicilor evaluare a personalității elevului - Stăpânirea conceptelor, respectiv a metodologiei aferente dezvoltării individului ; - Înţelegerea şi utilizarea corectă a noţiunilor şi principiilor privind procesele cognitive și metacognitive implicate în procesul de învățare. Aplicarea principiilor şi metodelor didactice specifice activităţilor / disciplinelor predate care să asigure progresul şcolar al elevilor: - Evaluarea psihocomportamentala a elevului utilizând fișa de observație a comportamentului;
Competenţe transversale	- Realizarea eficientă a activităţilor şi exercitarea rolurilor specifice muncii în echipă. - Promovarea spiritului de iniţiativă, dialogului, cooperării, atitudinii pozitive şi respectului faţă de ceilalţi, diversităţii şi multiculturalităţii şi îmbunătăţirea continuă a propriei activităţi. Utilizarea eficientă a abilităţilor lingvistice şi a cunoştinţelor de tehnologia informaţiei şi a comunicării.

7. Obiectivele disciplinei (reieşind din grila competenţelor specifice acumulate)

7.1 Obiectivul general al disciplinei	Dobândirea fundamentelor teoretice privind dinamica și evoluția psihocomportamentală a elevilor; valorificarea cunoştinţelor acumulate în elaborarea unor produse (fișa de observație, instrumente de modificare comportamentului, formularea de obiective educaționale în concordanță cu modalități de învățare eficientă), de natură să indice capacităţi de analiză, sinteză, aplicare, interpretare şi gândire critică ale studenţilor.
7.2 Obiectivele specifice	1. formarea capacităţii de analiză şi evaluare a procesului de învățare; 2. formarea capacităţii de a cunoaște profilul psihocomportamental al elevului; 3. formarea abilității de a adecva conținuturile educaționae la particularitățile de vârstă a elevilor 4. utlizarea unor tehnici de modificare a comportamentului elevului care conduc la menținerea disciplinei.

8. Conţinuturi

8.1 Curs	Metode de predare	Observaţii
Introducere în psihologia educationala	Curs interactiv: - expunerea; - prelegerea intensificată; - explicaţia; - conversaţia euristică;	
Adaptarea (Conceptul de adaptare si formele sale. Ipostazele adaptarii).		
Informatia si cunoasterea psihologica (Conceptul de informatie. Cunoasterea psihologica).		
Cunoașterea personalității elevilor.		
Activitatea (Notiunea de activitate si formele sale. Constiinta).		
Învatarea (Notiuni generale despre învatare: definitie, continut, forme, mecanisme.)		
Creativitatea si relevanta ei în învatarea scolara.		
Modificari comportamentale aplicate în scoala.		
Perceptia persoanei în contextul clasei de elevi (Precizari		

conceptuale. Formarea perceptiei celuilalt. Factori distorsionanti în perceptia profesor – elev).		
Dezvoltarea copilului și adolescentului.		
Metacognița, modalități de dezvoltare a abilităților metacognitive		
Profesorul în procesul instruirii-formarii.		
Cercetarea psihopedagogica si elaborarea lucrarilor stiintifice.		
Dezvoltarea personalității morale		

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Neculau, A. (1998). *Psihologie socială*, Iaşi, Ed. polirom.

Trif, G. F., (2005). *Ce metode se folosesc în cercetare psihologică?*, în L. Filimon coord, Formare în profesia didactică, Ed Univ. din Oradea.

Trif, G. F., (2012). *Programe de instruire online pentru formarea cadrelor didactice.* Editura Accent, Cluj-Napoca.

8.2 Seminar / laborator / proiect	Metode de predare	Observaţii
Psihologia educationala: principii, obiective, metode	- problematizarea; - tutorial; - exerciții; - dezbaterea; - studiul de caz; - discuția referatelor;	
Metode psihologice de investigare a elevului şi a clasei: experimental, studiul corelational		
Teoria procesării informaţiei şi învăţarea în şcoală: simulare, dezbatere		
Paradigma constructivistă pentru învăţarea în şcoală: tutorial, studiu de caz		
Modalităţi de aplicare ale principiilor învăţării în procesul de proiectare didactică – aplicaţie harta conceptuală		
Tehnici de învăţare		
Tehnici cognitiv-comportamentale de ameliorare a performantelor scolare		

Jurcău, N. (coord) (2008). *Psihologia educaţiei*, Cluj-Napoca: Editura U. T. Pres.

Miclea, Mircea. (1994). *Psihologie cognitivă,* Cluj-Napoca: Casa de Editură Gloria SRL.

Radu, I. , (coord.). (1991). *Introducere în psihologia contemporană,* Cluj-Napoca: Editura Sincron.

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Trif, G. F., (2012). *Programe de instruire online pentru formarea cadrelor didactice.* Editura Accent, Cluj-Napoca.

9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor profesionale şi angajatorilor reprezentativi din domeniul aferent programului

Competenţele dobândite la absovirea acestui curs permit absolventului, indiferent de specializare, o gestionare mai eficientă a vieţii personale şi profesionale, respectiv o inserţie productivă pe piaţa forţei de muncă (prin cunoştinţele şi competenţele privind: managementul stresului, al timpului, cunoaşterea posibilităţilor personale şi profesionale reale, autodepăşire şi motivare, aplicarea pentru job-ul adecvat, comunicare eficientă ş.a.).

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	Rezolvarea de probleme si raspunsuri pentru subiecte din teorie	examinare finală –	60%.
10.5 Seminar/Laborator	Prezentare eseuri si studii de caz	Eseuri	40%
10.6 Standard minim de performanţă			
Să rezolve subiecte corespunzând notei minime 5.			

Data completării:	Titulari	Titlu Prenume NUME	Semnătura
	Curs	Lector dr. Trif Gheorghe Fllorin	
	Aplicații	Lector dr. Trif Gheorghe Fllorin	

Data avizării în Consiliul Departamentului ……..	Director Departament DSPP Conf. dr. Monica Laura Maier
Data aprobării în Consiliul Facultății …………..	Decan Prof.dr.ing.

FIŞA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	Inginerie Industrială, Robotică și Managementul Producției
1.3 Departamentul	Ingineria Proiectarii si Robotica
1.4 Domeniul de studii	Mecatronică și Robotică
1.5 Ciclul de studii	Licenţă
1.6 Programul de studii / Calificarea	Robotică / Inginer
1.7 Forma de învăţământ	IF – învăţământ cu frecvenţă
1.8 Codul disciplinei	206.00

2. Date despre disciplină

2.1 Denumirea disciplinei	Managementul clasei de elevi				
2.2 Aria de conţinut	Științe ale educației				
2.3 Titularul de curs	*Conf. univ. dr. Liana Crișan-Tăușan - liana.tausan@dppd.utcluj.ro*				
2.4 Titularul activităţilor de seminar / laborator / proiect	*Conf. univ. dr. Liana Crișan-Tăușan - liana.tausan@dppd.utcluj.ro*				
2.5 Anul de studiu	3	2.6 Semestrul	2	2.7 Tipul de evaluare	E
2.8 Regimul disciplinei	Categoria formativă				DS
	Opționalitate				DOB

3. Timpul total estimate

3.1 Număr de ore pe săptămână	2	din care:	3.2 Curs	1	3.3 Seminar	1	3.3 Laborator	-	3.3 Proiect	-
3.4 Număr de ore pe semestru	28	din care:	3.5 Curs	14	3.6 Seminar	14	3.6 Laborator	-	3.6 Proiect	-

3.7 Distribuţia fondului de timp (ore pe semestru) pentru:	
(a) Studiul după manual, suport de curs, bibliografie şi notiţe	15
(b) Documentare suplimentară în bibliotecă, pe platforme electronice de specialitate şi pe teren	15
(c) Pregătire seminarii / laboratoare, teme, referate, portofolii şi eseuri	15
(d) Tutoriat	0
(e) Examinări	2
(f) Alte activităţi:	0

3.8 Total ore studiu individual (suma (3.7(a)...3.7(f)))	47
3.9 Total ore pe semestru (3.4+3.8)	75
3.10 Numărul de credite	3

4. Precondiţii (acolo unde este cazul)

4.1 de curriculum	• Psihologia educației, Pedagogie I, Pedagogie II, Didactica specialității
4.2 de competenţe	• Competențe formate ca urmare a studierii disciplinelor Psihologia educației, Pedagogie I, Pedagogie II, Didactica specialității

5. Condiţii (acolo unde este cazul)

5.1. de desfăşurare a cursului	• Participare activă • Sală de curs dotată cu videoproiector, tablă, flip-chart

5.2. de desfăşurare a seminarului / laboratorului / proiectului	• Lectura bibliografiei recomandate • Documentare suplimentară • Elaborarea şi susţinerea prezentărilor planificate • Participare activă

6. Competenţele specifice acumulate

Competenţe profesionale	C1: Proiectarea unor programe de instruire sau educaţionale adaptate pentru diverse niveluri de vârstă/pregătire şi diverse grupuri ţintă; C2: Evaluarea proceselor de învăţare, a rezultatelor şi a progresului înregistrat de elevi; C3: Abordarea managerială a grupului de elevi, a procesului de învăţământ şi a activităţilor de învăţare/integrare socială specifice vârstei grupului ţintă C4:Autoevaluarea şi ameliorarea continuă a practicilor profesionale şi a evoluţiei în carieră; C5:Aplicarea caracteristicilor învățământului centrat pe elev în proiectarea, implementarea și evaluarea curriculum-ului școlar;
Competenţe transversale	CT1 Aplicarea principiilor și a normelor de deontologie profesională, fundamentate pe opțiuni valorice explicite, specifice specialistului în științele educației; CT2 Cooperarea eficientă în echipe de lucru profesionale, interdisciplinare, specifice desfășurării proiectelor și programelor din domeniul științelor educației; CT3 Utilizarea metodelor și tehnicilor eficiente de învățare pe tot parcursul vieții, în vederea formării și dezvoltării profesionale continue;

7. Obiectivele disciplinei (reieşind din grila competenţelor specifice acumulate)

7.1 Obiectivul general al disciplinei	• Familiarizarea studenților cu domeniul managementului clasei de elevi, cu conceptele de bază, cu principalele teorii și modele de aplicare a problematicii managementului educaţional la nivelul clasei de elevi;
7.2 Obiectivele specifice	• cunoaşterea semnificaţiei principalelor concepte din cadrul managementului clasei de elevi; dezvoltarea capacităţilor de utilizare a conceptelor; • identificarea specificului abordării manageriale în procesul de învățământ; • analizarea componentelor managementului clasei de elevi; • formarea capacităţii de a argumenta legăturile logice dintre funcţiile manageriale şi cele trei procese implicate în instruirea şcolară: predare, învăţare, evaluare; • formarea capacităţii de a argumenta legăturile logice dintre funcţiile manageriale şi cele trei procese implicate în instruirea şcolară: predare, învăţare, evaluare.; • dezvoltarea capacităţilor / abilităţilor de a aplica teoria pedagogică managerială în rezolvarea unor situaţii educaţionale variate; • utilizarea unor metode de autoevaluare a propriei activități de învățare ; • dezvoltarea competenţelor de a formula soluţii, ipoteze, concluzii pentru diferite situaţii educaţionale oferite de teoria şi practica educativ-managerială; • identificarea situațiilor de criză educațională încă din faza incipientă, ordonarea și clasificarea lor în funcție de specific; • determinarea soluțiilor pertinente pentru diferitele situații

	de criză educațională; • respectarea normelor de deontologie profesională (a codului deontologic al profesorului), fundamentate pe opţiuni valorice explicite, specifice unui viitor profesor ; • cooperarea în echipe de lucru pentru rezolvarea diferitelor sarcini de învățare; • perfecționarea stilului managerial propriu.

8. Conţinuturi

<table>
<tr><th>8.1 Curs</th><th>Nr. ore</th><th>Metode de predare</th><th>Observaţii</th></tr>
<tr><td>Managementul clasei de elevi – delimitări conceptuale.
Cadrul didactic – manager al clasei de elevi
- delimitări terminologice (management, management educațional, management al clasei de elevi);
- elemente definitorii ale managementului educațional;
- scop, necesitate, argumente pentru un management al clasei de elevi (organizaționale, istorice, sociologice, psihologice, manageriale);
- roluri manageriale de bază ale cadrului didactic (planificarea, organizarea, controlul și îndrumarea, evaluarea, consilierea, decizia educaţională);
- stiluri manageriale și influența lor asupra climatului școlii;
- tipologii ale stilurilor mangeriale.</td><td>2</td><td rowspan="6">prelegerea
conversația
euristică
dezbaterea
problematizarea
dezbaterea cu oponent imaginar
exercițiul de reflecție
studii de caz,
brainstorming
explicația

suporturi video</td><td rowspan="6"></td></tr>
<tr><td>Managmentul relațiilor și interacțiunilor educaționale
- reguli, roluri și responsabilități în clasa de elevi;
- funcțiile clasei de elevi;
- particularitățile clasei de elevi – ca grup socio-educativ;
tipologia relațiilor interpersonale;</td><td>2</td></tr>
<tr><td>Comunicarea interpersonală
- delimitări conceptuale;
- etapele procesului de comunicare;
forme ale comunicării (verbală, nonverbală, asertivă, pasivă, agresivă)</td><td>2</td></tr>
<tr><td>Managementul informațiilor și al învățării
- managementul informațiilor: abilități de informare;
- managementul învățării : motivația pentru învățare, strategii de învățare;</td><td>2</td></tr>
<tr><td>Managementul problemelor disciplinare
- conceptul de disciplină;
- teorii privitoare la disciplină;
- tehnici procedurale necesare rezolvării problemelor de disciplină ale clasei;
- strategii de modificare comportamentală
- pedeapsa – eficiență și alternative</td><td>2</td></tr>
<tr><td>Cunoașterea elevilor
- metode de cunoaștere a personalității elevilor bazate pe analiza conduitei și activității acestora: observația;</td><td>2</td></tr>
</table>

analiza rezultatelor activităţii elevilor; - metode de cunoaştere a personalităţii elevilor, bazate pe colaborarea cu persoana: anamneza/metoda biografică; convorbirea; chestionarul; - metode de investigare a grupurilor şcolare: metoda aprecierii obiective a personalităţii; proba ”Ghici cine?”; tehnicile sociometrice;			
Gestionarea situațiilor de criză educațională în clasa de elevi Conceptul de mijloace de învăţământ - caracteristicile situațiilor de criză educațională; - clasificarea tipurilor de crize educaționale; - cauze generatoare de criză educațională; - gestionarea situațiilor de criză educațională – etape; - strategii de intervenție educațională.	2		

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Ciascai, Liliana – *Managementul clasei de elevi. De la teorie la practică,* Ed. Casa Cărții de Știință, Cluj-Napoca, 2007

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Păun, Emil – *Şcoala - abordare sociopedagogică*, Polirom, Iaşi, 1999.

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Schulman Kolumbus, Elinor – *Didactică preşcolară*, Ediţia a II-a, V&I Integral, Bucureşti, 2000.

Stan, Emil – *Managementul clasei*, Aramis, Bucureşti, 2003.

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Ţoca, Ioan – *Management educaţional*, E.D.P., Bucureşti, 2002.

Voiculescu, F. - *Analiza resurse-nevoi şi managementul strategic în învăţământ*. Bucureşti : Aramis, 2004.

Zlate, M. - *Leadership şi management*. Iaşi: Polirom, 2004.

http://www.intime.uni.edu/model/Romanian_Model/teacher/covenant.html.

8.2 Seminar / laborator / proiect	Nr. ore	Metode de predare	Observaţii
Cadrul didactic – manager al clasei de elevi	2	Prezentări, dezbateri, studii de caz, brainstorming, joc de rol, conversația euristică, explicația	
Managementul relațiilor și interacțiunilor educaționale	2		
Comunicarea interpersonală	2		
Managementul informațiilor și al învățării	2		
Managementul problemelor disciplinare	2		
Cunoașterea elevilor	2		
Gestionarea situațiilor de criză educațională în clasa de elevi	2		

Bibliografie

Băban, Adriana - *Consiliere educațională,* Imprimeria Ardealul, Cluj-Napoca, 2001
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Stan, Emil – *Managementul clasei*, Aramis, Bucureşti, 2003.
Stan, Emil – *Profesorul între autoritate şi putere*, Teora, Bucureşti, 1999.
Ţoca, Ioan – *Management educaţional*, E.D.P., Bucureşti, 2002.
Voiculescu, F. - *Analiza resurse-nevoi şi managementul strategic în învăţământ*. Bucureşti : Aramis, 2004.
Zlate, M. - *Leadership şi management*. Iaşi: Polirom, 2004.
http://www.intime.uni.edu/model/Romanian_Model/teacher/covenant.html.

9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor profesionale şi angajatorilor reprezentativi din domeniul aferent programului

- corectitudinea și acuratețea folosirii terminologiei însușite la nivelul disciplinei – vor satisface așteptările reprezentanților comunității epistemice/academice din domeniul științelor educației, competențele procedurale și atitudinale ce vor fi achiziționate la nivelul disciplinei – vor satisface așteptările reprezentanților asociațiilor profesionale și angajatorilor din domeniul științelor educației;

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	Volumul şi corectitudinea cunoştinţelor Rigoarea ştiinţifică a limbajului Organizarea conţinutului Originalitatea Capacitatea de evidențiere a aplicabilității temei teoretice	Probă de evaluare scrisă, durata evaluării: 2 ore	60%
10.5 Seminar/Laborator /Proiect	Elaborarea și prezentarea materialelor/elementelor componente ale portofoliului Participare activă la seminarii (dezbateri, analiza și sinteza unor materiale/conținuturi, transpunerea în practică a conținuturilor teoretice, analize critice) Originalitatea și potențialul creativ	Portofoliu Observarea curentă a participării active a studenților la seminar	20% 20%

	manifestate de studenți în cadrul activităților de seminar și în întocmirea portofoliului.		

10.6 Standard minim de performanţă

- 50% rezultat după însumarea punctajelor ponderate conform pct.10.3.

Data completării:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	Curs	Conf. dr. Liana CRIȘAN-TĂUȘAN	
	Aplicații	Conf. dr. Liana CRIȘAN-TĂUȘAN	

Data avizării în Consiliul Departamentului …….. Director Departament

____

Data aprobării în Consiliul Facultății …………… Decan …..

____

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics
1.7 Form of education	IF - full-time education
1.8 Discipline code	209.00

2. Discipline data

2.1 Name of subject	Art and communication				
2.2 Course holder	Prof. Anamaria Tomiuc (anamaria.tomiuc@uad.ro)				
2.3 Holder of seminar/lab/project activities	N/A				
2.4 Year of study	3	2.5 Semester	2	2.6 Type of evaluation	E
2.7 Discipline regime	Formative category				DC
	Optional				DFac

3. Total estimated time

3.1 Number of hours per week	1	of which: 3.2 course	1	3.3 seminar / laboratory	0
3.4 Total curriculum hours	14	of which: 3.5 course	14	3.6 seminar / laboratory	0

Distribution of time fund	hours
Study according to the textbook, course material, bibliography and notes	0
Further documentation in the library, on specialist electronic platforms and in the field	7
Preparation of seminars/labs, homework, papers, portfolios and essays	0
Tutorial	0
Reviews	0
Other activities	4

3.7 Total individual study hours	11
3.8 Total hours per semester	25
3.9 Number of credits	1.0

4. Prerequisites (where applicable)

4.1 of curriculum	N/A
4.2 competences	N/A

5. Conditions (where applicable)

5.1. of the course	Classroom with projector
5.2. seminar / laboratory / project	N/A

6. Specific competences acquired

Professional skills	C6 Combining knowledge of art with classical and digital techniques of artistic creation to create materials needed to promote products. C6.1.Knowledge and appropriate use of the principles, methods, techniques and specific tools of artistic creation for the production of commercial advertising products, necessary for the marketing of products. C6.4 Appropriate use of principles, criteria and evaluation methods from the field of artistic creation to plan, develop and coordinate projects for events to promote new products or services on the market. C6.5 Development of specific professional projects to promote new products or services on the market associated with the development of advertising materials necessary for promotional campaigns, organisation of exhibitions, round tables, debates, etc.
Cross-cutting skills	CT1. Responsible execution of professional tasks. CT2. Communication and teamwork. CT3. Aware of the need for continuous training.

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	-Familiarizing students with the workings and main issues of the world of contemporary art and the world of contemporary design (actors, institutions, issues), allowing a broader knowledge of the contemporary art environment
7.2 Specific objectives	- Understand methods of using practical knowledge in the sphere of contemporary art and design -Understanding methods of using practical knowledge in the field of visual communication and using it in personal, creative examples -Training the ability to argue / problematize / construct individual discourses in relation to contemporary art and design phenomena

8. Content

8.1 Course	No. hours	Teaching methods	Comments
1.Introductory course. Presentation of the subject, objectives, organisation of activities and explanation of the final assessment.	1	The teaching staff will focus on a series of visual materials to stimulate discussion of the theories and concepts presented. The course involves teacher-student interaction, so multiple teaching	
2. Who cares about contemporary art? Issues of the contemporary art system in a national and international context.	1		
3. Contemporary art world. Actors of the contemporary art system.	1		
4. Contemporary art system. Institutions of the contemporary art system.	1		
5. Contemporary art market. Contemporary design market.	1		
6. Artwork vs. Design object. Contemporary art exhibition vs. contemporary design exhibition.	1		

7. The phenomenon of branding in contemporary art and design. Contemporary artists vs. contemporary designers.	1	techniques will be used, which may include: lectures, ppt textual materials, speeches, brainstorming, group activities, role plays, interviews, videos, etc.	
8. Contemporary artistic practices. Art, marketing and advertising.	1		
9. Communication strategies and symbolic mediation in the digital age.	1		
10. Urban practices, cultural policies, power, institutional branding, marketing in the age of globalization.	1		
11. Communication strategies in the artistic and contemporary design spheres.	1		
12. Integrated communication campaigns - case studies.	1		
13. Artistic events. Trade fairs and festivals.	1		
14. Contemporary culture, photography, fashion, design, contemporary art - where to?	1		

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- Persuit, Jeanne M (2015), Social Media and Integrated Marketing Communication, Lexington Books.
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- Richards G, Palmer R, (2010), Eventful Cities: Management and Urban Revitalisation, Routledge, London & New York.
- Scherdin, M, Zandler, (2011) I, Art Entrepreneurship, Edward Elgar Publishing, Cheltenham, UK - Northampton MA, USA
- Smith, Terry, What is contemporary art, The University of Chicago Press, 2009
- Weintraub, Linda, Making Contemporary Art: How Today's Artists Think and Work, ed. Thames & Hudson, 2003

8.2 Seminar / laboratory / project	No. hours	Teaching methods	Comments
N/A	0		

Bibliography

- N/A

9. Correlation of subject content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the programme.

Connecting with developments in the field of art and creative industries in order to diagnose their potential development directions and to identify the major axes that can guide the work of future graduates. Active and involved participation in artistic events and dialogue in the arts and creative industries.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight of final mark
10.4 Course	Correct assimilation of the knowledge taught; Ability to work with the assimilated knowledge in order to articulate coherent ideas and to argue / problematize / understand how meaning is constructed and deciphered, as well as to construct a theoretical discourse on the field of	Exam - Final project	

	contemporary art and design.		
10.5 Seminar/Laboratory	N/A		
10.6 Minimum performance standard			
Demonstration of a minimum assimilation of the knowledge taught in the course and the ability to use it in a creative way (related to creative industries)			

Date of completion:	**Headlines**	**Title Forename NAME**	**Signature**
	Course	Prof. Dr. Anamaria Tomiuc	
	Applications	Prof. Dr. Anamaria Tomiuc	

Date of endorsement in the IPR Department Council _________________________	Department Director Prof. dr. ing. Călin NEAMȚU
Date of approval in the IIRMP Faculty Council _________________________	Dean Prof. dr. ing. Corina BÎRLEANU

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	301.00

2. Discipline data

2.1 Name of subject	Volunteering 1				
2.2 Course holder	*Title Name First name - Email address*				
2.3 Holder of seminar/lab/project activities	*Title Name First name - Email address*				
2.4 Year of study	1	2.5 Semester	1	2.6 Type of evaluation	V
2.7 Discipline regime	Formative category				DC
	Optional				DFac

3. Total estimated time

3.1 Number of hours per week		of which:	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	
3.4 Number of hours per semester	50	of which:	3.5 Course	14	3.6 Seminar		3.6 Laboratory	28	3.6 Project	

3.7 Distribution of time fund (hours per semester) for:	
(a) Study according to textbook, course material, bibliography and notes	
(b) Further documentation in the library, on electronic specialist platforms and in the field	
(c) Preparation of seminars/labs, homework, papers, portfolios and essays	
(d) Mentoring	
(e) Examinations	
(f) Other activities: Volunteer placement in a student organisation	50

3.8 Total individual study hours (sum (3.7(a)...3.7(f)))	8
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credits	2

4. Prerequisites (where applicable)

4.1 of curriculum	-
4.2 competences	-

5. Conditions (where applicable)

5.1. of the volunteer placement	- the existence of an institutional protocol between UTCN and NGOs - NGO projects in which UTCN volunteers can be involved

6. Specific competences acquired

Professional skills	According to the specifics of each faculty
Cross-cutting skills	**1. Communication in mother tongue** - ability to express and interpret concepts, thoughts, feelings, facts and opinions, both orally and in written form (listening, speaking, reading and writing) and to interact linguistically in an appropriate and creative way in a full range of cultural and social contexts; **2. Communication in foreign languages** - which, in addition to the main dimensions of communication in the mother tongue, it also involves mediation skills and intercultural understanding. The level of knowledge depends on several factors and the ability to listen, speak, read and writing; **3. Mathematical skills and basic science and technology skills** - ability to develop and apply mathematical thinking to solve different problems in different situations everyday life, focusing on process, activity and knowledge. Core competences science and technology refers to the mastery, use and application of knowledge and methodologies for explaining the world around us. These involve an understanding of the changes caused by human activity and the responsibility of each individual as a citizen; **4. Digital skills** - confident and critical use of technology in society information technology (IST) and thus basic information and communication technology skills (ICT); **5. "Learning to learn"** - the ability of people to pursue and organise their own learning, either individually or in groups, according to their own needs, as well as awareness of methods and opportunities; **6. Social and civic competences** - personal, interpersonal and intercultural competences and all forms of behaviour that enable each person to participate effectively and constructive to social and professional life. These competences are linked to well-being personal and social. It is essential to understand the codes of conduct and customs in different the environments in which people work. Civic competences, in particular knowledge of concepts and social and political structures (democracy, justice, equality, citizenship and civil rights), make possible for people to participate actively and democratically; **7. Initiative and entrepreneurship** - the ability to turn ideas into action. This creativity, innovation and risk-taking, as well as the ability to plan and manage projects to achieve objectives. The person is aware of context of its own activity and is able to take advantage of opportunities that arise. This is the foundation for the acquisition of more specialised skills and knowledge needed by those establishing or contributing to a social or commercial activity. This should include raising awareness of ethical values and promoting good governance; **8. Cultural awareness and expression** - appreciation of the importance of cultural expression of ideas, ideas experiences and emotions through a range of channels (music, theatre, literature and visual arts).

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Acquiring soft skills in non-formal and informal education contexts through voluntary involvement in activities within non-governmental organisations. - increasing employability through the development of labour market compatible skills - improving the

	quality of voluntary work or as a stepping stone to more complex voluntary activities
7.2 Specific objectives	1. Knowledge and understanding (knowledge and appropriate use of Understanding of the relevance of the work of the teacher in the subject) Volunteering in the context of the profile of the specialization pursued - Highlighting the particularities of different non-governmental organizations in society as a whole; - Understanding the functioning of public non-governmental organizations in Romania from the perspective of the legal regulations in force. 2. Explanation and interpretation (explaining and interpreting ideas, Explaining the role of volunteering activities from the perspective of current relevance - Interpreting NGO activities from a critical and comparative perspective - Critical reporting on life and its real issues as a result of involvement in volunteering activities. 3. Instrumental-applicative (designing, conducting and evaluating specific practical activities; using methods, techniques and tools for investigation and application) - Participating in concrete volunteering activities according to the NGO's activity profile and own interests; - Developing a Volunteering Portfolio; 4. Attitudinal (displaying a positive and responsible attitude towards the scientific field / cultivating a scientific environment centred on democratic values and relations / promoting a system of cultural, moral and civic values / making the most of one's own potential in scientific activities / involvement in institutional development and the promotion of scientific innovations / engaging in partnership relations with other people and institutions with similar responsibilities / participating in one's own professional development) - stimulating interest in voluntary work, citizenship and social responsibility;

8. Content

Bibliography

Bibliography

A. Models of good practice or relevant projects carried out at European level which have had significant components focusing on the recognition of competences developed through volunteering:

1. Key competences for lifelong learning, Recommendation 2006/962/EC of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning [Official Journal L 394 of 30.12.2006].

2. List of key competences, common to several occupations, approved by the CNFPA Decision no. 86/24.06.2008

3. Key competences for a changing world, Draft Joint Progress Report for 2010 Council and Commission Decision on the implementation of the Education and Training 2010 work programme, reproduced in full in Official Journal of the European Union 2010/C 117/01.

5. Validation of Prior Learning (VPL) - method promoted by Movisie International (Netherlands centre for social development)

6. Vskills - an approach promoted by Volunteer Development Scotland (www.vds.org.uk)

7. Volunteer Card (Ehrenamtskarte) - service promoted by the Federal Government of the Rhine-Westphalia Region (Germany) http://www.ehrensache.nrw.de/

8. Model rubric - competency self-assessment model

9. Competence assessment (Kompetenzbilanz aus Freiwilligen-Engagement) - model developed in Germany
- http://www.dji.de/5_kompetenznachweis/KB_Kompetenzbilanz_281206.pdf 10.Service Learning - method promoted in Slovakia at Matej University Bel 11.Experience, Learning, Description - Toolkit for the recognition of non-formal and informal learning in Sweden - http://eldkompetens.se
12. Certificate Generator (Nachweisgenerator)- service developed online in Germany - http://www.nachweisgenerator.de/
Komprax - Competences for practice, project promoted by Iuventa Slovakia (www.iuventa.sk)
14. Benevol - project implemented in Switzerland
15. Nefix - project implemented in Slovenia
16. Online resources:www.europass.ro, www.youthpass.eu, www.tvet.ro, www.ise.ro
17. ECTS Users' Guide - http://europass.cedefop.europa.eu/en/documents/european-skillspassport/diplomasupplement/info-for-necs/ects-user-guide/pdf.pdf
18. GUIDE FOR THE RECOGNITION OF COMPETENCES ACQUIRED THROUGH VOLUNTEERING - http://www.voluntariat.ro/download/Ghid_pt_recunoasterea_competentelor_dobandite_prin_voluntariat.pdf

B. Relevant reports in the field of volunteering and non-formal education:
1. Sunshine Report on Non-Formal Education, published by the European Youth Forum http://www.youthforum.org/OLD/?q=en/node/162
2. "Volunteering Infrastructure in Europe - http://www.alliancenetwork.eu/uploads/Alliance%20documents/Other%20documents%20Volunteering%
20and%20Youth/CEV_Vol unteering%20infrastructure.pdf
3. Report of the conference ''Bridges for recognition'' (January 2005) www.salto-youth.net
4. Report ''European inventory on validation of non-formal and informal learning'' (published by Cedefop).
5. European portfolio for youth leaders, report published by the Council of Europe

9. Correlation of subject content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the programme.

The content of the subject is in line with the European Union's concern to encourage voluntary activities and to recognise the skills acquired as a result.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Course	Running the volunteer placement. Drafting the portfolio of volunteering	Volunteering portfolio	70%
10.5 Seminar/Workshop/Project		Evaluation report from host organisation side	30%

Date of completion:

Date of approval in the Faculty Council　　　　Dean

Date approved by the Board of Directors　　　　RECTOR
Prof.dr.ing. Vasile ȚOPA

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	302.00

2. Discipline data

2.1 Name of subject	Volunteering 2					
2.2 Course holder	*Title Name First name - Email address*					
2.3 Holder of seminar/lab/project activities	*Title Name First name - Email address*					
2.4 Year of study	1	2.5 Semester	2	2.6 Type of evaluation		V
2.7 Discipline regime	Formative category					DC
	Optional					DFac

3. Total estimated time

3.1 Number of hours per week		of which:	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	
3.4 Number of hours per semester	50	of which:	3.5 Course		3.6 Seminar		3.6 Laboratory	14	3.6 Project	

3.7 Distribution of time fund (hours per semester) for:	
(a) Study according to textbook, course material, bibliography and notes	
(b) Further documentation in the library, on electronic specialist platforms and in the field	
(c) Preparation of seminars/labs, homework, papers, portfolios and essays	
(d) Mentoring	
(e) Examinations	
(f) Other activities: Volunteer placement in a student organisation	50

3.8 Total individual study hours (sum (3.7(a)...3.7(f)))	36
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credits	2

4. Prerequisites (where applicable)

4.1 of curriculum	-
4.2 competences	-

5. Conditions (where applicable)

5.1. of the volunteer placement	- the existence of an institutional protocol between UTCN and NGOs - NGO projects in which UTCN volunteers can be involved

6. Specific competences acquired

Professional skills	According to the specifics of each faculty
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7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Acquiring soft skills in non-formal and informal education contexts through voluntary involvement in activities within non-governmental organisations. - increasing employability through the development of labour market compatible skills - improving the

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7.2 Specific objectives	1. Knowledge and understanding (knowledge and appropriate use of Understanding of the relevance of the work of the teacher in the subject) Volunteering in the context of the profile of the specialization pursued - Highlighting the particularities of different non-governmental organizations in society as a whole; - Understanding the functioning of public non-governmental organizations in Romania from the perspective of the legal regulations in force. 2. Explanation and interpretation (explaining and interpreting ideas, Explaining the role of volunteering activities from the perspective of current relevance - Interpreting NGO activities from a critical and comparative perspective - Critical reporting on life and its real issues as a result of involvement in volunteering activities. 3. Instrumental-applicative (designing, conducting and evaluating specific practical activities; using methods, techniques and tools for investigation and application) - Participating in concrete volunteering activities according to the NGO's activity profile and own interests; - Developing a Volunteering Portfolio; 4. Attitudinal (displaying a positive and responsible attitude towards the scientific field / cultivating a scientific environment centred on democratic values and relations / promoting a system of cultural, moral and civic values / making the most of one's own potential in scientific activities / involvement in institutional development and the promotion of scientific innovations / engaging in partnership relations with other people and institutions with similar responsibilities / participating in one's own professional development) - stimulating interest in voluntary work, citizenship and social responsibility;

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16. Online resources:www.europass.ro, www.youthpass.eu, www.tvet.ro, www.ise.ro
17. ECTS Users' Guide - http://europass.cedefop.europa.eu/en/documents/european-skillspassport/diplomasupplement/info-for-necs/ects-user-guide/pdf.pdf
18. GUIDE FOR THE RECOGNITION OF COMPETENCES ACQUIRED THROUGH VOLUNTEERING - http://www.voluntariat.ro/download/Ghid_pt_recunoasterea_competentelor_dobandite_prin_voluntariat.pdf

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The content of the subject is in line with the European Union's concern to encourage voluntary activities and to recognise the skills acquired as a result.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Course	Running the volunteer placement. Drafting the portfolio of volunteering	Volunteering portfolio	70%
10.5 Seminar/Workshop/Project		Evaluation report from host organisation side	30%

Date of completion:

Date of approval in the Faculty Council — Dean

Date approved by the Board of Directors — RECTOR
Prof.dr.ing. Vasile ȚOPA

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	303.00

2. Discipline data

2.1 Name of subject	Volunteering 3				
2.2 Course holder	*Title Name First name - Email address*				
2.3 Holder of seminar/lab/project activities	*Title Name First name - Email address*				
2.4 Year of study	2	2.5 Semester	1	2.6 Type of evaluation	V
2.7 Discipline regime	Formative category				DC
	Optional				DFac

3. Total estimated time

3.1 Number of hours per week		of which:	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	
3.4 Number of hours per semester	50	of which:	3.5 Course		3.6 Seminar		3.6 Laboratory	14	3.6 Project	

3.7 Distribution of time fund (hours per semester) for:	
(a) Study according to textbook, course material, bibliography and notes	
(b) Further documentation in the library, on specialised electronic platforms and in the field	
(c) Preparation of seminars/labs, homework, papers, portfolios and essays	
(d) Mentoring	
(e) Examinations	
(f) Other activities: Volunteer placement in a student organisation	50

3.8 Total individual study hours (sum (3.7(a)...3.7(f)))	36
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credits	2

4. Prerequisites (where applicable)

4.1 of curriculum	-
4.2 competences	-

5. Conditions (where applicable)

5.1. of the volunteer placement	- the existence of an institutional protocol between UTCN and NGOs - NGO projects in which UTCN volunteers can be involved

6. Specific competences acquired

Professional skills	According to the specifics of each faculty
Cross-cutting skills	**1. Communication in mother tongue** - ability to express and interpret concepts, thoughts, feelings, facts and opinions, both orally and in written form (listening, speaking, reading and writing) and to interact linguistically in an appropriate and creative way in a full range of cultural and social contexts; **2. Communication in foreign languages** - which, in addition to the main dimensions of communication in the mother tongue, it also involves mediation skills and intercultural understanding. The level of knowledge depends on several factors and the ability to listen, speak, read and writing; **3. Mathematical skills and basic science and technology skills** - ability to develop and apply mathematical thinking to solve different problems in different situations everyday life, focusing on process, activity and knowledge. Core competences science and technology refers to the mastery, use and application of knowledge and methodologies for explaining the world around us. These involve an understanding of the changes caused by human activity and the responsibility of each individual as a citizen; **4. Digital skills** - confident and critical use of technology in society information technology (IST) and thus basic information and communication technology skills (ICT); **5. "Learning to learn"** - the ability of people to pursue and organise their own learning, either individually or in groups, according to their own needs, as well as awareness of methods and opportunities; **6. Social and civic competences** - personal, interpersonal and intercultural competences and all forms of behaviour that enable each person to participate effectively and constructive to social and professional life. These competences are linked to well-being personal and social. It is essential to understand the codes of conduct and customs in different environments in which people work. Civic competences, in particular knowledge of concepts and social and political structures (democracy, justice, equality, citizenship and civil rights), make possible for people to participate actively and democratically; **7. Initiative and entrepreneurship** - the ability to turn ideas into action. This creativity, innovation and risk-taking, as well as the ability to plan and manage projects to achieve objectives. The person is aware of context of its own activity and is able to seize opportunities that arise. This is the foundation for the acquisition of more specialised skills and knowledge needed by those establishing or contributing to a social or commercial activity. This should include raising awareness of ethical values and promoting good governance; **8. Cultural awareness and expression** - appreciation of the importance of cultural expression of ideas, ideas experiences and emotions through a range of channels (music, theatre, literature and visual arts).

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Acquiring soft skills in non-formal and informal education contexts through voluntary involvement in activities within non-governmental organisations. - increasing employability through the development of labour market compatible skills - improving the

	quality of voluntary work or as a stepping stone to more complex voluntary activities
7.2 Specific objectives	1. Knowledge and understanding (knowledge and appropriate use of Understanding of the relevance of the work of the teacher in the subject) Volunteering in the context of the profile of the specialization pursued - Highlighting the particularities of different non-governmental organizations in society as a whole; - Understanding the functioning of public non-governmental organizations in Romania from the perspective of the legal regulations in force. 2. Explanation and interpretation (explaining and interpreting ideas, Explaining the role of volunteering activities from the perspective of current relevance - Interpreting NGO activities from a critical and comparative perspective - Critical reporting on life and its real issues as a result of involvement in volunteering activities. 3. Instrumental-applicative (designing, conducting and evaluating specific practical activities; using methods, techniques and tools for investigation and application) - Participating in concrete volunteering activities according to the NGO's activity profile and own interests; - Developing a Volunteering Portfolio; 4. Attitudinal (displaying a positive and responsible attitude towards the scientific field / cultivating a scientific environment centred on democratic values and relations / promoting a system of cultural, moral and civic values / making the most of one's own potential in scientific activities / involvement in institutional development and the promotion of scientific innovations / engaging in partnership relations with other people and institutions with similar responsibilities / participating in one's own professional development) - stimulating interest in voluntary work, citizenship and social responsibility;

8. Content

Bibliography

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A. Models of good practice or relevant projects carried out at European level which have had significant components focusing on the recognition of competences developed through volunteering:

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8. Model rubric - competency self-assessment model

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- http://www.dji.de/5_kompetenznachweis/KB_Kompetenzbilanz_281206.pdf 10.Service Learning - method promoted in Slovakia at Matej University Bel 11.Experience, Learning, Description - Toolkit for the recognition of non-formal and informal learning in Sweden - http://eldkompetens.se
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Komprax - Competences for practice, project promoted by Iuventa Slovakia (www.iuventa.sk)
14. Benevol - project implemented in Switzerland
15. Nefix - project implemented in Slovenia
16. Online resources:www.europass.ro, www.youthpass.eu, www.tvet.ro, www.ise.ro
17. ECTS Users' Guide - http://europass.cedefop.europa.eu/en/documents/european-skillspassport/diplomasupplement/info-for-necs/ects-user-guide/pdf.pdf
18. GUIDE FOR THE RECOGNITION OF COMPETENCES ACQUIRED THROUGH VOLUNTEERING - http://www.voluntariat.ro/download/Ghid_pt_recunoasterea_competentelor_dobandite_prin_voluntariat.pdf

B. Relevant reports in the field of volunteering and non-formal education:
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2. "Volunteering Infrastructure in Europe - http://www.alliancenetwork.eu/uploads/Alliance%20documents/Other%20documents%20Volunteering%
20and%20Youth/CEV_Vol unteering%20infrastructure.pdf
3. Report of the conference ''Bridges for recognition'' (January 2005) www.salto-youth.net
4. Report ''European inventory on validation of non-formal and informal learning'' (published by Cedefop).
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9. Correlation of subject content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field of the programme

The content of the subject is in line with the European Union's concern to encourage voluntary activities and to recognise the skills acquired as a result.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Course	Running the volunteer placement. Drafting the portfolio of volunteering	Volunteering portfolio	70%
10.5 Seminar/Workshop/Project		Evaluation report from host organisation side	30%

Date of completion:

Date of approval in the Faculty Council — Dean

Date approved by the Board of Directors — RECTOR
Prof.dr.ing. Vasile ȚOPA

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	304.00

2. Discipline data

2.1 Name of subject	Volunteering 4				
2.2 Course holder	*Title Name First name - Email address*				
2.3 Holder of seminar/lab/project activities	*Title Name First name - Email address*				
2.4 Year of study	2	2.5 Semester	2	2.6 Type of evaluation	V
2.7 Discipline regime	Formative category				DC
	Optional				DFac

3. Total estimated time

3.1 Number of hours per week		of which:	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	
3.4 Number of hours per semester	50	of which:	3.5 Course		3.6 Seminar		3.6 Laboratory	14	3.6 Project	

3.7 Distribution of time fund (hours per semester) for:	
(a) Study according to textbook, course material, bibliography and notes	
(b) Further documentation in the library, on electronic specialist platforms and in the field	
(c) Preparation of seminars/labs, homework, papers, portfolios and essays	
(d) Mentoring	
(e) Examinations	
(f) Other activities: Volunteer placement in a student organisation	50

3.8 Total individual study hours (sum (3.7(a)...3.7(f)))	36
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credits	2

4. Prerequisites (where applicable)

4.1 of curriculum	-
4.2 competences	-

5. Conditions (where applicable)

5.1. of the volunteer placement	- the existence of an institutional protocol between UTCN and NGOs - NGO projects in which UTCN volunteers can be involved

6. Specific competences acquired

Professional skills	According to the specifics of each faculty
Cross-cutting skills	**1. Communication in mother tongue** - ability to express and interpret concepts, thoughts, feelings, facts and opinions, both orally and in written form (listening, speaking, reading and writing) and to interact linguistically in an appropriate and creative way in a full range of cultural and social contexts; **2. Communication in foreign languages** - which, in addition to the main dimensions of communication in the mother tongue, it also involves mediation skills and intercultural understanding. The level of knowledge depends on several factors and the ability to listen, speak, read and writing; **3. Mathematical skills and basic science and technology skills** - ability to develop and apply mathematical thinking to solve different problems in different situations everyday life, focusing on process, activity and knowledge. Core competences science and technology refers to the mastery, use and application of knowledge and methodologies for explaining the world around us. These involve an understanding of the changes caused by human activity and the responsibility of each individual as a citizen; **4. Digital skills** - confident and critical use of technology in society information technology (IST) and thus basic information and communication technology skills (ICT); **5. "Learning to learn"** - the ability of people to pursue and organise their own learning, either individually or in groups, according to their own needs, as well as awareness of methods and opportunities; **6. Social and civic competences** - personal, interpersonal and intercultural competences and all forms of behaviour that enable each person to participate effectively and constructive to social and professional life. These competences are linked to well-being personal and social. It is essential to understand the codes of conduct and customs in different the environments in which people work. Civic competences, in particular knowledge of concepts and social and political structures (democracy, justice, equality, citizenship and civil rights), make possible for people to participate actively and democratically; **7. Initiative and entrepreneurship** - the ability to turn ideas into action. This creativity, innovation and risk-taking, as well as the ability to plan and manage projects to achieve objectives. The person is aware of context of its own activity and is able to seize opportunities that arise. This is the foundation for the acquisition of more specialised skills and knowledge needed by those establishing or contributing to a social or commercial activity. This should include raising awareness of ethical values and promoting good governance; **8. Cultural awareness and expression** - appreciation of the importance of cultural expression of ideas, ideas experiences and emotions through a range of channels (music, theatre, literature and visual arts).

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Acquiring soft skills in non-formal and informal education contexts through voluntary involvement in activities within non-governmental organisations. - increasing employability through the development of labour market compatible skills - improving the

	quality of voluntary work or as a stepping stone to more complex voluntary activities
7.2 Specific objectives	1. Knowledge and understanding (knowledge and appropriate use of Understanding of the relevance of the work of the teacher in the subject) Volunteering in the context of the profile of the specialization pursued - Highlighting the particularities of different non-governmental organizations in society as a whole; - Understanding the functioning of public non-governmental organizations in Romania from the perspective of the legal regulations in force. 2. Explanation and interpretation (explaining and interpreting ideas, Explaining the role of volunteering activities from the perspective of current relevance - Interpreting NGO activities from a critical and comparative perspective - Critical reporting on life and its real issues as a result of involvement in volunteering activities. 3. Instrumental-applicative (designing, conducting and evaluating specific practical activities; using methods, techniques and tools for investigation and application) - Participating in concrete volunteering activities according to the NGO's activity profile and own interests; - Developing a Volunteering Portfolio; 4. Attitudinal (displaying a positive and responsible attitude towards the scientific field / cultivating a scientific environment centred on democratic values and relations / promoting a system of cultural, moral and civic values / making the most of one's own potential in scientific activities / involvement in institutional development and the promotion of scientific innovations / engaging in partnership relations with other people and institutions with similar responsibilities / participating in one's own professional development) - stimulating interest in voluntary work, citizenship and social responsibility;

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18. GUIDE FOR THE RECOGNITION OF COMPETENCES ACQUIRED THROUGH VOLUNTEERING - http://www.voluntariat.ro/download/Ghid_pt_recunoasterea_competentelor_dobandite_prin_voluntariat.pdf

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The content of the subject is in line with the European Union's concern to encourage voluntary activities and to recognise the skills acquired as a result.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Course	Running the volunteer placement. Drafting the portfolio of volunteering	Volunteering portfolio	70%
10.5 Seminar/Workshop/Project		Evaluation report from host organisation side	30%

Date of completion:

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SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	305.00

2. Discipline data

2.1 Name of subject	Volunteering 5				
2.2 Course holder	*Title Name First name - Email address*				
2.3 Holder of seminar/lab/project activities	*Title Name First name - Email address*				
2.4 Year of study	3	2.5 Semester	1	2.6 Type of evaluation	V
2.7 Discipline regime	Formative category				DC
	Optional				DFac

3. Total estimated time

3.1 Number of hours per week		of which:	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	
3.4 Number of hours per semester	50	of which:	3.5 Course		3.6 Seminar		3.6 Laboratory	14	3.6 Project	

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3.8 Total individual study hours (sum (3.7(a)...3.7(f)))	36
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credits	2

4. Prerequisites (where applicable)

4.1 of curriculum	-
4.2 competences	-

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10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Course	Running the volunteer placement. Drafting the portfolio of volunteering	Volunteering portfolio	70%
10.5 Seminar/Workshop/Project		Evaluation report from host organisation side	30%

Date of completion:

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SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	306.00

2. Discipline data

2.1 Name of subject	Volunteering 6					
2.2 Course holder	*Title Name First name - Email address*					
2.3 Holder of seminar/lab/project activities	*Title Name First name - Email address*					
2.4 Year of study	3	2.5 Semester	2	2.6 Type of evaluation		V
2.7 Discipline regime	Formative category					DC
	Optional					DFac

3. Total estimated time

3.1 Number of hours per week		of which:	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	
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(e) Examinations	
(f) Other activities: Volunteer placement in a student organisation	50

3.8 Total individual study hours (sum (3.7(a)...3.7(f)))	36
3.9 Total hours per semester (3.4+3.8)	50
3.10 Number of credits	2

4. Prerequisites (where applicable)

4.1 of curriculum	-
4.2 competences	-

5. Conditions (where applicable)

5.1. of the volunteer placement	- the existence of an institutional protocol between UTCN and NGOs - NGO projects in which UTCN volunteers can be involved

6. Specific competences acquired

Professional skills	According to the specifics of each faculty
Cross-cutting skills	**1. Communication in mother tongue** - ability to express and interpret concepts, thoughts, feelings, facts and opinions, both orally and in written form (listening, speaking, reading and writing) and to interact linguistically in an appropriate and creative way in a full range of cultural and social contexts; **2. Communication in foreign languages** - which, in addition to the main dimensions of communication in the mother tongue, it also involves mediation skills and intercultural understanding. The level of knowledge depends on several factors and the ability to listen, speak, read and writing; **3. Mathematical skills and basic science and technology skills** - ability to develop and apply mathematical thinking to solve different problems in different situations everyday life, focusing on process, activity and knowledge. Core competences science and technology refers to the mastery, use and application of knowledge and methodologies for explaining the world around us. These involve an understanding of the changes caused by human activity and the responsibility of each individual as a citizen; **4. Digital skills** - confident and critical use of technology in society information technology (IST) and thus basic information and communication technology skills (ICT); **5. "Learning to learn"** - the ability of people to pursue and organise their own learning, either individually or in groups, according to their own needs, as well as awareness of methods and opportunities; **6. Social and civic competences** - personal, interpersonal and intercultural competences and all forms of behaviour that enable each person to participate effectively and constructive to social and professional life. These competences are linked to well-being personal and social. It is essential to understand the codes of conduct and customs in different the environments in which people work. Civic competences, in particular knowledge of concepts and social and political structures (democracy, justice, equality, citizenship and civil rights), make possible for people to participate actively and democratically; **7. Initiative and entrepreneurship** - the ability to turn ideas into action. This creativity, innovation and risk-taking, as well as the ability to plan and manage projects to achieve objectives. The person is aware of context of its own activity and is able to seize opportunities that arise. This is the foundation for the acquisition of more specialised skills and knowledge needed by those establishing or contributing to a social or commercial activity. This should include raising awareness of ethical values and promoting good governance; **8. Cultural awareness and expression** - appreciation of the importance of cultural expression of ideas, ideas experiences and emotions through a range of channels (music, theatre, literature and visual arts).

7. Objectives of the subject (from the grid of specific competences acquired)

7.1 General objective of the subject	Acquiring soft skills in non-formal and informal education contexts through voluntary involvement in activities within non-governmental organisations. - increasing employability through the development of labour market compatible skills - improving the

	quality of voluntary work or as a stepping stone to more complex voluntary activities
7.2 Specific objectives	1. Knowledge and understanding (knowledge and appropriate use of Understanding of the relevance of the work of the teacher in the subject) Volunteering in the context of the profile of the specialization pursued - Highlighting the particularities of different non-governmental organizations in society as a whole; - Understanding the functioning of public non-governmental organizations in Romania from the perspective of the legal regulations in force. 2. Explanation and interpretation (explaining and interpreting ideas, Explaining the role of volunteering activities from the perspective of current relevance - Interpreting NGO activities from a critical and comparative perspective - Critical reporting on life and its real issues as a result of involvement in volunteering activities. 3. Instrumental-applicative (designing, conducting and evaluating specific practical activities; using methods, techniques and tools for investigation and application) - Participating in concrete volunteering activities according to the NGO's activity profile and own interests; - Developing a Volunteering Portfolio; 4. Attitudinal (displaying a positive and responsible attitude towards the scientific field / cultivating a scientific environment centred on democratic values and relations / promoting a system of cultural, moral and civic values / making the most of one's own potential in scientific activities / involvement in institutional development and the promotion of scientific innovations / engaging in partnership relations with other people and institutions with similar responsibilities / participating in one's own professional development) - stimulating interest in voluntary work, citizenship and social responsibility;

8. Content

Bibliography Bibliography **A. Models of good practice or relevant projects carried out at European level which have had significant components focusing on the recognition of competences developed through volunteering:** 1. Key competences for lifelong learning, Recommendation 2006/962/EC of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning [Official Journal L 394 of 30.12.2006]. 2. List of key competences, common to several occupations, approved by the CNFPA Decision no. 86/24.06.2008 3. Key competences for a changing world, Draft Joint Progress Report for 2010 Council and Commission Decision on the implementation of the Education and Training 2010 work programme, reproduced in full in Official Journal of the European Union 2010/C 117/01. 5. Validation of Prior Learning (VPL) - method promoted by Movisie International (Netherlands centre for social development) 6. Vskills - an approach promoted by Volunteer Development Scotland (www.vds.org.uk) 7. Volunteer Card (Ehrenamtskarte) - service promoted by the Federal Government of the Rhine-Westphalia Region (Germany) http://www.ehrensache.nrw.de/ 8. Model rubric - competency self-assessment model

9. Competence assessment (Kompetenzbilanz aus Freiwilligen-Engagement) - model developed in Germany
- http://www.dji.de/5_kompetenznachweis/KB_Kompetenzbilanz_281206.pdf 10.Service Learning - method promoted in Slovakia at Matej University Bel 11.Experience, Learning, Description - Toolkit for the recognition of non-formal and informal learning in Sweden - http://eldkompetens.se
12. Certificate Generator (Nachweisgenerator)- service developed online in Germany - http://www.nachweisgenerator.de/
Komprax - Competences for practice, project promoted by Iuventa Slovakia (www.iuventa.sk)
14. Benevol - project implemented in Switzerland
15. Nefix - project implemented in Slovenia
16. Online resources:www.europass.ro, www.youthpass.eu, www.tvet.ro, www.ise.ro
17. ECTS Users' Guide - http://europass.cedefop.europa.eu/en/documents/european-skillspassport/diplomasupplement/info-for-necs/ects-user-guide/pdf.pdf
18. GUIDE FOR THE RECOGNITION OF COMPETENCES ACQUIRED THROUGH VOLUNTEERING - http://www.voluntariat.ro/download/Ghid_pt_recunoasterea_competentelor_dobandite_prin_voluntariat.pdf

B. Relevant reports in the field of volunteering and non-formal education:

1. Sunshine Report on Non-Formal Education, published by the European Youth Forum http://www.youthforum.org/OLD/?q=en/node/162
2. "Volunteering Infrastructure in Europe - http://www.alliancenetwork.eu/uploads/Alliance%20documents/Other%20documents%20Volunteering%
20and%20Youth/CEV_Vol unteering%20infrastructure.pdf
3. Report of the conference ''Bridges for recognition'' (January 2005) www.salto-youth.net
4. Report ''European inventory on validation of non-formal and informal learning'' (published by Cedefop).
5. European portfolio for youth leaders, report published by the Council of Europe

9. Correlation of subject content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field of the programme

The content of the subject is in line with the European Union's concern to encourage voluntary activities and to recognise the skills acquired as a result.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Course	Running the volunteer placement. Drafting the portfolio of volunteering	Volunteering portfolio	70%
10.5 Seminar/Workshop/Project		Evaluation report from host organisation side	30%

Date of completion:

Date of approval in the Faculty Council — Dean

Date approved by the Board of Directors — RECTOR
Prof.dr.ing. Vasile ȚOPA

SUBJECT SHEET

1. Programme data

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Industrial Engineering, Robotics and Production Management
1.3 Department	Design Engineering and Robotics
1.4 Field of study	Mechatronics and Robotics
1.5 Cycle of studies	License
1.6 Study programme / Qualification	Robotics Engineer
1.7 Form of education	IF - full-time education
1.8 Discipline code	307.00

2. Discipline data

2.1 Name of subject	Volunteering 7				
2.2 Course holder	*Title Name First name - Email address*				
2.3 Holder of seminar/lab/project activities	*Title Name First name - Email address*				
2.4 Year of study	4	2.5 Semester	1	2.6 Type of evaluation	V
2.7 Discipline regime	Formative category				DC
	Optional				DFac

3. Total estimated time

3.1 Number of hours per week		of which:	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	
3.4 Number of hours per semester	50	of which:	3.5 Course		3.6 Seminar		3.6 Laboratory	14	3.6 Project	

3.7 Distribution of time fund (hours per semester) for:	
(a) Study according to textbook, course material, bibliography and notes	
(b) Further documentation in the library, on electronic specialist platforms and in the field	
(c) Preparation of seminars/labs, homework, papers, portfolios and essays	
(d) Mentoring	
(e) Examinations	
(f) Other activities: Volunteer placement in a student organisation	50

3.8 Total individual study hours (sum (3.7(a)...3.7(f)))	36
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17. ECTS Users' Guide - http://europass.cedefop.europa.eu/en/documents/european-skillspassport/diplomasupplement/info-for-necs/ects-user-guide/pdf.pdf
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10.5 Seminar/Workshop/Project		Evaluation report from host organisation side	30%

Date of completion:

Date of approval in the Faculty Council

Dean

Date approved by the Board of Directors

RECTOR
Prof.dr.ing. Vasile ȚOPA

FIŞA DISCIPLINEI

1. Date despre program

1.1 Instituţia de învăţământ superior	Universitatea Tehnică din Cluj-Napoca
1.2 Facultatea	Inginerie Industrială, Robotică și Managementul Producției
1.3 Departamentul	Ingineria Proiectarii si Robotica
1.4 Domeniul de studii	Mecatronică și Robotică
1.5 Ciclul de studii	Licenţă
1.6 Programul de studii / Calificarea	Robotică / Inginer
1.7 Forma de învăţământ	IF – învăţământ cu frecvenţă
1.8 Codul disciplinei	202

2. Date despre disciplină

2.1 Denumirea disciplinei	Pedagogie II (Teoria și metodologia instruirii. Teoria și metodologia evaluării)				
2.2 Aria de conţinut	Științe ale educației				
2.3 Titularul de curs	*Conf. univ. dr. Liana Crișan-Tăușan - liana.tausan@dppd.utcluj.ro*				
2.4 Titularul activităţilor de seminar / laborator / proiect	*Conf. univ. dr. Liana Crișan-Tăușan - liana.tausan@dppd.utcluj.ro*				
2.5 Anul de studiu	2	2.6 Semestrul	1	2.7 Tipul de evaluare	E
2.8 Regimul disciplinei	Categoria formativă				DF
	Opționalitate				DOB

3. Timpul total estimate

3.1 Număr de ore pe săptămână	4	din care:	3.2 Curs	2	3.3 Seminar	2	3.3 Laborator	-	3.3 Proiect	-
3.4 Număr de ore pe semestru	56	din care:	3.5 Curs	28	3.6 Seminar	28	3.6 Laborator	-	3.6 Proiect	-

3.7 Distribuţia fondului de timp (ore pe semestru) pentru:	
(a) Studiul după manual, suport de curs, bibliografie şi notiţe	20
(b) Documentare suplimentară în bibliotecă, pe platforme electronice de specialitate şi pe teren	20
(c) Pregătire seminarii / laboratoare, teme, referate, portofolii şi eseuri	25
(d) Tutoriat	0
(e) Examinări	4
(f) Alte activităţi:	0

3.8 Total ore studiu individual (suma (3.7(a)...3.7(f)))	69
3.9 Total ore pe semestru (3.4+3.8)	125
3.10 Numărul de credite	5

4. Precondiţii (acolo unde este cazul)

4.1 de curriculum	• Psihologia educației • Pedagogie I
4.2 de competenţe	• Competențe formate ca urmare a studierii disciplinelor Psihologia educației, Pedagogie I

5. Condiţii (acolo unde este cazul)

5.1. de desfăşurare a cursului	• Participare activă • Sală de curs dotată cu videoproiector, tablă, flip-chart • Desfășurare online sau onsite (după caz)
5.2. de desfăşurare a seminarului / laboratorului / proiectului	• Lectura bibliografiei recomandate • Documentare suplimentară • Elaborarea şi susţinerea prezentărilor planificate • Participare activă • Desfășurare online sau onsite (după caz)

6. Competenţele specifice acumulate

Competenţe profesionale	C1: Proiectarea unor programe de instruire sau educaţionale adaptate pentru diverse niveluri de vârstă/pregătire şi diverse grupuri ţintă; C2: Realizarea activităţilor specifice procesului instructiv-educativ din învăţământul gimnazial; C3: Evaluarea proceselor de învăţare, a rezultatelor şi a progresului înregistrat de elevi; C6:Autoevaluarea şi ameliorarea continuă a practicilor profesionale şi a evoluţiei în carieră; C7:Utilizarea metodelor de cercetare științifică și prelucrare a datelor în domeniul educației; C8:Aplicarea caracteristicilor învățământului centrat pe elev în proiectarea, implementarea și evaluarea curriculum-ului școlar;
Competenţe transversale	CT1 Aplicarea principiilor si a normelor de deontologie profesionala, fundamentate pe optiuni valorice explicite, specifice specialistului în stiintele educatiei; CT2 Cooperarea eficienta în echipe de lucru profesionale, interdisciplinare, specifice desfasurarii proiectelor si programelor din domeniul stiintelor educatiei; CT3 Utilizarea metodelor si tehnicilor eficiente de învatare pe tot parcursul vietii, în vederea formarii si dezvoltarii profesionale continue; CT4: Promovarea valorilor asociate realizării unui învăţământ de calitate, în conformitate cu politicile educaţionale interne şi în acord cu cele elaborate şi popularizate la nivel european, pe baza cunoașterii specificității domeniului educațional european și a interculturalității.

7. Obiectivele disciplinei (reieşind din grila competenţelor specifice acumulate)

7.1 Obiectivul general al disciplinei	• dobândirea unor competențe vizând cunoașterea, interpretarea, prelucrarea și aplicarea problematicii teoriei și metodologiei instruirii și a teoriei și metodologiei evaluării, a modalităților de organizare a activității școlare pe principiul calităţii şi valorificării eficiente a resurselor;
7.2 Obiectivele specifice	• cunoaşterea semnificaţiei principalelor concepte din cadrul teoriei și metodologiei instruirii și a teoriei și metodologiei evaluării; dezvoltarea capacităţilor de utilizare a conceptelor; • identificarea corectă a referinţelor empirice ale conceptelor pedagogice şi semnificaţiilor conceptuale ale proceselor de predare-învățare-evaluare; • utilizarea corectă şi în contexte variate a terminologiei specifice teoriei şi metodologiei instruirii și teoriei și metodologiei evaluării; • analizarea modalităților de abordare a procesului de învățământ;

	• identificarea unor modalităţi de articulare şi integrare a metodelor şi strategiilor de instruire în procesul de învăţământ; • identificarea unor oportunităţi noi de abordare a metodelor şi procedeelor educaţionale din perspectiva elaborării strategiilor de instruire; • operarea cu conceptele, structurile şi tipologiile implicate în activitatea de evaluare şcolară; • propunerea unor metode şi procedee de evaluare corectă, obiectivă şi semnificativă a performanţelor şcolare ale elevilor; • elaborarea unor proiecte educaţionale, bazate pe strategii didactice coerente, care facilitează stilurile individuale de învăţare şi modurile de organizare a procesului de învăţământ; • elaborarea unor modele de proiectare prin aplicarea normativităţii în activităţile didactice; • dezvoltarea motivaţiei pozitive şi a unei atitudini favorabile faţă de profesia didactică, a receptivităţii şi responsabilităţii faţă de schimbările inovatoare din domeniul didacticii generale;

8. Conţinuturi

8.1 Curs	Nr. ore	Metode de predare	Observaţii
Didactica – teorie generală a procesului de învățământ Paradigme și orientări educaționale actuale Didactica – definire, caracteristici, funcții Obiectul de studiu al didacticii Subramurile didacticii Direcții de dezvoltare a didacticii contemporane	2	prelegerea conversația euristică dezbaterea problematizarea dezbaterea cu oponent imaginar exercițiul de reflecție studii de caz, brainstorming explicația suporturi video (metodele vor fi aplicate în scenariu online sau onsite, după caz)	
Procesul de învăţământ - abordare sistemică Definirea conceptelor: sistem de învăţământ, proces de învăţământ Note definitorii ale procesului de învăţământ Abordarea sistemică a procesului de învăţământ	2		
Procesul de învățământ – abordare comunicațională Comunicarea – concept, structură Forme ale comunicării Comunicarea didactică Definire și caracteristici ale comunicării didactice Elemente structurale ale comunicării didactice Surse de distorsiune în comunicarea didactică. Eficientizarea comunicării didactice	2		
Abordarea interacţională a procesului de învăţământ Predarea – componentă esenţială a procesului de	2		

învăţământ (conceptul de predare: semnificaţii tradiţionale şi moderne; forme ale predării; stiluri de predare) Învățarea (conceptele de învăţare şi învăţare şcolară; stiluri de învățare)			
Sistemul principiilor didactice Principiile didactice: concept, caracteristici Sistemul principiilor didactice Principiul legării teoriei cu practica Principiul accesibilității (al respectării particularităților de vârstă și individuale) Principiul intuiției (al corelației dintre concret și abstract, dintre senzorial și rațional) Principiul sistematizării și continuității în învățare Principiul participării conștiente și active a elevilor Principiul însușirii temeinice	2		
Metodologia didactică Delimitări conceptuale: tehnologie didactică, metodologie didactică, strategie didactică, metodă de învățământ, procedeu didactic Tendințe actuale privind metodologia didactică Metodele de învățământ Metode de comunicare și dobândire a valorilor socioculturale Metode de explorare sistematică a realității obiective Metode fundamentate pe acțiune practică Metode de raționalizare a conținuturilor și operațiilor de predare/învățare	6		
Mijloacele de învăţământ Conceptul de mijloace de învăţământ Funcţiile mijloacelor de învăţământ Taxonomia mijloacelor de învăţământ; Cerinţe de selectare şi utilizare a mijloacelor de învăţământ.	2		
Lecţia – formă de bază a organizării procesului de învăţământ Varietatea formelor de organizare a procesului de învăţământ: concept, evoluție, clasificare Lecţia – formă fundamentală a organizării procesului de învăţământ Definirea lecției Valențe și critici ale lecției Variabile și cerințe pedagogice ale lecției Tipuri fundamentale de lecţii	2		
Evaluarea în procesul de învăţământ Definirea şi analiza conceptelor: evaluare, măsurare, apreciere. Funcţiile evaluării	4		

Forme de evaluare a rezultatelor şi progreselor şcolare: evaluarea iniţială, evaluarea finală (sumativă), evaluarea formativă (continuă), evaluarea formatoare Metode şi tehnici de evaluare a rezultatelor şi progreselor şcolare Erori în evaluarea şcolară. Modalităţi de corectare.			
Proiectarea didactică Proiectarea didactică: concept, caracteristici. Modelul tradițional/modelul curricular al proiectării Etapele proiectării pedagogice Condiţiile unei proiectări pedagogice eficiente Demersurile proiectării didactice la nivel micro Lectura personalizată a programei şi a manualelor şcolare Planificarea calendaristică Proiectarea secvențială a unităților de învățare Proiectarea lecţiilor/ activităţilor didactice	4		

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8.2 Seminar / laborator / proiect	Nr. ore	Metode de predare	Observaţii
Didactica tradițională /didactica modernă. Centrarea pe elev – obiectiv al didacticii moderne.	2	Prezentări, dezbateri, studii de caz, brainstorming, joc de rol, conversația euristică, explicația (metodele vor fi aplicate în scenariu online sau onsite, după caz)	
Abordarea sistemică a procesului de învățământ: componentele procesului de învățământ și relațiile dintre ele.	2		
Comunicarea didactică: elemente structurale, retroacțiuni, surse de distorsiuni, modalități de eficientizare a comunicării didactice.	2		
Interacțiunea proceselor de predare-învățare-evaluare. Condițiile predării eficiente. Condițiile învățării.	2		
Moduri concrete de aplicare a principiilor didactice pe diverse situații de instruire.	2		
Metode de comunicare, metode de explorare a realității, metode bazate pe acțiune practică, metode de raționalizare a conținuturilor – caracteristici, avantaje, limite, exemplificări	4		
Metode interactive, metode de dezvoltare a gândirii critice – caracteristici, exemplificări	4		
Cerinţe pedagogice impuse de desfăşurarea unei lecţii eficiente. Modalităţi de modernizare a lecţiei.	2		
Testul docimologic – cerințe, exemplificări	2		
Modalități practice de atenuare a erorilor în evaluare.	2		
Condiții ale unei proiectări didactice eficiente. Exerciții de proiectare didactică: planificare calendaristică, proiectarea unității de învățare, proiectarea lecției.	2		
Evaluare portofoliu seminar	2		

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9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţii epistemice, asociaţiilor profesionale şi angajatorilor reprezentativi din domeniul aferent programului

- corectitudinea și acuratețea folosirii terminologiei însușite la nivelul disciplinei – vor satisface așteptările reprezentanților comunității epistemice/academice din domeniul științelor educației, competențele procedurale și atitudinale ce vor fi achiziționate la nivelul disciplinei – vor satisface așteptările reprezentanților asociațiilor profesionale și angajatorilor din domeniul științelor educației;

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	Volumul şi corectitudinea cunoştinţelor Rigoarea ştiinţifică a limbajului Organizarea conţinutului Originalitatea Capacitatea de evidențiere a aplicabilității temei teoretice	Portofoliu (electronic sau fizic în funcție de scenariul adoptat online sau onsite) Observarea curentă a participării active a studenților la curs (se va realiza în scenariul online sau onsite, după caz)	30% 30%
10.5 Seminar/Laborator /Proiect	Elaborarea și prezentarea materialelor/elementelor componente ale portofoliului Participare activă la seminarii (dezbateri, analiza și sinteza unor materiale/conținuturi, transpunerea în practică a conținuturilor teoretice, analize critice) Originalitatea și potențialul creativ manifestate de studenți în cadrul activităților de seminar și în întocmirea portofoliului.	Portofoliu (electronic sau fizic în funcție de scenariul adoptat online sau onsite) Observarea curentă a participării active a studenților la seminar (se va realiza în scenariul online sau onsite, după caz)	20% 20%
10.6 Standard minim de performanţă • 50% rezultat după însumarea punctajelor ponderate conform pct.10.3.			

Data completării:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	Curs	Conf. dr. Liana CRIȘAN-TĂUȘAN	
	Aplicații	Conf. dr. Liana CRIȘAN-TĂUȘAN	

Data avizării în Consiliul Departamentului ……..	Director Departament
___________________________	
Data aprobării în Consiliul Facultății ……………	Decan …..
___________________________	

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Machine Building
1.3	Department	Engineering Design and Robotics
1.4	Field of study	Mechatronics and Robotics
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Robotics
1.7	Form of education	Full time
1.8	Subject code	36.10

2. Data about the subject

2.1	Subject name			Hydraulic drives of industrial robots			
2.2	Subject area			DO-DS			
2.3	Course responsible/lecturer			Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro			
2.4	Teachers in charge of seminars			Lecturer PhD Eng. Ionut Chis - ionut.chis@muri.utcluj.ro			
2.5 Year of study	2	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DO

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
Tutoring	4
Exams and tests	2
Other activities	4

3.7	Total hours of individual study	44
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Promotion to disciplines: Materials Engineering, Mechanics, Resistance, Physics, Descriptive Geometry and Technical Drawing

5. Requirements (where appropriate)

5.1	For the course	Tableroom and video projector
5.2	For the applications	Laboratory room for pneumatic and hydraulic drives.

6. Specific competences

Professional competences	• To know the existence, the role and the fields of use of modern systems in hydraulic drives. • Understand the construction and operation of hydraulic devices. • To know the symbolism of hydraulic devices. • Know the structure of modern hydraulic systems and understand the operation of the specific schemes represented symbolically.
Cross competences	• Knowing new systems of modern hydraulic drives. • Calculate the basic parameters of a hydraulic system. • Identify hydraulic devices after symbolism. • To inspect the functioning of the hydraulic systems according to the devices that compose them. • Design modern drive systems using specific symbols. • Include the assimilated knowledge in the structure of the systems of action.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Understand, conceive and use new modern hydraulic systems with high yields and reduced costs.
7.2	Specific objectives	To be able to develop and innovate new hydraulic solutions with high economic and technical efficiency.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Defining the field, compared to mechanical and electrical drives.	Exposure, interactive course	Video projector
2.	Sensors, field-specific transducers and electronic circuits for signal processing provided by them.		
3.	Actuators specific to proportional and servo technique: torsion motor, proportional electromagnet, magneto-strictive motor, piezo-electric motor. Electronic circuits associated with actuators studied,		
4.	Electronic regulators associated with proportional hydraulic devices. Criteria of static performance and dynamics that they have to meet.		
5.	Specific notions of automatic control theory.		
6.	Hydraulic proportional pressure regulating devices: proportional pressure limiting valves, proportional reduction valves.		
7.	Hydraulic proportional flow control devices: proportional flow droplets and regulators.		

8.	Proportional distributors and servo-distributors. The principle of operation, constructive solutions, performance criteria that they have to meet.		
9.	Pumps with adjustable volume, proportional. Servo-hydraulic systems with closed circuit operation.		
10.	Electro-hydraulic proportional, linear and rotary axles.		
11.	Electro-hydraulic proportional systems.		
12.	Elaboration of functional cycles, Application sizing and design criteria.		
13.	Examples of robot domain applications.		
14.	Examples of robot domain applications.		

Bibliography

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2. C. Ratiu, I. Chis – Actionari hidraulice si penumatice, note de curs.
3. A. Cotentiu – Hidraulica aplicata.
4. I. Cristian – Actionarea hidraulica a robotilor industriali.
5. A. Manring - Hydraulic control systems.
6. Deacu L., Ratiu C. ş.a., Tehnica hidraulicii proporţionale,
7. Ratiu C. Axe electro-hidraulice liniare,
8. Deacu L. Ratiu C. Complemente de electro-pneumatica, format electronic.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Presentation of the laboratory and study topics. Safety and health rules.	Interactive discussions, apparatus analysis, case studies	Hydraulic and pneumatic laboratory
2.	Symbols used in the development of servo-hydraulic schemes. Examples.		
3.	Determination of force / displacement characteristics for a proportional electromagnet.		
4.	Regulatory proportional, integral, derivative. Determination of P, I, and D constants		
5.	Determination of static characteristic, Q = f (p), for droplets and proportional flow regulators.		
6.	Determination of the step signal response for the proportional pressure limiting valve.		
7.	Determining pressure-flow characteristics for a pressure limiting valve.		
8.	Determining the positioning precision of a linear electrohydraulic axis correlated with the displacement speed.		
9.	Determination of positioning precision and static rigidity for a linear electro-pneumatic axis.		
10.	Hydraulic systems with closed circuit operation. Case Study.		
11.	Dimensioning of hydraulic power sources. Sizing of pumps and hydraulic reservoirs.		
12.	Use of hydraulic accumulators. Criteria for use.		

13.	Servo-hydraulic circuits with robot-specific linear motors. Case Study.		
14.	Servo-hydraulic circuits with oscillating / rotating robot motors. Case Study.		

Bibliography

1. M. Manescu – Probleme rezolvate si propuse.
2. C. Ratiu, I. Chis – Actionari hidraulice si penumatice, indrumator de laborator.
3. I. Cristian – Actionarea hidraulica a robotilor industriali.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The competences gained during the course of Hydraulic Action of Industrial Robots will be required for the students involved in the automation and robotization of certain processes in the industry in order to increase the fence of the technical and economic efficiency of these processes.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Exam written with questions from the lessons learned.	Written test	60%
Applications	Designing an application with one of the devices studied in the laboratory.	Written test	40%
10.4 Minimum standard of performance			
Calculation mode final grade NF = 0.6 * NT + 0.4 * NA Nf - final note; NT - Theory; NA - Laboratory application note. It is necessary to get a minimum grade of 5 for the NT and NA examination to pass the exam.			

Date of filling in:		**Title Surname Name**	**Signature**
	Lecturer	Lecturer PhD Eng. Ionut Chis	
	Teachers in charge of application	Lecturer PhD Eng. Ionut Chis	

Date of approval in the department ……..	Head of department Prof.dr.ing.
__________________________	
Date of approval in the faculty ……………	Dean Prof.dr.ing.
__________________________	