COURSE GUIDE

Academic year 2025-2026

1. Date despre program

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iași
1.2 Faculty	Machine Manufacturing and Industrial Management
1.3 Department	Machine Manufacturing Technology
1.4 Field	Industrial Engineering
1.5 Study level[1]	Master of science
1.6 Study program	Intelligent Manufacturing and Automation

2. Course info

2.1.1 Course name – (în limba română) (în limba engleză, conform Suplimentului la diplomă)							
2.1.2. Code					2.1.3. Formative Category		DS
2.2 Course organizer (lecturer)				Assoc. prof. Adriana MUNTEANU, PhD			
2.3 Teaching assistants (S, L, P, Pr)				Assoc. prof. Adriana MUNTEANU, PhD			
2.4 Year of study[2]	1	2.5 Semester[3]	1	2.6 Assessement[4]	**V**	2.7 Type of subject[5]	DOB

3. Timpul total estimat al activităţilor zilnice (ore pe semestru)

3.1 Număr de ore pe săptămână	3	3.2 curs	1	3.3a sem.		3.3b laborator	2	3.3c proiect		3.3.d practică	
3.4 Total ore din planul de învăţământ[6]	42	3.5 curs	14	3.6a sem.		3.6b laborator	28	3.6c proiect		3.6.d practică	

Distribuţia fondului de timp[7]	Nr. ore
Studiul după manual, suport de curs, bibliografie şi notiţe	28
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate şi pe teren	22
Pregătire seminarii/ laboratoare/ proiecte, teme, referate şi portofolii	16
Examinări[8]	8
Alte activităţi:	4

3.7 Total ore studiu individual[9]	78
3.8 Total ore pe semestru[10]	120
3.9 Numărul de credite	5

4. Prerequisites (where applicable)

4.1 Curricula type[12]	
4.2 Competence type	Physics, Mathematics, Computer programming

5. Infrastructure (where applicable)

5.1. for lectures[13]	Computers connected to Internet, Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers
5.2. for laboratories[14]	Computer assisted experimental research features, computer software (data and signal processing), manufacturing systems, sensors, data acquisition systems

6. General objective of the discipline

The general objective of this discipline is to develop students' and researchers' capacity to apply experimental, computer-aided methods for the design, analysis, optimization, and intelligent control of modern manufacturing systems. It aims to provide a comprehensive understanding of how computer-based experimentation, data acquisition, signal processing, and intelligent diagnostic tools can be integrated to improve the precision, reliability, and efficiency of manufacturing processes. The course emphasizes the development and implementation of computer-aided experimental systems to support research, evaluation, and decision-making in the field of intelligent manufacturing.

7. Learning outcomes [14]

Knowledge	The student/graduate: - explains the objectives and role of experimental computer-aided research in the design, operation, and optimization of intelligent manufacturing systems; - evaluates the effectiveness of computer-aided methodologies for inspection, precision measurement, and dynamic behavior analysis in intelligent manufacturing environments; - defines the key concepts, parameters, and indicators related to computer-aided experimentation, signal processing, and condition diagnosis - uses computer-aided tools and experimental techniques to analyze dimensional, positional, and dynamic properties of manufacturing systems; - applies research methodologies and diagnostic approaches to assess and optimize the performance, precision, and energy efficiency of intelligent manufacturing systems
Skills	The student/graduate: - uses computer-aided experimental systems, sensors, and software tools to acquire and process data in intelligent manufacturing research; - plans experimental research procedures for the analysis, optimization, and diagnosis of intelligent manufacturing systems; - operates computer-aided inspection and monitoring equipment to evaluate dimensional accuracy, displacement, position, and system dynamics; - critically evaluates the performance, precision, and operational behavior of intelligent manufacturing systems based on experimental data and diagnostic indicators.
Responsibility and autonomy	The student/graduate: - respects the principles, norms, and values of ethics in the correct and timely execution of professional tasks, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - assumes responsibilities in order to contribute to professional knowledge and practices and/or to review the strategic performance of teams; - continuously seeks information and documentation in their field of activity through the appropriate use of effective lifelong learning methods and techniques.

8. Teaching method

In the teaching activity, participatory lectures and debates will be used, based on PowerPoint presentations that will be made available to students. The presentations include images and sketches so that the information is easy to understand and assimilate. Each lecture will begin with a brief review of the concepts covered in the previous session.

The teaching method is also based on discovery learning models facilitated by direct and indirect exploration of reality (experiment, demonstration, modeling), as well as on action-based methods such as exercises, practical activities, and problem-solving.

9. Contents

9. 1. Lectures [15]	**Teaching methods19**	**Notes**
The main objectives and the role of experimental computer aided research in intelligent manufacturing systems design, exploitation and optimization.	An exhaustive and interactive presentation of the issues, using the course support notes and other resources available from the literature and on the web.	1 hour
A glimpse in the architecture of computer aided experimental research systems (structure, components, sensors, data acquisition, signal processing and software).		2 hours
Research methodology, data/signal acquirement and processing in experimental computer aided inspection (CAI) of dimensional properties of manufactured objects.		4 hours
Research methodology and data/signal acquire and processing in experimental computer aided study of precision and accuracy of displacement, position, and trajectories on intelligent manufacturing systems.		2 hours
Research principles and methodology in computer aided research of dynamic behaviour of intelligent manufacturing systems.		2 hours

Computer aided condition diagnosis in intelligent manufacturing systems based on the evolution of parameters of input electrical energy flow.		2 hours
Some considerations on the synthesis of the autonomous computerized systems for self-correction of errors in intelligent manufacturing.		1 hour

References:

1. Munteanu A., Computer assisted measurements, course support notes (in progress).
2. Horodinca M., Computer assisted experimental research, course support notes (in progress).
3. Horodinca M., Laboratory experiments on dynamics of cantilever beams, Performantica Edition, Iasi, Romania 2014.
4. SantnerBrian J., WilliamsWilliam J., Notz I., The Design and Analysis of Computer Experiments, Springer, 2003.
5. Oehlert G. W., A First Course in Design and Analysis of Experiments, University of Minnesota, http://users.stat.umn.edu/~gary/book/fcdae.pdf (accessed on 23.11.2021).
6. Montgomery D. C., Design and Analysis of Experiments, Eighth Edition, John Wiley & Sons, Inc, 2013. http://www.ru.ac.bd/stat/wp-content/uploads/sites/25/2019/03/502_06_Montgomery-Design-and-analysis-of-experiments-2012.pdf (accessed on 23.11.2021).

9.2b Laboratory	**Teaching methods** [17]	**Notes**
Computer aided experimental research of the shape accuracy of manufactured objects (data acquisition).	Practical demonstrations, experiments and exercises	2 hour
Computer aided experimental research of the shape accuracy of manufactured objects (data processing).		2 hours
Computer aided experimental research of the surface quality of manufactured objects (data acquisition and processing).		2 hours
Computer aided experimental research on the precision and accuracy of circular trajectories on manufacturing systems.		4 hours
Computer aided experimental research on dynamics of manufacturing systems.		2 hours
Computer aided experimental research on the mirroring of transient regimes in the evolution of the constituents of input electric power flow		2 hours

References:

1. Munteanu A., Computer assisted measurements, course support notes (in progress).
2. Horodinca M., Computer assisted experimental research, course support notes (in progress).
3. Horodinca M., Laboratory experiments on dynamics of cantilever beams, Performantica Edition, Iasi, Romania 2014.
4. Santner Brian J., Williams William J., Notz I., The Design and Analysis of Computer Experiments, Springer, 2003.
5. Oehlert G. W., A First Course in Design and Analysis of Experiments, University of Minnesota, http://users.stat.umn.edu/~gary/book/fcdae.pdf (accessed on 18.11.2021).
6. Montgomery D. C., Design and Analysis of Experiments, Eighth Edition, John Wiley & Sons, Inc, 2013. http://www.ru.ac.bd/stat/wp-content/uploads/sites/25/2019/03/502_06_Montgomery-Design-and-analysis-of-experiments-2012.pdf (accessed on 18.11.2021).

10. Assessment

Activity type	**10.1 Assessment criteria**	**10.2 Assessment methods**		**10.3 Percentage of final mark**
10.4a Verification	Theoretical acquired knowledge (quantity and correctness)	Tests along the semester 2 (week 6 and 10)	20%	60%
		Homework: 1	10%	
		Final assessment: Verification	70%	
10.5 Laboratory	Theoretical and experimental knowledge and skills: experiment organization, experimental setup structure, data and signals acquisition, signal processing, result analysis.	The accomplishment of experimental tasks of each laboratory The accomplishment of a report with the results of data and signal processing on each laboratory		40%
10.6 Minimum assessment passes conditions: -handing over the laboratory works at the established term; -the minimum mark 5 at the final assessment.				

The final assessment result for a subject results from considering the scores and weights assigned to each activity within the subject. Whole marks from 10 to 1 will be awarded, with a mark of 5 certifying the acquisition of the minimum learning outcomes related to a subject and the granting of study credits related to it.

Completion date 22.09.2025
Course organizer signature, Assoc. Prof. Adriana MUNTEANU, PhD
Teaching assistant signature, Assoc. Prof. Adriana MUNTEANU, PhD

Date of validation in SPD Depatment: 26.09.2025

Department director signature,,
Prof. Catalin Gabriel DUMITRAS

CMMI approval date,

Dean,

Assoc. Prof. Florin NEGOESCU, PhD

FIȘA DISCIPLINEI

Anul universitar 2025-2026

1. Date despre program

1.1 Instituția de învățământ superior	Universitatea Tehnică „Gheorghe Asachi” din Iași
1.2 Facultatea	Construcții de Mașini și Management Industrial
1.3 Departamentul	Tehnologia Construcțiilor de Mașini
1.4 Domeniul de studii	Inginerie industrială
1.5 Ciclul de studii[1]	Master
1.6. Programul de studii	Intelligent Manufacturing and Automation

2. Date despre disciplină

2.1.1 Denumirea disciplinei – (în limba română) (în limba engleză, conform Suplimentului la diplomă)				**Proiectare Tehnologică Avansată** **Advanced Computer Aided Technological Design**			
2.1.2. Codul disciplinei				FAI-IA-107	2.1.3. Categoria formativă		DA
2.2 Titularul/ titularii activităților de curs				*Conf. univ. dr. ing. Andrei Marius Mihalache*			
2.3 Titularul/ titularii activităților de aplicații (S, L, P, Pr)				*Conf. univ. dr. ing. Andrei Marius Mihalache*			
2.4 Anul de studii[2]	1	2.5 Semestrul[3]	2	2.6 Tipul de evaluare[4]	E	2.7 Opționalitate[5]	DI

3. Timpul total estimat al activităților zilnice (ore pe semestru)

3.1 Număr de ore pe săptămână	2	3.2 curs	1	3.3a sem.	-	3.3b laborator	1	3.3c proiect	-	3.3.d practică		
3.4 Total ore din planul de învățământ[6]	28	3.5 curs	14	3.6a sem.	-	3.6b laborator	14	3.6c proiect	-	3.6.d	-	

Distribuția fondului de timp[7]	Nr. ore
Studiul după manual, suport de curs, bibliografie și notițe	28
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate și pe teren	14
Pregătire seminarii/ laboratoare/ proiecte, teme, referate și portofolii	28
Examinări[8]	2
Alte activități:	-

3.7 Total ore studiu individual[9]	72
3.8 Total ore pe semestru[10]	100
3.9 Numărul de credite	4

4. Precondiții (acolo unde este cazul)

4.1 de curriculum[11]	
4.2 de rezultate ale învățării	

5. Condiții

5.1 de desfășurare a cursului[12]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers
5.2 de desfășurare a seminarului / laboratorului/ proiectului[13]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers

6. Obiectiv general al disciplinei

The objective of the Advanced Computer Aided Technological Design discipline is for students to acquire in-depth knowledge of the main manufacturing technologies in terms of concepts, specificity, utility, costs, applicability, as well as a comparative multi-criteria analysis of them.

7. Rezultatele învățării (*Exemplu: Disciplina X*)[14]

Cunoștințe	The student/graduate: - explains the links between the operating principles and the processes underlying the manufacturing processes; - compares methods and proposes software solutions necessary for the transfer of the design and manufacturing task to the digital environment; - evaluates the results obtained and uses the results of comparative analyses between certain manufacturing technologies to determine the opportunity for implementation in the production process; - defines and implements the applicable rules of ethics and professional deontology in compliance with the legislation in force; - describes, analyzes and manages possible situations generated by non-compliance with occupational health and safety regulations; - uses updated technical solutions in compliance with the recommendations imposed by manufacturers; - applies the design principles from a technological point of view and adjusts them according to the specifics and limitations of the chosen manufacturing technology.
Abilități	The student/graduate: - uses updated IT solutions in accordance with the requirements imposed by manufacturing technology; - quantitatively and qualitatively evaluates the available technical documentation and interprets the technical conditions; - checks the correspondence between the prescribed characteristics and the functional role of the analyzed parts; - operates, draws up and coordinates tasks for the preparation of a viable project for the processing of parts/assemblies; - operates with laboratory equipment used for the study of the integrity and the proper conduct of manufacturing; - critically evaluates existing processing processes and technologies and proposes solutions for improvement; - appropriately chooses the optimal manufacturing technology.
Responsabilitate și autonomie	The student/graduate: - demonstrates autonomy in learning on issues specific to products, phenomena and mechanical processing processes; - assumes responsibilities to contribute to professional knowledge and practices; - respects the principles, norms and ethical values in order to correctly and on time perform professional tasks; - integrates into the work group and applies correct relationship/collaboration/subordination principles in order to maintain a friendly work climate; - permanently informs and documents himself in his own field of activity by appropriately using effective methods and techniques of lifelong learning; - demonstrates autonomy in learning on issues specific to computer-aided manufacturing technologies; - - selects and uses pertinent (from verified sources) and up-to-date bibliographic sources.

8. Metode de predare

The teaching activity will use participatory lectures and debates based on the presentation of the topics with the review of the main notions that are taught based on permanent dialogue with the students. The presentations contain images and sketches arranged in an interactive manner, so that the information is easy to understand and assimilate. Each course will begin with a brief recapitulation of the notions covered in the previous course.

The teaching method is also based on discovery learning models facilitated by direct and indirect exploration of reality (experimentation, demonstration, modeling), but also on action-based methods, such as exercise, practical activities and problem solving.

9. Conținuturi

9. 1. Curs[15]	**Metode de predare**	**Timp alocat**
Ch. 1. The concept of computer aided design (1/2 hours) 1.1. Systemic analysis of the design process		1 hour

1.2. Solutions for setting up the CAP environment 1.3. Implementation of assisted technological design systems *Ch. 2. Assisted design elements (1/2 hours)* 2.1. The hardware structure of the workstation. 2.2. Software structure of the workstation. 2.3. Software structure of the workstation. *Ch. 3. Models, methods and algorithms in design and assisted manufacturing (1/2 hours)* 3.1. Deduction of mathematical models. 3.2. Creating databases. *Ch. 4. The concept of technological databases (2 hours)* 4.1. Creating a database 4.2. Design models. 4.3. Analysis of economic systems. 4.3.1 Customer identification. 4.3.2 Identifying problems. 4.3.3 Defining the database domain. 4.3.4 Research and design. 4.4. Practical application. *Ch. 5. Geometric modeling (1 hour)* 5.1. Geometric calculations specific to assisted design. 5.2. Curves and surfaces used in assisted design. *Ch. 6. SolidEdge application presentation (1/2 hours)* 6.1. SolidEdge, a high-performance design software solution. 6.2. SolidEdge modules. 6.3. Principles of assisted design. 6.4. Working interface. *Ch. 7. Making sketches and profiles (1/2 hours)* 7.1. Drawing sketches. 7.2. Reference plans. 7.3. Use of profiles and sketches. 7.4. Interface for making sketches. 7.5. Sketch interface. *Ch. 8. Modeling curves and surfaces (1 hour)* 8.1. Creating curves. 8.2. Creating surfaces. *Ch. 9. Generating solid models (2 hours)* 9.1. Complex entities for adding (Add) and removing material (Cut) by translation. 9.2. Rotational entities and cuts. 9.3. Generating complex entities: Sweep, Loft, Helix, Normal, Thicken. 9.4. Solid entities for cast or injected metal or plastic parts. 9.5. Rotational entities and cuts. *Ch. 10. Design using Synchronous Technology (2 hours)* 10.1. SolidEdge setting for traditional or synchronous version. 10.2. Synchronous Part. 10.2.1 The interface. 10.2.2 Blocking the work plan and drawing sketches. Regions. 10.2.3 Creating solid entities in the synchronous environment. 10.2.4 Steering Wheel and Live Rules. 10.2.5 Sizing in Synchronous. 10.2.6 Migrating from one modeling environment to another (Synchronous - Ordered). 10.2.7 Importing and modifying parts. 10.2.8 Importing and modifying parts. 10.3. Synchronous Sheet Metal.	Presentation-based exposition of essential concepts; explanation of the connection between the concepts presented with other concepts acquired in related disciplines in the curriculum; illustration of the areas of practical applicability of the concepts presented; dialogue with the auditor; detailing on the board the elements identified as being unclearly received by the auditor; critical discussion on filmed scenarios in different fields of activity, contrastive analysis; recommendation of readings, cases, scenarios; simulation of activities in a system.	1 hour 1 hour 1 hour 1 hour 1 hour 1 hour 1 hour 1 hour

10.4. Synchronous Assembly. *Ch. 11. Design of sheet metal parts (1/2 hours)* 11.1. Methods. Interface. 11.2. Applications. *Ch. 12. Design of assemblies (1 hour)* 12.1. Working interface with assemblies. 12.2. Usual assemblies. Applications. 12.3. Special assemblies made with Engineering Reference. *Ch. 13. Assemblies management (1 hour)* 13.1. Document management. 13.2. Revision of assemblies. 13.3. Copy files for review. 13.4. Internal link management. 13.5. Document properties. *Ch. 14. Drafting with SolidEdge (1 hour)* 14.1. Choosing and changing the drawing format. 14.2. Generating main and auxiliary views. 14.3. Dimensioning, sectioning and details in the drawing. 14.4. Internal link management. 14.5. Document & File properties.		1 hour 1 hour 1 hour 1 hour
Bibliografie curs: *1. Mihalache MA, Fabricația asistată de calculator bazată pe sisteme CAM, Editura Performantica, Iași, 2024* *2. Marius Andrei Mihalache, Aplicarea procedeelor de inginerie inversă în domeniul mecanic, Ed. Performantica, 2024* *3. Schnakovszky, C., Muscă, G, Zicltil, V., „Ingineria și modelarea sistemelor de producție", Editura Tehnică, Chișinău, 1998* *4. Muscă, Gavril, Proiectarea tehnologică asistată de calculator, Editura Junimea, Iași, 1999* *5. Musca, Gavril, Tabacaru, Lucian, Performanța în proiectare cu SOLID EDGE ST și managementul datelor tehnice în concepția produselor, Editura PIM, laşi 2010*		
9.2a Seminar	Metode de lucru[16]	Observații, timp alocat
.....		
9.2b Laborator	Metode de lucru[17]	
1. Programming elements. Database design and programming. 2. CAD design. Sketch and profit in SolidEdge. Solid entities in SolidEdge. Translation and rotation protrusions in SolidEdge 3. CAD design. Complex protrusions, loft, sweep, holes, helical in SolidEdge 4. Assisted design of machine parts. Gear. Belt wheels, springs of compression and stretching elements 5. Assemblies and positioning relationships in assisted design 6. Facilities in ensembles. Exploding, viewing, component table. Drawing parts and assemblies in SolidEdge. 7. Design of components and joints used in welded assemblies.	The student is guided in the development of a series of activities, structured in stages. The goal is to refine the theoretical concepts acquired in the course. The student has access to extensive documentation, recommendations for documentation sources, examples of assignments, tools necessary for the development of assignments (software, templates, questionnaires, examples, etc.).	1 hour 1 hour 1 hour 1 hour 1 hour 1 hour 1 hour
9.2c Proiect	Metode de lucru[18]	
Bibliografie aplicații (seminar/ laborator/ proiect): *1. Laurențiu Slătineanu, Cazimir Bohosievici, Traian Grămescu, Dragoș Paraschiv, Gavril Muscă, Oana Dodun, Gheorghe Nagîț, Dumitru Nedelcu, Alexandru Sover, Liviu-Lucian Tăbăcaru, Constantin Cărăușu, Gheorghe Crețu, Vasile Merticaru, Margareta Coteață, Mihai Boca, Marius Andrei Mihalache, Marius Ionuț Rîpanu, Simona Nicoleta Mazurchievici, Teodor Daniel Mîndru, Marius Andrei Boca, Adelina Hrițuc, Justina Georgiana Motaș, Aplicații de ingineria fabricației, Ed. PIM, 2021*		

1. Mihalache MA, Fabricația asistată de calculator bazată pe sisteme CAM, Editura Performantica, Iași, 2024 *2. Marius Andrei Mihalache, Aplicarea procedeelor de inginerie inversă în domeniul mecanic, Ed. Performantica, 2024* *3. Schnakovszky, C., Muscă, G, Zicltil, V., „Ingineria și modelarea sistemelor de producție", Editura Tehnică, Chișinău, 1998* *4. Muscă, Gavril, Proiectarea tehnologică asistată de calculator, Editura Junimea, Iași, 1999* *5. Musca, Gavril, Tabacaru, Lucian, Performanța în proiectare cu SOLID EDGE ST și managementul datelor tehnice în concepția produselor, Editura PIM, lași 2010*		

10. Evaluare

Tip activitate	**10.1 Criterii de evaluare**	**10.2 Metode de evaluare**		**10.3 Pondere din nota finală** ***(se recomandă să fie în concordanță cu numărul de ore alocat fiecărui tip de activitate)***
10.4a Examen	Completeness and correctness of knowledge. Logical coherence, fluency, argumentative force. Capacity for analysis, personal interpretation, originality, creativity. Degree of assimilation of specialized language and communication ability. Ability to capitalize on acquired skills. Ability to process data and stated problems.	- systematic observation of students (individual/team assignments - assignments must be completed in the week between classes, preparation of a paper - case study).	30%	60%
		- formative evaluation test (checks throughout the semester).	30%	
		- summative evaluation test (final check).	40%	
10.4c Laborator	Laboratory activity – Ability to work in a team, Ability to apply in practice, in different contexts, the knowledge learned. Ability to analyze, personal interpretation, originality, creativity.	- completion of laboratory sheets (all laboratory work must be completed, only one outstanding laboratory work may be made up); - evaluation test (laboratory colloquium).		40%
10.5 Condiții de promovare				
The final assessment result for a subject results from considering the scores and weights assigned to each activity within the subject. Whole marks from 10 to 1 will be awarded, with a mark of 5 certifying the acquisition of the minimum learning outcomes related to a subject and the granting of study credits related to it.				

Data completării:

Titular/ titulari de curs: *Conf. univ. dr. ing. Andrei Marius Mihalache*

Titular/ titulari de aplicații: *Conf. univ. dr. ing. Andrei Marius Mihalache*

Data avizării în departament: Director de departament
Conf. univ. dr. ing. Vasile Merticaru

Data aprobării în Consiliul Facultății: Decan,
Conf. univ. dr. ing. Florin Negoescu

[1] *Licență/ Masterat.*
[2] *1-4 pentru licență, 1-2 pentru masterat.*
[3] *1-8 pentru licență, 1-4 pentru masterat.*

[4] *Examen (E), verificare (V) – din planul de învățământ.*
[5] *DOB – disciplină obligatorie, DOP– disciplină opțională, DFA– disciplină facultativă;*
[6] *Este egal cu 14 săptămâni x numărul de ore de la punctul 3.1 (similar pentru 3.5, 3.6abc).*
[7] *Liniile de mai jos se referă la studiul individual; totalul se completează la punctul 3.7.*
[8] *Între 2 și 6 ore. Acestea reprezintă ore didactice și nu se includ în studiul individual.*
[9] *Suma valorilor de pe liniile anterioare, care se referă la studiul individual.*
[10] *Suma dintre numărul de ore de activitate didactică directă (3.4) și numărul de ore de studiu individual (3.7); trebuie să fie egală cu numărul de credite alocat disciplinei (punctul 3.9) x 27 de ore pe credit.*
[11] *Se menționează disciplinele obligatoriu a fi promovate anterior sau echivalente.*
[12] *Tablă, videoproiector, flipchart, materiale didactice specifice etc.*
[13] *Tehnică de calcul, pachete software, standuri experimentale, etc.*
[14] *Rezultatele învățării prezentate sub formă de cunoștințe, abilități, responsabilitate și autonomie specifice disciplinei. Rezultatele învățării sunt concordante cu nivelul 7 din CNC, diferențiate în funcție de tipul de program de studii universitare de masterat. Astfel, în cazul masteratului de cercetare, acestea vor include cunoștințe, abilități, responsabilitate și autonomie astfel definite încât să îi permită absolventului să desfășoare activități de cercetare științifică independentă (https://www.aracis.ro/wp-content/uploads/2025/07/Standarde-specifice-masterat.pdf).*
[15] *Titluri de capitole și paragrafe.*
[16] *Discuții, dezbateri, prezentare și/sau analiză de lucrări, rezolvare de exerciții și probleme.*
[17] *Demonstrație practică, exercițiu, experiment.*
[18] *Studiu de caz, demonstrație, exercițiu, analiza erorilor etc.*

COURSE GUIDE

Academic year 2025-2026

1. Program information

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iaşi
1.2 Faculty	Machine Manufacturing and Industrial Management
1.3 Department	Machine Manufacturing Technology
1.4 Field	Industrial Engineering
1.5 Study level[1]	Master of science
1.6 Study program	Intelligent Manufacturing and Automation

2. Course information

2.1.1 **Course name** – (in English/Romanian, accordingly to the Diploma Supplement)				**Sustainable Product Development /** Dezvoltarea durabilă a produselor			
2.1.2. Code				FAI-IA-110	2.1.3. Formative Category		DS
2.2 Course organizer (lecturer)				Assoc. Prof. Vasile MERTICARU, PhD			
2.3 Teaching assistants				Assoc. Prof. Vasile MERTICARU, PhD			
2.4 Year of study[2]	1	2.5 Semester[3]	2	2.6 Assessment[4]	V	2.7 Type of subject[5]	DI/DOB

3. Estimated total time (hours per semester for teaching activities)

3.1 Number of hours per week	2	3.2 lecture	1	3.3a sem.		3.3b laboratory		3.3c project	1	3.3.d practice		
3.4 Total number of hours in curricula[6]	28	3.5 lecture	14	3.6a sem.		3.6b laboratory		3.6c project		3.6.d	-	

	Time distribution[7]	Hours
	Textbook, course support, references and course notes study	14
	Library, electronic platforms and on site documentation	33
	Seminar/laboratory preparation, homework, reports, portfolios and essays	21
	Assessment[8]	4
	Other activities:	-

3.7 Total individual study hours[9]	72	
3.8 Total hours per semester[10]	100	
3.9 Number of credit points	4	

4. Prerequisites (where applicable)

4.1 Curricula type[11]	
4.2 Competence type	

5. Infrastructure

5.1. for lectures[12]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers
5.2. for laboratories[13]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers, computers connected to Internet, software EI99

6. Course general target

The general target of the course *Sustainable Product Development* is the development of professional competences in operation of advanced integrated digital solutions, generally in use of basic strategies and techniques of research & development and innovation for solving complex tasks specific to industrial engineering, and particularly for sustainable product and manufacturing process development. Development of professional cognitive and applicative skills in sustainable product development, in relation with a set of connected areas (product design, ergonomics, ecology, marketing, industrial & intellectual property, advertising, DfX, CAD/CAM/CAx/PDM/PLM, industrial management) for advanced and intelligent manufacturing, are targeted.

7. Learning Outcomes [14]

Knowledge	The student/ The graduated: - identifies and describes graphical representations specific to the phenomena and to the advanced industrial processes - explains theoretical and experimental results, and technical documentation associated to the products, phenomena and advanced industrial processes - classifies and compares principles and design methods for the development of advanced industrial products, equipment and processes - identifies, classifies and compares tools and solutions for sustainable product developments.
Skills	The student/ The graduated: - uses graphical representations specific to the phenomena and to the advanced industrial processes - operates with phenomena and advanced industrial processes - operates with theoretical and experimental results, obtained for advanced industrial processes - uses software solutions for programming, database management, graphical representations and modeling for products, phenomena and advanced industrial processes - selects and combines tools and solutions for sustainable product developments..
Responsibility and Autonomy	The student/ The graduated: - selects and uses references specific to the professional field - proves autonomy in learning on issues specific to the products, phenomena and advanced industrial processes

8. Teaching methods

Procedures used in course teaching:

a. presentations specific to academic lecture, using PC and visual techniques, drawing principle constructive-functional schemes and calculation examples on the blackboard

b. interactive collaboration with students;

9. Contents

9. 1. Lectures[15]	**Teaching methods**	**Assigned Time**
9.1.1. Chapt. 1. Basic concepts in Sustainable Development - Sustainable Development - concept & components - Strategies & policies - Sustainability indicators	Interactive Lecture, Discussions, Explanations	2 hours
9.1.2. Chapt. 2. Fundamentals of Product/Process Development - Product & Process - Concept of New Product Development (NPD) - Product Life-Cycle - Stages in NPD	Interactive Lecture, Discussions, Explanations	2 hours
9.1.3. Chapt. 3. Product Design in Sustainable Product Development - Concepts of DfX, DfS, DfE etc. - Modern theories in Sustainable Design (Design Thinking, Holistic, Lean, Agile, Axiomatic etc.)	Interactive Lecture, Discussions, Explanations	2 hours
9.1.4. Life-Cycle Sustainability Assessment (LCSA) in NPD - E-LCA – Environmental Life-Cycle Assessment - LCC – Life-Cycle Costs - S-LCA – Societal Life-Cycle Assessment	Interactive Lecture, Discussions, Explanations	4 hours
9.1.5. Chapt. 5. Elements of Industrial Design, Aesthetics and Ergonomics in Sustainable Product Development - Industrial Design fundamentals - CAID – Computer-Aided Industrial Design - Aesthetics of Industrial Product - Ergonomics of Industrial Product	Interactive Lecture, Discussions, Explanations	4 hours

References: 1. Annacchino M.A., *New Product Development: from initial idea to product management*, Butterworth-Heinemann, Elsevier (USA), ISBN 0-7506-7732-5, 2003 2. Annacchino M.A., *The Pursuit of New Product Development: The Business Development Process,* Butterworth-Heinemann, Elsevier (USA), ISBN-13: 9780750679930, 2007 3. Bralla J.G, *Design for excellence*, ISBN 0-07-007138-1, McGraw-Hill, New York, 1996 4. Farid A.M., Suh N.P., *Axiomatic Design in Large Systems*, ISBN 978-3-319-32387-9, Springer, 2016 5. Goedkoop M., Effting S., Collignon M., *The Eco-indicator 99 - A damage oriented method for Life Cycle Impact Assessment - Manual for Designers,* PRé Consultants B.V., 2000 6. Huang G.Q., *Design for X,* ISBN 978-94-010-5762-2, Springer, 1996 7. Hintermann B., *Looking Good - An introduction to Industrial design for small-medium enterprises*. Intellectual Property for Business Series.-4, World Intellectual Property Organization – WIPO. Publication No. 498(E) ISBN 92-805-1293-3, Geneva, 2006 8. Merticaru V., *Sustainable Product Development – course notes* (manuscript). 9. Reinertsen D., *The Principles of Product Development Flow: Second Generation* – Lean Product Development, Celeritas Publish., 2009 10. Silva A., Simoes R., *The Handbook of Research on Trends in Product Design and Development,* Business Science Reference, New York, 2011 11. Ulrich K.T., Eppinger S.D., *Product Design and Development - Sixth Edition*, McGraw-Hill, New York, ISBN 978-0-07-802906-6, 2016 12. Walker S., Giard J., *The Handbook of Design for Sustainability*, Bloomsbury, London, 2013		
9.2a Seminar	Work Methods[16]	Notes, Assigned Time
-	-	-
9.2b Laboratory	Work Methods[17]	
-	-	-
9.2c Project	Work Methods[18]	
Project activities will approach a case study on E-LCA (Environmental Life-Cycle Assessment) using a calculation algorithm for EI99 sustainability indicator, based on *PRé Consultant's Eco-indicator 99* methodology and an Excel application. 1. Case study task identification. Selection and description of the analyzed product **2.** Evaluation of EI99 score for Production stage. **3.** Evaluation of EI99 score for Product Use stage. **4.** Evaluation of EI99 score for Product End-of-Life stage. **5.** Generation and interpretion of scores and reports for product EI99 indicator. **6.** Conclusions and improvement solutions. Elaboration of case study report. **7.** Presentation and evaluation of case study synthesis report.	Practical demonstrations and exercises	 2 hours 2 hours 2 hours 2 hours 2 hours 2 hours 2 hours
References: 1. Annacchino M.A., *New Product Development: from initial idea to product management*, Butterworth-Heinemann, Elsevier (USA), ISBN 0-7506-7732-5, 2003 2. Annacchino M.A., *The Pursuit of New Product Development: The Business Development Process,* Butterworth-Heinemann, Elsevier (USA), ISBN-13: 9780750679930, 2007 3. Bralla J.G, *Design for excellence*, ISBN 0-07-007138-1, McGraw-Hill, New York, 1996 4. Farid A.M., Suh N.P., *Axiomatic Design in Large Systems*, ISBN 978-3-319-32387-9, Springer, 2016 5. Goedkoop M., Effting S., Collignon M., *The Eco-indicator 99 - A damage oriented method for Life Cycle Impact Assessment - Manual for Designers,* PRé Consultants B.V., 2000 6. Huang G.Q., *Design for X,* ISBN 978-94-010-5762-2, Springer, 1996 7. Hintermann B., *Looking Good - An introduction to Industrial design for small-medium enterprises*. Intellectual Property for Business Series.-4, World Intellectual Property Organization – WIPO. Publication No. 498(E) ISBN 92-805-1293-3, Geneva, 2006 8. Merticaru V., *Sustainable Product Development – course notes* (manuscript). 9. Reinertsen D., *The Principles of Product Development Flow: Second Generation* – Lean Product Development, Celeritas Publish., 2009 10. Silva A., Simoes R., *The Handbook of Research on Trends in Product Design and Development,* Business Science Reference, New York, 2011 11. Ulrich K.T., Eppinger S.D., *Product Design and Development - Sixth Edition*, McGraw-Hill, New York, ISBN 978-0-07-802906-6, 2016 12. Walker S., Giard J., *The Handbook of Design for Sustainability*, Bloomsbury, London, 2013		

10. Assessment

<table>
<tr><th>Activity type</th><th>10.1 Assessment criteria</th><th colspan="2">10.2 Assessment methods</th><th>10.3 Percentage of final mark</th></tr>
<tr><td rowspan="3">10.4
Verifying</td><td rowspan="3">Knowledge completeness and correctness
Logical coherence, argumentation strength
Ability of analysis, personal interpretation, originality, creativity
Professional language and communication skills
Ability to exploit aquired skills
Ability to process data and to solve problems</td><td>- systematic observation of the students
Homework - 1 homework, as a short state-of-the-art of one of the course’s subjects.</td><td>20%</td><td rowspan="3">60% (minimum 5)</td></tr>
<tr><td>- Formative assesment test (during the semester).
1 short test along the semester</td><td>20%</td></tr>
<tr><td>- summative assessment test (final assessment).
Final assessment Single test:
Oral evaluation on synthesis report;
Tasks: report presentation and responses to related questions.
Working conditions: interactive discussions examinator - student;</td><td>60%
(minimum 5)</td></tr>
<tr><td>10.5a Seminar</td><td>-</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>10.5b Laboratory</td><td>Quality of laboratory reports and of the acquired practical skills (self-evaluation, reports content, argumentation of solutions)</td><td colspan="2">- elaboration of all laboratory reports ;
- laboratory colloquium - interactive discussions examinator - student</td><td>40% (minimum 5)</td></tr>
<tr><td>10.5c Project</td><td></td><td colspan="2"></td><td></td></tr>
<tr><td colspan="5">10.6 Passing minimal standards</td></tr>
<tr><td colspan="5">The result of the final assessment is obtained by considering the marks and percentages assigned to each activity within the course. Full marks from 10 to 1 are assigned, the mark 5 certifying the aquiring of minimal learning outcomes corresponding to the course and the obtaining of the credit points assigned to it.</td></tr>
</table>

Completion date: 20.09.2025

Course organizer signature: Assoc. Prof. Vasile MERTICARU, PhD

Teaching assistant signature: Assoc. Prof. Vasile MERTICARU, PhD

Department approval date: 22.09.2025

Head of Department
Assoc. Prof. Vasile MERTICARU, PhD

Faculty Council approval date:

Dean,
Assoc. Prof. Florin NEGOESCU, PhD

[1] *Licenţă/ Masterat.*
[2] *1-4 penrtru licenţă, 1-2 pentru masterat.*
[3] *1-8 pentru licenţă, 1-4 pentru masterat.*
[4] *Examen (E), verificare (V) – din planul de învăţământ.*
[5] *DOB – disciplină obligatorie, DOP– disciplină opţională, DFA– disciplină facultativă;*
[6] *Este egal cu 14 săptămâni x numărul de ore de la punctul 3.1 (similar pentru 3.5, 3.6abc).*
[7] *Liniile de mai jos se referă la studiul individual; totalul se completează la punctul 3.7.*
[8] *Între 2 şi 6 ore. Acestea reprezintă ore didactice şi nu se includ în studiul individual.*
[9] *Suma valorilor de pe liniile anterioare, care se referă la studiul individual.*
[10] *Suma dintre numărul de ore de activitate didactică directă (3.4) şi numărul de ore de studiu individual (3.7); trebuie să fie egală cu numărul de credite alocat disciplinei (punctul 3.9) x 27 de ore pe credit.*
[11] *Se menţionează disciplinele obligatoriu a fi promovate anterior sau echivalente.*
[12] *Tablă, vidoproiector, flipchart, materiale didactice specifice etc.*
[13] *Tehnică de calcul, pachete software, standuri experimentale, etc.*
[14] *Rezultatele învăţării prezentate sub formă de cunoştinţe, abilităţi, responsabilitate şi autonomie specifice disciplinei. Rezultatele învăţării sunt concordante cu nivelul 7 din CNC, diferenţiate în funcţie de tipul de program de studii universitare de masterat. Astfel, în cazul masteratului de cercetare, acestea vor include cunoştinţe, abilităţi, responsabilitate şi autonomie astfel definite încât să îi permită absolventului să desfăşoare activităţi de cercetare ştiinţifică independentă (https://www.aracis.ro/wp-content/uploads/2025/07/Standarde-specifice-masterat.pdf).*
[15] *Titluri de capitole şi paragrafe.*
[16] *Discuţii, dezbateri, prezentare şi/sau analiză de lucrări, rezolvare de exerciţii şi probleme.*
[17] *Demonstraţie practică, exerciţiu, experiment.*
[18] *Studiu de caz, demonstraţie, exerciţiu, analiza erorilor etc.*

COURSE GUIDE

Academic year 2025-2026

1. Program information

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iași
1.2 Faculty	Machine Manufacturing and Industrial Management
1.3 Department	Machine Manufacturing Technology
1.4 Field	Industrial Engineering
1.5 Study level[1]	Master of science
1.6 Study program	Intelligent Manufacturing and Automation

2. Course information

2.1.1 **Course name** – (in English/Romanian, accordingly to the Diploma Supplement)				**Advanced Manufacturing Automation Processes /** Procese avansate de automatizare a producției			
2.1.2. Code				FAI-IA-201	2.1.3. Formative Category		DS
2.2 Course organizer (lecturer)				Assoc. Prof. Vasile MERTICARU, PhD			
2.3 Teaching assistants				Assoc. Prof. Vasile MERTICARU, PhD			
2.4 Year of study[2]	2	2.5 Semester[3]	1	2.6 Assessment[4]	V	2.7 Type of subject[5]	DI/DOB

3. Estimated total time (hours per semester for teaching activities)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a sem.		3.3b laboratory	1	3.3c project		3.3.d practice	
3.4 Total number of hours in curricula[6]	42	3.5 lecture	28	3.6a sem.		3.6b laboratory	14	3.6c project		3.6.d	-

	Time distribution[7]	Hours
	Textbook, course support, references and course notes study	21
	Library, electronic platforms and on site documentation	30
	Seminar/laboratory preparation, homework, reports, portfolios and essays	28
	Assessment[8]	4
	Other activities:	-

3.7 Total individual study hours[9]	83	
3.8 Total hours per semester[10]	125	
3.9 Number of credit points	5	

4. Prerequisites (where applicable)

4.1 Curricula type[11]	
4.2 Competence type	

5. Infrastructure

5.1. for lectures[12]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers
5.2. for laboratories[13]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers, computers connected to Internet, software RobotStudio, Laboratory Robot WorkStation IRB140-IRC5, Laboratory mock-ups

6. Course general target

The general target of the course *Advanced Manufacturing Automation Processes* is the development of professional skills in the operation of advanced integrated digital solutions and respectively in the use of basic strategies and techniques of research & development and innovation for solving complex tasks specific to industrial engineering in generally, respectively for sustainable product development and particularly manufacturing process development. Development of professional cognitive and applicative skills in design and operation of manufacturing automation solutions for advanced and intelligent manufaturing, are targeted.

7. Learning Outcomes [14]

Knowledge	The student/ The graduated: - identifies and describes graphical representations specific to the phenomena and to the advanced industrial processes - explains theoretical and experimental results, and technical documentation associated to the products, phenomena and advanced industrial processes - classifies and compares principles and design methods for the development of advanced industrial products, equipment and processes - identifies, classifies and compares technical solutions for automated manufacturing systems and robotic cells.
Skills	The student/ The graduated: - uses graphical representations specific to the phenomena and to the advanced industrial processes - operates with phenomena and advanced industrial processes - operates with theoretical and experimental results, obtained for advanced industrial processes - uses software solutions for programming, database management, graphical representations and modeling for products, phenomena and advanced industrial processes - selects and combines technical solutions for automated manufacturing systems and robotic cells.
Responsibility and Autonomy	The student/ The graduated: - selects and uses references specific to the professional field - proves autonomy in learning on issues specific to the products, phenomena and advanced industrial processes

8. Teaching methods

Procedures used in course teaching:

a. presentations specific to academic lecture, using PC and visual techniques, drawing principle constructive-functional schemes and calculation examples on the blackboard

b. interactive collaboration with students;

9. Contents

9. 1. Lectures[15]	**Teaching methods**	**Assigned Time**
9.1.1. Chapt. 1. Basic concepts in advanced manufacturing automation processes - History of Manufacturing Automation. - Industry 4.0 - Artificial Intelligence - Cyber-physical system - Cloud systems - IoT - Internet of things - Virtual Reality. Augmented reality - Virtual Engineering. Virtual Manufacturing - Cobots – Collaborative Robots - Industry 5.0	Interactive Lecture, Discussions, Explanations	2 hours
9.1.2. Chapt. 2. Principles of advanced manufacturing automation processes - Manufacturing as automated system - Principles and theories in design of manufacturing automation systems - Functional requirements of automation processes in manufacturing	Interactive Lecture, Discussions, Explanations	4 hours
9.1.3. Chapt. 3. Storage automation solutions in advanced manufacturing - Functional requirements of automated storage in manufacturing - Warehouse Management - Automatic storage management strategies - ASRS - Automated Storage and Retrieval Systems	Interactive Lecture, Discussions, Explanations	4 hours
9.1.4. Chapt. 4. Automated Conveyor Systems - Roller Conveyors - Screw Conveyors - Vertical Conveyors - Slat Conveyors - Pneumatic Conveyors - Drag Conveyors	Interactive Lecture, Discussions, Explanations	6 hours

- Bucket Conveyors - Overhead Conveyors - Vibrating Conveyors - Magnetic Conveyors - Vacuum Conveyors - Omnidirectional Conveyors – Cellular Conveyor systems		
9.1.5. Chapt. 5. Sorting automation solutions in advanced manufacturing - Optical sorting - Geometric sorting - Magnetic sorting - Actuators in sorting systems	Interactive Lecture, Discussions, Explanations	4 hours
9.1.6. Chapt. 6. Programming elements for automation processes in advanced manufacturing - Programming of automated storage systems - Programming of automated transport systems - Programming of automated dosing systems - Programming of automated machining stations with industrial robots - Programming of automated assembly stations with industrial robots.	Interactive Lecture, Discussions, Explanations	8 hours
References: 1. Berger R. SC, *The digital transformation of industry, BDI, 2015* 2. Boothroyd G., *Assembly Automation and Product Design*, Second Edition, CRC Press, Taylor & Francis, USA, 2005https://www.multi-conveyor.com/ 3. Gilb T., *Competitive Engineering,* Elsevier Butterworth-Heinemann, ISBN 0 7506 6507 6, 2005 4. Merticaru V., *Advanced Manufacturing Automation Processes – course notes* (manuscript). 5. Miraz M. et al., *Internet of Nano-Things, Things and Everything: Future Growth Trends*, Future Internet 2018, 10, 68; doi:10.3390/fi10080068 6. Østergaard E.H., *Welcome o Industry 5.0,* universal-robots.com, 2017 7. Sandler B.Z., *Robotics : designing the mechanisms for automated machinery*, Second Edition, Academic Press, USA, 1999 8. Timings R., *Fabrication and Welding Engineering*, Newnes – Elsevier, ISBN: 978-0-7506-6691-6, 2008 9. Wisskirchen G. et al. *Artificial Intelligence and Robotics and Their Impact on the Workplace,* IBA Global Employment Institute, 2017 10. World Econ Forum & Kearney A.T., *Technology and Innovation for the Future of Production: Accelerating Value Creation,* 2017 11. https://new.abb.com/products/robotics/robotstudio/tutorials 12. https://search.abb.com/library/Download.aspx?DocumentID=3HAC032104-001&LanguageCode=en&DocumentPartId=&Action=Launch 13. https://www.thomasnet.com/articles/automation-electronics/automated-conveyors/ 14. https://www.thomasnet.com/articles/materials-handling/understanding-conveyor-systems/		
9.2a Seminar	Work Methods[16]	Notes, Assigned Time
-	-	-
9.2b Laboratory	Work Methods[17]	
1. Informing on specific OHS (Occupational Health and Safety) regulations and Laboratory activities general presentation. 2. General identification of Laboratory Robot WorkStation IRB140-IRC5. Structure. Classification 3. Manual command capabilities of Robot System IRB140-IRC5. 4. Automated command capabilities of Robot System IRB140-IRC5. 5. Creating a program for a manipulating operation using the pendant 6. General approach on RobotStudio CAM for robots solution 7. Final evaluation of laboratory activity and reports	Practical demonstrations and exercises	2 hours 2 hours 2 hours 2 hours 2 hours 2 hours 2 hours
9.2c Project	Work Methods[18]	
-	-	-
References: 1. Berger R. SC, *The digital transformation of industry, BDI, 2015* 2. Boothroyd G., *Assembly Automation and Product Design*, Second Edition, CRC Press, Taylor & Francis, USA, 2005https://www.multi-conveyor.com/ 3. Gilb T., *Competitive Engineering,* Elsevier Butterworth-Heinemann, ISBN 0 7506 6507 6, 2005 4. Merticaru V., *Advanced Manufacturing Automation Processes – course notes* (manuscript). 5. Miraz M. et al., *Internet of Nano-Things, Things and Everything: Future Growth Trends*, Future Internet 2018, 10, 68; doi:10.3390/fi10080068 6. Østergaard E.H., *Welcome o Industry 5.0,* universal-robots.com, 2017 7. Sandler B.Z., *Robotics : designing the mechanisms for automated machinery*, Second		

Edition, Academic Press, USA, 1999 8. Timings R., *Fabrication and Welding Engineering*, Newnes – Elsevier, ISBN: 978-0-7506-6691-6, 2008 9. Wisskirchen G. et al. *Artificial Intelligence and Robotics and Their Impact on the Workplace,* IBA Global Employment Institute, 2017 10. World Econ Forum & Kearney A.T., *Technology and Innovation for the Future of Production: Accelerating Value Creation,* 2017 11. https://new.abb.com/products/robotics/robotstudio/tutorials 12. https://search.abb.com/library/Download.aspx?DocumentID=3HAC032104-001&LanguageCode=en&DocumentPartId=&Action=Launch 13. https://www.thomasnet.com/articles/automation-electronics/automated-conveyors/ 14. https://www.thomasnet.com/articles/materials-handling/understanding-conveyor-systems/		

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods		10.3 Percentage of final mark
10.4 Verifying	Knowledge completeness and correctness Logical coherence, argumentation strength Ability of analysis, personal interpretation, originality, creativity Professional language and communication skills Ability to exploit aquired skills Ability to process data and to solve problems	- systematic observation of the students Homework - 1 homework, as a short state-of-the-art of one of the course's subjects.	20%	60% (minimum 5)
		- Formative assesment test (during the semester). 1 short test along the semester	20%	
		- summative assessment test (final assessment). Final assessment Single test: Oral evaluation on synthesis report; Tasks: report presentation and responses to related questions. Working conditions: interactive discussions examinator - student;	60% (minimum 5)	
10.5a Seminar	-	-		-
10.5b Laboratory	Quality of laboratory reports and of the acquired practical skills (self-evaluation, reports content, argumentation of solutions)	- elaboration of all laboratory reports ; - laboratory colloquium - interactive discussions examinator - student		40% (minimum 5)
10.5c Project				
10.6 Passing minimal standards				
The result of the final assessment is obtained by considering the marks and percentages assigned to each activity within the course. Full marks from 10 to 1 are assigned, the mark 5 certifying the aquiring of minimal learning outcomes corresponding to the course and the obtaining of the credit points assigned to it.				

Completion date: 20.09.2025

Course organizer signature: Assoc. Prof. Vasile MERTICARU, PhD

Teaching assistant signature: Assoc. Prof. Vasile MERTICARU, PhD

Department approval date: 22.09.2025

Head of Department
Assoc. Prof. Vasile MERTICARU, PhD

Faculty Council approval date:

Dean,
Assoc. Prof. Florin NEGOESCU, PhD

[1] *Licenţă/ Masterat.*
[2] *1-4 penrtru licenţă, 1-2 pentru masterat.*
[3] *1-8 pentru licenţă, 1-4 pentru masterat.*
[4] *Examen (E), verificare (V) – din planul de învăţământ.*
[5] *DOB – disciplină obligatorie, DOP– disciplină opţională, DFA– disciplină facultativă;*
[6] *Este egal cu 14 săptămâni x numărul de ore de la punctul 3.1 (similar pentru 3.5, 3.6abc).*
[7] *Liniile de mai jos se referă la studiul individual; totalul se completează la punctul 3.7.*
[8] *Între 2 şi 6 ore. Acestea reprezintă ore didactice şi nu se includ în studiul individual.*
[9] *Suma valorilor de pe liniile anterioare, care se referă la studiul individual.*
[10] *Suma dintre numărul de ore de activitate didactică directă (3.4) şi numărul de ore de studiu individual (3.7); trebuie să fie egală cu numărul de credite alocat disciplinei (punctul 3.9) x 27 de ore pe credit.*
[11] *Se menţionează disciplinele obligatoriu a fi promovate anterior sau echivalente.*
[12] *Tablă, vidoproiector, flipchart, materiale didactice specifice etc.*
[13] *Tehnică de calcul, pachete software, standuri experimentale, etc.*
[14] *Rezultatele învăţării prezentate sub formă de cunoştinţe, abilităţi, responsabilitate şi autonomie specifice disciplinei. Rezultatele învățării sunt concordante cu nivelul 7 din CNC, diferenţiate în funcţie de tipul de program de studii universitare de masterat. Astfel, în cazul masteratului de cercetare, acestea vor include cunoştinţe, abilităţi, responsabilitate şi autonomie astfel definite încât să îi permită absolventului să desfăşoare activităţi de cercetare ştiinţifică independentă (https://www.aracis.ro/wp-content/uploads/2025/07/Standarde-specifice-masterat.pdf).*
[15] *Titluri de capitole şi paragrafe.*
[16] *Discuţii, dezbateri, prezentare şi/sau analiză de lucrări, rezolvare de exerciţii şi probleme.*
[17] *Demonstraţie practică, exerciţiu, experiment.*
[18] *Studiu de caz, demonstraţie, exerciţiu, analiza erorilor etc.*

COURSE GUIDE

Academic year 2025-2026

1. Program info

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iaşi
1.2 Faculty	Machine Manufacturing and Industrial Management
1.3 Department	Machine Manufacturing Technology
1.4 Field	Industrial Engineering
1.5 Study level[1]	Master of science
1.6 Study program	Intelligent Manufacturing and Automation

2. Course info

2.1 Course name: Advanced Manufacturing Technologies of Composite Materials						Code: IMA.IA.602	
2.2 Course organizer (lecturer)		Professor Dumitru Nedelcu, Ph.D.					
2.3 Teaching assistants		Professor Dumitru Nedelcu, Ph.D.					
2.4 Year of study[2]	2	2.5 Semester[3]	3	2.6 Assessement[4]	E	2.7 Type of subject[5]	DD

3. Estimated total time (hours per semester for teaching activities)

3.1 Number of hours per week	4	3.2 lecture	2	3.3a seminar/laboratory	1	3.3b project	1
3.4 Total number of hours in curricula[6]	56	3.5 lecture	28	3.6a seminar/laboratory	14	3.6b project	14

Time distribution[7]	hours
Textbook, course support, references and course notes study	18
Library, electronic platforms and on site documentation	12
Seminar/laboratory preparation, homework, reports, portfolios and essays	12
Tutoring[8]	12
Assessment[9]	10
Other activities	0

3.7 Total individual study hours[10]	**64**
3.8 Total hours per semester[11]	**120**
3. 9 Number of credit points	**5**

4. Prerequisites (where applicable)

4.1 Curricula type[12]	Mechanical processing technology.
4.2 Competence type	Measurement of mechanical quantities.

5. Infrastructure (where applicable)

5.1. for lectures[13]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers. Presentation of the notions with the explanation of the exposed topics on the board, the use of the video projector for different examples, engaging students in discussions to clarify some high technical aspects.
5.2. for laboratories[14]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers, computers connected to Internet -Students will respect the Code of student rights and obligations and the Regulations provided by the Charter of "Gheorghe Asachi" Technical University of Iasi. - The individual verification of the theoretical knowledge acquired by the students regarding the laboratory topic to be performed is performed. -Students will perform the works on the experimental stands and machine tools within the Fine Mechanics and Nanotechnology laboratory, the data processing being done using the existing calculation technique. -Discussions with students based on the results obtained. -Evaluation by note of the individual activity regarding the processing and interpretation of the results.

	-The handing over of the laboratory reports made after the works will be done at the last laboratory session.

6. Specific competences[15]

		Number of credits allocated to the discipline[16]	5	Distribution of credits by competencies[17]
Professional competences	C4.1	Description of theories, methods and fundamental principles specific to composite manufacturing technologies		3
	C4.2	Use of basic knowledge to explain and interpret different types of manufacturing processes specific to composite materials		
	C4.3	Application of basic principles and methods for the design of technological manufacturing processes, on classic and / or CNC machines with well-defined input data, under conditions of qualified assistance.		
Transversal competences	CT1	Applying the values and ethics of the engineering profession and responsible execution of professional tasks in conditions of limited autonomy and assistance.		2
	CT2	Carrying out 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 activity.		
	CT3	Objective self-assessment of the need for continuous professional training in order to enter the labor market and adapt 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. Course targets (as resulting from **6. Specific competences** table)

7.1 Course main target	Knowledge of the theoretical and practical aspects regarding the manufacturing technologies specific to the composite materials and the acquisition of the elements for the evaluation of the technological variants and for the elaboration of the technological documentation.
7.2 Course specific targets	-Transmission to students of basic knowledge and manufacturing technologies specific to composite parts: technologies for processing plastic parts; technologies for obtaining parts from metal materials; technologies for obtaining parts from ceramic materials; assembly technologies; -Initiation and familiarization of students with the ways of practical realization of specific works; -Initiation and familiarization with the possibilities of designing technologies for processing composite parts.

8. Contents

8. 1. Lectures[18]	**Teaching methods**[19]	**Notes**
INTRODUCTION: Short history of composite materials; Evolution of engineering materials; Advantages/Disadvantages of composite materials; General classification of composite materials.	Presentation of the studied issues, use of video projector, discussions with the students	4 hours
PROCESSING/MANUFACTURING METHODS OF COMPOSITE MATERIALS: Processing methods for metals, ceramics and polymers in terms of the five categories; Polymer matrix composite materials; Metal matrix composite processes; Ceramic matrix composites;		6 hours
TECHNOLOGIES FOR PROCESSING PLASTIC PARTS: pressing processing; by injection; forming parts and semi-finished products from plastic sheets; cold casting of plastics; plastics coating technologies; fused deposition modelling; blow moulding; reactive injection moulding; rotational molding; selective laser sintering;stereo lithography;		6 hours
TECHNOLOGIES FOR PROCESSING CERAMIC PARTS: blow moulding; uniaxial and isostatic pressing; hot presing; extrusion; powder injection moulding; 3D printing with binder; selective laser sintering;		6 hours
TECHNOLOGIES FOR PROCESSING METAL PARTS: permanent mould casting; extrusion; forging; rolling; hot pressing; coating; powder injection moulding; sputtering; chemical vaopur deposition; selective laser sintering;		6 hours
References:		

8. 2. Laboratory	Teaching methods[22]	Notes
Labor protection norms	Practical demonstrations of different technologies	2 hours
Obtaining plastic parts by injection moulding.		2 hours
Obtaining plastic parts by Fused Deposition Modelling Technology		2 hours
Obtaining aluminum parts reinforced with carbon fibers.		2 hours
Obtaining filaments through extrusion from plastic granules.		2 hours
Obtaining plastic parts by LOM Technology		2 hours
Obtaining metal parts on CNC machine tools.		2 hours
References:		
8.3. Project		
Design of injection mould: Calculation of weight part; The choice of injection machine; Calculation of the total time of the injection cycle; Calculating the number of mold cavities; The cavities dimensions according to the contraction of plastic materials; Choosing the injection system type; Resistance calculations; Choosing the cooling system for forming plate and punch; The choice of throwing out system; The choice of centering and driving system; Injection molding sketch; The choice of materials used to manufacture parts that make up the mold.	Practical demonstrations of: mould assembly/disassembly technology; injection moulding process using the designed mould.	14 hours
References:		

9. Course contents corroboration with the expectations of the epistemic community representatives, professional associations and relevant employers in the field of the program [23]

Considering the needs and expectations on the labor market, when establishing the content of the course and the applications, some economic agents in the field were contacted. After completing the course, students acquire a rich volume of knowledge in close connection with the competencies provided in grid 1-RNCIS and grid 2-RNCSIS.
The content of the course and of the applications correlates with that of the related disciplines from the curriculum and is adapted to the request of knowledge necessary for the graduates of the master studies from the specialization of Intelligent Manufacturing and Automation.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of final mark
10.4 Lectures	Acquired theoretical knowledge (quantity, correctness, accuracy)	Tests along the semester [24]	-
		Homework	-
		Final assessment	60%
10.5 Laboratory	Knowledge of the equipment, how to use specific tools; evaluation of tools or achievements, processing and interpretation of results	Oral answer; Laboratory notebook (experimental works, papers); Practical demonstration.	20%
10.6 Project	Knowledge of the design steps of injection molds.	Handing over the mold design project.	20%
10.6 Minimum performance standard[26]			
Minimum assessment passes conditions: -handing over the laboratory works at the established term; -the minimum mark 5 at the final assessment.			

Completion date:
20.09.2025

Course organizer signature,
Professor Dumitru Nedelcu, Ph.D

Teaching assistant signature,
Professor Dumitru Nedelcu, Ph.D

Department approval date,
22.09.2025

Department director signature,
Assoc. Prof. Vasile Merticaru, Ph.D.

Faculty Council approval date:

Dean,
Assoc. Prof. Florin Negoescu, PhD

[1] *Licenţă / Master*
[2] *1-4 penrtru licenţă, 1-2 pentru master*
[3] *1-8 pentru licenţă, 1-3 pentru master*
[4] *Examen, colocviu sau VP A/R – din planul de învăţământ*
[5] *DF - disciplină fundamentală, DID - disciplină în domeniu, DS – disciplină de specialitate sau DC - disciplină complementară - din planul de învăţământ*
[6] *Este egal cu 14 săptămâni* x *numărul de ore de la punctul 3.1 (similar pentru 3.5, 3.6abc)*
[7] *Liniile de mai jos se referă la studiul individual; totalul se completeaza la punctul 3.7.*
[8] *Între 7 şi 14 ore*
[9] *Între 2 şi 6 ore*
[10] *Suma valorilor de pe liniile anterioare, care se referă la studiul individual.*
[11] *Suma dintre numărul de ore de activitate didactică directă (3.4) şi numărul de ore de studiu individual (3.7); trebuie să fie egală cu numărul de credite alocat disciplinei (punctul 3.9)* x *24 de ore pe credit.*
[12] *Se menţionează disciplinele obligatoriu a fi promovate anterior sau echivalente*
[13] *Tablă, vidoproiector, flipchart, materiale didactice specifice etc.*
[14] *Tehnică de calcul, pachete software, standuri experimentale, etc.*
[15] *Competenţele din Grilele G1 şi G1bis ale programului de studii, adaptate la specificul disciplinei, pentru care se repartizează credite (www.rncis.ro sau site-ul facultăţii)*
[16] *Din planul de învăţământ*
[17] *Creditele alocate disciplinei se distribuie pe competenţe profesionale şi transversale în funcţie de specificul disciplinei*
[18] *Titluri de capitole şi paragrafe*
[19] *Expunere, prelegere, prezentare la tablă a problematicii studiate, utilizare videoproiector, discuţii cu studenţii (pentru fiecare capitol, dacă este cazul)*

COURSE GUIDE

Academic year 2025-2026

1. Program info

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iaşi
1.2 Faculty	Machine Manufacturing and Industrial Management
1.3 Department	Machine Manufacturing Technology
1.4 Field	Industrial Engineering
1.5 Study level[1]	Master of science
1.6 Study program	Intelligent Manufacturing and Automation

2. Course info

2.1 Course name: Entrepreneurial Skills						Code: IMA.IA.602	
2.2 Course organizer (lecturer)		Professor Dumitru Nedelcu, Ph.D.					
2.3 Teaching assistants		Professor Dumitru Nedelcu, Ph.D.					
2.4 Year of study[2]	1	2.5 Semester[3]	1	2.6 Assessement[4]	C	2.7 Type of subject[5]	DC

3. Estimated total time (hours per semester for teaching activities)

3.1 Number of hours per week	2	3.2 lecture	1	3.3a seminar/laboratory	-	3.3b project	1
3.4 Total number of hours in curricula[6]	28	3.5 lecture	14	3.6a seminar/laboratory	-	3.6b project	14

Time distribution[7]	hours
Textbook, course support, references and course notes study	10
Library, electronic platforms and on site documentation	10
Seminar/laboratory preparation, homework, reports, portfolios and essays	8
Tutoring[8]	8
Assessment[9]	8
Other activities	0

3.7 Total individual study hours[10]	**44**
3.8 Total hours per semester[11]	**72**
3. 9 Number of credit points	**3**

4. Prerequisites (where applicable)

4.1 Curricula type[12]	-
4.2 Competence type	-

5. Infrastructure (where applicable)

5.1. for lectures[13]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers. Presentation of the notions with the explanation of the exposed topics on the board, the use of the video projector for different examples, engaging students in discussions to clarify some high technical aspects.
5.2. for laboratories[14]	Video projector, laptop, wireless presenters for PowerPoint presentations, white board markers, computers connected to Internet -Students will respect the Code of student rights and obligations and the Regulations provided by the Charter of "Gheorghe Asachi" Technical University of Iasi. - The individual verification of the theoretical knowledge acquired by the students regarding the laboratory topic to be performed is performed. -Students will perform the works on the experimental stands and machine tools within the Fine Mechanics and Nanotechnology laboratory, the data processing being done using the existing calculation technique. -Discussions with students based on the results obtained. -Evaluation by note of the individual activity regarding the processing and interpretation of the results.

	-The handing over of the laboratory reports made after the works will be done at the last laboratory session.

6. Specific competences[15]

		Number of credits allocated to the discipline[16]	5	Distribution of credits by competencies[17]
Professional competences	C4.1	Description of theories, methods and fundamental principles specific to Entrepreneurial Skills		3
	C4.2	Use of basic knowledge to explain and interpret different types of Entrepreneurial Skills		
	C4.3	Application of basic principles and methods for the design of entrepreneurial projects, under conditions of qualified assistance.		
Transversal competences	CT1	Applying the values and ethics of the engineering profession and responsible execution of professional tasks in conditions of limited autonomy and assistance.		2
	CT2	Carrying out 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 activity.		
	CT3	Objective self-assessment of the need for continuous professional training in order to enter the labor market and adapt 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. Course targets (as resulting from **6. Specific competences** table)

7.1 Course main target	Knowledge of the theoretical and practical aspects regarding the Entrepreneurial Skills and the acquisition of the elements for the evaluation of the skills and for the elaboration of the technological documentation.
7.2 Course specific targets	-Transmission to students of basic knowledge in field of Entrepreneurial Skills; -Initiation and familiarization of students with the ways of practical realization of Entrepreneurial styles management and career development.

8. Contents

8. 1. Lectures[18]	**Teaching methods**[19]	**Notes**
INTRODUCTION: Basic finance skills, networking, accepting and acting on feedback, recognizing patterns, maintaining a growth mindset,	Presentation of the studied issues, use of video projector, discussions with the students	2 hours
THE ENTREPRENEURIAL SKILLS: Vision and leadership, focus and execution, persistence and passion, technical skills, flexibility.		4 hours
DEVELOPMENT OF ENTRENEURIAL SKILLS: roles and responsabilities of entrepreneurial akills, entrepreneurial capacity, methodology, models of development skills.		4 hours
ENTRENEURIAL SKILLS – BUILD A GREAT BUSINESS: personal characteristics, interpersonal skills, critical and creative skills, practical skills.		4 hours
References: 1). Catherine Cote, Harvard Business School. 2). Dave Lavinsky, Entrepreneurial Skills, https://www.growthink.com/content/5-most-important-entrepreneurial-skills 3). Maria Jose Sousa et al., Entrepreneurial Skills Development, Recent advances in applied economics, 4). R. Christine, Entrepreunerial skills and their role in enhancing the relative independence of farmers, http://www.esofarmers.org/fileadmin/esofarmers/documents/Publication_rudmann_EsoF_000.pdf		
8. 2. Laboratory	**Teaching methods**[22]	**Notes**
-	-	-
8.3. Project		
Study concerning the developing strategies and tools to promote the development of entrepreneurial skills: methodology, e-learning and self-assessment tool, technical skills, managerial skills, entrepreneurial skills, Personal Maturity Skills, creativity, ambiguity, mashalling, finance, self-efficacy.	Practical demonstrations of: mould assembly/disassembly technology; injection moulding	14 hours

	process using the designed mould.	

References:
1). R. Christine, Entrepreunerial skills and their role in enhancing the relative independence of farmers, http://www.esofarmers.org/fileadmin/esofarmers/documents/Publication_rudmann_EsoF_000.pdf
2). William L. Smith, Ken Schallenkamp, Douglas E. Eichholz, Entrepreneurial Skills Assessment: An Exploratory Study, School of Business Emporia State University
3). Jibbe Holwerda, The relationship between entrepreneurial skills and intentions, https://www.theseus.fi/bitstream/handle/10024/150602/The%20Relationship%20between%20Entrepreneurial%20skills%20and%20Intentions.pdf?isAllowed=y&sequence=1

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Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of final mark
10.4 Lectures	Acquired theoretical knowledge (quantity, correctness, accuracy)	Tests along the semester [24]	-
		Homework	-
		Final assessment	60%
10.5 Laboratory	-	-	-
10.6 Project	Knowledge of the project steps.	Handing over the project design.	40%
10.6 Minimum performance standard[26]			
Minimum assessment passes conditions: -handing over the laboratory works at the established term; -the minimum mark 5 at the final assessment.			

Completion date: 20.09.2025
Course organizer signature, Professor Dumitru Nedelcu, Ph.D
Teaching assistant signature, Professor Dumitru Nedelcu, Ph.D

Department approval date, 22.09.2025
Department director signature, Assoc. Prof. Vasile Merticaru, Ph.D.

Faculty Council approval date:
Dean, Assoc. Prof. Florin Negoescu, PhD

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[1] *Licenţă / Master*
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