COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	University Transilvania of Braşov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Silviculture Forest Engineering / Forest Management Planning and Terrestrial Measurements
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Forestry for Multiple Purposes / Master in Forest Science

2. Data about the course

2.1 Name of course			***International environmental governance and forests (IEGF)***					
2.2 Course convenor			Mr. Viorel Nelu Bellmondo Blujdea (PhD)					
2.3 Seminar/ laboratory/project convenor			Mr. Viorel Nelu Bellmondo Blujdea (PhD)					
2.4 Study year	***1***	2.5 Semester	***1***	2.6 Evaluation type	***C***	2.7 Course status	Content[3)]	***SC***
							Attendance type[4)]	***CPC***

3. **Total estimated time** (hours of teaching activities per semester)

3.1 Number of hours per week	**2**	out of which: 3.2 lecture	**2**	3.3 seminar/ laboratory/ project	-
3.4 Total number of hours in the curriculum	**28**	out of which: 3.5 lecture	**28**	3.6 seminar/ laboratory/ project	-

Time allocation	hours
Study of textbooks, course support, bibliography and notes	38
Additional documentation in libraries, specialized electronic platforms, and field research	15
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	33
Tutorial	0
Examinations	6
Other activities.....	0

3.7 Total number of individual study hours	92
3.8 Total number per semester	120
3.9 Number of credits[5)]	4

4. **Prerequisites** (if applicable)

4.1 curriculum-related	-
4.2 competences-related	-

5. **Conditions** (if applicable)

5.1 for course development	• Course attendance is compulsory
5.2 for seminar/ laboratory/ project development	• -

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems.** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in the management of forest ecosystems and technical forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to the management of forest ecosystems and technical forest production systems. **Relevance:** This aligns with understanding **forest governance frameworks**, analyzing the **drivers of governance** at various scales, and applying knowledge of **sustainable development principles** to manage forest resources effectively. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems.** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance:** The course equips students to analyze and engage with **international environmental processes**, including climate change, biodiversity conservation, and trade, as well as the **roles of governance actors and frameworks** in forest management.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector.** • **LO 1.1:** The graduate objectively evaluates the responsibilities and capacities of team members or collaborators. **Relevance:** Students learn to assess **stakeholder roles** in forest governance and engage in **policy dialogues** to support collaborative solutions for sustainable forest management. **CT.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects.** • **LO 2.3:** The graduate can efficiently lead teams and research projects. **Relevance:** The course includes **case studies** and participatory exercises in **decision-making**, fostering leadership and teamwork abilities. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands.** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. **Relevance:** The emphasis on **global governance processes**, **science-based decision-making**, and **adaptation strategies** prepares students for evolving challenges in the environmental governance sector.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To familiarize students with principles and fundamentals regarding to forest/forestry within the framework of int'l environmental governance and sustainable development.
7.2 Specific objectives	• To make students to understand, analyze and operate with forest related governance issues at international, regional and local scale; • To develop student's personal skills related to forest resources and environmental governance, as well as sustainable development concepts.

8. Content

8.1 Course	Teaching methods	Remarks
Introduction, course overview 1. Natural resources and humanity evolution: past, current and future of anthropogenic driven impact on Earth; 2. Fundamentals and principles of environmental governance and sustainable development.	Lecture 1	2 hours
Understanding sustainable management of natural resources	Lecture 2	2 hours

1. Theory of management of natural resources, focus on forest management. 2. Forest in the land-water-food-energy nexus 3. Access to resources and implications on resource stability		
History and trends in forest governance 1. Int'l, regional and national scale of implementation of forest governance requirements and obligations; 2. Decision making, processes and drivers, stakeholder interests and players in forestry governance; 3. Role of institutions in forest governance process.	Lecture 3	2 hours
Science, technicality and monitoring in policy development, implementation and compliance 1. Scientific advisory and technical support for policy making; 2. Scientific tools and instruments used in forest related int'l processes; 3. Data types, providers and users' capacity needs.	Lecture 4	2 hours
Forest governance framework 1. Processes directly targeting forests and forestry- overview of all forest, forestry and wood/timber int'l processes; 2. Focus on key understanding provisions, gaps, strength, trends.	Lecture 5	2 hours
Non-forest related forest governance 1. Indirect effects on forest and forestry from non-forest instruments (e.g. climate change, certification, biodiversity/nature conservation, food security, water, soils, natural disasters reduction, sustainable development); 3. Focus on key understanding provisions, gaps, strength, trends.	Lecture 6	2 hours
Forest, forestry and wood under climate change regime 1. Land use, land use change and forestry concept and its evolution under climate change process); 2. Understanding the adaptation needs and challenges for forest and forestry sector.	Lecture 7	2 hours
Quantitative commitments in climate change mitigation 1. Forest activities portfolio and GHG mitigation potential, effectiveness and impacts a. C sinks and C stocks management (incl. afforestation); b. reducing emissions from deforestation and forest degradation; c. substitution and cascading effect of wood; d. challenges of balancing national GHG emissions by net removals on lands and forestry; e. trade-offs of mitigation by forest: geochemical and biophysical impact of mitigation; f. up-to-date technologies involving wood and forest land (biomass energy and capture carbon and storage, substitution).	Lecture 8	2 hours
Practicing mitigation outcome of the forestry portfolio (forest land) 1. Mitigation by afforestation; 2. Emissions from deforestation and forest degradation; 3. Method for accoutring additional anthropogenic mitigation by forest management.	Lecture 9	2 hours
Practicing mitigation outcome of the forestry portfolio (wood-chain) 1. Understanding the four- wood-dimensions: volume, biomass, energy and carbon *2.* Mitigation by harvested wood products *3.* Substitution by wood biomass of carbon or energy intensive materials	Lecture 10	2 hours
Combating land degradation and desertification 1. Analysis and understand the land and soil resources; 2. Land use balance concept – contribution of forest and trees; 3. Net zero land degradation concept; 4. Land use improvement approaches and practices (incl. afforestation and agro-forestry opportunities).	Lecture 11	2 hours
Frameworks for action and innovation in the development of forest resources governance 1. Challenges of the change: understanding the barriers and needs for success; 2. Opportunities for social and economic development by environmental synergies; 3. Solutions for ensuring success in policy making, implementation and compliance.	Lecture 12	2 hours
Designing environmental synergies on local scale for forestry activities 1. Top-down and bottom -up drivers and restrictions 2. Dealing with conflictual issues in forestry	Lecture 13	2 hours
Simulation of a participatory process of decision making on forest governance 1. Interactive activity – practicing citizenship and authority on an environmental subject	Lecture 14	2 hours
Bibliography 1. Bocken, NMP, Ritalia, P., Huotari, P. 2017. The circular economy: exploring the introduction of the concept		

among S&P 500 firms. Journal of Industrial Ecology. 21:487-490
2. HALALISAN, A.F., ABRUDAN, I.V., POPA, B. (2018): Forest Management Certification in Romania: Motivations and Perceptions. Forests. ISSN 1999-4907 (Print), DOI: 10.3390/f9070425. Volume 9 (7) 425 (July 2018), pg. 2-16
3. HALALISAN, A.F., POPA, B., HERAS-SAIZARBITORIA, I., IORAS, F., ABRUDAN, I.V. (2019): Drivers, perceived benefits and impacts of FSC Chain of Custody Certification in a challenging sectoral context: the case of Romania. International Forestry Review. ISSN 14655489, DOI: 10.1505/146554819826606595, Volume 21, No.2, pg. 195-211.
4. Meyer R., 2017. Bioeconomy Strategies: Context, Visions, Guiding, Implementation Principles and Resulting debates. Sustainability9, 1031.
5. Relevant scientific and technical documentation to be distributed by the teacher

8.2 Seminar/ laboratory/ project	Teaching-learning methods	Number of hours	Remarks
NA	NA	NA	NA

Bibliography

Course material, indicated internet resources.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

National and regional authorities, international organizations, non-governmental organizations, private sector

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Understanding the theoretical background and principles of environmental sustainability	Exam, Participation in activities	100%
	• Understanding the meaning of forestry governance		
	• Understand the drivers and policy solutions striving to forest resources sustainability		
	• Advanced understanding of the international processes related to forests		
	• Understanding of the scientific and technical needs for policy making		
	• Development of own critical understanding and knowledge on the course contents		
	• Capability to understand differences and weaknesses of an argumentation from environmental sustainability perspective		
	• Capability to evaluate others' arguments and demonstration		
10.5 Seminar/ laboratory/ project	NA	NA	NA
	NA	NA	NA
10.6 Minimal performance standard			
• Students will be able to understand the principles and fundamentals for sustainable management of natural resources; • Students will be able to correctly identify the most likely policy process under which a specific forestry issue may fall; • Students will be able to correctly identify most likely drivers leading to non-sustainable forestry in a given case study.			

This course outline was certified in the Department Board meeting on 27.09 2024 and approved in the Faculty Board meeting on 30/09/2024

(Dean: Academic degree, first name, LAST NAME and signature), **Prof. dr. ing. Alexandru Lucian Curtu** **Dean**	**(Head of Department: Academic degree, first name, LAST NAME and signature),** **Prof. dr. ing. Alexandru Stelian Borz** **Head of Department**
Course holder **Viorel Nelu Bellmondo Blujdea** Date: 01.10.2024	**Holder of seminar/ laboratory/ project** **NA**

Note:

1) Field of study – select one of the following options: BA/MA/PhD. (to be filled in according to the forceful classification list for study programmes);

2) Study level – *choose from among:* BA/MA/PhD.;

3) Course status (content) – *for the BA level, select one of the following options:* **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); *for the MA level, select one of the following options*: **PC** (proficiency course)/ **SC** (synthesis course)/ **AC** (advanced course)

4) Course status (attendance type) – *select one of the following options:* **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 – 30 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	University Transilvania of Braşov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Forest Engineering , Forest Management Planning and Terrestrial Measurements
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Forestry for Multiple Purposes / Master in Forest Science

2. Data about the course

2.1 Name of course			Remote sensing and GIS in natural resource management					
2.2 Course convenor			Prof. dr.eng. Mihai Daniel Niță					
2.3 Seminar/ laboratory/ project convenor			Prof. dr.eng. Mihai Daniel Niță					
2.4 Study year	1	2.5 Semester	1	2.6 Evaluation type	E	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	3	out of which: 3.2 lecture	1	3.3 seminar/ laboratory/ project	2
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	26
Additional documentation in libraries, specialized electronic platforms, and field research	26
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	43
Tutorial	5
Examinations	8
Other activities	0

3.7 Total number of individual study hours	**108**
3.8 Total number per semester	**150**
3.9 Number of credits[5)]	**5**

4. Prerequisites (if applicable)

4.1 curriculum-related	•
4.2 competences-related	•

5. Conditions (if applicable)

5.1 for course development	• Course attendance is facultative.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory; • Deadlines for portfolio submission will be commonly established by the teacher and students.

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems.** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance:** This aligns with **understanding satellite image interpretation, vegetation indices, and land cover monitoring**, which are core tasks in natural resource management using remote sensing and GIS. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems.** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance:** Students will **analyze and make decisions** regarding **natural resource degradation**, land-use changes, and sustainable management solutions through GIS and remote sensing.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector.** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance:** Critical for teamwork in laboratory exercises, portfolio development, and reporting results from **GIS-based analysis** or **case studies**. **CT.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects.** • **LO 2.3:** The graduate can efficiently lead teams and research projects. **Relevance:** Applicable when students collaborate on **spatial analysis projects** or conduct fieldwork using **QField** and **GNSS techniques**. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands.** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. **Relevance:** Important for integrating the **latest remote sensing tools** (e.g., Google Earth Engine) and **advancing spatial decision-making methodologies**.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To familiarize the students with the state-of-art and advanced knowledge approaches used in remote sensing and geographical information systems in natural resource management.
7.2 Specific objectives	• To develop the personal and interpersonal skills related to satellite images interpretation and using GIS in natural resource management; • To understand, assess and monitoring the effects of land use/land cover changes on the natural resources; • To develop the skills to use remote sensing and GIS in various applications

	regarding natural resource management.

8. Content

8.1 Course	Teaching methods	Remarks
Introduction to remote sensing: Spectral reflectance curves, Image characteristics, Sensor systems (Landsat MSS, TM, ETM, HRV, LISS, IKONOS-2, Quickbird-2 and others), Platforms (type and orbital characteristics), Thermal infrared (characteristics, TIR band proprieties, TIR image interpretation)	Lecture	2 hours
Data sources and procurement, Data formats (BSQ, BIL, BIP, etc), Image subletting & enhancement, Image cleaning, Atmosphere path correction, Image mosaicking and color balancing, Image rectification, Registration and re-sampling, Band rations	Lecture	2 hours
Vegetation indices, Image filtering, Difference images, Principal component analysis, Classification schemes, Types, algorithms, Field data collection, Qualitative and quantitative techniques, Sampling techniques, Error matrices, Ground-verification (Field verification).	Lecture	2 hours
Microwave and hyperspectral remote sensing: Sensor and platforms types (RADAR, SAR, AIRSAR, SLAR etc.), Working mechanism, Spectral characteristics of microwave images, RADAR Image geometry and interferometry, Data compression and reconstruction, RADAR image pre-processing and classification, Field verification, Data fusion techniques, Microwave applications, Hyperspectral remote sensing channels and spectral libraries sensors (AIS, AIVIS etc.), Application of hyperspectral data.	Lecture	2 hours
Introduction to GIS: Introduction, Definition, Key components, Functional subsystem, Raster data model, Vector data model, Attribute data model, Data acquisition techniques, Data sources, Data capturing technique and procedures, Data transformation, Visualization of spatial data, Map design, Data classification, Spatial analysis, Spatial data quality.	Lecture	2 hours
Spatial decision support systems: Decision making processes: Introduction, Major decision-making, Paradigms, Models of decision-making, Different Hierarchy of decisions types of problem, Hierarchy of decisions. Spatial decision-making: Introduction, A systematic approach for solving spatial problems, Methods and techniques to support spatial decisions, Performance modeling and types of criteria, Uncertainty in decision making process.	Lecture	2 hours

Decision Support Systems: Introduction, Definition and components, Fundamental phases, Characteristics and capabilities of DSS, GIS and DSS, Spatial decision support systems, Integration of GIS and DSS. Methods and tools for collaborative decision-making: Introduction, Task analysis as a need assessment, Conflict analysis		
Using GIS in the field: Android GPS Receivers – functioning and solutions in forestry, Using Qfield for updating GIS database in the field, Personalizing forms	Lecture	2 hours

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2. Butler R., Schlaepfer R., (2004), Spruce snag quantification by coupling colour infrared aerial photos and a GIS, *Forest Ecology and management*, 195, 325-339.
3. Canada Centre for Remote Sensing Tutorial. *Fundamentals of Remote Sensing.* http://www.ldeo.columbia.edu/res/fac/rsvlab/fundamentals_e.pdf.
4. Congalton, R.G., Green, K. (2009). *Assessing the accuracy of remotely sensed data. Principles and practices*. Second Edition. Taylor and Francis Group, Boca Raton, London, New York.
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9. Landsat Project Science Office (2002). Landsat 7 Science Data User's Handbook. http://ltpwww.gsfc.nasa.gov/IAS/handbook/handbook_toc.html.
10. Leica Geosystems (2005). ERDAS Imagine, Version 9.0. Leica Geosystems Geospatial Imaging LLC, Norcross, GA.
11. Levin, N. (1999). *Fundamentals of Remote Sensing*. http://geography.huji.ac.il/personal/Noam%20Levin/1999-fundamentals-of-remote-sensing.pdf.
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15. Richards, J.A. (2013). *Remote sensing digital image analysis. An introduction*. Springer.
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17. Wang X., Yu S., Huang G.H., (2004), Land allocation based on integrated GIS-optimization modeling at a watershed level, *Landscape and Urban Planning*, 66, 61-74.
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8.2 Seminar/ laboratory/ project	Teaching-learning methods	Remarks
Digital Image Processing – optical images: Introduction in laboratory and software, Single band image interpretation, False color predictions, False color composite images interpretation, Various sensors data comparison, Thermal infrared image interpretation, Introduction to ENVI, display, Geo-linking, Zooming, Identification of targets, field trip. Image management (import/export and display), Enhancement techinques, Spectral and spatial digitising, Mosaicing and color balancing, Rectification and registration and re-sampling, Band rations, Vegetation indices, Difference images, Image filters, Signature selection, Supervised, unsupervised and hybrid classification, ISODATA, MDM, MLC and Baysian classification, Error matrix generation, Classification validation, Field work (data aquisition with GNSS technique). Application: vegetation changes, LULC changes, Forest disturbances, Cropping pattern, Environmental monitoring, Surface mining etc.	Case study	8 hours
Microwave and hyperspectral remote sensing: Introduction to microwave image processing module, Microwave image comparison, Visual interpretation of radar images, Radar image pre-processing (Total power image, Like an unlike polarization, Ground resolution, Rectification and registration, Optical and RADAR data fusion case studies). Application: vegetation changes, LULC changes, Forest disturbances, Cropping pattern, Environmental monitoring, Surface mining etc.	Case study	6 hours
Using Google Earth Engine to for digital image processing: Getting used with GEE coding, building your own code, codding for cloud masking, building vegetation indices mosaics	Case study	4 hours
Introduction to GIS: Introduction to GIS Lab (hardware/software), Raster/Vector/Attribute data display, Scanning, Digitization, Coordinate based point mapping, Raster/Vector conversion, Data layer integration and display of different projection, Map layout, Data classification and thematic mapping, Handling with topological errors, Overlay ant network analysis.	Case study	4hours
Spatial data analysis: Assignment on spatial		

analysis for various applications, Geo-coding and point analysis exercise, Network analysis exercise, Areal analysis exercise, Buffer analysis exercise, Multivariate analysis, Assignment on advanced spatial analysis, Interpolation of elevation data and surface modelling, Suitability analysis, Risk modeling, Assignment on uncertainties in spatial modeling	Case study	2 hours
Using Qfield: Creating a personalized project and form, collecting data directly in the field, integrating Qfield measurements in GIS and Remote Sensing applications	Case study	4 hours

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2. Butler R., Schlaepfer R., (2004), Spruce snag quantification by coupling colour infrared aerial photos and a GIS, *Forest Ecology and management*, 195, 325-339.
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14. Raney, R.K. (1998). *Radar fundamentals: technical perspective. Principles and Applications of Imaging Radar, Manual of Remote Sensing*, 3rd ed., vol. 2, Wiley, New York, 9–130.
15. Richards, J.A. (2013). *Remote sensing digital image analysis. An introduction*. Springer.
16. Vopenka P., Kaspar J., Marusak R., (2015), GIS tool optimization of forest hervest-scheduling, *Computers and Electronics in Agriculture*, 113, 254-259.
17. Wang X., Yu S., Huang G.H., (2004), Land allocation based on integrated GIS-optimization modeling at a watershed level, *Landscape and Urban Planning*, 66, 61-74.
18. Welch R., Madden M., Jordan T., (2002), Photogrammetric and GIS techniques for the development of vegetation databases of montainous areas: Great Smoky Mountains National Park, *Journal of Photogrammetry & Remote Sensing*, 57, 53-68.
19. Wikstrom P., Edenius L., Elving B., Eriksson L.O., Lamas T., et al., (2011), The heureka forestry decision support

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20. Zambelli P., Lora C., Spinelli R., Tattoni C., Vitti A., Zatelli P., Ciolli M., (2012), A GIS decision support system for regional forest management to assess biomass availability for renewable energy production, *Environmental Modelling & Software*, 38, 203-213.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The course content is in accordance with the other courses developed in other universities from the country and abroad. Also, the course content is aligned with the strategy and vision of Faculty of Silviculture and Forest Engineering, with the qualification system and the European qualification framework.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge correctness and complexity • Capability to properly use the concepts and terminology in remote sensing and GIS • Capability to analyze and interpret relevant case studies and contexts in remote sensing and GIS	Exam	50%
10.5 Seminar/ laboratory/ project	• Capability to correctly use the software and methods to interpret satellite images used like support for analysis in natural resource management • Capability to use GIS software in analysis the different cases and making decisions in natural resource management • Capability to join the remote sensing and GIS methods for analysis and making decisions in natural resource management	Portfolio	50%
10.6 Minimal performance standard			
• Students will be able to interpret and analyse the satellite images and using GIS in natural resource management; • Students will be able to analyse different situations occurred in environment and solve them using remote sensing techniques and GIS; • Students will be able to use remote sensing techniques and GIS in decision making in natural resource management.			

This course outline was certified in the Department Board meeting on 27/09/2024 and approved in the Faculty Board meeting on 30/09/2024

Dean: **Prof. Dr. Ing. Alexandru Lucian CURTU**	**Head of Department:** **Prof. Dr. Ing. Stelian Alexandru BORZ**
Course holder: Prof. dr.eng. Mihai Daniel Niță	**Holder of laboratory:** Prof. dr.eng. Mihai Daniel Niță

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorat;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	*Transilvania* University of Braşov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Silviculture
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Forestry for Multiple Purposes / Master in Forest Science

2. Data about the course

2.1 Name of course			FORESTS AND WATER					
2.2 Course convenor			Assoc.Prof. Victor Dan Pacurar -Part I/ Prof. Mihai Daniel NIȚĂ-Part II					
2.3 Seminar/ laboratory/ project convenor			Assoc.Prof. Victor Dan Pacurar -Part I/ Prof. Mihai Daniel NIȚĂ-Part II					
2.4 Study year	1	2.5 Semester	1	2.6 Evaluation type	E	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	3	out of which: 3.2 lecture	1	3.3 seminar/ laboratory/ project	2
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	42
Additional documentation in libraries, specialized electronic platforms, and field research	28
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	38
Tutorial	24
Examinations	6
Other activities.....	-

3.7 Total number of individual study hours	138
3.8 Total number per semester	180
3.9 Number of credits[5)]	6

4. Prerequisites (if applicable)

4.1 curriculum-related	--
4.2 competences-related	--

5. Conditions (if applicable)

5.1 for course development	• Course attendance is facultative.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory; • Deadlines for portfolio submission will be commonly established by the teacher and students.

6. Specific competences

Professional competences	**CP.1**: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems. • **LO 1.1**: The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2**: The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance:** The course focuses on the **impact of forests on local, regional, and global water resources**, modeling hydrological processes, and evaluating erosion risks, directly aligning with these competences. **CP.2**: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems. • **LO 2.1**: The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2**: The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance:** The course emphasizes **digital watershed models**, **InVEST tools**, and **GIS-based approaches** for flood, erosion, and water yield simulation, supporting practical problem-solving in forest-water interactions.

Transversal competences	**CT.1**: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector. • **LO 1.1**: The graduate objectively evaluates the responsibilities and capacities of team members or collaborators. • **LO 1.2**: The graduate organizes activities based on employee qualifications, task complexity, and agreed time and performance norms. • **LO 1.3**: The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance:** Students develop autonomy in problem-solving through **fieldwork, case studies, and hands-on use of digital tools**, enhancing critical thinking and independent decision-making.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To provide structured knowledge regarding the forest water relationships in the context of sustainable multiple purpose forest management
7.2 Specific objectives	• To analyse the forest ecosystems impact on local, regional and global water resources • To learn modelling methods of water flux in the soil-tree-atmosphere system. • To study modelling and simulation of hydrological and erosion processes • To learn to use complex digital watershed models (GIS databases) in flood and erosion risk analysis and flow hydrograph simulation

8. Content

8.1 Course	Teaching methods	Remarks
Part I 1. Modelling and simulation of hydrological and erosion processes. Models' classification. Expert systems. 2. Soil erosion risk assessment in forest areas by using an adapted version of RUSLE (Revised Universal Soil Loss Equation). 3. Distributed Models: Basic elements and applications in Romanian watersheds	Lecture Lecture	2 hours 2 hours

(ANSWERS, TOPMODEL, and WEPP). 4. Flood and erosion risk analysis by using complex digital watershed models. Part II 5. Forest and water interactions: forest and water ecosystem services. Forest management impacts on water ecosystem services 6. The enabling environment for forests and water: risk management, regional context, future developments 7. Past and current research and management activities in quantifying this relation in Romania. Hydrological risk assessment and hydrological classification of land use in forested watersheds 8. Economic valuation of water-related forest ecosystem services	Lecture Lecture Lecture Lecture Lecture	2 hours 1 hour 2 hours 2 hours 1 hour

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Singh, V.P. -Editor -Computer Models of Watershed Hydrology, Water Resouces Publications, Colorado, U.S., 1995.
Woolhiser, D.A., Smith,R.E., Goodrich, D.C. KINEROS, A Kinematic Runoff and Erosion Model, Documentation and User Manual, Agricultural Research Service, United States Department of Agriculture, 1990.

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FAO. 2008. Forests and water. A thematic study prepared in the framework of the Global Forest Resources Assessment 2005. FAO Forestry Paper 155. FAO. Rome
Fiquepron, J, Garcia, S, Stenger, A 2013. Land use impact on water quality: valuing forest services in terms of the water supply sector. Journal of environmental management, 126, 113-121.
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Niță MD., Clinciu I (2017) Forest Management and Water in Romania. Capitol In: Pablo A. Garcia-Chevesich, Daniel G. Neary, David F. Scott, Richard G. Benyon, Teresa Reyna. (eds) Forest management and the impact on water resources: a review of 13 countries. United Nations Educational, Scientific and Cultural Organization, 7, place de Fontenoy, 75352 Paris 07 SP, France and UNESCO Regional Office for Sciences for Latin America and the Caribbean – UNESCO Montevideo. p. 9. ISBN 978-92-3-100216-8
UNECE. 2016. Water Policy Reforms in Eastern Europe, the Caucasus and Central Asia Achievements of the European Union Water Initiative, 2006-16
UNECE (2018): Forests and Water. Valuation and payments for forest ecosystem services. Geneva. ISBN 978-92-1-117175-4

8.2 Seminar/ laboratory/ project	Teaching-learning methods	Remarks
Part I		
1. The water cycle. Water role in trees` life. Forest cover impact on local, regional and global water resources.	Problem based learning	2 hours
2. Water flux modelling in the soil-tree-atmosphere system. Evapotranspiration evaluation (Penmann-Monteith Equation). Water	Problem based learning	2 hours

balance analysis in forest stands (Rainfall interception, throughfall, stemflow, infiltration and runoff estimation).		
3. An overview of water related hazards (land degradation processes) and control measures in Romania.	Problem based learning	2 hours
4. Field analysis of an area affected by complex degradation.	Problem based learning - fieldwork	6 hours
5. Flow hydrograph simulation and peak discharge evaluation in forested watershed by using the digital isochrones method.	Problem based learning	2 hours
Part II		
6. Demonstration of forest influence for water supply service using InVEST model. General description and usage of InVEST model	Problem based learning	2 hours
7. Identify the forest influence using Sediment Retention model to estimate the capacity of a land parcel to retain sediment by using information on geomorphology, climate, vegetative coverage and management practices.	Problem based learning	2 hours
8. Quantify the influence of forest in Water Purification. Nutrient Delivery Ratio model maps nutrient sources from watersheds and their transport to the stream. This spatial information can be used to assess the service of nutrient retention by natural vegetation	Problem based learning	2 hours
9. Using InVEST "Water Yield model" to estimate the annual average quantity of water produced by a watershed.	Problem based learning	2 hours
10. Mapping the ecosystem services of forest in respect to sediment retention, water purification and water yield in different scenarios.	Problem based learning	2 hours
11. Applied examples on evaluating the characteristics of forest in regulating the runoff using GIS and remote sensing products	Problem based learning	2 hours
12. Applied examples on evaluating the characteristics of forest in regulating the runoff using GIS and remote sensing products	Problem based learning	2 hours

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Hamel and Guswa 2014 (Hydrological Earth Systems Science Uncertainty analysis of a spatially-explicit annual water-balance model: case study of the Cape Fear Catchment, NC
Hamel et al. 2015 (Science of the Total Environment) A new approach to modeling the sediment retention service (InVEST 3.0): Case study of the Cape Fear catchment, North Carolina, USA
MD Niță, BȘ Candrea-Bozga, I Clinciu (2015) Monitoring status of forest hydrological and erosional protection service using geospatial analysis. Revista Pădurilor 130 (5/6), 66-73
Popa B., Coman C., Borz A.A., Nita D M., Codreanu C., Ignea Gh., Marinescu V., Ioras F., Ionescu O. (2013) Total economic value of natural capital – a case study of Piatra Craiului National Park. Notulae Botanicae Horti Agrobotanici 41(2):608-612.
Terrado et al. 2014 (Ecological Indicators) Impact of climate extremes on hydrological ecosystem services in heavily humanized Mediterranean basin
Toft et al. 2013 (ICES Journal of Marine Sciences) From mountains to sound: modelling the sensitivity of Dungeness crab and Pacific oyster to land–sea interactions in Hood Canal, WA

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The sustainable management of forest and water resources are intricately linked and the specific knowledge and skills will be extremely beneficial for the future managers of natural resources, especially in the context of the possible climate changes.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade

10.4 Course	Ability to use modelling and simulation in analysing hydrological and erosion processes	Written examination	60
10.5 Seminar/ laboratory/ project	Capability to analyse and interpret relevant case studies and to design technical solutions	Portofolio/ Written examination	40
10.6 Minimal performance standard			
• Basic knowledge regarding the forest water relationships in the context of sustainable multiple purpose forest management			

This course outline was certified in the Department Board meeting on 27/09/2024 and approved in the Faculty Board meeting on 30/09/2024

Prof.dr.ing. Lucian Alexandru CURTU **Dean**	**Prof.dr.ing. Stelian Alexandru Borz** **Head of Department**
Conf.dr.ing.Victor Dan PACURAR **Prof.dr.ing. Mihai Daniel NIȚĂ** **Course holder**	**Conf.dr.ing.Victor Dan PACURAR** **Prof.dr.ing. Mihai Daniel NIȚĂ** **Holder of seminar/ laboratory/ project**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

[2)] Study level – choose from among: Bachelor / Master / Doctorat;

[3] Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

[4] Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

[5] One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1Higher education institution	Transilvania University of Brasov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measureme
1.4 Field of study	Forestry
1.5 Study level	Master
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master in Forest Science

2. Data about the course

2.1 Name of course			Applied statistics in forest research					
2.2 Course convenor			Prof. dr.ing. Ion Catalin Petritan and Prof. dr.ing. Ioan Dutca					
2.3 Seminar/ laboratory/ project convenor			Prof. dr.ing. Ion Catalin Petritan and Prof. dr.ing. Ioan Dutca					
2.4 Study year	1	2.5 Semester	1	2.6 Evaluation type	EI	2.7 Course status	Content[3)]	PC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**4**	out of which: 3.2 lecture	**2**	3.3 seminar/ laboratory/ project	**2**
3.4 Total number of hours in the curriculum	56	out of which: 3.5 lecture	28	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	80
Additional documentation in libraries, specialized electronic platforms, and field research	4
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	60
Tutorial	2
Examinations	8
Other activities.....	

3.7 Total number of hours of student activity	154
3.8 Total number per semester	210
3.9 Number of credits[5)]	7

4. Prerequisites (if applicable)

4.1 curriculum-related	•
4.2 competences-related	•

5. Conditions (if applicable)

5.1 for course development	•
5.2 for seminar/ laboratory/ project development	• Compulsory attendance

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems.** • **LO 1.1:** The graduate understands statistical concepts, methods, and tools necessary for evaluating and modeling forest ecosystems. • **LO 1.2:** The graduate applies statistical methods to analyze data from observational and experimental forest studies and interprets the results within an ecological context. **Relevance:** This course emphasizes statistical **data analysis, hypothesis testing, regression, and multivariate methods** directly applicable to **forest ecosystem research and management.** **CP.4: New and emerging technologies applications in analyzing, developing, evaluating, and modeling forest ecosystems and forest technical systems.** • **LO 4.1:** The graduate integrates **modern statistical tools** such as R language and Bayesian models into forestry research workflows. • **LO 4.2:** The graduate designs and conducts statistically robust experiments to evaluate forest ecosystem functions and processes. **Relevance:** This course trains students to use **R programming** for advanced data analysis, including **spatial statistics, multivariate analysis, and Bayesian models,** ensuring they are equipped for contemporary research demands.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector.** • **LO 1.3:** The graduate communicates statistical results effectively to diverse stakeholders, including scientists, policymakers, and practitioners. **Relevance:** Students enhance their ability to **visualize and interpret statistical results** and present their findings through **graphs and reports,** meeting the needs of interdisciplinary teams. **CT.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects.** • **LO 2.1:** The graduate collaborates in research projects, sharing knowledge of statistical approaches and ensuring rigorous analysis. **Relevance:** Through group-based **seminars and project work,** students learn to collaborate, interpret statistical findings, and support research decision-making. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands.** • **LO 3.1:** The graduate stays updated on emerging statistical methods and tools, adapting to advancements in forestry and ecological research. **Relevance:** The course encourages lifelong learning through hands-on exposure to statistical tools such as R and JAGS, fostering adaptability to changing research methodologies.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• Exploring the advantages offered by modern statistical analysis in order to evaluate and infer the structure and functioning of forest ecosystem.
7.2 Specific objectives	To provide an understanding for forestry students on statistical concepts and methods

	To help students understand the ecological meaning of statistical results To provide support for using effectively R statistical language Engage in active, student-directed learning in preparation for professional life

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. Brief introduction to R language (Basics, Computation using R, Vectors-Matrices and arrays, Data frames, Input and Output, Data visualization-Graphs. Types of data. Central limit theorem	Lecturing	8	
2. Data exploration (Descriptive statistics, Exploring relationship between variables-correlation)	Lecturing	2	
3. Hypothesis testing (one and two sample tests): one and two-sample t test, Wilcoxon signed-rank test, Mann-Whitney U test, Fisher test, paired T and Wilcoxon test	Lecturing	2	
4. One and two-way Analysis of Variance (the variance assumption, pairwise comparisons and multiple testing, Kruskal-Wallis test, Friedman test), Analysis of Covariance	Lecturing	2	
5. Regression analysis (Simple, multiple and factorial linear regression, Goodness of fit, Model assumptions and diagnostic (Linearity, independence, variance homogeneity and normality). Interactions. Mixed effect models (varying intercept and slope models; exploring the random and fixed effect). Logistic regression	Lecturing	4	
6. Multivariate analysis (principal component analysis, cluster analysis, factor analysis)	Lecturing	2	
7. Spatial statistics (univariate and bivariate point pattern analysis-pair-correlation function, Ripley function, marked-correlation function, various indices based on distance between nearest neighbour)	Lecturing	6	
8. Sampling	Lecturing	2	
Bibliography Wiegand, T., Moloney, K.A. 2014: Handbook of Spatial Point-Pattern Analysis in Ecology. Chapman and Hall/CRC Daalgard, P. 2008. Introductory statistics with R. Second edition. Springer Shahbaba, B. 2012. Biostatistics with R. An introduction to statistics through biological data. Springer MacFarland TW, 2014. Introduction to data analysis and graphical presentation in biostatistics with R. Springer			
8.2 Seminar/ laboratory/ project	Teaching-learning	Number of hours	Remarks

	methods		
1. Brief introduction to R language (Basics, Computation using R, Vectors-Matrices and arrays, Data frames, Input and Output, Data visualization-Graphs	Computer applications	6	
2. Data exploration (Descriptive statistics, Exploring relationship between variables-correlation)	Computer applications	2	
3. Hypothesis testing (one and two sample tests): one and two-sample t test, Wilcoxon signed-rank test, Mann-Whitney U test, Fisher test, paired T and Wilcoxon test 4. One and two-way Analysis of Variance (the variance assumption, pairwise comparisons and multiple testing, Kruskal-Wallis test, Friedman test), Analysis of Covariance	Computer applications	4	
5. Regression analysis (Simple, multiple and factorial linear regression, Goodness of fit, Model assumptions and diagnostic (Linearity, independence, variance homogeneity and normality). Interactions. Mixed effect models (fitting a random intercept model; a random slope model and a random intercept and slope model; interpretation of random and fixed effects)	Computer applications	4	
6. Multivariate analysis (principal component analysis, cluster analysis, factor analysis)	Computer applications	2	
7. Spatial statistics (univariate and bivariate point pattern analysis-pair-correlation function, Ripley function, marked-correlation function, various indices based on distance between nearest neighbour)	Computer applications	6	
8. Introduction to JAGS (Just Another Gibbs Sampler) called from R. Developing a simple linear Bayesian regression model and a Bayesian mixed effect model in JAGS using informative and non-informative priors	Computer applications	4	
Bibliography			

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations and potential employers. Furthermore, the course contents were aligned to the national

qualification system and to the European qualification framework by a participative approach that included curricula discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Knowledge of statistical concepts and methods	Written examination	40%
	Ability to use statistical terminology and concepts		
	Ability to analyze and interpret results in context		
	Demonstration of logical consistency and clarity		
10.5 Seminar/ laboratory/ project	Ability to apply statistical methods to real datasets	Practical computer applications	50%
	Critical thinking and ability to evaluate results		
	Participation and active engagement in class activities	Active participation in class	10%
	Attendance and timely submission of assignments		
10.6 Minimal performance standard			
• Demonstrate basic knowledge of statistical concepts and their applications in forestry research. • Perform basic statistical analyses (e.g., t-tests, ANOVA, regression) using R language and interpret the results appropriately. • Create basic data visualizations in R to effectively communicate results. • Apply suitable statistical methods to analyze forestry datasets and explain the ecological implications.			

This course outline was certified in the Department Board meeting on 27/09/2024 and approved in the Faculty Board meeting on 30/09/2024

Prof.Dr. Alexandru Lucian Curtu **Dean**	**Prof.Dr. Eng. Stelian Alexandru Borz** **Head of Department**
dr.ing. Ion Catalin Petritan & dr.ing. Ioan Dutca **Course holder**	**dr.ing. Ion Catalin Petritan & dr.ing. Ioan Dutca** **Holder of seminar/ laboratory/ project**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorat;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transilvania University of Braşov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurement
1.4 Field of study	Forestry
1.5 Study level	Master
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master in Forest Science

2. Data about the course

2.1 Name of course			**Biodiversity conservation**					
2.2 Course convenor			Prof. Alexandru Lucian Curtu /Prof. Victor Adrian Indreica					
2.3 Laboratory			Prof. Alexandru Lucian Curtu / Prof. Victor Adrian Indreica					
2.4 Study year	**1**	2.5 Semester	**1**	2.6 Evaluation type	**E**	2.7 Course status	Content[3)]	**PC**
							Attendance type[4)]	**CPC**

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**2**	out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**1**
3.4 Total number of hours in the curriculum	**28**	out of which: 3.5 lecture	**14**	3.6 seminar/ laboratory/ project	**14**

Time allocation	hours
Study of textbooks, course support, bibliography and notes	**38**
Additional documentation in libraries, specialized electronic platforms, and field research	**19**
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	**28**
Tutorial	**3**
Examinations	**4**
Other activities -	

3.7 Total number of individual study hours	**92**
3.8 Total number per semester	**120**
3.9 Number of credits[5)]	**4**

4. Prerequisites (if applicable)

4.1 curriculum-related	• Botany, Dendrology, Genetics
4.2 competences-related	-

5. Conditions (if applicable)

5.1 for course development	• Course attendance is facultative.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory; • Deadlines for portfolio submission will be commonly established by the teacher and students.

6. Specific competences

Professional competences	**CP.1:** Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems. • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in the management of forest ecosystems and technical forest production systems. • **LO 1.2:** The graduate applies/uses the concepts, theories, principles, methods, techniques, and technologies related to the management of forest ecosystems and technical forest production systems.
Transversal competences	**CT.2:** Managing personal and interpersonal relationships specific to teamwork in forest management and forestry research and application projects. • **LO 2.1:** The graduate applies ethical principles in their professional activity. • **LO 2.2:** The graduate promotes high standards of quality and professional integrity within the team/program they manage. • **LO 2.3:** The graduate is capable of efficiently coordinating teams and research projects. **CT.3:** Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands. • **LO 3.1:** The graduate keeps themselves updated with advances in techniques and research in their field of practice. • **LO 3.2:** The graduate identifies opportunities for continuous professional development. • **LO 3.3:** The graduate self-evaluates and plans realistic career development goals, identifying strategies to overcome professional challenges.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To develop knowledge and skills in the field of biodiversity conservation – from gene to plant community level
7.2 Specific objectives	• To explore population and species diversity through genetics tools • To know some important endangered, vulnerable, rare, endemic plant and animal species included in the Red List for Romania or protected by international conventions. • To acquire the ability to identify habitats and to evaluate their conservation status • To understand the national network of natural protected areas from different I.U.C.N. categories

8. Content

8.1 Course	Teaching methods	Nr. of hours	Remarks
1. Biodiversity – concept, definitions and levels	Lecture	2	
2. Gene conservation – in situ, ex situ and sampling strategies	Lecture	2	
3. Natural protected areas – types and conservation objectives	Lecture	2	
4. Protected species – IUCN red list criteria; Bern Convention, Habitats Directive, Romanian red lists of vascular plants	Lecture	2	
5. Evaluation of ecosystem's biodiversity. Monitoring of protected species and habitats	Lecture	4	
6. Conservation planning	Lecture	2	

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Magurran A.E. 2004. Measuring biological diversity. Blackwell Science, Oxford.
Schulze E.D., Beck E., Buchmann N., Clemens S., Müller-Hohenstein K., Scherer-Lorenzen M., 2020. Biodiversity. In: Schultze et al. - Plant Ecology. pp. 743-823. Springer.
White T.L., Adams W.T., Neale D.B., 2007. Forest Genetics. *CAB International.*

8.2 Laboratory	Teaching-learning methods	Nr of hours	Remarks
1. Measures of genetic diversity based on genetic markers	Laboratory analysis	2	
2. Protected areas, plant species and habitats. Survey and mapping.	Field Work	4	
3. Assessing the conservation status of species and habitats. Biodiversity indices	Field work. Study case. Exercises	4	
4. Writing the management plan for a protected area	Study case	4	

Bibliography

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Hurdu B.I., et al. 2022. Ex situ conservation of plant diversity in Romania: A synthesis of threatened and endemic taxa – Supplementary Material 1. Journal for Nature Conservation 68():1-21
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Kent M., 2012. Vegetation description and data analysis. A practical approach. 2nd ed. Willey-Blackwell.
Lee T., Middleton J., 2003. Guidelines for Management Planning of Protected Areas. IUCN Gland, Switzerland and Cambridge, UK
Souheil H., Germain L., Boivin D., Douillet R. et al., 2011. Natura 2000 Management Plan. Methodological Guide for drawing up the Management Plan. Atelier Technique des Espaces Naturels. Montpellier. 120 p.
TNC, 2007. Conservation Action Planning Handbook: Developing Strategies, Taking Action and Measuring Success at Any Scale. The Nature Conservancy, Arlington, VA
White T.L., Adams W.T., Neale D.B., 2007. Forest Genetics. *CAB International.*

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

This course offers to graduated students the theoretical background and practical skills required in the field of nature conservation. The acquired competences will made them able to be employed in forest and biological research institutes, environmental agencies, administrative institutions of protected areas, genetic laboratory, public or private entities dealing with species and vegetation survey, impact studies, environmental consultancy.

10. Evaluation

Activity type	Evaluation criteria	Evaluation methods	Percentage of the final grade
Course	Knowledge of advanced terminology and methods in biodiversity conservation	Exam	50 %
	Capability to use specific concepts and to evaluate study cases		

Laboratory	Ability to interpret genetic diversity indices	Portfolio	50 %
	Ability to survey, identify and evaluate diversity of species and habitats		
	Ability to conceive and assess a protected area management plan		
	Capability to organize the own research activity and to deliver scientifically the results		
Minimal performance standard			
• To apply a set of performant methods for identification of forests ecosystems diversity • To compose a scientific project for evaluation of conservation status of forests species and habitats			

This course outline was certified in the Department Board meeting on 29/09/2024 and approved in the Faculty Board meeting on 30/09/2024

Prof.dr. Alexandru Lucian CURTU Dean	Prof.dr. Stelian Alexandru BORZ Head of Department
Prof.dr. Alexandru Lucian CURTU Assoc.prof.dr. Victor Adrian INDREICA Course holders	Prof.dr. Alexandru Lucian CURTU Assoc.prof.dr. Victor Adrian INDREICA Holders of laboratory

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorat;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	TRANSILVANIA UNIVERSITY OF BRAȘOV
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	Master
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master of Forest Sciences

2. Data about the course

2.1 Name of course			Academic Skills and Ethics in Research					
2.2 Course convenors			Prof. A.L. Curtu / Prof. M. Burada					
2.3 Seminar/ laboratory/ project convenors			Prof. A.L. Curtu / Prof. M. Burada					
2.4 Study year	I	2.5 Semester	I	2.6 Evaluation type	C	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**1**	out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**-**
3.4 Total number of hours in the curriculum	14	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	-

Time allocation	hours
Study of textbooks, course support, bibliography and notes	25
Additional documentation in libraries, specialized electronic platforms, and field research	37
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	28
Tutorial	6
Examinations	10
Other activities.....	-

3.7 Total number of hours of student activity	106
3.8 Total number per semester	120
3.9 Number of credits[5)]	4

4. Prerequisites (if applicable)

4.1 curriculum-related	• none
4.2 competences-related	• English (level B2 and above)

5. Conditions (if applicable)

5.1 for course development	• Student attendance is compulsory
5.2 for seminar/ laboratory/ project development	• N.A.

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems.** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. **Relevance:** Understanding **guidelines for scientific writing**, including research articles and abstracts, directly supports effective dissemination of knowledge related to **forest ecosystems and forest management**. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems.** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. **Relevance:** This applies to understanding **research ethics** and the **principles of academic integrity**, ensuring compliance with best practices in forestry-related research.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector.** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance:** Developing **oral presentations** and effective **written communication** fosters the ability to clearly convey research results at professional and academic events. **CT.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects.** • **LO 2.1:** The graduate applies ethical principles in professional activities. **Relevance:** This directly aligns with adhering to **research ethics** and principles of **academic integrity** when conducting and publishing research. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands.** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.3:** The graduate self-evaluates and plans realistic career development goals, identifying strategies to overcome professional challenges. **Relevance:** Critical for **professional growth**, as students are trained to reflect on their work, maintain academic integrity, and develop skills for their evolving careers.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To develop the students' competence to communicate effectively and appropriately in professional settings, using English as a working language.
7.2 Specific objectives	• To acquaint students to the metalanguage used to connect ideas/sentences into larger chunks of text. • To make fair and effective use of the specialist literature in their own texts. • To develop their skills in disseminating the results of their own research in written texts (abstracts) and via oral presentations.

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
Academic Integrity and Ethics in Research	Lecture, group discussions	2	
An introduction to communication in forestry-related research: guidelines for writing research articles in forest sciences	Lecture, group discussions	2	
Aspects of written communication in research: abstracts (typology, structural organization, language).	Lecture, text analysis, in-class text writing	4	
Aspects of oral communication in research: conference presentations (from planning to delivery)	Lecture, video watching, in-class preparation	6	

8.1 Course

Selected bibliography & Webliography

Curtu, A. L., Burada M.(2020) Lecture notes (available on the e-learning platform).

Allan, Robert. N (2003) How to Prepare an Abstract for a Scientific Meeting in "How to Write a Paper", George M. Hall (ed.), 3rd edition, London: BMJ Books, pp. 72-84.

Burada, Marinela (2017) "Joint Authorship: A Glimpse into some Local Practices of Merit Attribution". In 13th Conference on British and American Studies - Language Diversity in a Globalized World. Newcastle: Cambridge Scholars Publishing, pp. 198-216.

Halliday, M.A.K. & Hasan, R. (1976) Cohesion in English. London: Longman.

Jordan, R.R. (1980, 1990) Academic Writing Course. London: Collins ELT.

Lozano, G. A. (2014) "Ethics of using language editing services in an era of digital communication and heavily multi-authored papers". Science and Engineering Ethics 20: 363-377.

Moss, Fiona (2003) Titles, Abstracts, and Authors in "How to Write a Paper", George M. Hall (ed.), 3rd edition, London: BMJ Books, pp. 42-50

Pecorari, Diane (2010) Academic Writing and Plagiarism. A Linguistic Analysis. London/NY: Continuum International Publishing Group.

Swales, J.M. (1990) Genre Analysis. English in Academic and Research Settings. Cambridge: CUP.

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8.2 Seminar/ laboratory/ project

Bibliography

N.A.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The contents of this course have been developed in keeping with the strategy and vision of the Faculty of Silviculture and Forest Engineering, taking into account the suggestions made by the Romanian members of epistemic communities, professional associations and potential employers. The course contents are in line with the national qualification system and to the European qualification framework by a participative approach that included curricula discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Accuracy, appropriacy and effectiveness of written/spoken output.	Mid-term assessment of written output	40%
		Final assessment of spoken output	60%
10.5 Seminar/ laboratory/ project	N.A.		
10.6 Minimal performance standard			
• Ability to convey written/spoken message accurately and with reasonable clarity.			

This course outline was certified in the Department Board meeting on 29/09/2024 and approved in the Faculty Board meeting on 30/09/2024

Prof.dr.eng. Alexandru Lucian CURTU **Dean**	**Prof.dr.eng. Stelian Alexandru BORZ** **Head of Department**
Prof.dr.eng. Alexandru Lucian CURTU **Prof. dr. Marinela BURADA (Faculty of Letters)**	**Holder of seminar/ laboratory/ project** **N.A.**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorat;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	TRANSILVANIA UNIVERSITY OF BRAŞOV
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Forestry for Multiple Purposes /Master in Forest Sciences

2. Data about the course

2.1 Name of course			Forest stand dynamics					
2.2 Course convenor			dr. Petru Tudor Stăncioiu					
2.3 Seminar/ laboratory/ project convenor			dr. Petru Tudor Stăncioiu					
2.4 Study year	1	2.5 Semester	2	2.6 Evaluation type	E	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**4**	out of which: 3.2 lecture	**2**	3.3 seminar/ laboratory/ project	**2**
3.4 Total number of hours in the curriculum	56	out of which: 3.5 lecture	28	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	77
Additional documentation in libraries, specialized electronic platforms, and field research	28
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	44
Tutorial	3
Examinations	2
Other activities	0

3.7 Total number of individual study hours	154
3.8 Total number per semester	210
3.9 Number of credits[5)]	7

4. Prerequisites (if applicable)

4.1 curriculum-related	Basic knowledge of forest ecology and silviculture
4.2 competences-related	English knowledge – write, read, speak (level – average to good)

5. Conditions (if applicable)

5.1 for course development	Reading the assigned text before class, each week.
5.2 for seminar/ laboratory/ project development	Laboratory attendance is compulsory. Preparation for discussion based on assigned materials

6. Specific competences

Professional competences	**PC.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems.** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance:** This directly aligns with understanding and applying concepts of **stand dynamics**, ecological succession, and disturbance processes presented in the course. Students will be able to analyze stand structures and dynamics to solve complex forestry problems. **PC.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems.** • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance:** Students will develop **decision-making skills** for managing dynamic and multi-resource ecosystems, balancing natural processes with management-driven dynamics like close-to-nature silviculture.
Transversal competences	**TC.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector.** • **LO 1.1:** The graduate objectively evaluates the responsibilities and capacities of team members or collaborators. **Relevance:** The course involves case studies, and debates where students critically evaluate and defend arguments on forest dynamics issues. **TC.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects.** • **LO 2.3:** The graduate can efficiently lead teams and research projects. **Relevance:** Through field trips, case study discussions, and scenario-based tasks, students build their capacity to collaborate and **lead discussions** on stand development patterns and ecosystem management. **TC.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands.** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. **Relevance:** By engaging with scientific literature and case studies, students learn to continuously improve their knowledge in **forest stand dynamics** and adapt to real-world challenges.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To develop critical thinking of the students regarding the dynamics of forest stands – a reality of nature
7.2 Specific objectives	• To help students understand the way forest stands react to natural and/or anthropogenic disturbances; • To help students gain knowledge on predicting and decision making process in dynamic and complex forest ecosystems; • To develop personal strengths in managing forests as dynamic and multi-resource ecosystems.

8. Content

8.1 Course	Teaching methods	Hours	Remarks
8.1.1. Introduction to the class. The process of change in ecosystems: Stand dynamics and Ecological succession (Oliver and Larson 1996 and Kimmins 2004)	Lecture – Power Point presentation	2	
8.1.2. The process of change in ecosystems: Ecological succession (cont.) (Kimmins 2004).	Lecture – Power Point presentation	2	
8.1.3. Plant interactions and limitations of growth (Oliver and Larson 1996)	Lecture – Power Point presentation	2	
8.1.4. Tree architecture and growth (Oliver and Larson 1996)	Lecture – Power Point presentation	2	
8.1.5. Disturbances and forest stand development (Oliver and Larson 1996)	Lecture – Power Point presentation	2	
8.1.6. Ecosystem stability. Understanding and emulating natural forest disturbances (Larsen, J. B. 1995 and Kimmins 2004)	Lecture – Power Point presentation	2	
8.1.7. Overview of stand development patterns (Oliver and Larson 1996)	Lecture – Power Point presentation	2	
8.1.8. Temporal and spatial patterns of tree invasion. Stand initiation stage: single cohort stands (Oliver and Larson 1996)	Lecture – Power Point presentation	2	
8.1.9. Stem exclusion stage: single cohort stands, single-species stands and mixed-species stands (Oliver and Larson 1996)	Lecture – Power Point presentation	2	
8.1.10. Understory reinitiation stage. Old growth stage. (Oliver and Larson 1996)	Lecture – Power Point presentation	2	
8.1.11. Multicohort stands: behaviour of component cohorts. Development of multicohort stands (Oliver and Larson 1996)	Lecture – Power Point presentation	2	

8.1.12. Stand edges, gaps and clumps. Stand structure and biodiversity (Oliver and Larson 1996; Kimmins 2004; Hunter 1990; Stăncioiu 2022)	**Lecture – Power Point presentation**	**2**	
8.1.13. Forest patterns over long times and large areas (Oliver and Larson 1996)	**Lecture – Power Point presentation**	**2**	
8.1.14. Ecosystem management and landscape ecology (Kimmins 2004)	**Lecture – Power Point presentation**	**2**	

Bibliography

1. Hunter, M.L. Jr. 1990. ***Wildlife, forests, and forestry: Principles of managing forests for biological diversity***. Prentice-Hall, Englewood Cliffs, NJ. 370pp
2. Kimmins, J. P. 2004. ***Forest ecology***. A foundation for sustainable forest management and environmental ethics in forestry. New Jersey: Prentice Hall.
3. Larsen, J. B. 1995. ***Ecological stability of forests and sustainable silviculture***. Forest Ecology and Management 73: 85-96
4. Oliver, C. D., Larson, B. C. 1996. ***Forest Stand Dynamics***. New York: John Wiley & Sons, Inc.
5. Stăncioiu, P.T. 2022. ***Biodiversity Conservation in Forest Management***. In Giurcă A. and Dima, D.P. (Editors) *The Plan B for Romania's Forests and Society* (pp. 49-64). Transilvania University Press. Brasov, Romania

8.2 Laboratory	**Teaching-learning methods**	**Hours**	**Remarks**
8.2.1. Continuous change as a rule (equilibrium = transient and the exception)	**Fieldtrip "Dupa Ziduri"**	**2**	**Fieldtrips will cover the most important issues presented in the class.** **For case studies, students will read ahead texts provided by instructor and prepare to debate/defend the topic. The teacher will provide hints for discussion and will coordinate the discussions during the seminar.**
8.2.2. Continuous change as a rule (equilibrium = transient and the exception)	**Case study**	**2**	
8.2.3. The process of change in ecosystems: Ecological succession. Types, models and theories.	**Field trip „Pietrele lui Solomon"**	**2**	
8.2.4. Effects of "stop doing something" on ecosystem dynamics (Change from grassland to closed vegetation)	**Case study**	**2**	
8.2.5. Plant interactions and limitations of growth. Where do plants grow? What is growing space? Growing space and disturbances.	**Field trip „Pietrele lui Solomon"**	**2**	
8.2.6. Effects of "doing something" on ecosystem dynamics (Change from closed forest to open habitat – coppice effects on butterflies)	**Case study**	**2**	
8.2.7. Tree architecture and growth. Crown and tree development in side shade. Low vs. High shade. Release from side shade. Ecological niche	**Field trip „Pietrele lui Solomon"**	**2**	

8.2.8. Effects of "doing nothing" on ecosystem dynamics - The role of intact forests (Sustainable management vs. No management)	Case study	2	
8.2.9. Tree cooperation / mutualism? or competition? Trees and mycorrhizal networks	Case study	2	
8.2.10-11-12. Development stage, stand structure and biodiversity. Old-growth. Understory re-initiation. Stem exclusion	Field trip to Stramba UNESCO forest	6	
8.2.13 Disturbances, growing space and stand development	Field trip „Pietrele lui Solomon"	2	
8.2.14. Stand dynamics and silviculture (natural vs. management driven dynamics). Close-to-nature silviculture in a changing world. Save the planet!?	Case study	2	
Bibliography Students will be provided with the texts for the case study they will debate/defend in class.			

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included curricula discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge on advanced terminology in forest stand dynamics	Exam	70%
	• Ability to understand and use the concepts and terminology in forest stand dynamics		
	• Ability to analyze and make decisions on relevant case studies and contexts in forest stand dynamics		
10.5 Seminar/ laboratory/ project	• Ability to critically evaluate a certain situation / statement / topic	Participation in class and at the fieldtrips	30%
	• Ability to follow the presentation and ask questions / give answers		

	• **Ability to build own arguments and to defend own ideas**		
	• **Ability to evaluate own and others' arguments**		
10.6 Minimal performance standard			
• **Students must be able to correctly describe a given concept related to stand dynamics;** • **Students must be able to understand and choose the appropriate measures for a given case from a list of options;** • **Students must be able to defend a decision in a certain case scenario.**			

This course outline was certified in the Department Board meeting on 29/09/2024 and approved in the Faculty Board meeting on 30/09/2024

Prof. Dr. Alexandru Lucian CURTU	**Prof. Dr. Alexandru Stelian BORZ**
Dean	**Head of Department**
Dr. Petru Tudor STANCIOIU	**Dr. Petru Tudor STANCIOIU**
Lecture instructor	**Seminar instructor**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorat;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transilvania University of Braşov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master in Forest Science

2. Data about the course

2.1 Name of course			Integrated Pest Management					
2.2 Course convenor			Assoc. dr. eng. Isaia Gabriela-Aurora					
2.3 Seminar/ laboratory/ project convenor			Assoc. dr. eng. Isaia Gabriela-Aurora					
2.4 Study year	1	2.5 Semester	2	2.6 Evaluation type	E	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	3	out of which: 3.2 lecture	1	3.3 seminar/ laboratory/ project	2
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	45
Additional documentation in libraries, specialized electronic platforms, and field research	54
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	50
Tutorial	3
Examinations	16
Other activities.....	0

3.7 Total number of hours of student activity	168
3.8 Total number per semester	210
3.9 Number of credits[5)]	7

4. Prerequisites (if applicable)

4.1 curriculum-related	-
4.2 competences-related	-

5. Conditions (if applicable)

5.1 for course development	• Course attendance is facultative.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory; • Deadlines for portfolio submission will be commonly established by the teacher and students.

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems.** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance:** The course focuses on analyzing **pest risks** to forest ecosystems, understanding integrated pest management (IPM) principles, and applying sustainable strategies for controlling pests while maintaining ecosystem balance. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems.** • **LO 2.1:** The graduate understands the economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies knowledge to implement regulatory frameworks, such as **pesticide regulations**, biodiversity strategies, and IPM policies. **Relevance:** The course addresses the **social and economic constraints** of pesticide use, highlighting regulatory compliance and developing pest management plans that align with sustainable forestry practices.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector.** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance:** Students collaborate on **field trips** and **laboratory work**, preparing and presenting results on pest identification, exotic species, and management strategies. Effective communication is essential for teamwork and presenting findings. **CT.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects.** • **LO 2.1:** The graduate applies ethical principles in professional activities. • **LO 2.3:** The graduate can efficiently lead teams and research projects. **Relevance:** The laboratory sessions, including **identifying entomophagous insects** and developing protocols for invasive species, require teamwork, leadership, and ethical scientific practices. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands.** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. **Relevance:** The course involves **case studies**, bibliographic research, and **practical applications**, helping students understand emerging challenges in pest management and solutions through lifelong learning.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• The goal of this course is to develop an understanding of the concepts and principles of IPM as a complex mix of practices and technologies to efficiently manage pest populations.
7.2 Specific objectives	• Understanding the terms relevant to integrated pest management • Learning practical skills in organizing activities for monitoring the negative impact of pests on forest and environment • Understanding the different tactics used to manage pest insects in crop situations • Acquiring the ability to design an appropriate pest management strategy in a given situation • Understanding the social and economic constraints of pesticide use • Acquiring the ability of bibliographic documentation by consulting various sources

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. IPM-General definitions and concepts	Interactive lecture	2	
2. Exotic and invasive species. Definitions. European invasive species and their impact. Invasive insects in Romania.	Interactive lecture, video	2	
3. Pest forecast models in IPM . Forecast models based on degree-days. Case study - *Ips typographus* (The effects of the spruce bark beetle attacks. The current management and the need to change it. Systems / models for hazard or risk assessment. Phenological models)	Interactive lecture, video	2	
4. Biodiversity and IPM. What is biodiversity? Biodiversity at European level. Biodiversity in Romania. The importance of deadwood in the forest. Biodiversity - the basis for integrated pest management.	Interactive lecture, video	2	
5. IPM strategies and tactics. Essential elements in the development of IPM strategies. Fundamental criteria in IPM.	Interactive lecture, video	2	
6. Biological control of pests. Biological control: advantages and disadvantages. Pathogenic microorganisms (viruses, bacteria, fungi, protozoa). Entomophagous species. Case study - Ants & Biological control	Interactive lecture, video	2	
7. Pesticides and alternatives. Chemical method: advantages and disadvantages. Pesticide regulations in Romania. Biopesticides.	Interactive lecture, video	2	
Bibliography Arora, R., Singh, B., Dhawan, A. K., 2017 - *Theory and practice of integrated pest management*. Scientific Publishers. Brudea V., 2007 – *Combaterea biologică în managementul integrat al dăunătorilor, cu referire specială la ecosistemele silvice.* Editura Univ. „Ştefan cel Mare" Suceava, p. 240. Coulson, R. N., Witter, J. A., 1984 – *Forest Entomology: Ecology and Management.* John Wiley and Sons, N.Y. Deguine, J. P., Aubertot, J. N., Flor, R. J., Lescourret, F., Wyckhuys, K. A., Ratnadass, A., 2021 - Integrated pest			

management: good intentions, hard realities. A review. *Agronomy for Sustainable Development*, *41*(3), 38.
Dent, D., Binks, R. H., 2020 - *Insect pest management*. Cabi.
Grant, W. P., Chandler, D., Bailey, A., Greaves, J., Tatchell, M., & Prince, G., 2010 - *Biopesticides: pest management and regulation*. CABI.
Koul, O., Dhaliwal, G. S., & Cuperus, G. W. (Eds.)., 2004 -*Integrated pest management: potential, constraints and challenges*. CABI.
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Pedigo, L. P., Rice, M. E., Krell, R. K., 2021 - *Entomology and pest management*. Waveland Press.
Perju T., 2004 – *Dăunătorii din principalele agroecosisteme şi combaterea lor integrată*. Editura Academic Pres, Cluj-Napoca, p. 496.

8.2 Seminar/ laboratory/ project	Teaching-learning methods	Number of hours	Remarks
Natural enemies of pests	Determining the entomophagous insects using a stereomicroscope. Individual work	8	
Pest management decisions in Spruce stands	Laboratory and field application	12	
Exotic and invasive insects	Field trip and individual work	8	

Bibliography

Arora, R., Singh, B., Dhawan, A. K., 2017 - *Theory and practice of integrated pest management*. Scientific Publishers.
Brudea V., 2007 – *Combaterea biologică în managementul integrat al dăunătorilor, cu referire specială la ecosistemele silvice.* Editura Univ. „Ştefan cel Mare" Suceava, p. 240.
Coulson, R. N., Witter, J. A., 1984 – *Forest Entomology: Ecology and Management.* John Wiley and Sons, N.Y.
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Dent, D., Binks, R. H., 2020 - *Insect pest management*. Cabi.
Grant, W. P., Chandler, D., Bailey, A., Greaves, J., Tatchell, M., & Prince, G., 2010 - *Biopesticides: pest management and regulation*. CABI.
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Norris, R. F., Caswell-Chen E.P., Kogan, M., 2003 – *Concepts in integrated pest management*. Pearson Education, Inc., Upper Saddle River, New Jersey USA, p. 586.
Pedigo, L. P., Rice, M. E., Krell, R. K., 2021 - *Entomology and pest management*. Waveland Press.
Perju T., 2004 – *Dăunătorii din principalele agroecosisteme şi combaterea lor integrată*. Editura Academic Pres, Cluj-Napoca, p. 496.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included curricula discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	General assessment criteria (completeness and correctness of knowledge, logical consistency, fluency of speech, force of argumentation). Specific criteria of discipline	Written exam	50%
	Criteria that envisage the attitudinal and motivational work of the student	Attendance at least 75% of courses	10%
10.5 Seminar/ laboratory/ project	Specific criteria of discipline	Practical test - Identification of entomophagous insects	10%
	Specific criteria of discipline. Criteria that envisage the attitudinal and motivational work of the student	Identification of bark beetles and non-target beetles /Results interpretation	20%
	Specific criteria of discipline Criteria that envisage the attitudinal and motivational work of the student	Completion of the protocol for exotic and invasive insects	10%
10.6 Minimal performance standard			
• Knowledge of the terms relevant to integrated pest management • Knowledge of the pests and their impacts on forest • Knowledge of the different tactics used to manage pests • Knowledge of the social and economic constraints of pesticide use			

This course outline was certified in the Department Board meeting on 29/09/2024 and approved in the Faculty Board meeting on 30/09/2024

Prof.PhD.Eng. Alexandru Lucian CURTU, **Dean**	**Prof.PhD.Eng. Stelian Alexandru BORZ,** **Head of Department**
Assoc. Prof. PhD. Eng. Gabriela-Aurora ISAIA, **Course holder**	**Assoc. Prof. PhD. Eng. Gabriela-Aurora ISAIA,** **Holder of seminar/ laboratory/ project**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

[2] Study level – choose from among: Bachelor / Master / Doctorat;

[3] Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

[4] Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

[5] One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transilvania University of Brasov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Silviculture
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master in Forestry

2. Data about the course

2.1 Name of course			**Management of Wildlife Population**					
2.2 Course convenor			Professor dr. eng. Ovidiu Ionescu					
2.3 Seminar/ laboratory/ project convenor			Lecture dr. eng. Mihai Fedorca					
2.4 Study year	I	2.5 Semester	II	2.6 Evaluation type	E	2.7 Course status	Content[3)]	
							Attendance type[4)]	

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**3**	out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**2**
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	44
Additional documentation in libraries, specialized electronic platforms, and field research	39
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	46
Tutorial	10
Examinations	2
Other activities.....	

3.7 Total number of individual study hours	138
3.8 Total number per semester	180
3.9 Number of credits[5)]	6

4. Prerequisites (if applicable)

4.1 curriculum-related	• Game animals and salmonids; Management of game animal population;
4.2 competences-related	•

5. Conditions (if applicable)

5.1 for course development	• Video projection
5.2 for seminar/ laboratory/ project development	•

6. Specific competences

Professional competences	CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems LO 1.1: The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. LO 1.2: The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. Relevance to SYFE: This competence aligns with the course's focus on stand dynamics, yield modeling, and silvicultural interventions, emphasizing the practical application of theoretical knowledge to real-world forestry challenges. CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems LO 2.1: The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. LO 2.2: The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector.
Transversal competences	CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector LO 1.1: The graduate objectively evaluates the responsibilities and capacities of team members or collaborators. LO 1.2: The graduate organizes activities based on employee qualifications, task complexity, and agreed time and performance norms. LO 1.3: The graduate employs effective communication strategies and techniques within the team and with external partners. Relevance to SYFE: The course involves fieldwork and collaborative analysis, enhancing students' ability to organize and communicate within a team and with external stakeholders in forestry operations. CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands LO 3.1: The graduate keeps updated with advances in techniques and research in their field of practice. LO 3.2: The graduate identifies opportunities for continuous professional development. LO 3.3: The graduate self-evaluates and plans realistic career development goals, identifying strategies to overcome professional challenges.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• Acquisition of theoretical and practical knowledge related to the silvic and technical management of the forests and its products, acquisition of cognitive and practical abilities
7.2 Specific objectives	• Knowledge of the evolution of game keeping in Romania. • Knowledge of the evolution of hunting law.

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. Introduction	Video projection	2	
2. Food and nutrition	Video projection	2	
3. Dispersal and distribution	Video projection	2	

4. Predation	Video projection	2	
5. Counting animals	Video projection	2	
6. Experimental management	Video projection	2	
7. Wildlife harvesting	Video projection	2	

Bibliography

1. Fryxell, John M., Anthony RE Sinclair, and Graeme Caughley. Wildlife ecology, conservation, and management. John Wiley & Sons, 2014.
2. Morrison, Michael L., Bruce Marcot, and William Mannan. "Wildlife-habitat relationships: concepts and applications." (2012).
3. Mills, L. Scott. Conservation of wildlife populations: demography, genetics, and management. John Wiley & Sons, 2012.

8.2. Laboratory/seminar	Teaching methods	Number of hours	Remarks
1. Wildlife ecology	Video projection. Interactive discussions	4	
2. The ecology of behaviour	Video projection. Interactive discussions	4	
3. Population regulation, fluctuation, and competition within species	Video projection. Interactive discussions	4	
4. Parasites and pathogens	Video projection. Interactive discussions	4	
5. Age structure. Adaptive management	Video projection. Interactive discussions	4	
6. Conservation of wildlife populations	Video projection. Interactive discussions	4	
7. Wildlife controls. Human-wildlife conflinct	Video projection. Interactive discussions	4	

Bibliography

1. Fryxell, John M., Anthony RE Sinclair, and Graeme Caughley. Wildlife ecology, conservation, and management. John Wiley & Sons, 2014.
2. Morrison, Michael L., Bruce Marcot, and William Mannan. "Wildlife-habitat relationships: concepts and applications." (2012).
3. Mills, L. Scott. Conservation of wildlife populations: demography, genetics, and management. John Wiley & Sons, 2012.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The course provides comprehensive data for the identification of all aspects of management and research of species of hunting interest in Romania and worldwide and their roles in the ecosystem.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course		Standardised test	70

10.5 Seminar/ laboratory/ project		Project	30
10.6 Minimal performance standard			
•			

This course outline was certified in the Department Board meeting on 29/09/2024 and approved in the Faculty Board meeting on 30./09/2024

Dean University professor dr.eng. Curtu Alexandru Lucian	Head of Department, Associate professor dr. eng. Gurean Dan Marian
Course holder Professor dr.eng. Ovidiu IONESCU	Holder of seminar Lecture dr.eng. Mihai FEDORCA

Note:

1) Field of study – select one of the following options: BA/MA/PhD. (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: BA/MA/PhD;

3) Course status (content) – for the BA level, select one of the following options: FC (fundamental course) / DC (course in the study domain)/ SC (speciality course)/ CC (complementary course); for the MA level, select one of the following options: PC (proficiency course)/ SC (synthesis course)/ AC (advanced course);

4) Course status (attendance type) – select one of the following options: CPC (compulsory course)/ EC (elective course)/ NCPC (non-compulsory course);

5) One credit is the equivalent of 25 – 30 study hours (teaching activities and individual study).

1.1 Higher education institution	Transilvania University of Brașov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study	Forestry
1.5 Study level	Master
1.6 Study programme/Qualification	Multiple Purpose Forestry / Master in Forest Sciences

2. Data about the course

2.1 Name of course			Management of Timber Harvesting Operations					
2.2 Course convenor			Prof. dr. eng. Stelian Alexandru Borz					
2.3 Laboratory			Prof. dr. eng. Stelian Alexandru Borz					
2.4 Study year	I	2.5 Semester	II	2.6 Evaluation type	E	2.7 Course status	Content	PC
							Attendance type	CPC

3. Total estimated time

3.1 Number of hours per week	**3**	out of which: 3.2 lecture	**1**	3.3 laboratory	**2**
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 laboratory	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	56
Additional documentation in libraries, specialized electronic platforms, and field research	38
Preparation of portfolios, and essays	26
Tutorial	8
Examinations	10
3.7 Total number of hours of student activity	138
3.8 Total number per semester	180
3.9 Number of credits	6

4. Prerequisites

4.1 curriculum-related	•
4.2 competences-related	•

5. Conditions

5.1 for course development	• Course attendance is facultative
5.2 for laboratory	• Laboratory attendance is compulsory • Deadlines for the portfolio submission will be commonly established by the teacher and students

6. Specific competences

Professional competences	• **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to MTHO:** This competence aligns with the discipline's focus on **timber harvesting which is described as a system shaped by economic, environmental, and social sustainability**, which includes the characterization, analysis, modeling, and evaluation of timber harvesting systems under the main pillars of sustainability. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to MTHO:** This competence aligns with the discipline's focus on **timber harvesting which is described at several levels of decision making, and includes perspectives in timber harvesting shaped by economic, regulatory, and strategic levels**.
Transversal competences	**CT.1: Mastery of skills required for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.1:** The graduate objectively evaluates the responsibilities and capacities of team members or collaborators. • **LO 1.2:** The graduate organizes activities based on employee qualifications, task complexity, and agreed time and performance norms. • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to MTHO:** The discipline involves **field work and/or work in simulated environments**, enhancing the ability to self-organize and communicate within a team and with external stakeholders.

7. Course objectives

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in the engineering and management of forest operations.
7.2 Specific objectives	• To define, elaborate (deepen) and use the concepts, methods, instruments, and approaches in forest operations engineering and management;

1.2. Role of forests 1.3. Assessment criteria 1.4. Decision making in three steps 1.5. System theory as a basic concept		
2. Harvesting chains – description and classification 2.1. Functions of harvesting 2.2. Sub-functions of harvesting 2.3. Tools and machines for harvesting 2.4. Degree of mechanization 2.5. Degree of mechanization with composed systems 2.6. The functiogram 2.7. Process chaining	Lecture	2 hours
3. Economic suitability 3.1. Economic criteria 3.2. Machine cost calculation 3.2.1. Productivity 3.2.2. Additional costs 3.2.3. Total system costs & exceptions	Lecture	2 hours
4.Ecological suitability 4.1. Risks, side-effects, and damage 4.2. Damage to forest soils 4.3. Soil repair and prevention 4.4. Avoiding soil damage 4.5. Solutions for trafficable areas	Lecture	2 hours
5. Social suitability 5.1. Societal compatibility 5.2. Working stress 5.3. Strain at work 5.4. Social suitability	Lecture	2 hours
6. Path to the optimal solution 6.1. Selecting the best option 6.2. Target driven optimality	Lecture	2 hours
7.Recapitulation	Lecture	2 hours
Bibliography Erler J., Spinelli R., Borz S.A., Mederski P. (2023). Technodiversity. Transilvania University Press, 172 p.		
8.2 Laboratory	Teaching-learning methods	Remarks
1.Outline & assignments 1.1. Outline 1.2. Assignments	Presentation	2 hours
2. Harvesting equipment at work in real environments	On-site presentation and	8 hours

4.1. Group assignment and scenario assumptions 4.2. Group work on developing an optimal harvesting chain	on Case Studies	

Bibliography

Erler J., Spinelli R., Borz S.A., Mederski P. (2023). Technodiversity. Transilvania University Press, 172 p.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations, and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included discussions with Romanian and European experts in the field. An important part of the course and its specific activities were developed in the framework of the Erasmus + Technodiversity project as a common European understanding and agreement on the teaching activities at the master level in Forest Operations.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge on advanced terminology in forest operations	Oral exam	40 %
	• Capability to properly use the concepts and terminology in forest operations		
	• Capability to analyse and interpret relevant case studies and contexts in forest operations		
	• Capability to build argumentations on complex case studies		
	• Capability to evaluate, argue and make decisions on complex case studies		
10.5 Laboratory	• Development of own knowledge on the course and laboratory contents	Portfolio	60 %

	• Capability to build own arguments and to defend own ideas		
	• Capability to evaluate own and others' arguments		
10.6 Minimal performance standard			
• Students will be able to correctly describe and argument the effectiveness of a given timber harvesting sub-process; • Students will be able to choose the appropriate harvesting equipment for a given case from a limited list of options; • Students will be able to correctly describe the workflow of a functiogram.			

This course outline was certified in the Department Board meeting on 27.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Prof. dr. eng. Alexandru Lucian CURTU **Dean**	**Prof. dr. eng. Stelian Alexandru BORZ** **Head of Department**
Prof. dr. eng. Stelian Alexandru BORZ **Course holder**	**Prof. dr. eng. Stelian Alexandru BORZ** **Holder of seminar/ laboratory/ project**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorate(to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorate;

3) Course status (content) – for the Bachelor level, select one of the following options:**FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (specialtycourse)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC**(advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC**(non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	UNIVERSITY TRANSILVANIA OF BRAŞOV
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Forest Engineering, Forest Management Planning and Terrestr Measurements
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master in Forest Sciences

2. Data about the course

2.1 Name of course			Advanced Forest Biometry					
2.2 Course convenor			Prof. dr. eng. Maria Magdalena Vasilescu					
2.3 Seminar/ laboratory/ project convenor			Prof. dr. eng. Maria Magdalena Vasilescu					
2.4 Study year	1	2.5 Semester	2	2.6 Evaluation type	C 2	2.7 Course status	Content[3)]	AC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**2**	out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**1**
3.4 Total number of hours in the curriculum	28	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	14

Time allocation	hours
Study of textbooks, course support, bibliography and notes	**28**
Additional documentation in libraries, specialized electronic platforms, and field research	**28**
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	**29**
Tutorial	**2**
Examinations	**4**
Other activities.....	-

3.7 Total number of hours of student activity	92
3.8 Total number per semester	120
3.9 Number of credits[5)]	4

4. Prerequisites (if applicable)

4.1 curriculum-related	•
4.2 competences-related	•

5. Conditions (if applicable)

5.1 for course development	• Course attendance is facultative.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory; • Deadlines for portfolio submission will be commonly established by the teacher and students.

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. **Relevance:** o Aligned with **Course Objectives**: Familiarization with state-of-the-art tools in forest biometry, recent tools for forest mensuration (e.g., laser hypsometers, portable laser scanners). o **Course Content**: Topics like stem profile models, taper functions, and volume/biomass equations for European tree species. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance:** o Emphasized in **Seminar/Practical Activities**: Field measurements using modern tools, and case studies on taper functions and stem volume equations. o **Evaluation**: Capability to correctly use modern instruments and methods for studies on stem profiles and volume estimation (portfolio evaluation). **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance:** While the course primarily focuses on biometry, understanding and adopting advanced modeling techniques can have indirect applications in economic and regulatory decision-making regarding forestry.

Transversal competences	**TC.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector.** • **LO 1.1:** The graduate objectively evaluates the responsibilities and capacities of team members or collaborators. **Relevance:** The course involves case studies, and debates where students critically evaluate and defend arguments on advanced forest biometry issues. **TC.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects.** • **LO 2.3:** The graduate can efficiently lead teams and research projects. **Relevance:** Through field trips, case study discussions, and scenario-based tasks, students build their capacity to collaborate and **lead discussions** on advanced tools used in measurements, and methods used in stem profile, volume and biomass estimation. **TC.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands.** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. **Relevance:** By engaging with scientific literature and case studies, students learn to continuously improve their knowledge in **advanced forest biometry** and adapt to real-world challenges.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in forest biometry.
7.2 Specific objectives	• To define, elaborate and use the concepts, methods, instruments and approaches in forest biometry; • To understand the context of recent tools developments on advanced research; • To develop the personal and interpersonal skills related to engineering, research and social dimensions.

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. Recent development in instrumentation 1.1. Digital calipers 1.2. Laser hypsometers and calipers 1.3. Instruments based on ultrasound technology 1.4. Portable laser scanner 1.5. Discussion	Lecture	2 hours	
2. Stem profile models 2.1. Introduction 2.2. Taper functions 2.3. Polynomials and segmented polynomials 2.4. Discussion	Lecture	4 hours	

3. Volume equations for tree species in Europe 3.1. Introduction 3.2. Volume equations 3.2.1. With one predictor variable 3.2.2. With two predictor variables 3.2.3. With more than two predictor variables 3.3. Merchantable stem volume equation 3.4. Discussion	Lecture	4 hours	
4. Biomass equations for tree species in Europe 4.1. Introduction 4.2. Tree-level regression models used to estimate the aboveground biomass and total tree biomass 4.3. Biomass estimation functions for tree parts 4.4. Discussion	Lecture	2 hours	
5. Remote sensing in forest mensuration 5.1. Introduction 5.2. Ground measurement of tree stem and tree parts using handheld laser scanner 5.3. Discussion	Lecture	2 hours	

Bibliography

1. Beltran H A, Chauchard L, Iaconis A, Pastur G M (2017). Volume and taper equations for commercial stems of Nothofagus obliqua and N. alpina. *Cerne*, *23*, 299-309.
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species in Europe. Silva Fennica Monographs 4, pp. 63.

8.2 Seminar/ laboratory/ project	Teaching-learning methods	Number of hours	Remarks
1. Field measurement using modern tools and non-destructive methods in order to conduct studies on taper functions and stem volume equations	Case study	8 hours	
2. Portfolio specifications and preparation	Individual work	6 hours	

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9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included curricula discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Knowledge on advanced terminology in forest biometry	Exam	50 %
	Capability to properly use the concepts and terminology in recent tools development, stem profile models, volume and biomass equations for tree species in Europa		
	Capability to build argumentations on complex case studies		
	Capability to argue and make decisions on complex case studies related to tree stem and tree parts modeling and analysis using recent development in instrumentation		
10.5 Seminar/ laboratory/ project	Development of own knowledge on the course and laboratory contents	Portfolio	50 %
	Capability to analyse the stem volume and to interpret the controversial situations		
	Capability to correctly use the methods of volume estimation and research on stem profile		
	Capability to build own arguments and to defend own ideas		
10.6 Minimal performance standard			
• Students will be able to correctly use the modern instruments; • Students will be able to use the appropriate methods of volume and biomass estimation.			

This course outline was certified in the Department Board meeting on 27/09/2024 and approved in the Faculty Board meeting on 30/09/2024.

Prof. Dr. Eng. Alexandru Lucian CURTU **Dean**	**Prof. Dr. Eng. Stelian Alexandru BORZ** **Head of Department**

Prof. Dr. Eng. Maria Magdalena Vasilescu **Course holder**	**Prof. Dr. Eng. Maria Magdalena Vasilescu** **Holder of laboratory**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorat;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	TRANSILVANIA UNIVERSITY OF BRAŞOV
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Silviculture
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Multiple Purpose Forestry/Master in Forest Sciences

2. Data about the course

2.1 Name of course			Forest Management and Chain of Custody Certification					
2.2 Course convenor			Prof. Dr. Ioan Vasile Abrudan					
2.3 Seminar/ laboratory/ project convenor			Prof. Dr. Ioan Vasile Abrudan / Assoc. prof. Aureliu Florin Halalisan					
2.4 Study year	2	2.5 Semester	1	2.6 Evaluation type	E	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**3**	out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**2**
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	47
Additional documentation in libraries, specialized electronic platforms, and field research	40
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	40
Tutorial	3
Examinations	8
Other activities.....	0

3.7 Total number of hours of student activity	138
3.8 Total number per semester	180
3.9 Number of credits[5)]	6

4. Prerequisites (if applicable)

4.1 curriculum-related	• NA
4.2 competences-related	• NA

5. Conditions (if applicable)

5.1 for course development	• Course attendance is optional/facultative.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory; • Deadline for the thematic report submission will be commonly established by the lecturer and students.

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical systems related to product traceability.** • **LO 1.1:** The graduate demonstrates advanced knowledge of terminology and standards used in forest management and chain of custody certification. • **LO 1.2:** The graduate applies concepts, standards, and tools to analyze and interpret forest management and product traceability systems in real-world contexts. **Relevance:** The course addresses forest certification systems (**FSC, PEFC**), providing students with the technical knowledge to evaluate **forest sustainability standards** and **product chain of custody processes.** **CP.4: Applications of new and emerging technologies in the evaluation, development, and implementation of forest management systems.** • **LO 4.1:** The graduate designs and evaluates certification compliance systems for forest management units and wood-processing enterprises. • **LO 4.2:** The graduate demonstrates the ability to use decision-making tools for implementing and monitoring product chain of custody certification systems. **Relevance:** Hands-on activities, such as **fieldwork in forest districts and wood-processing enterprises,** allow students to apply knowledge to practical certification processes.
Transversal competences	**CT.1: Effective communication and networking in interdisciplinary and institutional environments.** • **LO 1.3:** The graduate effectively presents and defends certification-related reports and findings to forestry stakeholders. **Relevance:** The course emphasizes preparing and presenting **thematic reports,** enhancing communication skills essential for collaboration with certification bodies and forestry professionals. **CT.3: Commitment to lifelong learning and adaptation to sectoral dynamics and labor market demands.** • **LO 3.1:** The graduate keeps updated on evolving certification schemes, standards, and their applications. **Relevance:** The inclusion of international experts and **case studies** fosters continuous professional development.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in forest management and chain of custody certification
7.2 Specific objectives	• To define, elaborate (deepen) and use the concepts, methods, instruments and approaches in forest management and chain of custody certification; • To understand the context of forest management and wood tracing as part of larger systems; • To develop the personal and interpersonal skills related to engineering, research and social dimensions.

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1.Introduction to forest management and	Lecture	2 hours	

chain of custody certification 1.1. Definitions and origins 1.2.Overview of the existing certification schemes			
2.Forest certification schemes: from standard to label 2.1. Organisation and structure of a forest management certification scheme 2.2. Forest management standards 2.3. Accreditation 2.4. Certification 2.5. Labelling	Lecture	4 hours	National and international experts will be invited to deliver presentations and views
3.The main forest certification schemes in Europe 3.1.FSC Scheme 3.2.PEFC scheme	Lecture	2 hours	
4.Chain of custody certification and product tracking 4.1. Chain of custody certification 4.2. Product tracing and managing claims and labels	Lecture	2 hours	
5. Practical aspects of forest management and chain of custody certification: from getting started to getting the certificate	Lecture	1 hours	
6. Impact, costs and benefits of forest certification	Lecture	1hours	
7.Evolution of forest management and chain of custody in Romania and world-wide	Lecture	2 hours	
8. Forest certification in the wider context of sustainable forest management: governance, policy and regulatory framework	Lecture	2 hours	

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www.fsc.org
www.pefc.org

8.2 Laboratory	Teaching methods	Number of hours	Remarks
1. Practical aspects of forest management certification (related to forest district)	Case study	12 hours	Part of the activities will be carried on in the forest district
2. Practical aspects of chain of custody certification (related to harvesting company / wood processing company)	Case study	12 hours	Part of the activities will be carried on in the harvesting area/ company
3. A thematic report on a specific aspect of forest management or chain of custody certification	Case study	4 hours	
Bibliography: Procedures available at: www.fsc.org www.pefc.org			

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The content of this course has been developed in accordance with the strategy and vision of the Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional forestry associations and potential employers. Furthermore, the course content was aligned to the existing national and international trends in forest management and product tracing and based on the realities of the sectors of forest management, wood harvesting and processing.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge of basic and advanced terminology in forest management and chain of custody certification	Written and oral exam/presentation	**60%**
	• Capability to properly use the concepts and terminology in forest management and chain of custody certification		

	• Capability to analyze and interpret relevant case studies and contexts in forest management and chain of custody certification		
	• Capability to build argumentations and to evaluate, argue and make decisions on complex case studies		
10.5 Seminar/ laboratory/ project	• Development of own knowledge on the course and laboratory contents regarding forest management and chain of custody certification	The quality of the thematic reports and their presentations	40%
	• Capability to correctly use the instruments and procedures of and to evaluate, argue and make decisions on specific case studies		
	• Capability to build own arguments/to defend own ideas and to evaluate own and others' arguments		
10.6 Minimal performance standard			
• Student will be able to correctly describe and argument the way forest management and chain of custody certification is defined and organised; • Students will be able to correctly describe and practical aspects of forest management and chain of custody certification. The condition to pass the exam is to get a minimum grade of 5 for both the written and oral exams/reports			

This course outline was certified in the Department Board meeting on 27.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Prof. Alexandru Lucian CURTU, **Prof. Alexandru Stelian BORZ**

Dean **Head of Department**

Prof. dr. eng. Ioan Vasile ABRUDAN **Assoc. prof. dr. eng. Aureliu Florin HALALISAN,**

Course holder **Holder of seminar/ laboratory/ project**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorate(to be filled in according to the forceful classification list for study programmes);

[2)] Study level – choose from among: Bachelor / Master / Doctorate;

[3] Course status (content) – for the Bachelor level, select one of the following options:**FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (specialtycourse)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC**(advanced course);

[4] Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC**(non-compulsory course);

[5] One credit is the equivalent of 25study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transylvania University of Brașov
1.2 Faculty	Faculty of Silviculture and Forestry Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Multipurpose Forestry

2. Data about the course

2.1 Name of course			Strategy and Marketing of Forest Products					
2.2 Course convenor			Professor Bogdan POPA					
2.3 Seminar/ laboratory/ project convenor			Professor Bogdan POPA					
2.4 Study year	II	2.5 Semester	III	2.6 Evaluation type	E	2.7 Course status	Content[3)]	AC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**2**	Out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**1**
3.4 Total number of hours in the curriculum	28	Out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	14

Time allocation	Hours
Study of textbooks, course support, bibliography and notes	27
Additional documentation in libraries, specialized electronic platforms, and field research	32
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	26
Tutorial	3
Examinations	4
Other activities.....	

3.7 Total number of hours of student activity	92
3.8 Total number per semester	120
3.9 Number of credits[5)]	4

4. Prerequisites (if applicable)

4.1 curriculum-related	-
4.2 competences-related	-

5. Conditions (if applicable)

5.1 for course development	-
5.2 for seminar/ laboratory/ project development	-

6. Specific competences

Professional competences	**CP.1: Understanding the specifics of marketing within the forestry sector.** • **LO 1.1:** The graduate understands Business-to-Business marketing principles specific to forestry. • **LO 1.2:** The graduate demonstrates the ability to design marketing strategies that comply with governance and policy requirements. • **LO 1.3:** The graduate evaluates forest products and services markets, including intangible ecosystem services. **Relevance:** The course provides students with tools and knowledge to analyze forest products markets, develop strategies, and comply with sectoral policies. **CP.4: Application of strategic approaches in forest products marketing.** • **LO 4.1:** The graduate designs and develops innovative marketing strategies for forest products. • **LO 4.2:** The graduate demonstrates the ability to link forestry policies and strategies to practical marketing and business operations. **Relevance:** Seminars focus on case studies and business plan development, fostering applied knowledge for **market segmentation, product positioning, and strategy formulation.**
Transversal competences	**CT.1: Collaborative and ethical professional behavior in marketing contexts.** • **LO 1.4:** The graduate demonstrates teamwork abilities in developing marketing strategies and solving forestry-related challenges. • **LO 1.5:** The graduate integrates ethical principles into decision-making processes in forestry marketing. **Relevance:** Seminars involve group discussions and case study analysis, emphasizing collaboration and ethical marketing practices. **CT.3: Entrepreneurial thinking and adaptability to market dynamics.** • **LO 3.1:** The graduate develops business ideas based on forest products and demonstrates enterprise skills in forestry marketing. **Relevance:** Students engage in activities like **developing start-up business ideas** and preparing short business plans, encouraging entrepreneurial growth.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in the elaboration process for the specific strategy of the forest products
7.2 Specific objectives	• To provide students with the knowledge of value addition and utilisation of different forest produce • To provide students with the basic understanding of market operations for forestry products • To develop the personal and interpersonal skills related to engineering, research and social dimensions

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks

1. Concepts and theories of markets and marketing. Forest products in the forest specific supply chain	In depth lecture given by the convenor based on Power Point Presentation	2	
2. Markets for forest products/services		4	
3. Markets for intangible forest products/services		2	
4. Markets for forest products and policy instruments		2	
5. Strategic marketing – strategies for forest products marketing		4	

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12. http://www.fao.org/
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8.2 Seminar/ laboratory/ project	Teaching-learning methods	Number of hours	Remarks
1. Segmenting/targeting/positioning in forest products markets	Discussions chaired by teacher	2	
2. Payments for ecosystem services. Best practice examples	Discussions chaired by teacher	2	
3. Developing start-up business idea involving forest products	Case study analysis & elaboration of short business plan and presentations by students	3	
4. Linkage between the forestry policy and strategy and the strategy of the forest products	Discussions chaired by teacher	3	
5. The specific items that appear in the elaboration process of the public policy	Discussions chaired by teacher	2	
6. Cross-sectorial links of Forestry	Discussions chaired by teacher	2	

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9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

Today students will be part of the transition to bioeconomy during their working career. Properly educated they can speed up this transition

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Capacity to use the accumulated knowledge in elaborating an essay on an imposed topic, during the exam	Written exam	50%
10.5 Seminar/ laboratory/ project	Student participation and involvement in the discussions during the seminars		10%
	Portfolio of case studies and essays on topics discussed during the seminars	Portfolio analysis	40%
10.6 Minimal performance standard			
• Students should be able to understand and use the marketing concepts and approaches in general and in forestry context. • Minimum ability to write essays on pre-determined forest products marketing topics and defend them in students' debates,			

This course outline was certified in the Department Board meeting on 27.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Professor, Eng., PhD Lucian Alexandru CURTU **Professor, Eng., PhD Stelian Alexandru BORZ**

Dean
Professor, Eng., PhD Bogdan POPA

Head of Department
Professor, Eng., PhD Bogdan POPA

Course holders **Holder of seminar/ laboratory/ project**

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transylvania University of Braşov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Silviculture
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Multiple Purpose Forestry

2. Data about the course

2.1 Name of course			**Silviculture and Yield of Forest Ecosystems (SYFE)**					
2.2 Course convenor			Prof. dr. M.Sc. Valeriu-Norocel Nicolescu					
2.3 Seminar/ laboratory/ project convenor			Prof. dr. M.Sc. Valeriu-Norocel Nicolescu					
2.4 Study year	2	2.5 Semester	3	2.6 Evaluation type	E	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	CPC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	2	out of which: 3.2 lecture	1	3.3 seminar/ laboratory/ project	1
3.4 Total number of hours in the curriculum	28	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	14

Time allocation	hours
Study of textbooks, course support, bibliography and notes	26
Additional documentation in libraries, specialized electronic platforms, and field research	20
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	33
Tutorial	3
Examinations	10
Other activities.....	0

3.7 Total number of individual study hours	92
3.8 Total number per semester	120
3.9 Number of credits[5)]	4

4. Prerequisites (if applicable)

4.1 curriculum-related	-
4.2 competences-related	-

5. Conditions (if applicable)

5.1 for course development	• The attendance of lectures is not compulsory.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory. • Deadlines of all kinds will be jointly decided upon by the teacher and students.

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to SYFE:** This competence aligns with the course's focus on **stand dynamics, yield modeling, and silvicultural interventions**, emphasizing the practical application of theoretical knowledge to real-world forestry challenges. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to SYFE:** This competence connects to discussions on **stand density control, species composition, and yield optimization**, requiring an understanding of broader policy and regulatory contexts impacting silviculture and yield.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.1:** The graduate objectively evaluates the responsibilities and capacities of team members or collaborators. • **LO 1.2:** The graduate organizes activities based on employee qualifications, task complexity, and agreed time and performance norms. • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to SYFE:** The course involves **fieldwork and collaborative analysis**, enhancing students' ability to organize and communicate within a team and with external stakeholders in forestry operations. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.2:** The graduate identifies opportunities for continuous professional development. • **LO 3.3:** The graduate self-evaluates and plans realistic career development goals, identifying strategies to overcome professional challenges. **Relevance to SYFE:** This competence supports the course's goal of **developing advanced skills and lifelong learning habits**, encouraging students to stay informed about emerging silvicultural and yield methodologies.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in the fields of Silviculture and Yield.
7.2 Specific objectives	• To define and use the concepts, methods, tools and approaches specific to the fields of Silviculture and Yield. • To develop the personal and inter-personal skills related to engineering,

	research and social dimensions.

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. Forest (stand) dynamics, growth and yield: state-of-the-art and perspectives	Lecture	1	
2. Primary production, growth and harvestable yield: specific terminology and links	Lecture	1	
3. Stand structures: description and analysis	Lecture	1	
4. Growing space and competitive situation of individual trees	Lecture	1	
5. Growth relationships and their biometric formulation	Lecture	2	
6. Stand structure and yield: even-aged vs. uneven-aged (all-aged) stands	Lecture	2	
7. Stand density control and yield: role of planting schemes, thinning (*stand silviculture* vs *crop tree silviculture*), and silvicultural systems	Lecture	4	
8. Species composition and yield: pure vs. mixed stands	Lecture	2	

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8.2 Laboratory	Teaching-learning methods	Number of hours	Remarks
1. Stand structure: description and analysis	Fieldwork (stands managed by Kronstadt F.D.)	2 hours	
2. Planting schemes and yield	Lab work/case studies	2 hours	
3. Relationship between silvicultural interventions (cleaning-respacing and thinning), growth and yield in (a) European-beech, (b) Norway spruce and (c) silver fir-dominated stands	Fieldwork (forests managed by Kronstadt F.D. and Cristian F.D.)	10 hours	

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9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations and potential employers.
Furthermore, the course contents are in-line with the national qualification system and the European qualification framework being produced through a participatory approach including curricula discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge of specific terminology of Silviculture and Yield	Exam	70%
	• Capability to properly use the concepts and terminology of Silviculture and Yield		
	• Capability to analyze and interpret relevant case-studies in Silviculture and Yield		
	• Capability to evaluate, argue and make decisions on complex case-studies		
10.5 Seminar/ laboratory/ project	• Development of own knowledge on the course and laboratory contents	Portfolio	30%
	• Capability to correctly use the tools and procedures of Silviculture and Yield		
	• Capability to build own arguments and to defend own ideas		
	• Capability to evaluate own and others' arguments		
10.6 Minimal performance standard			
• Students will be able to correctly describe and argument the importance of Silviculture and Yield in forestry and forest ecosystem management. • Students will be able to select the most appropriate silvicultural tools/operations to be used for a certain management/yield target.			

This course outline was certified in the Department Board meeting on 29.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Prof.dr.eng. Alexandru-Lucian CURTU Dean	Prof.dr.eng. Stelian Alexandru BORZ Head of Department
Prof.dr.M.Sc.eng. Valeriu-Norocel NICOLESCU Course holder	Prof.dr.M.Sc.eng. Valeriu-Norocel NICOLESCU Holder of seminar/ laboratory/ project

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);
2) Study level – choose from among: Bachelor / Master / Doctorat;
3) Course status (content) – for the Bachelor level, select one of the following options: FC (fundamental course) / DC (course in the study domain)/ SC (speciality course)/ CC (complementary course); for the Master level, select one of the following options: PC (proficiency course)/ SC (synthesis course)/ AC (advanced course);
4) Course status (attendance type) – select one of the following options: CPC (compulsory course)/ EC (elective course)/ NCPC (non-compulsory course);
5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

1.1 Higher education institution	Transilvania University of Brașov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study	Forestry
1.5 Study level	Master
1.6 Study programme/Qualification	Multiple Purpose Forestry / Master in Forest Sciences

2. Data about the course

2.1 Name of course			Research Activity					
2.2 Course convenor			Prof. dr. eng. Mihai Daniel Niță					
2.3 Laboratory			Prof. dr. eng. Mihai Daniel Niță					
2.4 Study year	II	2.5 Semester	II	2.6 Evaluation type	E	2.7 Course status	Content	AC
							Attendance type	CPC

3. Total estimated time

3.1 Number of hours per week	**11**	out of which: 3.2 lecture		3.3 project	**11**
3.4 Total number of hours in the curriculum	154	out of which: 3.5 lecture		3.6 project	154

Time allocation	hours
Study of textbooks, course support, bibliography and notes	16
Additional documentation in libraries, specialized electronic platforms, and field research	360
Preparation of research reports	50
Tutorial	10
Examinations	10

3.7 Total number of hours of student activity	446
3.8 Total number per semester	600
3.9 Number of credits	20

4. Prerequisites

4.1 curriculum-related	• The student should be proficient in the theory of the discipline in which the research activity is carried out
4.2 competences-related	• The student should be familiarised with the research practice of the discipline in which the research activity is carried out

5. Conditions

5.1 for course development	•
5.2 for project	• Progress reports are to be provided and defended in due time as agreed with the supervising teacher

Professional competences	• **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to Course:** Students develop the ability to **analyze and interpret research topics** in forestry, applying **appropriate methods and tools** to solve complex problems and enhance their understanding of advanced forestry systems. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to Course:** Students adopt **argumentation-based evaluation strategies** and apply their **knowledge of forestry's economic and policy aspects** to conduct impactful research and solve significant problems.
Transversal competences	**CT.2: Managing personal and interpersonal relationships specific to teamwork in forestry management and forestry research projects** • **LO 2.1:** The graduate applies ethical principles in professional activities. • **LO 2.2:** The graduate promotes high standards of quality and professional integrity in the team/program managed. **Relevance to Course:** The course encourages students to participate in **collaborative research activities**, fostering **professional integrity** and ethical practices when developing articles or projects. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.2:** The graduate identifies opportunities for continuous professional development. **Relevance to Course:** Students are encouraged to continuously update their **knowledge and skills**, ensuring their **research remains relevant** and aligned with modern forestry challenges and opportunities.

7. Course objectives

7.1 General course objective	• To enhance the knowledge and skills needed in the forest science and

3.1 Research activity	Teaching methods	Remarks
1.Safety first: safety training in relation to the requirements set for the research topic		
2.Supervised research based on the student option on one of the disciplines included in the curriculum		
3.Preparation of research progress reports		
4.Defending research progress reports		
Bibliography Books, guidelines and scientific articles provided by the course conveyor		

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The contents of the research activity have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations, and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.5 project	• Quality of the research reports		100%
	• Other criteria as established by the supervisors		
10.6 Minimal performance standard			
• Integration of the own knowledge and skills in research reports at an average level, proved by the layout, structure, correctness, relevance and innovation brought by the research reports.			

This course outline was certified in the Department Board meeting on 27.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Prof. dr. eng. Alexandru Lucian CURTU **Dean**	**Prof. dr. eng. Stelian Alexandru BORZ** **Head of Department**
Prof. dr. eng. Mihai Daniel NITA	**Prof. dr. eng. Mihai Daniel NITA**

(course in the study domain)/ **SC** (specialty course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC**(advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC**(non-compulsory course);

5) One credit is the equivalent of 25study hours (teaching activities and individual study).

1.1 Higher education institution	Transilvania University of Brașov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4Field of study	Forestry
1.5Study level	Master
1.6 Study programme/Qualification	Multiple Purpose Forestry / Master in Forest Sciences

2. Data about the course

2.1 Name of course			Elaboration of the MSc Thesis					
2.2 Course convenor			Prof. dr. eng. Mihai Daniel Niță					
2.3 Laboratory			Prof. dr. eng. Mihai Daniel Niță					
2.4 Study year	II	2.5 Semester	II	2.6 Evaluation type	E	2.7 Course status	Content	AC
							Attendance type	CPC

3. Total estimated time

3.1 Number of hours per week	**4**	out of which: 3.2 lecture		3.3 project	**4**
3.4 Total number of hours in the curriculum	56	out of which: 3.5 lecture		3.6 project	56
Time allocation					hours
Study of textbooks, course support, bibliography and notes					20
Additional documentation in libraries, specialized electronic platforms, and field research					94
Writing the MSc thesis					120
Tutorial					5
Examinations					5

3.7 Total number of hours of student activity	244
3.8 Total number per semester	300
3.9 Number of credits	10

4. Prerequisites

4.1 curriculum-related	• The student should be proficient in the theory of the discipline in which the research activity is carried out • The student should be proficient in the theory of academic ethics and academic writing
4.2 competences-related	• The student should be familiarised with the research reporting practice of the discipline in which the research activity is carried out • The student should be proficient in computer use and practice of academic writing

5. Conditions

Professional competences	• **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to Course:** The MSc thesis development requires students to **understand advanced concepts and techniques** related to their specific research field in forestry and apply this knowledge to produce scientifically sound results. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to Course:** Students need to integrate broader **regulatory and strategic considerations** into their research, ensuring the MSc thesis aligns with real-world challenges and sectoral policies.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to Course:** Students must effectively **communicate their research findings** with their supervisor, colleagues, and the academic community, ensuring clarity and adherence to institutional standards. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.3:** The graduate self-evaluates and plans realistic career development goals, identifying strategies to overcome professional challenges. **Relevance to Course:** The process of writing the MSc thesis encourages students to **continuously improve their skills**, **update their knowledge**, and plan for future career growth through research excellence.

8. Content

8.1 Elaboration of the MSc thesis	Teaching methods	Remarks
1.Template: checking the requirements of the institution on how the MSc thesis should be developed		
2.Writing the MSc thesis 2.1.Preparation and documentation of the results: artwork, tables, metadata, models, appendixes, databases and text to comment them 2.2.Discussion of the results in the view of own hypotheses and in the view of the results reported by others 2.3.Writing and documenting the materials and methods 2.4.Writing the conclusions 2.5.Writing the introduction 2.6.Writing the abstract and providing keywords		
3.Proofing and editing the text according to the suggestions provided by the supervisor and institutional rules on a regular basis		
4.Similarity check and deposition of the document		
Bibliography Guidelines provided by the course conveyor Institutional template of the MSc thesis		

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The contents of the research activity have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations, and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.5 Laboratory	• Quality of the MSc thesis • Other criteria as established by the		100%

Prof. dr. eng. Alexandru Lucian CURTU **Dean**	**Prof. dr. eng. Stelian Alexandru BORZ** **Head of Department**
Prof. dr. eng. Mihai Daniel NITA **Course holder**	**Prof. dr. eng. Mihai Daniel NITA** **Holder of project**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorate(to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorate;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (specialty course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC**(advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC**(non-compulsory course);

5) One credit is the equivalent of 25study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transilvania University of Brașov
1.2 Faculty	Faculty of Silviculture and Forestry Engineering
1.3 Department	Forest Management and Engineering
1.4 Field of study	Forestry
1.5 Study level	MA
1.6 Study programme/ Qualification	Multipurpose Forestry

2. Data about the course

2.1 Name of course			Forest-based Bioeconomy					
2.2 Course convenor			Professor Bogdan POPA					
2.3 Seminar/ laboratory/ project convenor			Professor Bogdan POPA					
2.4 Study year	II	2.5 Semester	III	2.6 Evaluation type	E	2.7 Course status	Content[3]	AC
							Attendance type[4]	EC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**3**	out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**2**
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	30
Additional documentation in libraries, specialized electronic platforms, and field research	30
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	41
Tutorial	3
Examinations	4
Other activities.....	

3.7 Total number of hours of student activity	108
3.8 Total number per semester	150
3.9 Number of credits[5]	5

4. Prerequisites (if applicable)

4.1 curriculum-related	-
4.2 competences-related	-

5. Conditions (if applicable)

5.1 for course development	-
5.2 for seminar/ laboratory/ project development	-

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to Course:** The course discusses forest-based bioeconomy strategies, requiring students to **understand and apply key concepts** related to forest ecosystems and their technical applications in a bioeconomic context. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to Course:** The course emphasizes the role of governance, policy, and strategies in forest-based bioeconomy, aligning with the need for students to analyze and evaluate economic, regulatory, and political systems in the forestry sector.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to Course:** The seminars and team assignments focus on **collaborative efforts**, requiring students to communicate and present findings effectively within their groups and to the academic audience. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.3:** The graduate self-evaluates and plans realistic career development goals, identifying strategies to overcome professional challenges. **Relevance to Course:** The course encourages students to **adapt to the bioeconomy-driven evolution** in forestry, enabling them to integrate new research and techniques into their professional development plans.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• The aim of this course is to familiarize students to different facets of the forest-based bioeconomy. These include the origins of the bioeconomy, the national and international context, the different challenges in managing forest resources and changing patterns of supply and demand in forestry in the bioeconomic context.
7.2 Specific objectives	• Review the basics of the Economics of the Forest Sector (e.g. specificity).

	• Explains the concepts and aspirations of bioeconomy as a new sustainable way that the economy should be organized. • Explain the particularities of the forest sector from the perspective of bioeconomy. • Transfer knowledge about the need and applicability of the Ecosystem Services Approach. • Explain the entrepreneurial challenge in forest-based bioeconomy. • Determine students to better assess the policy and governance approach needs in the context of bioeconomy.

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. Course introduction. *Why bioeconomy? Concepts in Bioeconomy, Green economy, Circular economy*	In depth lecture given by the convenor based on Power Point Presentation	2	
2. Challenges and Opportunities in Forest based Bioeconomy. *Forest sector outlook. FBB challenge. Whats and hows in FBB. Great potential for new products*		2	
3. Cross-sectorial approach in Forest based Bioeconomy – European perspective. *Biomass availability. Impact on biodiversity. Relation with climate change. The forest amenity values and bioeconomy. Competitiveness in Bioeconomy. Social aspects. Recommendations.*		2	
4. Forest based Bioeconomy strategies and policies. *Policy instruments – short review. Global and EU outlook on Bioeconomy strategies.*		2	
5. Forest based Bioeconomy – Business innovation and entrepreneurship. *Sustainable business models' archetypes. Examples of business models in FBB*		2	
6. Forest Bioeconomy and Green Deal. *What is the new EU perspective over the Forest based bioeconomy?*		2	
7. Recapitulation. Preparing for the exam.		2	

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8.2 Seminar/ laboratory/ project	Teaching-learning methods	Number of hours	Remarks
1. Bioeconomy: Strengths, Weaknesses, Opportunities and Threats	Discussions chaired by students	2	
2. Forest based Bioeconomy perspective outlook: forest products; forest bioenergy; new products and forest based services; topic tor team assignment (1)	Team Assignments guidance	2	
3. Presentations of team assignments (1) and discussions	Discussions chaired by students	2	
4. Multiple choice individual assignment: *Still questions to be asked.*	Individual assignment guidance	2	
5. Presentations of individual assignments (2) and discussions	Discussions chaired by students	2	
6. Presentations of individual assignments (2) and discussions	Discussions chaired by students	2	
7. Forest based Bioeconomy – Romanian perspective	Discussions chaired by convenor	2	
8. Regional&country approach in Forest based Bioeconomy	Team Assignments guidance	2	
9. Presentations of team assignments (3) and discussions	Discussions chaired by students	2	
10. Small business ideas/Forest based bioeconomy innovations	Team Assignments guidance	2	
11. Presentations of team assignments (4) and discussions	Discussions chaired by students	2	
12. 2018 EU Bioeconomy strategy	Discussions chaired by convenor	2	
13. Bioeconomy in Forest Policy	Discussions chaired by convenor	2	
14. Bioeconomy in Government and Governance	Discussions chaired by convenor	2	
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5. Meyer R., 2017. Bioeconomy Strategies: Context, Visions, Guiding, Implementation Principles and Resulting debates. Sustainability9, 1031.
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7. World Bank. 2011. Romania Functional Review, Environment, Water and Forestry, Volume 2: Forestry. World Bank, Washington DC

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

Today students will be part of the transition to bioeconomy during their working career. Properly educated they can speed up this transition

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Capacity to use the accumulated knowledge in elaborating an essay on an imposed topic, during the exam	Written exam	50%
10.5 Seminar/ laboratory/ project	Student participation and involvement in the discussions during the seminars		10%
	Portfolio of case studies and essays on topics discussed during the seminars	Portfolio analysis	40%
10.6 Minimal performance standard			
• Students should be able to understand and use the bioeconomy contexts and approaches in general and in forestry context. • Minimum ability to write essays on pre-determined bioeconomy topics and defend them in students' debates.			

This course outline was certified in the Department Board meeting on 27/09/2024 and approved in the Faculty Board meeting on 30/09/2024.

Professor, Eng., PhD Lucian Alexandru CURTU **Professor, Eng., PhD Stelian Alexandru BORZ**

Dean
Professor, Eng., PhD Bogdan POPA

Head of Department
Professor, Eng., PhD Bogdan POPA

Course holder

Holder of seminar/ laboratory/ project

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transilvania University of Brașov
1.2 Faculty	Faculty of Silviculture and Forestry Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measureme
1.4 Field of study	Forestry
1.5 Study level	Master
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master in Forest Science

2. Data about the course

2.1 Name of course			Management of Research Projects (MRP)					
2.2 Course convenor			Professor Bogdan POPA					
2.3 Seminar/ laboratory/ project convenor			Professor Bogdan POPA					
2.4 Study year	II	2.5 Semester	III	2.6 Evaluation type	E	2.7 Course status	Content[3)]	AC
							Attendance type[4)]	EC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	**3**	out of which: 3.2 lecture	**1**	3.3 seminar/ laboratory/ project	**2**
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	30
Additional documentation in libraries, specialized electronic platforms, and field research	30
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	41
Tutorial	3
Examinations	4
Other activities.....	

3.7 Total number of hours of student activity	108
3.8 Total number per semester	150
3.9 Number of credits[5)]	5

4. Prerequisites (if applicable)

4.1 curriculum-related	NA
4.2 competences-related	NA

5. Conditions (if applicable)

5.1 for course development	NA
5.2 for seminar/ laboratory/ project development	NA

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems** **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Revelance to the course:** The course deliver information related to planning and performing research projects , requiring students to **understand and apply key concepts** related to forest ecosystems and their technical applications in research project context.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to Course:** The seminars and team assignments focus on **collaborative efforts**, requiring students to communicate and present findings effectively within their groups and to the academic audience.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• The aim of this course is to introduce the essential elements in managing any type of research – at any stage of career.
7.2 Specific objectives	• Understand the essential principles of effective research project management • Identify the eight key skills every research project manager needs to develop • Appreciate how successful research project management can benefit your career – both inside and outside of academia • Understand the four core stages of the research project lifecycle, so you'll be better prepared to manage every research project and programme for success

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. Generalities about scientific research. Scientific methods. The scientific research process. The steps of the research project	In depth lecture given by the convenor based on Power Point Presentation	2	
2. Instruments of scientific research. Planning the experiments. Experimental data analysis	In depth lecture given by the convenor based on Power Point Presentation	2	
3. Formulation of research hypothesis: necessity, transferability, objectives, hypothesis, experimental strategy, research project methodology	In depth lecture given by the convenor based on Power Point Presentation	2	
4. Research project resources. Research project budget	In depth lecture given by the convenor based on Power Point Presentation	2	
5. Project management. Project evaluation plan	In depth lecture given by the convenor based on Power Point Presentation	2	

6. Project results dissemination. Technical reports, documents for disseminating results of the scientific research	In depth lecture given by the convenor based on Power Point Presentation	2	
7. Best practices: research projects in forestry	In depth lecture given by the convenor based on Power Point Presentation	2	

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- Bennett, F. Lawrence. 1996. *The management of engineering*. New York: Wiley.
- Cleland, David. 1998. *Field guide to project management.* New York: Wiley.
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- FERNANDES Gabriela; 2021; Managing Collaborative R&D Projects: Leveraging Open Innovation Knowledge-Flows for Co-Creation; Springer Nature AG; Switzerland.

8.2 Seminar/ laboratory/ project	Teaching-learning methods	Number of hours	Remarks
1. Bibliographic research	Discussions chaired by students	4	
2. Planning the experiments and research. Examples from forestry sector: case studies on real data	Case studies	4	
3. Objectives of research projects. Case studies	Case studies	4	
4. Research project budget	Case studies	4	
5. Practical application: Elaboration of a research application	Portfolio elaborated by students in teams	12	

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- FERNANDES Gabriela; 2021; Managing Collaborative R&D Projects: Leveraging Open Innovation Knowledge-Flows for Co-Creation; Springer Nature AG; Switzerland.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

Today students will be able to fulfill the requirements of research and academia institutions but also the requirements of companies in research and development activity.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Capacity to use the accumulated knowledge in elaborating an essay on a imposed topic, during the exam	Written exam	50%
10.5 Seminar/ laboratory/ project	Student participation and involvement in the discussions during the seminars		10%
	Portfolio of case studies and essays on topics discussed during the seminars	Portfolio analysis	40%
10.6 Minimal performance standard			
• Students should be able to understand and use the terminology and procedures that are specific to designing and managing a research project • Students should have the minimum ability to design the research project for their dissertation thesis specific research, and defend it in students debate.			

This course outline was certified in the Department Board meeting on 27/09/2024 and approved in the Faculty Board meeting on 30/09/2024.

Prof.dr.eng. Alexandru Lucian CURTU

Dean
Professor, Eng., PhD Bogdan POPA

.....
Course holder

Prof.dr.eng. Stelian Alexandru BORZ

Head of Department
Professor, Eng., PhD Bogdan POPA

.....
Holder of seminar/ laboratory/ project

Note:

1) Field of study – select one of the following options: BA/MA/PhD. (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: BA/MA/PhD;

3) Course status (content) – for the BA level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (speciality course)/ **CC** (complementary course); for the MA level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 – 30 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transylvania University of Braşov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Department of Silviculture
1.4 Field of study[1)]	Forestry
1.5 Study level[2)]	MA
1.6 Study programme/ Qualification	Multiple Purpose Forestry / Master in Forestry

2. Data about the course

2.1 Name of course			**Decision-Support Systems in Forest Ecosystem Management (SSFM)**					
2.2 Course convenor			Prof.dr.M.Sc. Valeriu-Norocel Nicolescu					
2.3 Seminar/ laboratory/ project convenor			Sef lucr.dr.ing. Mihai-Bogdan Fedorca					
2.4 Study year	2	2.5 Semester	3	2.6 Evaluation type	E	2.7 Course status	Content[3)]	SC
							Attendance type[4)]	EC

3. Total estimated time (hours of teaching activities per semester)

3.1 Number of hours per week	2	out of which: 3.2 lecture	1	3.3 seminar/ laboratory/ project	1
3.4 Total number of hours in the curriculum	28	out of which: 3.5 lecture	14	3.6 seminar/ laboratory/ project	14

Time allocation	hours
Study of textbooks, course support, bibliography and notes	44
Additional documentation in libraries, specialized electronic platforms, and field research	30
Preparation of seminars/ laboratories/ projects, homework, papers, portfolios, and essays	35
Tutorial	3
Examinations	10
Other activities……	0

3.7 Total number of individual study hours	122
3.8 Total number per semester	150
3.9 Number of credits[5)]	5

4. Prerequisites (if applicable)

4.1 curriculum-related	-
4.2 competences-related	-

5. Conditions (if applicable)

5.1 for course development	• The attendance of lectures is not compulsory.
5.2 for seminar/ laboratory/ project development	• Laboratory attendance is compulsory. • Deadlines of all kinds will be jointly decided upon by the teacher and students.

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to Course:** The course equips students with the ability to analyze forest ecosystems and their dynamics using decision-support tools and technical methods, critical for ecosystem-based management. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to Course:** Students learn to utilize decision-support systems to incorporate regulatory, political, and strategic considerations in forest ecosystem management, addressing complex challenges effectively.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to Course:** Seminars and case studies encourage teamwork and communication skills, enabling students to collaborate and present solutions to complex problems in forestry management. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.3:** The graduate self-evaluates and plans realistic career development goals, identifying strategies to overcome professional challenges. **Relevance to Course:** The course emphasizes staying updated with innovations in decision-support tools and their applications, preparing students to adapt and grow professionally in a rapidly evolving field.

7. Course objectives (resulting from the specific competences to be acquired)

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in the decision-support systems for forest ecosystem management.
7.2 Specific objectives	• To define and use the concepts, methods, tools and approaches specific to the decision-support systems for forest ecosystem management. • To understand the context and importance of decision-support systems for forest ecosystem management. • To develop the personal and inter-personal skills related to engineering, research and social dimensions.

8. Content

8.1 Course	Teaching methods	Number of hours	Remarks
1. *Decision:* definition, types (classification), attributes	Lecture	1	
2. Decision-making process: definitions, steps, methods and techniques, factors of influence and constraints, ethics	Lecture	2	
3. *Systems analysis tools* relevant to silvicultural decision-making and their use for: (i) modelling forest ecosystem issues (ecological processes, forest growth dynamics), (ii) analysing socio-economic issues (socio-economic modelling, economic evaluation) and (iii) developing and applying decision-support systems	Lecture	2	
4. *Decision-support systems* and *artificial intelligence (AI)*: background/definition, history, goals (problems and sub-problems), components (sub-domains), tools, applications, ethical issues	Lecture	2	
5. *Expert systems (ES)*: background/definition, relation AI/ES, components (sub-systems), software architecture, advantaged/disadvantages of using ES, applications	Lecture	4	
6. *Use of silvicultural decision support systems/tools in forest ecosystem management* (regeneration, tending, silvicultural systems)	Lecture	3	

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*** *Expert systems* (https://en.wikipedia.org/wiki/Expert_system – accessed 9 March 2016)
*** *Artificial intelligence* (https://en.wikipedia.org/wiki/Artificial_intelligence – accessed 9 March 2016)

8.2 Seminar/ laboratory/ project	Teaching-learning methods	Number of hours	Remarks
1. Decision-making process: case-studies in forest resource management	Case-studies	3	
2. Artificial intelligence: applications	Case studies/applications	3	
3. Use of decision-support tools - growth and yield models - in silvicultural decision making	Case-studies	2	
3. Use of decision-support tools - stand dynamics - in silvicultural decision making	Case-studies	2	
3. Use of decision-support tools - ecological principles - in silvicultural decision making	Case-studies	2	
3. Use of decision-support tools - economic issues - in silvicultural decision making	Case-studies	2	

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Petrokofsky G., Hemery, G., Brown, N., 2008*: Knowledge feeds decision making: the people's say in UK forestry.* Quarterly Journal of Forestry 102: 221-225.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers in the field of study)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian members of epistemic communities, professional associations and potential employers.
Furthermore, the course contents are in-line with the national qualification system and the European qualification framework being produced through a participatory approach including curricula discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge of specific terminology of decision-support systems	Exam	70%
	• Capability to properly use the concepts and terminology of decision-support systems		
	• Capability to analyze and interpret relevant case-studies in decision-support systems		
	• Capability to evaluate, argue and make decisions on complex case-studies		
10.5 Seminar/ laboratory/ project	• Development of own knowledge on the course and laboratory contents	Portfolio	30%
	• Capability to correctly use the tools and procedures of decision-support systems		
	• Capability to build own arguments and to defend own ideas		
	• Capability to evaluate own and others' arguments		
10.6 Minimal performance standard			
• Students will be able to correctly describe and argument the effectiveness of decision-support systems in forest ecosystem management. • Students will be able to select the appropriate decision-support tools to be used for a given situation from a limited number of options.			

This course outline was certified in the Department Board meeting on 29/09/2024 and approved in the Faculty Board meeting on 30/09/2024.

Prof.dr.eng. Alexandru-Lucian CURTU Dean	Prof.dr.eng. Stelian Alexandru BORZ Head of Department
Prof.dr.M.Sc.eng. Valeriu-Norocel NICOLESCU Course holder	Lecturer dr. Mihai-Bogdan FEDORCA Holder of seminar/ laboratory/ project

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorat (to be filled in according to the forceful classification list for study programmes);
2) Study level – choose from among: Bachelor / Master / Doctorat;
3) Course status (content) – for the Bachelor level, select one of the following options: FC (fundamental course) / DC (course in the study domain)/ SC (speciality course)/ CC (complementary course); for the Master level, select one of the following options: PC (proficiency course)/ SC (synthesis course)/ AC (advanced course);
4) Course status (attendance type) – select one of the following options: CPC (compulsory course)/ EC (elective course)/ NCPC (non-compulsory course);
5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transilvania University of Brasov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study	Forestry
1.5 Study level	MA
1.6 Study programme/Qualification	Multiple Purpose Forestry / Master in Forest Sciences

2. Data about the course

2.1 Name of course			Energy Procurement from Woody Biomass					
2.2 Course convenor			Prof. dr. eng. Valeriu Norocel Nicolescu Prof. dr. eng. Stelian Alexandru Borz Asist. prof. dr. eng. Cezar Scriba					
2.3 Laboratory			Prof. dr. eng. Valeriu Norocel Nicolescu Prof. dr. eng. Stelian Alexandru Borz Asist. prof. dr. eng. Cezar Scriba					
2.4 Study year	II	2.5 Semester	III	2.6 Evaluation type	E	2.7 Course status	Content	SC
							Attendance type	EC

3. Total estimated time

3.1 Number of hours per week	**1**	out of which: 3.2 lecture	**1**	3.3 laboratory	**2**
3.4 Total number of hours in the curriculum	28	out of which: 3.5 lecture	14	3.6 laboratory	14

Time allocation	hours
Study of textbooks, course support, bibliography and notes	25
Additional documentation in libraries, specialized electronic platforms, and field research	25
Preparation of portfolios, and essays	64
Tutorial	4
Examinations	4

3.7 Total number of hours of student activity	122
3.8 Total number per semester	150
3.9 Number of credits	5

4. Prerequisites

4.1 curriculum-related	• The attendees will have basic knowledge of Silviculture and Forest Engineering
4.2 competences-related	• The attendees will have basic knowledge of computer use

5. Conditions

5.1 for course development	• Course attendance is facultative
5.2 for laboratory	• Laboratory attendance is compulsory

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to Course:** Students learn to analyze forest resources, including the potential of wood for energy production, apply silvicultural methods to establish and manage forests for energy, as well as the technologies and logistics used to procure wood for energy. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to Course:** The course emphasizes the design of energy wood supply chains and the evaluation of their economic and environmental impacts, aligning with bioeconomy and regulatory frameworks.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to Course:** Laboratory tasks require collaboration, effective communication, and presentations, promoting teamwork and stakeholder engagement in forest operations. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.2:** The graduate identifies opportunities for continuous professional development. **Relevance to Course:** The course encourages staying informed about advancements in technologies used to convert biomass to energy, supply chain innovations, and environmental performance, promoting lifelong learning.

7. Course objectives

7.1 General course objective	• To familiarize the attendees with the advanced knowledge and the state-of-art approaches used in the silviculture and utilization of wood for energetic purposes.
7.2 Specific objectives	• To define, elaborate (deepen) and use the concepts, methods, instruments

	and approaches in the silviculture and utilization of wood for energetic purposes; • To understand the context of silviculture and utilization of wood for energetic purposes as part of larger systems; • To develop the personal and interpersonal skills related to engineering, research and social dimensions.

8. Content

8.1 Course	Teaching methods	Number of hours
First part: Introduction to class, first part 1.Resources of energy wood 1.1. Availability of energy wood 1.1.1. Wood originating from traditional silviculture 1.1.2. Wood originating from urban forestry 1.1.3. Wood originating from short and very short rotation coppices (SRCs)	Lecture	1 hour
2.Traditional silviculture for energy wood production 2.1. High forest silviculture 2.2. Coppice silviculture	Lecture	2 hours
3.Silviculture of SRCs 3.1. Willows and poplars 3.2. Eucalypts 3.3. Black locust 3.4. Paulownia	Lecture	2 hours
Second part: Introduction to class, second part 4.Supply chains for energy wood procurement 4.1. An overview of delivery systems and logistics 4.2. Equipment and delivery systems used in the operational management of SRCs 4.2.1. Understanding the operational performance in establishment operations 4.2.2. Understanding the operational performance in harvesting and transportation operations 4.2.3. Cost performance of delivery systems 4.2.4. Environmental performance of delivery systems	Lecture	5 hours
Third part: Introduction to class, third part 5.Biofuels 5.1. Classification of biofuels 5.2. Generations of biofuels 5.3. Lignocellulosic biofuels 5.4. Characteristics of woody biofuels	Lecture	2 hours
6.Woody biofuels and conversion technologies 6.1. Conversion technology in general 6.2. Conversion to heat 6.3. Conversion to power	Lecture	2 hours

6.4. Co-generation		

Bibliography

First part:

1.Cannell, M.G.R., 2004: *Short rotation forestry for biomass production*. In: Encyclopedia of Forest Sciences, vol. 2 (ed. J. Burley, J. Evans, Y.A. Youngquist), Elsevier and Academic Press, Amsterdam-Boston-Heidelberg-London-New York-Oxford-Paris-San Diego-San Francisco-Singapore-Sydney-Tokyo, pp. 872-877.

2.CREFF, 2012: *Technical Guide. Short rotation coppice*. http://www.creff.eu, 39 p.

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6.Nicolescu, V.N., Hochbichler, E., Bruckman, V.: *Sustainable biomass potentials from coppice forests for pyrolysis: chances and limitations*. In: Biochar: A regional supply chain approach in view of climate change mitigation (ed. V. Bruckman), Cambridge University Press, Cambridge (in press).

7.Nicolescu, V.N., 2014: *Silvicultură II. Silvotehnică*. Editura Aldus, Brașov, 289 p.

8.Savill., P., 2004: *Silvicultural systems*. In: Encyclopedia of Forest Sciences, vol. 3 (ed. J. Burley, J. Evans, Y.A. Youngquist), Elsevier and Academic Press, Amsterdam-Boston-Heidelberg-London-New York-Oxford-Paris-San Diego-San Francisco-Singapore-Sydney-Tokyo, pp. 1003-1011.

9.Smith, D.M., Larson, B.C., Kelty, M.J., Ashton, P.M.S., 1997: *The practice of silviculture: applied forest ecology*. Ninth Edition. John Wiley and Sons, Inc., New York-Chichester-Brisbane-Toronto-Singapore-Weinheim, 537 p.

Second part:

1.Berhongaray, G., El Kasmioui, O., Ceulemans, R. 2013: *Comparative analysis of harvesting machines on an operational high-density short rotation woody crop (SRWC) culture: One process versus two-process harvest operation*. Biomass and Bioenergy 58: 333–342.

2.Bush, C., Volk, T.A., Eisenbies, M.H., 2015: *Planting rates and delays during the establishment of willow biomass crops*. Biomass and Bioenergy 83: 290-296.

3.Bucholz, T., Volk, T.A., 2011: *Improving the profitability of willow crops - identifying opportunities with a crop budget model*. Bioenergy Research 4: 85-95.

4.Danfors, B., Nordén, B., 1994: *Logistics for simultaneous harvesting and cutting of short rotation energy forest*. Swedish Institute of Agricultural Engineering, Ultuna - Uppsala, JTI rapport 194, 55 p.

5.Ehlert, D., Pecenka, R., 2013: *Harvesters for short rotation coppice: Current status and new solutions*. International Journal of Forest Engineering 24: 170–182.

6.Eisenbies, M.H., Volk, T.A., Posselius, J., Foster, C., Shi, S., Karapetyan, S. 2014: *Evaluation of a single-pass, cut and chip harvest system on commercial-scale, short-rotation shrub willow biomass crops*. Bioenergy Research **7** (4): 1506-1518.

7.Forestry Commission, 1998: *Harvesting and comminution of short rotation coppice. Harvesting machine trials*. Technical Development Branch. Technical Note 8/98. Forestry Commission, Ae.

8.Guidi, W., Pitre, F.E., Labrecque, M., 2013: *Short rotation coppice of willows for the production of biomass in Eastern Canada*. In: Matovic M.D. (ed.) Biomass Now - Sustainable Growth and Use, INTECH. p. 421-448.

9.Hartsough, B., Spinelli, R. 2001: *Recent reports on SRC harvesters in Europe. Productivities and costs of short rotation woody crops harvest technologies: projections for American plantations*. Final Report to Oak Ridge National Laboratory. Davis, University of California, USA.

10.Manzone, M., Balsari, P., 2014: *Planters performance during a very short rotation coppice planting*. Biomass and Bioenergy 67: 188-192.

11.Scholz, V., Ehlert, D., Hoffmann, T., Kern, J., Pecenka, R. 2011. *Cultivation, harvest and storage of short rotation*

coppice - Long-term field trials, environmental effects and optimization potentials. Journal of Agricultural Machinery Science 7: 205-210.
12.Schweier, J., Becker, G. 2012a: *New Holland forage harvester's productivity in short rotation coppice: Evaluation of field studies from a German perspective*. International Journal of Forest Engineering 23: 82-88.
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Spinelli, R., Schweier, J., De Francesco, F., 2012: *Harvesting techniques for non-industrial biomass-plantations*. Biosystems Engineering 113: 319-324.
17.Spinelli, R., Nati, C., Magagnotti, N. 2009: *Using modified foragers to harvest short-rotation poplar plantations*. Biomass & Bioenergy 33 (5): 817-821.
18.Spinelli, R., Magagnotti, N., Picchi, G., Lombardini, C., Nati, C. 2011: *Upsized harvesting technology for coping with the new trends in short-rotation coppice*. Applied Engineering in Agricultulture 27 (4): 551-557.
19.Tubby, I., Armstrong, A., 2002: *Establishment and management of short rotation coppice*. Practice note, Forestry Commission, 12 p.
20.van der Meijden, G.P.M., Gigler, J.K., 1995: *Harvesting techniques and logistics of short rotation energy forestry. A descriptive study on harvest and transport systems in Salix production currently used in Sweden*. Swedish Institute of Agricultural Engineering, Ultuna – Uppsala, JTI rapport 200, 49 p.
21.Other resources provided by the teacher.

Third part:

1.Krzysztof, J. Ptasinski, 2012: Efficiency of biomass energy: An exergy approach to biofuels, power, and biorefineries, John Wiley & Sons, 2012.
2.Sjaak Van Loo, Jaap Koppejan, 2008: The handbook of biomass combustion and co-firing, Earthscan, London, 2008.

8.2 Laboratory	Teaching-learning methods	Number of hours
1.Specific techniques and technologies for the establishment and tending of stands/cultures used for energy wood production	Case studies	2 hours
2. Portfolio specifications part 1	Presentation & Individual work	1 hour
3.Methods and tools used in the assessment and development of effective supply chains for energy wood procurement	Case study	2 hours
4. Portfolio specifications part 2	Presentation & Individual work	1 hour
5.Methods used in the design and implementation of CHP facilities	Case studies	2 hours
6.Portfolio specifications and preparation	Presentation & Individual work	1 hour
7. On-site observation of SRC procurement operations & conversion facilities	Field trip	5 hours

Bibliography

See the course bibliography.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian & international members of epistemic communities, professional associations and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that

included discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge on advanced terminology in silviculture, delivery systems and conversion technology of wood into energy	Exam	50 %
	• Capability to properly use the concepts and terminology specific to procurement of wood for energetic utilization		
	• Capability to analyse and interpret relevant case studies and contexts in the procurement of wood for energetic utilization		
	• Capability to build argumentations on complex case studies in the procurement of wood for energetic utilization		
	• Capability to evaluate, argue and make decisions on complex case studies in the procurement of wood for energetic utilization		
10.5 Laboratory	• Development of own knowledge on the course and laboratory contents	Portfolio	50 %
	• Capability to correctly use the engineering instruments, methods and procedures in the procurement of wood for energetic utilization		
	• Capability to build own arguments and to defend own ideas		
	• Capability to evaluate own and others' arguments		
10.6 Minimal performance standard			

• Students should be able to correctly describe the specific issues related to the resources of energy wood as well as to the establishment and tending of stands/cultures designated to energy wood production; • Students should be able to correctly describe and argument the effectiveness of a given wood supply chain / logistics as used in the procurement of wood for energetic utilization; • Students should be able to correctly classify the biofuels and to describe and argument the effectiveness of a given conversion technology.

This course outline was certified in the Department Board meeting on 29.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Prof. dr. eng. Alexandru Lucian CURTU **Dean**	**Prof. dr. eng. Stelian Alexandru BORZ** **Head of Department**
Prof.dr.eng. Valeriu Norocel Nicolescu	Prof.dr.eng. Valeriu Norocel Nicolescu
Prof.dr.eng. Stelian Alexandru Borz	Prof.dr.eng. Stelian Alexandru Borz
Asist.prof.dr.eng. Cezar Scriba	Asist.prof.dr.eng. Cezar Scriba
Course holders	Holders of laboratory

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorate (to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorate;

3) Course status (content) – for the Bachelor level, select one of the following options: **FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (specialty course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC** (advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC** (non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

1.1 Higher education institution	Transilvania University of Brasov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study	Forestry
1.5 Study level	Master
1.6 Study programme/Qualification	Multiple Purpose Forestry / Master in Forest Sciences

2. Data about the course

2.1 Name of course			Life Cycle Assessment in Forestry					
2.2 Course convenor			Prof. dr. eng. Stelian Alexandru Borz					
2.3 Laboratory			Prof. dr. eng. Stelian Alexandru Borz					
2.4 Study year	II	2.5 Semester	I	2.6 Evaluation type	E	2.7 Course status	Content	AC
							Attendance type	EC

3. Total estimated time

3.1 Number of hours per week	**3**	out of which: 3.2 lecture	**1**	3.3 laboratory	**2**
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 laboratory	28

Time allocation	hours
Study of textbooks, course support, bibliography and notes	43
Additional documentation in libraries, specialized electronic platforms, and field research	30
Preparation of portfolios, and essays	57
Tutorial	4
Examinations	4

3.7 Total number of hours of student activity	138
3.8 Total number per semester	180
3.9 Number of credits	6

4. Prerequisites

4.1 curriculum-related	• The attendees will have basic knowledge of Ecology, Forest Engineering and Chemistry
4.2 competences-related	• The attendees will have basic knowledge of computer use

5. Conditions

5.1 for course development	• Course attendance is facultative
5.2 for laboratory	• Laboratory attendance is compulsory

6. Specific competences

Professional competences	• **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to Course:** The course equips students with the foundational understanding and practical application of Life Cycle Assessment (LCA) concepts and tools to evaluate forest operations and environmental impacts effectively. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to Course:** The focus on LCA ties directly to assessing the economic and environmental trade-offs in forestry practices, aligning with policy and strategic decision-making requirements.
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to Course:** Group-based laboratory work and presentations enhance teamwork and communication skills, fostering collaboration on complex LCA projects. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.2:** The graduate identifies opportunities for continuous professional development. **Relevance to Course:** LCA is a constantly evolving field. This course encourages the students to stay updated with the latest methodologies and technologies in environmental assessment.

7. Course objectives

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in the environmental assessment.
7.2 Specific objectives	• To define, elaborate (deepen) and use the concepts, methods, instruments

0.Introduction to class 1.An introduction to LCA 1.1. Main characteristics of LCA 1.1.1. What is LCA? 1.1.2. Role of LCA in relation to products 1.1.3. Role of LCA in wider applications 1.2. Limitations of LCA 1.3. LCA as a part of a toolbox 1.4. History and development of LCA	Lecture	2 hours
2. Management of LCA projects 2.1. Designing an LCA project 2.2. Context of an LCA project 2.3. Process management in LCA 2.4. Organization and assignment 2.5. Reporting an LCA project	Lecture	2 hours
3.Goal and scope definition 3.1. Procedures 3.2. Goal definition 3.3. Scope definition 3.4. Functional unit 3.5. Results of goal and scope definition	Lecture	2 hours
4.Inventory analysis 4.1. Procedures 4.2. System boundary 4.3. Flow diagram 4.4. Format and data categories 4.5. Data quality 4.6. Data collection 4.7. Relating data to unit processes 4.8. Data validation 4.9. Cut-off and data estimation 4.10. Multifunctionality and allocation 4.11. Calculation method 4.12. Results of inventory analysis	Lecture	3 hours
5.Impact assessment 5.1. Procedures 5.2. Impact categories 5.3. Characterization methods 5.4. Classification 5.5. Characterization	Lecture	3 hours

6.4. Contribution analysis 6.5. Perturbation analysis 6.6. Sensitivity and uncertainty analysis 6.7. Conclusions and recommendations 6.8. Results of interpretation		

Bibliography

1.Guinée J.B., Gorrée M., Heijungs R., Huppes G., Kleijn R., de Koning A., van Oers L., Wegener Sleeswijk A., Suh S., de Haes H.A.U., de Bruijn H., van Duin R., Huijbregts M.A.J., Lindeijer E., Roorda A.A.H., van der Ven B.L., Weidema B.P. (2004). Handbook on Life Cycle Assessment. Operational Guide to ISO Standards. Kluwer Academic Publishers.

2.Klein D., Wolf C., Schulz C., Weber-Blaschke G. (2015). 20 years of life cycle assessment (LCA) in the forestry sector: state of the art and a methodological proposal for the LCA of forest production. International Journal of Life Cycle Analysis 20:556-575.

3.Heinimann H.R. (2012). Life cycle assessment in forestry - State and perspectives. Croatian Journal of Forest Engineering 33 (2): 357-372.

4. PRé Consultants (2013) SimaPro Introduction to LCA

5. ISO LCA Series of Standards.

8.2 Laboratory	Teaching-learning methods	Number of hours
1.Introduction to laboratory. LCA tools and databases	Presentation	2 hours
2.Inventory analysis: Case studies on groups	Presentation &Assignment of work	2 hours
3. Inventory analysis: Group work	Group work	22 hours
4.Portfolio specifications and preparation	Individual work	2 hours

Bibliography

1.Guinée J.B., Gorrée M., Heijungs R., Huppes G., Kleijn R., de Koning A., van Oers L., Wegener Sleeswijk A., Suh S., de Haes H.A.U., de Bruijn H., van Duin R., Huijbregts M.A.J., Lindeijer E., Roorda A.A.H., van der Ven B.L., Weidema B.P. (2004). Handbook on Life Cycle Assessment. Operational Guide to ISO Standards. Kluwer Academic Publishers.

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian & international members of epistemic communities, professional associations and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge of terminology in Life Cycle	Written exam	40 %

	interpret relevant case studies and contexts specific to Life Cycle Assessment		
	• Capability to build argumentations on complex case studies		
	• Capability to evaluate, argue and make decisions on complex case studies		
10.5 Laboratory	• Development of own knowledge on the course and laboratory contents	Portfolio	60 %
	• Capability to correctly use the instruments and procedures of Life Cycle Assessment		
	• Capability to build own arguments and to defend own ideas		
	• Capability to evaluate own and others' arguments		
10.6 Minimal performance standard			
• Students will be able to correctly describe and characterize the main steps of implementing a Life Cycle Analysis; • Students will be able to handle specific software to run Life Cycle Analyses, proven by the portfolio contents.			

This course outline was certified in the Department Board meeting on 27.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Prof. dr. eng. Alexandru Lucian CURTU **Dean**	**Prof. dr. eng. Stelian Alexandru BORZ** **Head of Department**
Prof. dr. eng. Stelian Alexandru BORZ **Course holder**	**Prof. dr. eng. Stelian Alexandru BORZ** **Holder of seminar/ laboratory/ project**

(course in the study domain)/ **SC** (specialty course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC**(advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC**(non-compulsory course);

5) One credit is the equivalent of 25 study hours (teaching activities and individual study).

COURSE OUTLINE

1. Data about the study programme

1.1 Higher education institution	Transilvania University of Brasov
1.2 Faculty	Faculty of Silviculture and Forest Engineering
1.3 Department	Forest Engineering, Forest Management Planning and Terrestrial Measurements
1.4 Field of study	Forestry
1.5 Study level	MA
1.6 Study programme/Qualification	Multiple Purpose Forestry / Master in Forest Sciences

2. Data about the course

2.1 Name of course			Business Process Management in Forestry					
2.2 Course convenor			Prof. dr. eng. Stelian Alexandru Borz					
2.3 Laboratory			Prof. dr. eng. Stelian Alexandru Borz					
2.4 Study year	II	2.5 Semester	III	2.6 Evaluation type	E	2.7 Course status	Content	AC
							Attendance type	EC

3. Total estimated time

3.1 Number of hours per week	**3**	out of which: 3.2 lecture	**1**	3.3 laboratory	**2**
3.4 Total number of hours in the curriculum	42	out of which: 3.5 lecture	14	3.6 laboratory	28

Time allocation	hours
Study of textbooks, course support, bibliography, and notes	38
Additional documentation in libraries, specialized electronic platforms, and field research	32
Preparation of portfolios, and essays	60
Tutorial	4
Examinations	4
3.7 Total number of hours of student activity	138
3.8 Total number per semester	180
3.9 Number of credits	6

4. Prerequisites

4.1 curriculum-related	• The attendees will have basic knowledge of Business Administration, Forest Engineering and Logistics
4.2 competences-related	• The attendees will have basic knowledge of computer use

5. Conditions

5.1 for course development	• Course attendance is facultative
5.2 for laboratory	• Laboratory attendance is compulsory

6. Specific competences

Professional competences	**CP.1: Analysis, characterization, evaluation, and modeling of forest ecosystems and technical forest production systems** • **LO 1.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in forest ecosystem management and forest production systems. • **LO 1.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to forest ecosystem management and forest production systems. **Relevance to Course:** The course formalizes the students with the concepts of modelling and evaluating the business processes, aiming at radical change and improvement of forest-based business with the main goal to support the competitive advantage and business resilience on currently volatile markets. **CP.2: Analysis, characterization, evaluation, and modeling of forest-related economic, regulatory, political, and strategic systems** • **LO 2.1:** The graduate understands the concepts, theories, principles, methods, techniques, and technologies applied and anticipated in economic, regulatory, political, and strategic systems in the forestry sector. • **LO 2.2:** The graduate applies/uses concepts, theories, principles, methods, techniques, and technologies related to economic, regulatory, political, and strategic systems in the forestry sector. **Relevance to Course:** The focus is on the methods, tools and procedures used to evaluate the state-of-art economic and strategic business problems in terms of processes and then to (re)engineer the processes aiming at business effectiveness.	
Transversal competences	**CT.1: Mastery of techniques and procedures for interaction, networking, and communication at the micro- and macro-social and institutional levels in the forestry sector** • **LO 1.3:** The graduate employs effective communication strategies and techniques within the team and with external partners. **Relevance to Course:** Group-based laboratory work and presentations enhance teamwork and communication skills, fostering collaboration on complex business models. **CT.3: Objective self-evaluation of the need for continuous professional development to adapt competences to the dynamics of the field and labor market demands** • **LO 3.1:** The graduate keeps updated with advances in techniques and research in their field of practice. • **LO 3.2:** The graduate identifies opportunities for continuous professional development. **Relevance to Course:** Markets are continuously changing, requiring managers able to improve the competitive advantage of their businesses. This course encourages the students to stay updated with the latest methodologies and technologies used to stay competitive on the market.	

7. Course objectives

7.1 General course objective	• To familiarize the students with the advanced knowledge and the state-of-art approaches used in the Business Process Management in Forestry.
7.2 Specific objectives	• To define, elaborate (deepen) and apply the concepts, methods, instruments

	and approaches specific to Business Process Management; • To understand the context of Business Process Management as part of broader business assessment methods; • To develop the personal and interpersonal skills related to engineering, research, and social dimensions.

8. Content

8.1 Course	Teaching methods	Remarks
1. Course outline 2.1. Introduction to Business Process Management 2.2. Definition of a process 2.3. Types of processes 2.4. Examples of processes 2.5. Importance of processes in business 2.6. Normalization of deviance and its implications	Lecture	2 hours
2. Business Process Management 2.1. Definition of Business Process Management 2.2. Scope of Business Process Management 2.3. Process owner 2.4. Process management by collaboration 2.5. Process optimization 2.6. Managing processes by automation	Lecture	2 hours
3.Business Process Analysis 3.1. Definition of Business Process Analysis 3.2. Scope of Business Process Analysis 3.3. Process benchmarking 3.4. Process mapping 3.5. BPM software	Lecture	5 hours
4.Business Process Reengineering 4.1. Definition of Business Process Reengineering 4.2. Scope of Business Process Reengineering 4.3. Steps of Business Process Reengineering 4.4. Examples of Business Process Reengineering 4.5. Best Practices of Business Process Reengineering 4.6. Outsourcing of Business Process Reengineering	Lecture	3 hours
5.Recapitulation	Lecture	2 hours
Bibliography Hammer M., Champy J., 2002. Reengineering the corporation. A manifesto for business revolution. Harper Collins Publishers Inc., 257 p. Rauch P., Borz S.A., 2020: Reengineering the Romanian Timber Supply Chain from a Process Management Perspective. Croatian Journal of Forest Engineering, 41(1), 85-94.		
8.2 Laboratory	Teaching-learning methods	Remarks
1.Outline 1.1. Laboratory outline 1.2. Setup of activities	Presentation& Individual Work	2 hours
2. Setup and introduction to Bee Up software 2.1. Features & functionalities 2.2. Setting up a BPM project	Presentation & Individual Work	4 hours

3. Process benchmarking & mapping 3.1. Setup of work groups & assignments 3.2. Design of the questionnaire 3.3. Drawing up a preliminary process flow 3.4. Data benchmarking &collection 3.5. Mapping of process flow	Presentation &Teamwork on Case Studies	14 hours
4. Business process reengineering 4.1. Brainstorming session 4.2. Drawing up & checking for validity the improvement paths 4.3. Map redesign 4.4. Follow up	Presentation &Teamwork on Case Studies	6 hours
5. Portfolio specifications and preparation - final part	Presentation &Teamwork	2 hours
Bibliography Brandall B., Henshall A. The Complete Guide to Business Process Management. Process.st, 110p. Bee-Up software documentation. Available at: https://bee-up.omilab.org/activities/bee-up/		

9. Correlation of course content with the demands of the labour market (epistemic communities, professional associations, potential employers)

The contents of this course have been developed in accordance with the strategy and vision of Faculty of Silviculture and Forest Engineering, based on the suggestions made by the Romanian & international members of epistemic communities, professional associations, and potential employers. Furthermore, the course contents were aligned to the national qualification system and to the European qualification framework by a participative approach that included discussions with Romanian and European experts in the field.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	• Knowledge of terminology in Business Process Management	Written exam	40 %
	• Capability to properly use the concepts and terminology of Business Process Management		
	• Capability to analyse and interpret relevant case studies and contexts specific to Business Process Management		
	• Capability to build argumentations on complex case studies		
	• Capability to evaluate, argue and make decisions on complex case studies		

10.5 Laboratory	• Development of own knowledge on the course and laboratory contents	Portfolio	60 %
	• Capability to correctly use the instruments and procedures of Business Process Management		
	• Capability to build own arguments and to defend own ideas		
	• Capability to evaluate own and others' arguments		
10.6 Minimal performance standard			
• Students will be able to correctly describe the main steps of implementing Business Process Management procedures and to argument its effectiveness in forestry; • Students will be able to handle specific software to build BPM workflows, proven by the portfolio contents.			

This course outline was certified in the Department Board meeting on 27.09.2024 and approved in the Faculty Board meeting on 30.09.2024.

Prof. dr. eng. Alexandru Lucian CURTU **Dean**	**Prof. dr. eng. Stelian Alexandru BORZ** **Head of Department**
Prof. dr. eng. Stelian Alexandru BORZ **Course holder**	**Prof. dr. eng. Stelian Alexandru BORZ** **Holder of seminar/ laboratory/ project**

Note:

1) Field of study – select one of the following options: Bachelor / Master / Doctorate(to be filled in according to the forceful classification list for study programmes);

2) Study level – choose from among: Bachelor / Master / Doctorate;

3) Course status (content) – for the Bachelor level, select one of the following options:**FC** (fundamental course) / **DC** (course in the study domain)/ **SC** (specialty course)/ **CC** (complementary course); for the Master level, select one of the following options: **PC** (proficiency course)/ SC (synthesis course)/ **AC**(advanced course);

4) Course status (attendance type) – select one of the following options: **CPC** (compulsory course)/ **EC** (elective course)/ **NCPC**(non-compulsory course);

5) One credit is the equivalent of 25study hours (teaching activities and individual study).