



SVEUČILIŠTE U ZAGREBU, FAKULTET ŠUMARSTVA I DRVNE TEHNOLOGIJE
UNIVERSITY OF ZAGREB, FACULTY OF FORESTRY AND WOOD TECHNOLOGY

Graduate study Wood technology processes

Assessment methods and criteria

Acad. Year 2023/24



List of learning outcomes for the Graduate study: Wood technology Processes

A) WITH GENERAL ENGINEERING COMPETENCE

- A1: Explain the position and trends of the wood industry in the country and worldwide,
- A2: Independently gather data, statistically process, present and analyses gathered data, discuss and make conclusions based on analysed data and distinguish the possibilities of different, interpretation of the same problem analysed in different ways,
- A3: Apply simpler methods of operation research.

B) WITH FOCUSED ENGINEERING COMPETENCE

- B1: Apply current technical regulations in planning and managing systems, managing production and managing and assuring quality of wood, wooden materials and final products,
- B2: Apply scientific insights on wood as a renewable material and optimise wood usage through the application of techniques and technologies for reuse of wood excess,
- B3: Manage procedures and processes of improving natural wood disadvantages using chemical, physical and enzymatic modifications,
- B4: Plan and analyse material handling, solve problems of transport, storage and selection of transport technique, analyse factors influencing the efficiency and expenses of wood and wooden, materials transport and storage.

C) WITH TECHNOLOGICAL ENGINEERING COMPETENCE

- C1: Apply technological processes of mechanical and thermo-chemical wood refinement in the manufacturing of wood fibers and paper,
- C2: Manage wood technology processes in the field of sawmilling, hydrothermal treatment of wood, wood protection, technology of veneer and wooden board manufacturing, technology of products for building purposes, furniture and other wood products, and guide processes of wood and wooden products finishing,
- C3: Design technologies for primary and final wood treatment, develop, improve and optimize production, and apply knowledge from the field of technique and management in the wood industry,
- C4: Measure and evaluate quality parameters of wooden products (for building purposes) and interpret their size and meaning,
- C5: Choose and apply the CNC technique in final wood treatment,
- C6: Enhance existing technologies as well as implement new technologies in the wood industry,
- C7: Manage the industrial environment of wood processing and the wooden, chemically protected wood waste and excess.

D) WITH ORGANISATIONAL ENGINEERING COMPETENCE

- D1: Recommend resource usage through the management of a process which consists of planning, organizing, directing and controlling,
- D2: Perform tasks in the field of industrial management in wood refinement and furniture manufacturing, micro planning, assignment distribution, optimization of manufacturing decisions, production management and work control,
- D3: Organize and manage tasks of wood materials trade and transfer,
- D4: Manage and perform tasks in wood industry entrepreneurship,
- D5: Perform the most complex tasks in all types of companies dealing with processing, refinement and wood trade, as well as in consultancy and engineering companies.



E) WITH OTHER ENGINEERING COMPETENCE

- E1: Perform tasks of scientific and professional associates in scientific research institutions in the field of wood and wood technology,
- E2: Upgrade their professional and scientific competencies through different forms of education and postgraduate studies,
- E3: Gather, process and interpret reference sources and prepare simpler professional or scientific papers,
- E4: Conduct courses in vocational secondary school and other similar schools,
- E5: Perform activities and tasks in publicist writing and the media related to the wood profession.



The connection between the learning outcomes of the course and the learning outcomes of the program

| Code | General engineering competence | | | Focused engineering competence | | | | Technological engineering competence | | | | | | | Organisational engineering competence | | | | | Other engineering competence | | | | |
|--------|--------------------------------|----|----|--------------------------------|----|----|----|--------------------------------------|----|----|----|----|----|----|---------------------------------------|----|----|----|----|------------------------------|----|----|----|----|
| | A1 | A2 | A3 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | C6 | C7 | D1 | D2 | D3 | D4 | D5 | E1 | E2 | E3 | E4 | E5 |
| 235703 | | | | | | | | | + | | | | | | | | | | | | | | | |
| 235705 | | | | | | | | | + | + | + | | + | | | | | | | | | | | |
| 235706 | | | + | | | | + | | | + | | | | | + | + | | | | | | | | |
| 235707 | + | + | + | | | | | | | + | | | | | + | + | | + | + | | | | | + |
| 235708 | | | | | | | | | + | | | + | | | | | | | | | | | | |
| 33666 | | | | | | + | | | | | | | + | | | | | | | | | | | |
| 235717 | + | + | | | | | | | | | | | | | + | + | | + | + | | | | | + |
| 33671 | | | | | | | | | + | | | | + | | | | | | | | | | | |
| 235709 | | | | | | | | | + | | | | | | | | | | | | | | | |
| 33673 | | | | | | | | | + | | | | | | | | | | | | | | | |
| 235431 | | + | | | | | + | | | + | | | | | | | | | | | | + | | |
| 235710 | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | | + | + | + |
| 235719 | | | | | | | | + | | | | | | | | | | | | | | | | |
| 235722 | | | | | | | | | + | | | | | | | | | | | | | | | |
| 235723 | | | | | | | | | + | | | + | | | | | | | | | | | | |
| 33678 | | | + | | + | | | | | | | | | | | | | | | | | | | |
| 235711 | | | | + | | | | | + | + | + | | | | | | | | | | | | | |
| 235712 | | + | | + | | | | | + | | + | | + | + | | | | | | | | + | | |
| 235713 | | | | | | + | | | | | | | | | | | | | | | | | | |
| 235714 | | + | | | | | | | | | | | | | | | | | | | | | | |
| 235726 | | | | | + | | + | | | | + | | + | | + | + | | | | | | | | |
| 235728 | + | + | | + | | | | | | | | | | | + | + | | + | + | | | | | |
| 235729 | | | | | | | | | | + | | | | | | | | | | | | | | |
| 235730 | | | | | | + | | + | + | | | | | + | + | | | | | | | + | | |
| 235715 | | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | | + | | + |
| 235716 | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| 235731 | + | | | | + | + | | + | + | + | | | + | | | | | | | | | | | |
| 235732 | | | + | | + | + | + | + | + | + | | | + | | | | | | + | | | | | |
| 235733 | + | + | | + | | | | | | | | | + | | | | | | | | | | | |
| 235734 | | + | | | | | | | | + | | | | | | | | | | | | + | | |
| 235735 | | | | + | | | | | | | + | | | | | | | | | | | | | |



Thermohydromechanical Processing of Wood

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|---------------------------|--------------------------------------|
| Knowledge of the thermohydromechanical wood processes. | exercises, lectures, exam | C2 |
| Conduct optimal procedures of thermohydromechanical wood processing | exercises, lectures, exam | C2 |
| Optimize the procedures of thermohydromechanical wood processing. | exercises, lectures, exam | C2 |
| Know, evaluate and select the optimal technology of thermohydromechanical wood processing, in accordance with the requirements of production. | exercises, lectures, exam | C2 |

Methods of grading=Taking exam

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--|----------------|-----------------------|---|----------|
| Lectures (L) | - | | | 30 | 30 | 2 |
| Exercises (E) | 20 % | Partly disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 30 | 30 | 2 |
| | | Neat, legible, with major corrections and on time | Good (3) | | | |
| | | Neat, legible, with minor corrections and on time | Very good (4) | | | |
| | | Neat, legible, accurate and on time | Excellent (5) | | | |
| Partial exam (PE) | 80 % | 60-70% | Sufficient (2) | | 60 | 2 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100 % | (Ex20 + PEx80)/100 | | 60 | 120 | 6 |



| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|-------------------------|----------------|-----------------------|---|------|
| Final exam (FE) | | 60-70 % | Sufficient (2) | | | 1 |
| | | 71-80 % | Good (3) | | | |
| | | 81-90 % | Very good (4) | | | |
| | | 91-100 | Excellent (5) | | | |
| TOTAL | 100 % | (FEx80+Ex20)/100 | | | | |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|--|---|
| Attendance of lectures and exercises | The attendance of the students is checked and recorded. Student may justifiably be absent with a maximum of 10 % of direct teaching hours. | semester (60 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. At the beginning of the first exercise, students will receive templates. Exercises are written by hand. For each exercise, the term in which the exercise is handed and evaluated positively, is defined. If the exercise is not handed within the defined time frame or if the exercise is not evaluated positively, then that exercise will be reviewed later after semester ends and the student will receive the seminar assignment and additional computational tasks for each exercise. The accuracy, tidiness and regularity are evaluated. | in accordance with the agreed terms | Exceptionally, in the case of a justified reason. |
| Written exam | Exam can be attended by students who have completed the exercises. The exam consists of theoretical questions, computational tasks and of the sample that students must describe. For passage students must collect at least 60 % of points. | Exam terms | - |
| Oral exam | Students who pass a written exam are asked questions from different parts of the program. The final grade of the subject is obtained according to the formula (FEx80+Ex20)/100 | | - |



Sawmilling Techniques

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|--------------------|--------------------------------------|
| Suggest optimum saw blades arrangement for round wood sawing of our most important wood species. | Exercises, exam | C2 |
| Suggest optimum saw blades arrangement for possible further sawn wood processing. | Exercises, exam | C2 |
| Suggest a plan for sawing for individual wood species. | Exercises, exam | C2 |
| Evaluate and compare the success of sawing of our most important wood species according to the criteria of round and sawn wood quantitative yield | Exercises, exam | C4 |
| Evaluate and compare the success of sawing of our most important wood species according to the criteria of round and sawn wood value yield | Exercises, exam | C4 |
| Design and suggest possible technological improvements in some obscure sawmill production. | Exercises, exam | C6 |
| Active participation in designing new sawmill plants. | Exercises, exam | C3 |
| Plan and organize production in sawmills on a monthly and annual basis | Exercises, exam | C2 |
| Adjust the capacities of machines in sawmill | Exercises, exam | C2 |
| Review and evaluate the current technological state of production in sawmill. | Exercises, exam | C6 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--------------------------------------|----------------|-----------------------|---|------|
| Lectures (L) | | | | 30 | | 1 |
| Exercises (E) | | | | 30 | 60 | 3 |
| Written exam (WE) | 100% | Percentage of exam resolution 70-79% | Sufficient (2) | | 60 | 2 |
| | | Percentage of exam resolution 80-89% | Good (3) | | | |
| | | Percentage of exam resolution 90-95% | Very good (4) | | | |
| | | Percentage of exam resolution | Excellent (5) | | | |



| | | | | | | |
|-----------------|--|---|------------|----|-----|---|
| | | 95-100% | | | | |
| *Oral exam (OE) | | Percentage of response accuracy $\geq 70\%$ | Positively | | | |
| | | Percentage of response accuracy $< 70\%$ | Negative | | | |
| Final exam (FE) | | | | 60 | 120 | 6 |

* Only those students who want a higher final grade than those obtained on a written exam are issued to the oral exam. The requirement to enter an oral exam is that the score of the written exam is reached in the upper score of the score scale, close to the score of the achieved score. In the case of 70% and more positive answers, the final grade can only be achieved by one step higher than the previously achieved on the written exam.

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|--------------|
| Attendance of lectures and exercises | The attendance is checked and the attendance of the students is recorded. The student can justifiably absent from the direct teaching as much as stipulated in the Rulebook on Studying. | Semester (60 hours of direct lecturer and exercises) | - |
| Exercises (E) | As part of the exercise, 7 computer exercises from the teaching subjects are performed. Students with task assignments and instructions for making all 7 exercises, as well as the appearance of the fascicles, liners and inserts, are downloaded from the subject's web site. When submitting the exercises, the student should explain how to solve the exercises. | Continuously during the term of the semester according to the agreed term. Students who have created and explained all the exercises and those accepted by the teachers can access the exam. | |
| Written exam | Examinations can be attended by students who have completed, reviewed and explained all exercises. Students on a pre-printed print exam solve a complex computational task based on the simulation of one of the abridged blotting methods. The written exam is evaluated according to the scale given in the evaluation method = exam. | Exam terms | - |
| *Oral exam | Only those students who want a higher grade than those obtained on a written exam are issued an oral exam. The requirement to enter an oral exam is that the score of the written exam is reached in the upper score of the score scale, close to the score of the achieved score. They ask questions from different parts of the program content. In the case of 70% and more positive answers, only one step higher final grade than the previously achieved on a written exam can be achieved. | Exam terms | - |



Quantitative Methods for Operations Research

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|---|--------------------------------------|
| Analyzing and solving mathematical problems based on learned mathematical concepts and modeling situations outside a mathematical context. | participating in class problems, solving problems, partial exams, seminar, exam | A3 |
| Connecting quantitative methods with engineering practice. | participating in class problems, solving problems, partial exams, seminar, exam | A3 |
| Using linear algebra to calculate the matrix inverse. | participating in class problems, solving problems, partial exams, seminar, exam | A3 |
| Solving a system of m linear equations with n unknowns. | participating in class problems, solving problems, partial exams, seminar, exam | A3 |
| Solving a constrained maximization or minimization problem. | participating in class problems, solving problems, partial exams, seminar, exam | C3, D2 |
| Using the graphical method to solve a standard minimization problem. | participating in class problems, solving problems, partial exams, seminar, exam | C3, D2 |
| Organizing optimal production using linear programming. | participating in class problems, solving problems, partial exams, seminar, exam | C3 |
| Solving the transport problem. | participating in class problems, solving problems, partial exams, seminar, exam | B4 |
| Distinguishing multiple-criteria methods: multiple goal methods and optimal choice methods. | participating in class problems, solving problems, partial exams, seminar, exam | C3, D2 |
| Recommending a multiple-criteria method when making decisions in the wood industry. | participating in class problems, solving problems, partial exams, seminar, exam | D1 |
| Constructing a decision tree for a given problem. | participating in class problems, solving problems, partial exams, seminar, exam | D2 |
| Recognizing situation types when making decisions. | participating in class problems, solving problems, partial exams, seminar, exam | D2 |
| Comparing criteria importance in multiple-criteria decision-making. | participating in class problems, solving problems, partial exams, seminar, exam | D2 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|----------------------|---------------------|--------------------|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 30 | 2 |
| Exercises (E) | - | - | - | 13 | 17 | 1 |
| Partial exam 1 (PE1) | 50% | 50-59% | Sufficient (2) | | | |



| | | | | | | |
|----------------------|-------------|----------------|----------------|----|-----|---|
| | | 60-74% | Good (3) | 1 | 29 | 1 |
| | | 75-89% | Very good (4) | | | |
| | | 90-100% | Excellent (5) | | | |
| Partial exam 2 (PE2) | 50% | 50-59% | Sufficient (2) | 1 | 29 | 1 |
| | | 60-74% | Good (3) | | | |
| | | 75-89% | Very good (4) | | | |
| | | 90-100% | Excellent (5) | | | |
| TOTAL | 100% | PE1+PE2 | | 45 | 105 | 5 |

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|---------------------------------------|--|-----------------------|---|------|
| Final exam (FE) | 100% | 50-59% 60-74% 75-89% 90-100% | Sufficient (2) Good (3) Very good (4) Excellent (5) | | | 2 |
| TOTAL | 100% | FE | | | | |

*students who do not pass the course through partial exams can take the exam during exam terms. The exam consists of a written and oral part. Students need to achieve at least 50% on the written part in order to take the oral part of the exam. The oral part of the exam can be replaced with a seminar paper.

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|--|---|
| Attendance of lectures and exercises | Attendance is checked during class. Attendance and participation are necessary for obtaining the lecturer's signature and attending partial exams and exams. | semester (45 hours of direct lectures) | - |
| Partial exam 1 | Students solve problems from the coursework of the first part of the semester. The exam is in written form. | 8th week | Under extraordinary circumstances and with a valid excuse, the student can take the exam at a later date. |
| Partial exam 2 | Students solve problems from the coursework of the second part of the semester. The exam is in written form. | 15th week | Under extraordinary circumstances and with a valid excuse, the student can take the exam at a later date. |



| | | | |
|--------------|---|------------|--|
| Written exam | The exam includes coursework from the entire semester. Students who obtained the lecturer's signature can take the exam. | Exam terms | |
| Oral exam | The exam includes coursework from the entire semester. Students who passed the written exam can take the oral exam. The final grade is obtained by combining the results of the written and oral exams. | Exam terms | |
| Seminar | Oral exam can be replaced by a seminar. | | |

Production Management

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|---|--------------------------------------|
| Explain the underlying economic concepts and the concepts and functions of management. | Project assignment, oral and written exam | D2 |
| Apply managerial skills. | Project assignment, oral and written exam | D2 |
| Define production strategies, production strategy model, types of production strategies and production goals. | Project assignment, oral and written exam | D2 |
| Gain basic knowledge and concepts of production planning and management. | Project assignment, oral and written exam | D4 |
| Identify and apply microeconomic and macroeconomic models | Project assignment, oral and written exam | D2 |
| Prepare project documentation and technical reports using modern technology | Project assignment, oral and written exam | D5 |
| Identify, formulate, and solve engineering problems by using familiar methods and procedures | Project assignment, oral and written exam | D5 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 15 | 1,5 |
| Exercises (E) | 20% | Partly disordered and incomprehensible, with major corrections and on time | Sufficient (2) | | | |
| | | Neat, legible, with major corrections and on time | Good (3) | | | |



| | | | | | | |
|--------------------|--------------|---|----------------|-----------|------------|----------|
| | | Neat, legible, with minor corrections and on time | Very good (4) | 15 | 30 | 1,5 |
| | | Neat, legible, accurate and on time | Excellent (5) | | | |
| Seminar paper (SP) | 10% | Partially disordered, incomprehensible and illogically conceived text, with major corrections and on time | Sufficient (2) | - | 15 | 0,5 |
| | | Orderly, legible and logically conceived text, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible and logically conceived text, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and logically conceived text, without corrections and on time | Excellent (5) | | | |
| Test 1 (T1) | 35% | 60-70% | Sufficient (2) | 1 | 23 | 0,8 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Test 2 (T2) | 35% | 60-70% | Sufficient (2) | 1 | 20 | 0,7 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100 % | (Ex20 + SPx10 + T1x35 + T2x35)/100 | | 47 | 103 | 5 |

| Evaluation elements | Maximum points or share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---|---------------------------------------|---|--|-----------------------|---|------|
| Final exam (FE) | | 60-70 % 71-80 % 81-90 % 91-100 | Sufficient (2) Good (3) Very good (4) Excellent (5) | 2 | 30 | 1 |
| TOTAL | 100 % | (FEx100)/100 | | | | |
| * Students who during the semester do not pass the subject by a written test shall attend the exam, which makes 80% of the grade, and the remaining 20% make a grade out of the exercise. | | | | | | |

Detailed description of evaluation elements for lecturer, exercises and final exams:



| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|---|
| Attendance of lectures and exercises | The attendance of the students are checked and recorded. Student may justifiably be absent with a maximum of 15 % of direct teaching hours. | semester (90 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. For each exercise, students receive individual templates - tasks. The deadline for the exercise is two weeks and if the exercise is not timely submitted and the positive evaluation is not obtained, the student gets an additional task. The accuracy, tidiness and regularity of exercise are evaluated (time-honoured exercises). | in accordance with the agreed terms | Exceptionally, in the case of a justified reason. |
| Seminar /Project | Students choose the topic of the seminar paper from the proposed topics or receive a project assignment. The seminars are graded according to the attached criteria. | 13 th and 14 th week | Students who submit and receive a positive evaluation of their seminar paper can take the exam. |
| Test 1 | Students who have a positive assessment of the first half of exercises and who have not abstained from teaching more than 15% can access the first test. Test 50% comprise the knowledge acquired in lectures (theory), and 50% on the knowledge acquired exercises (tasks). | 9 th week | Students who pass the first test can access the second test. |
| Test 2 | Students who have a positive assessment of all exercises and who have not abstained from teaching more than 15% can access the second test. Test 50% comprise the knowledge acquired in lectures (theory), and 50% on the knowledge acquired exercises (tasks). | 15 th week | Students who pass 1 st and 2 nd test are exempted from the exam. |
| Written exam (WE) | Students who have a positive assessment of all exercises can attend the exam. The exam consists of three computational and theoretical tasks. To pass, students must acquire a minimum of 60% of the points. | Exam terms | - |
| Oral exam (OE) | Students who pass a written exam are asked questions from different parts of the program. The final grade of the subject is obtained according to the formula: (Wax50+OEX50)/100 | Exam terms | - |



CNC Techniques in Woodworking

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|---|--------------------------------------|
| Explain the principles of operation and the possibility of using NC and CNC machines in final wood processing | final exam | C5 |
| Differentiate and categorize the basic types of NC and CNC machines based on their capabilities (saw blades, planers, milling machines, machining centers, ...) | final exam | C5 |
| Suggest the application of various CNC machines to produce final products based on the production program | project task, assessment of exercises, final exam | C5 |
| Plan the optimal way to use the CNC machining center for the production of final products using: "macro-e", components, block commands, different processing planes, wood work piece and tool clamping systems | project task, assessment of exercises, final exam | C5 |
| Design the order of performing the processing operations of the final product elements on the CNC machining center | project task, assessment of exercises, final exam | C2 |
| Organize the machining center tool database | assessment of exercises, final exam | C2 |
| Prepare processing with a CNC machine using different methods of creating programs and processing subprograms (graphical programming, CAD, CAD/CAM software...). | project task, assessment of exercises, final exam | C2 |
| Manage the preparation process using CAM software based on the capabilities of the machining center or production system | project task, assessment of exercises, final exam | C5 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|------|
| Lectures (L) | 5% | - | - | 30 | 0 | 1 |
| Exercises (E) | 15% | Partly neat and partially accurate, corrected twice and not delivered at time | Sufficient (2) | 15 | 0 | 0,5 |
| | | Neat, partially accurate, twice corrected and delivered on time | Good (3) | | | |



| | | | | | | |
|-------------------------|------------------|---|----------------|-----------|-----------|----------|
| | | Neat, accurate, completed but not delivered on time or Neat, with minor corrections, completed and delivered on time | Very good (4) | | | |
| | | Neat, accurate, completed and delivered on time | Excellent (5) | | | |
| Field work (FW) | During exercises | | | 16 | 5 | 0,7 |
| Project assignment (PA) | 20% | Partially incomplete, incomprehensible and illogical with major repairs, submitted on time, but practically not done or clumsily done | Sufficient (2) | 3 | 18 | 0,7 |
| | | Partially incomplete, illogical with major repairs, delivered on time, and practically clumsily done | Good (3) | | | |
| | | Partially incomplete, with minor repairs, delivered on time, and practically well done | Very good (4) | | | |
| | | Complete, without repairs, delivered on time, and practically very well or excellently done | Excellent (5) | | | |
| Written exam (WE) | 30% | 51-64% | Sufficient (2) | 2 | 10 | 0,4 |
| | | 65-77% | Good (3) | | | |
| | | 78-89% | Very good (4) | | | |
| | | 90-100% | Excellent (5) | | | |
| Oral exam (OE) | 30% | 51-64% | Sufficient (2) | 2 | 20 | 0,7 |
| | | 65-77% | Good (3) | | | |
| | | 78-89% | Very good (4) | | | |
| | | 90-100% | Excellent (5) | | | |
| TOTAL | 100% | (P*5 + V*15 + PZ*20 + PI*30 + UI*30)/100 | | 67 | 53 | 4 |



Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|-------------------------|--|--|--|
| Lectures (L) | Attendance of students is checked and recorded during classes. A student can be excused for missing a maximum of 20% of classes. Each active lecture is monitored and the student's preparedness and skills in using the software are evaluated. The grade is the arithmetic mean of the grades of individual active lectures. | semester (30 hours of direct lecturer) | - |
| Exercises (E) | Students' attendance is checked and recorded during exercises. A student can excuse himself from a maximum of 10% of the exercises. Each self-created exercise is reviewed and graded. The grade of the exercises is the arithmetic mean of the grades of the individual exercises and reports from field classes | Right after finishing | Two conditional deadlines for subsequent submission of exercises for review |
| Field work (FW) | Students' attendance is checked and recorded during field classes. The student independently or in a group prepares a report that is evaluated and as such is included in the average of the grades from the exercises. | According to the field lesson plan | Independent visit to the company and handing in the report |
| Project assignment (PA) | The student solves the project task independently or in a group. The knowledge of the material is assessed through the completeness of the prepared processing program, the accuracy of the selection of tools, the logic of the processing sequence, the ingenuity in applying the learned programming methods, and the skills of working on the machine. | 15. week | - |
| Written exam (WE) | The exam can be taken by students who have graded exercises, a report from the field classes and regularly attended classes. The written exam is graded and participates in the final grade of the course. It consists of 3 tasks, each of which is scored with 5 points. To pass, it is necessary to have 8 points out of a total of 15 points (54%). | Exam terms | - |
| Oral exam (OE) | A condition for attending the oral part of the exam is a positive grade on the written part of the exam. Theoretical knowledge (from the script) is checked, as well as understanding and connection of thematic units. | Exam terms | It is possible to catch up at the next exam terms, the positive result of the exam written at the previous exam term is acceptable |



Wood modifications

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--------------------------|--------------------------------------|
| Differentiate unmodified wood from modified as well as modified from chemically protected and explain their advantages and disadvantages. | practice exercises, exam | B3 |
| Differentiate the different types of wood modification (thermal, chemical, ...) and the essential parameters of the modification regime. | exam | B3 |
| Select those properties of modified wood that are important for a particular product (eg, durability in external floors, dimensional stability in flooring in the interior). | exam | B3 |
| Recommend the type of wood and type of modification for a given product according to the hazard classes (HRN EN). | practice exercises, exam | B3 |
| Recommend the tests and independently test the selected properties of modified wood (test for loss of mass modification, examine biological resistance, hygroscopic properties, ...), interpret the obtained results and determine the durability class according to HRN EN norms. | practice exercises, exam | B3 |
| Compare the examined properties of modified wood and select the optimum for the desired product (eg loss of mass, dimensional stability, hardness, bending strength or tension, modulus of elasticity, loss of mass due to the action of fungi). | practice exercises, exam | B3 |
| Review the most important parameters and compare the effect of some modification parameters to suggest correction of modification regime to achieve the required properties (eg, correction of the temperature or treatment time required to achieve a certain degree of durability or color change level in thermal modification in the water vapor). | exam | C6 |
| Individually or in a team, make a durability insurance project for a new product from modified wood in terms of its use, to recommend the optimum modification procedure while respecting the ecological principles (eg, application of additional chemicals) and economic requirements (eg energy needs) and present it to a group of people. | practice exercises, exam | B3 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 25% | Mostly inaccurate, with major corrections | Sufficient (2) | 15 | 30 | 1,5 |
| | | Mostly accurate, with corrections | Good (3) | | | |



| | | | | | | |
|--------------|-------------|-------------------------------|----------------|----|----|-----|
| | | Exact, with minor corrections | Very good (4) | | | |
| | | Accurate and error-free | Excellent (5) | | | |
| Exam (PE) | 75% | 60-70% | Sufficient (2) | 45 | 75 | 1,5 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex25+ PEx75)/100 | | 45 | 75 | 4 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|---|
| Attendance of lectures and exercises | The attendance is checked and recorded. Exercises are attended by groups. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Exercises | Exercises are organised in groups. As part of the exercise, 6 practical exercises from the topic subject of technological and structural development of construction products made of wood. At the beginning of the first exercise, students are introduced to the rules of preparation, teaching and assessment of exercises. The accuracy, regularity and regularity (time-honored exercises) | in accordance with the agreed terms | Exceptionally, in the case of a justified reason, the student makes up the absence from a particular exercise |
| Written exam | The exam can be attended by students whose exercises were evaluated positively. The written exam is evaluated and participates in the final grade of the subject. | Exam terms | |
| Oral exam | Students get questions from different part of the subject program. Final mark of subject is achieved from the formula: (Ex25+ PEx75)/100 | | |



Operation Management

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--|--------------------------------------|
| Identify the places and roles of the production process within the company. | Project assignment, exercises in computer practicum, written oral exam | D1 |
| Apply operational methods and techniques in planning and monitoring production and business processes and explain the basic performance indicators of the production process | Project assignment, exercises in computer practicum, written oral exam | D2 |
| Propose a software solution for integrated planning and production management (teamwork with project developer). | Project assignment, exercises in computer practicum, written oral exam | D2 |
| Plan business and production database models (warehouses, raw materials, basic assets, merchandise, etc.). | Project assignment, exercises in computer practicum, written oral exam | D5 |
| Relate the business and production functions within the company with hardware and software solutions. | Project assignment, exercises in computer practicum, written oral exam | D5 |
| Apply the acquired knowledge and skills to solve a specific tasks in the real sector. | Project assignment, exercises in computer practicum, written oral exam | D4 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 20% | Partly disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 15 | 30 | 1,5 |
| | | Neat, legible, with major corrections and on time | Good (3) | | | |
| | | Neat, legible, with minor corrections and on time | Very good (4) | | | |
| | | Neat, legible, accurate and on time | Excellent (5) | | | |
| Seminar paper (SP) | 10% | Partially disordered, incomprehensible and illogically conceived text, with major corrections and on time | Sufficient (2) | - | 15 | 0,5 |



| | | | | | | |
|--------------|--------------|---|----------------|-----------|-----------|----------|
| | | Orderly, legible and logically conceived text, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible and logically conceived text, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and logically conceived text, without corrections and on time | Excellent (5) | | | |
| Test 1 (T1) | 35% | 60-70% | Sufficient (2) | 1 | 11 | 0,4 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Test 2 (T2) | 35% | 60-70% | Sufficient (2) | 1 | 17 | 0,6 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100 % | (Ex20 + SPx10 + T1x35 + T2x35) / 100 | | 47 | 75 | 4 |

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|----------------------|---------------------------------------|---|--|-----------------------|---|------|
| Final exam (FE) * | 100% | 60-70 % 71-80 % 81-90 % 91-100 | Sufficient (2) Good (3) Very good (4) Excellent (5) | 2 | 30 | 1 |
| TOTAL | 100 % | (FEx80+Ex20)/100 | | | | |

* If the student did not manage to achieve the minimum points for passing the tests, he is obliged to take the written and oral part of the exam. Only students who have met the conditions for signing (delivered exercises and seminar work) have the right to take the exam.



Detailed description of evaluation elements for lecturer, exercises and final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|---|
| Attendance of lectures and exercises | The attendance of the students is checked and recorded. Student may justifiably be absent with a maximum of 15 % of direct teaching hours. | semester (90 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. For each exercise, students receive individual templates - tasks. The deadline for the exercise is two weeks and if the exercise is not timely submitted and the positive evaluation is not obtained, the student gets an additional task. The accuracy, tidiness and regularity of exercise are evaluated (time-honoured exercises). | in accordance with the agreed terms | Exceptionally, in the case of a justified reason. |
| Seminar /Project | Students choose the topic of the seminar paper from the proposed topics or receive a project assignment. The seminars are graded according to the attached criteria. | 13 th and 14 th week | Students who submit and receive a positive evaluation of their seminar paper can take the exam. |
| Test 1 | Students who have a positive assessment of the first half of exercises and who have not abstained from teaching more than 15% can access the first test. Test 50% comprise the knowledge acquired in lectures (theory), and 50% on the knowledge acquired exercises (tasks). | 9 th week | Students who pass the first test can access the second test. |
| Test 2 | Students who have a positive assessment of all exercises and who have not abstained from teaching more than 15% can access the second test. Test 50% comprise the knowledge acquired in lectures (theory), and 50% on the knowledge acquired exercises (tasks). | 15 th week | Students who pass 1 st and 2 nd test are exempted from the exam. |
| Written exam (WE) | Students who have a positive assessment of all exercises can attend the exam. The exam consists of three computational and theoretical tasks. To pass, students must acquire a minimum of 60% of the points. | Exam terms | - |
| Oral exam (OE) | Students who pass a written exam are asked questions from different parts of the program. The final grade of the subject is obtained according to the formula: (Wax50+OEX50)/100 | Exam terms | - |



Veneer and Plywood Technology

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|---|--------------------------------------|
| Analyze and organize the technological systems for the production of veneer and plywoods. | Exercise, Seminar, Partial exam, Final Exam | C2 |
| Analyze the selection criteria for technological solutions in veneer and plywood production and propose the most optimal solution. | Exercise, Seminar, Partial exam, Final Exam | C2 |
| Calculate and analyze the existing ones and design optimum technological parameters for veneer and plywood production. | Exercise, Seminar, Partial exam, Final Exam | C2 |
| Calculate the production line capacity for veneer production and suggest improvements. | Exercise, Seminar, Partial exam, Final Exam | C2 |
| Design the technological phases of production and determine the optimum parameters for veneer and plywood production. | Exercise, Seminar, Partial exam, Final Exam | C6 |
| Plan and organize veneer production processes with high degree of automation. | Exercise, Seminar, Partial exam, Final Exam | C2 |
| Analyze the interaction of the constructional elements of the plywood and design the optimum construction of the plywood according to the requirements. | Exercise, Seminar, Partial exam, Final Exam | C6 |
| Determine and calculate material properties of plywood materials and propose procedures for optimizing these properties. | Exercise, Seminar, Partial exam, Final Exam | C6 |
| Apply numerical methods in the analysis of plywood properties (basics) and propose methods of production and methods of testing properties of optimized plywood. | Exercise, Seminar, Partial exam, Final Exam | C2 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--|----------------|-----------------------|---|------|
| Lectures (L) | | | | 30 | 0 | 1 |
| Exercises (E) | 15% | Partly disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 21 | 6 | 0,9 |
| | | Neat, legible, with bigger corrections and on time | Good (3) | | | |



| | | | | | | |
|-------------------------------|-------------|---|----------------|-----------|-----------|----------|
| | | Neat, readable with minor corrections and on time | Very good (4) | | | |
| | | Neat, readable, accurate and timely | Excellent (5) | | | |
| Seminar (S) | 20% | $8 \leq x < 10$ points | Sufficient (2) | 9 | 30 | 1,3 |
| | | $10 \leq x < 14$ points | Good (3) | | | |
| | | $14 \leq x < 18$ points | Very good (4) | | | |
| | | $18 \leq x < 20$ points | Excellent (5) | | | |
| Calculation partial exam (PE) | 15% | 60-70% | Sufficient (2) | 0 | 15 | 0,5 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Oral exam (OE) | 50 | 60-70% | Sufficient (2) | 0 | 39 | 1,3 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex15 + Sx20+PEx15 + OEx50)/100 | | 60 | 90 | 5 |

*Calculation partial exam is a part of Exercises but not a substitute for the exam

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|------------------------------|----------------|-----------------------|---|------|
| Final exam (FE) | 65 | 60-70% | Sufficient (2) | | | 1,8 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (FEx65+Ex15+Sx20)/100 | | | | |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|--|--------------|
| Attendance of lectures and exercises | Attendance of students is recorded in classes. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester (60 hours of direct lecturer) | - |
| Exercise | Exercises are performed by 10 project exercises. Before starting the exercises, students will receive training forms. At the end of each exercise, students receive tasks to control the acquired knowledge. The accuracy, precision and the time when the exercise is delivered is evaluated. | According to the appointed time | - |



| | | | |
|--------------|--|-------------|---|
| | | | |
| Seminar | Students write a seminar paper from a selected topic. A written copy, oral and a PowerPoint presentation, and answers to questions are evaluated. | 12-14. week | - |
| Partial exam | Calculation tasks | 15. week | - |
| Written exam | Exam can be accessed by students who have completed exercises and a written and presented seminar. Pre-printed exams round off accurate answers and solve calculation tasks. The written exam is evaluated and participates in the final grade of the course | Exam terms | - |
| Oral exam | Students who pass a written exam are asking questions from different parts of the program content. The final grade of the course is obtained according to the formula Ex15+S20+PEx15+FEEx50/100 | | |

Technology of Panels made from Fragmented Wood

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--|--------------------------------------|
| to identify and evaluate production technologies and process equipment for the production of panels from fragmented and defibrated wood | laboratory and practical classes, project task, final exam | C2 |
| to design the characteristics of basic and auxiliary raw materials depending of the production process and the type of product made from fragmented and/or defibrated wood | laboratory and practical classes, project task, final exam | C2 |
| to manage the technological processes in the production of boards and shaped products (moldings) made from fragmented and defibrated wood | laboratory and practical classes, project task, final exam | C2 |
| to optimize the panel properties by correcting the technological parameters | laboratory and practical classes, project task, final exam | C2 |
| to recommend the methods and technical conditions for the panel overlaying | laboratory and practical classes, project task, final exam | C2 |
| apply the technical regulations for wooden panels | laboratory and practical classes, project task, final exam | C2 |
| to design and implement new technologies in the production of boards and shaped products from fragmented and defibrated wood | laboratory and practical classes, project task, final exam | C2 |

Methods of grading



| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|----------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 20% | Partially disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 30 | 15 | 1.5 |
| | | Orderly, legible, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and on time | Excellent (5) | | | |
| Project task (PT) | 10% | Partially disordered, incomprehensible and illogically conceived text, with major corrections and on time | Sufficient (2) | - | 45 | 1.5 |
| | | Orderly, legible and logically conceived text, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible and logically conceived text, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and logically conceived text, without corrections and on time | Excellent (5) | | | |
| Exam (EX) | 70% | 50-61% | Sufficient (2) | - | 30 | 1 |
| | | 62-73% | Good (3) | | | |
| | | 74-85% | Very good (4) | | | |
| | | 86-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex20 + PTx10 + EXx70)/100 | | 60 | 90 | 5 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|---------------------|-------------|----------|--------------|
|---------------------|-------------|----------|--------------|



| | | | |
|-------------------------------------|--|--|--|
| Attendance of lectures and exercise | The attendance is checked and the attendance of the students is recorded. Student may justifiably be absent with a maximum of 10% of direct teaching hours. | semester (60 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. There are 4 exercises in total. Exercises 1 and 2 are conducted in practicum and are of computational type. Exercises 3 and 4 are of a practical character and are carried out in a workshop / laboratory. At the beginning of the first exercise, students receive templates for all exercises; they are acquainted with the details of each exercise, and how to submit the exercises report. The accuracy, legibility and regularity (submission on time) is evaluated. | in accordance with the agreed terms | Exceptionally, in the case of a justified reason, the student is allowed to compensate his/hers absence on the individual exercise |
| Project task | In their Project tasks the students examine specific areas of fragmented wood panels' technology. Practical part of the project task is done by the students during the course (on exercises) which are carried out in the workshop / laboratory. Theoretical part is performed through the study of relevant literature that they define in coordination with the course lecturer. The project task is submitted at the end of the semester, in the form of a written report. | 15. week | Students who submit and their project task report is evaluated positively can access the exam |
| Written exam | Only the students which have submitted their exercises reports and whose project task report is evaluated positively, can take the final written exam. The students are given the printed exam form and they answer the questions asked. The written exam is evaluated and participates in the final grade of the subject. | Exam terms | |
| Oral exam | Students that pass the written exam are asked questions from different parts of the program content. The final grade of the subject is obtained according to the formula $(EX20 + PTx10 + EXx70)/100$ | | |

Automation and measurement in woodworking industry

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|--------------------------|--------------------------------------|
| Calculate the accuracy of the analog and digital instrument. | partial exam, final exam | C2 |
| Distinguish measurements errors due to their origin. | partial exam, final exam | C2 |
| Determine the components of the measurement uncertainty and calculate the measurement uncertainty of the directly measured quantity for simpler cases and express the measurement result. | partial exam, final exam | C2 |
| Describe the role of the individual components of the control system and measurement chain. | partial exam, final exam | C2 |
| Differentiate the basic transfer characteristics of measurement transducers and analyze them on the | partial exam, final exam | C2 |



example of frequently used transducers in the wood industry.

| | | |
|---|--------------------------|----|
| Graphically calculate the static characteristic of connected units in the control system. | partial exam, final exam | C2 |
| Analyze the basic parameters of the first and second order system. | partial exam, final exam | C2 |

Methods of grading

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|----------------------|---------------------------------------|------------------------------|----------------|-----------------------|---|----------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | - | - | - | 13 | 20 | 1,1 |
| Partial exam 1 (PE1) | 50% | 50-60% | Sufficient (2) | 1 | 26 | 0,9 |
| | | 61-75% | Good (3) | | | |
| | | 76-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Partial exam 2 (PE2) | 50% | 50-60% | Sufficient (2) | 1 | 29 | 1 |
| | | 61-75% | Good (3) | | | |
| | | 76-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| UKUPNO | 100% | (PE1x50 + PE2x50)/100 | | 45 | 75 | 4 |

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|---------------------------------------|--|-----------------------|---|------|
| Final exam (FE) | 100 % | 50-60% 61-75% 76-90% 91-100% | Sufficient (2) Good (3) Very good (4) Excellent (5) | 2 | 55 | 1,9 |
| TOTAL | 100% | (FEx100)/100 | | | | |



Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|--------------|
| Attendance of lectures and exercises | The attendance is checked and the attendance of the students is recorded. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Partial exam 1 (PE1) | The partial exam can be accessed by all students. | 9. week | |
| Partial exam 2 (PE2) | The second partial exam can be accessed by students who have passed the first partial exam. Students who get enough points from both partial exams get a final score. | 14. week | |
| Written exam | The written exam consists of five numerical tasks. For the passage it is necessary to have at least 50% of the total number of points. | Exam terms | |
| Oral exam | The requirement for the oral part of the exam is sufficient number of points collected on the written part of the exam. Theoretical knowledge, ie. understanding and detailed examination of the subjects studied in the lectures, is checked. The final grade is obtained according to the formula (FEx100)/100 | Exam terms | |

Material handling

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|---|--------------------------------------|
| Collect and analyse relevant information and research results on the subject related to material handling in wood processing and furniture production. | prepared presentation on the particular subject | A2, B4, E3 |
| Present in a clear and concise way professional information related to handling materials in wood processing and furniture production. | performing of prepared presentation, communication with other students | A2 |
| Investigate, measure or calculate the properties of bulk wood materials and analyze the influencing factors on properties of materials important for their transport, storage and packaging (bulk density, bulk angle, granulation). | practical work, processing of measurement results, presentation of results and analysis of influential factors, final oral exam | A2, B4 |
| Plan and conduct research related to material handling (transport, storage, packaging) by surveying participants in wood processing industry and furniture production | development of a survey questionnaire, analyses of questionnaire results | A2, B4 |



| | | |
|---|---|------------|
| Self-study the task of material handling and suggest technical and organizational solutions in certain time and financial conditions. | solving a project task, calculation needed for project designing, presenting a project, final oral exam | A2, B4, C3 |
| Calculate the required size of the storage facilities depending on the type, quantity, layout of the material, used transport equipment etc. | solving a project task, calculation needed for project designing, presenting the project, final oral exam | A2, B4, C3 |
| Create and use simple Excel tables to keep track of the stock of material in the storage facilities. | designed tables in Excel | A2, B4, C3 |
| Produce self-conceptual design of dust and chips extraction and transportation system using the data of manufacturers of pipes, fans, electric motors and wood particle separators. | solving a project task, calculation needed for project designing, presenting a project, final oral exam | A2, B4, C3 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|-------------------------|---------------------|---|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 27 | 0 | 0,9 |
| Self-done projects (PR) | 60% | Partly untidy and incomprehensible, with major corrections and on time | Sufficient (2) | 15 | 45 | 2 |
| | | Tidy, comprehensible, with major corrections and on time | Good (3) | | | |
| | | Tidy, comprehensible, with minor corrections and on time | Very good (4) | | | |
| | | Tidy, comprehensible, without corrections and on time | Excellent (5) | | | |
| Presentation (P) | 10% | Student presents with occasionally reading, collected data are not comprehensive | Sufficient (2) | 2 | 16 | 0,6 |
| | | Students are presented without reading, the collected data are comprehensive but not logically presented | Good (3) | | | |
| | | The student presents without reading, the collected data are comprehensive and logically presented, the student does not emphasize and insufficiently clarifies | Very good (4) | | | |



| | | | | | | |
|----------------|-------------|--|----------------|----|-----------|----------|
| | | key data and basic principles | | | | |
| | | Student presents without reading, collected data are comprehensive and logically presented, student clarifies and highlights key data and basic principles | Excellent (5) | | | |
| Oral exam (OE) | 30% | min. 60 % correct answers to the questions asked | Sufficient (2) | 44 | 15 | 0,5 |
| | | min. 70 % correct answers | Good (3) | | | |
| | | min. 80 % correct answers | Very good (4) | | | |
| | | min. 90 % correct answers | Excellent (5) | | | |
| TOTAL | 100% | (PRx60 + Px10 + OEx30)/100 | | | 76 | 4 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|---|---|
| Attendance of lectures and exercises | The attendance of the students is recorded. A student may justifiably be absent with a maximum of 15% of direct teaching hours. Students prepare a presentation or work on the project of material handling according to the given task. | semester (45 hours of direct lecture and exercises) | - |
| Designing projects (DP) | Students in groups of two work on selected projects of material handling, partly during exercises and partly at home. As a rule, students need to create two project of material handling, one project of storage facilities, and one project of dust and chip extraction system. The needed data and documents for project development are available by eLearning on Merlin or should be taken by web browsing. Precision, tidiness and creativity of the project are evaluated. | in accordance with the agreed terms | There is no possibility of compensation |
| Presentation (P) | Students collect data on the particular subject and prepare the presentation. The comprehensiveness and relevance of the collected data and the way of presentation are assessed. | 15. week | There is no possibility of compensation |
| Oral exam (OE) | Students who have finished projects and had a presentation on a particular subject can access the oral exam. They are asked questions about the projects they have created and about the presentations of other students. The final grade of the subject is obtained according to the formula (DPx60 + Px10 + UIx30)/100 | | |



Professional practice

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|---------------------------------------|--|
| Apply the acquired knowledge and skills acquired during the study in specific situations | Diary report on professional practice | A2, A3, B1, B2, B3, C4, C2, C5, C6, C7, E4, E5 |
| Apply communication skills in new work environments | Diary report on professional practice | D2 |
| Record and comment on the features of the wood technology process and business and propose optimization and rationalization in accordance with applicable standards and regulations | Diary report on professional practice | B4, C1, C2, C3 |
| Design and propose possible improvements in the existing wood production and business | Diary report on professional practice | B2, B3, C4, C2, C6, C7 |
| Solve technical problems independently or as a team | Diary report on professional practice | D1, D2 |
| Form a sense of responsibility and motivation to perform assigned tasks | Diary report on professional practice | D2, D3, D4 |
| Prepare a written report on professional practice | Diary report on professional practice | E3 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--------------------|-------|-----------------------|---|------|
| Total: | | | | 60 | 60 | 4 |

| Evaluation elements | Description | Deadline | Compensation |
|--|--|----------|--------------|
| The work performance of a student during professional practice | a) High work performance b) Satisfactory work performance c) Weaker performance than expected without justified reasons | | |
| Application of theory in practical work during professional practice | a) It demonstrates the extraordinary skill of applying the theory in practical work b) Recognizes the theoretical framework in practical work c) Does not link the theoretical framework with practical work | | |
| The student's skill of solving problems during professional practice | a) Very skilled in solving problems, innovative and creative b) It is possible to solve the default | | |



| | | | |
|---|---|--|--|
| | problem in a familiar way c) Does not show satisfactory problem solving skills | | |
| Ability of a student to make decisions during professional practice | a) Decides independently, based on thorough analysis of (changing) circumstances b) Decisions are satisfactory in known situations c) It often makes wrong decisions without analysis of the situation | | |
| Ability to collaborate in the team during professional practice | a) Works in line with others, contributes to group relationships and efficiency b) Relationships with others are in accordance with normal circumstances, but does not stand out c) Uncommunicative and withdrawn to the extent of negatively affecting the group | | |
| Communication skills of a student during professional practice | a) Extremely clear, well-organized and convincing communication, written and spoken b) Satisfying skills of written and spoken communication c) Poor writing skills and speech communication | | |
| Motivation and responsibility of a student during professional practice | a) High degree of motivation in work and collective and social responsibility b) Satisfactory motivation for work and accountability c) Poor motivated, uninterested and lack of sense of responsibility towards the job | | |

Wood Fibers and Paper Technology

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--|--------------------------------------|
| to analyze and evaluate the processes of mechanical defibration of wood, and of producing semi- cellulose and technical cellulose | laboratory and practical classes, project task, final exam | C1 |
| to recommend appropriate methods and to manage technological processes of wood delignification and regeneration of chemicals | laboratory and practical classes, project task, final exam | C1 |
| to identify and recommend the methods, and to manage and evaluate processes of subsequent chemical treatment of produced wood fibres and regenerated cellulose | laboratory and practical classes, project task, final exam | C1 |
| to identify and evaluate the procedures of nano cellulose production | laboratory and practical classes, project task, final exam | C1 |
| to evaluate, recommend and manage technological processes of producing paper, cardboard and corrugated cardboard | laboratory and practical classes, project task, final exam | C1 |
| to improve the properties of paper and of wood fibres and nano cellulose based products | laboratory and practical classes, project task, final exam | C1 |



Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|----------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 20% | Partially disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 15 | 15 | 1 |
| | | Orderly, legible, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and on time | Excellent (5) | | | |
| Project task (PT) | 10% | Partially disordered, incomprehensible and illogically conceived text, with major corrections and on time | Sufficient (2) | - | 30 | 1 |
| | | Orderly, legible and logically conceived text, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible and logically conceived text, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and logically conceived text, without corrections and on time | Excellent (5) | | | |
| Exam (EX) | 70% | 50-61% | Sufficient (2) | - | 30 | 1 |
| | | 62-73% | Good (3) | | | |
| | | 74-85% | Very good (4) | | | |
| | | 86-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex20 + PTx10 + PEx70)/100 | | 45 | 75 | 4 |



Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|-------------------------------------|--|--|--|
| Attendance of lectures and exercise | The attendance is checked and the attendance of the students is recorded. Student may justifiably be absent with a maximum of 10% of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. All exercises are of practical character and are carried out in laboratory. At the beginning of the first exercise, students receive templates for all exercises; they are acquainted with the details of each exercise, and how to submit the exercises report. The accuracy, legibility and regularity (submission on time) is evaluated. | in accordance with the agreed terms | Exceptionally, in the case of a justified reason, the student is allowed to compensate his/hers absence on the individual exercise |
| Project task | In their Project tasks the students examine specific areas of wood fibres and paper technology. Practical part of the project task is done by the students during the course (on exercises) which are carried out in the laboratory, as well as in plants and internal laboratories of cellulose and paper factories. Theoretical part is performed through the study of relevant literature that they define in coordination with the course lecturer. The project task is submitted at the end of the semester, in the form of a written report. | 15. week | Students who submit and their project task report is evaluated positively can access the exam |
| Written exam | Only the students which have submitted their exercises reports and whose project task report is evaluated positively, can take the final written exam. The students are given the printed exam form and they answer the questions asked. The written exam is evaluated and participates in the final grade of the subject. | Exam terms | |
| Oral exam | Students that pass the written exam are asked questions from different parts of the program content. The final grade of the subject is obtained according to the formula $(Ex20 + PTx10 + EXx70)/100$ | | |

Special Technology of Wood Drying

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|---------------------------|--------------------------------------|
| Knowledge of the unconventional special technologies for drying of wood. | exercises, lectures, exam | C2 |
| Apply and conduct unconventional wood drying procedures. | exercises, lectures, exam | C2 |
| Evaluate and select the appropriate level of special drying technology according to production requirements. | exercises, lectures, exam | C2 |



Methods of grading=Taking exam

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|--|----------------|-----------------------|---|------|
| Lectures (L) | - | | | 30 | 30 | 2 |
| Exercises (E) | 20 % | Partly disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 15 | 15 | 1 |
| | | Neat, legible, with major corrections and on time | Good (3) | | | |
| | | Neat, legible, with minor corrections and on time | Very good (4) | | | |
| | | Neat, legible, accurate and on time | Excellent (5) | | | |
| Partial exam (PE) | 80 % | 60-70% | Sufficient (2) | | 30 | 1 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100 % | (Ex20 + PEx80)/100 | | 45 | 75 | 4 |
| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
| Final exam (FE) | | 60-70 % | Sufficient (2) | | | 1 |
| | | 71-80 % | Good (3) | | | |
| | | 81-90 % | Very good (4) | | | |
| | | 91-100 | Excellent (5) | | | |
| TOTAL | 100% | (FEx80+Ex20)/100 | | | | |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|--|---|
| Attendance of lectures and exercises | The attendance of the students is checked and recorded. Student may justifiably be absent with a maximum of 10 % of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. At the beginning of the first exercise, students will receive templates. Exercises are written by hand. For each exercise, the term in which the exercise is handed and evaluated positively, is defined. If the exercise is not handed within the defined | in accordance with the agreed terms | Exceptionally, in the case of a justified reason. |



| | | | |
|--------------|---|------------|---|
| | time frame or if the exercise is not evaluated positively, then that exercise will be reviewed later after semester ends and the student will receive the seminar assignment and additional computational tasks for each exercise. The accuracy, tidiness and regularity are evaluated. | | |
| Written exam | Exam can be attended by students who have completed the exercises. The exam consists of theoretical questions, computational tasks and of the sample that students must describe. For passage students must collect at least 60 % of points. | Exam terms | - |
| Oral exam | Students who pass a written exam are asked questions from different parts of the program. The final grade of the subject is obtained according to the formula (FEx80+Ex20)/100 | | - |

Multi-axial Woodworking

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--|--------------------------------------|
| Explain the possibilities of applying 3D strategies and multi-axis processing on wood products | final exam | C2 |
| Plan the optimal way of using the CNC machining center for production using 3D strategies and multi-axis machining | project assignment, exercises evaluation, final exam | C5 |
| Introduce solids and surfaces and model irregular surfaces using simple geometric shapes in CAM software | project assignment, exercises evaluation, final exam | C2 |
| Plan the use of arbitrary planes, spline and polyline lines and the extraction and projection of shapes and lines for processing in space. | project assignment, exercises evaluation, final exam | C2 |
| Design the sequence of operations for processing product elements with 3D strategies and multi-axis processing | project assignment, exercises evaluation, final exam | C2 |
| Design the optimal way of fixing the workpiece of complex shapes on the CNC machining center | project assignment, exercises evaluation, final exam | C5 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--------------------|-------|-----------------------|---|------|
| Lectures (L) | 5% | - | - | 30 | 0 | 1 |



| | | | | | | |
|-------------------------|----------------------|--|--------------------------------------|----|----|-----|
| Exercises (E) | 15% | Partly neat and partially accurate, corrected twice and not delivered at time | Sufficient (2) | 15 | 0 | 0,5 |
| | | Neat, partially accurate, twice corrected and delivered on time | Good (3) | | | |
| | | Neat, accurate, completed but not delivered on time or Neat, with minor corrections, completed and delivered on time | Very good (4) | | | |
| | | Neat, accurate, completed and delivered on time | Excellent (5) | | | |
| Field work (FW) | Within the exercises | Reports are graded as well as exercises | From Sufficient (2) to Excellent (5) | 8 | 4 | 0,4 |
| Project assignment (PA) | 20% | Partially incomplete, incomprehensible, and illogical with major corrections, submitted with delay and practically not done or clumsily done | Sufficient (2) | 3 | 18 | 0,7 |
| | | Partially incomplete, illogical with major corrections, delivered on time, and practically clumsily done | Good (3) | | | |
| | | Partially incomplete, with minor repairs, delivered on time, and practically done well | Very good (4) | | | |
| | | Complete, with no repairs, delivered on time, and practically very well or excellently done | Excellent (5) | | | |
| Written exam (WE) | 30% | 51-64% | Sufficient (2) | 2 | 19 | 0,7 |
| | | 65-77% | Good (3) | | | |
| | | 78-89% | Very good (4) | | | |
| | | 90-100% | Excellent (5) | | | |
| Oral exam (OE) | 30% | 51-64% | Sufficient (2) | 1 | 20 | 0,7 |
| | | 65-77% | Good (3) | | | |



| | | | | | | |
|--------------|-------------|---|---------------|----|----|---|
| | | 78-89% | Very good (4) | | | |
| | | 90-100% | Excellent (5) | | | |
| TOTAL | 100% | (Lx5 + Ex15 + PAx20 + WEx30 + OEx30)/100 | | 59 | 61 | 4 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|-------------------------|--|--|--|
| Lectures (L) | The attendance is checked, and the presence of students is recorded. The student can justifiably be absent with a maximum of 20% of classes. Each active lecture students are monitored and evaluated by the preparedness and skills of using the software. Final grade is the arithmetic mean of the grade of all attended active lectures. | semester (30 hours of direct lecturer) | - |
| Exercise report (ER) | The attendance is checked, and the presence of students is recorded. The student can justifiably be absent with a maximum of 10% of exercises. Each exercise is reviewed and evaluated. Final grade is the arithmetic mean of the grade of all evaluated exercises and field work report. | Immediately upon completion | Two terms for after deadline delivery |
| Field work (FW) | Students' attendance is checked and recorded during field work. The student independently or in a group prepares a report that is evaluated and as such is included in the average of the grades for the exercises. | Accordingly, to field work plan | Independent visit to the company and delivery of the report |
| Project assignment (PA) | The student solves the project task independently or in a group. Learning outcomes are evaluated through the completeness of the prepared processing program, the accuracy of the tool selection, the logic of the processing sequence, the ingenuity in the application of the learned programming methods, the solution for fixing the workpiece, and the skill of working on the machine. | 15. week | - |
| Written exam (WE) | The exam can be taken by students who have graded exercises, a report from the field work and who is regularly attended all classes. The written exam is graded and participates in the final grade of the course. It consists of 3 tasks, each of which is scored with 5 points. To pass, it is necessary to have 8 points out of 15 points in total (54%). | Exam terms | - |
| Oral exam (OE) | A condition for attending the oral part of the exam is a positive grade on the written part of the exam. Theoretical knowledge is checked, as well as understanding and linking of thematic entities. | Exam terms | It is possible to catch up at the next exam terms, the positive result of the exam written at the previous exam term is acceptable |



Wood industry power supply

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|-------------------------|--------------------------------------|
| Introduce the importance of using heat energy in woodworking processes | written exam, oral exam | A3 |
| Calculate the savings of electricity when using a motor with frequency and voltage regulation | written exam, oral exam | A3 |
| Create a plan for selecting hydraulic and pneumatic systems in the wood industry | written exam, oral exam | A3 |
| Predict the amount of wood residue that is generated in the wood processing industry by machining | written exam, oral exam | A3, B2 |
| Prepare a report on the advantages and disadvantages of the steam turbine Stirling facility for a selected woodworking plant in relation to the existing | written exam, oral exam | A3 |
| Combine the advantages and disadvantages of simultaneous generation of heat and electricity up to 2 MW _{el} | written exam, oral exam | A3 |
| Design a system for the production of thermal energy for the needs of the technological process on the basis of current consumers as well as planned in the strategic development | written exam, oral exam | A3 |
| Present and explain the costs of investment and profits in the production of densified wood from most commonly croatian hardwood | written exam, oral exam | A3, B2 |
| Improve the method of disposal of ash produced during combustion of biomass | written exam, oral exam | A3 |
| Submit the technical, economic and environmental protection report - the reason for using a flue gas purification filters | written exam, oral exam | A3 |

Methods of grading

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|---|--|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | - | - | - | 15 | 0 | 0,5 |
| Written exam (WE) | 50 % | 50 - 67 % 68 - 78 % 79 - 89 % 90 - 100 % | Sufficient (2) Good (3) Very good (4) Excellent (5) | | 45 | 1,5 |
| Oral exam (OE) | 50 % | 50 - 67 % 68 - 78 % 79 - 89 % 90 - 100 % | Sufficient (2) Good (3) Very good (4) Excellent (5) | | 30 | 1,0 |



| | | | | | |
|--------------|--------------|----------------------------|-----------|-----------|----------|
| TOTAL | 100 % | (WEx50 + OEx50)/100 | 45 | 75 | 4 |
|--------------|--------------|----------------------------|-----------|-----------|----------|

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|----------------------------|--|--|---------------------|
| Lectures + exercises | The teaching attendance is checked and recorded. Students may be absent with a maximum share of 20 % of direct teaching. | semester (45 hours of direct lecturer) | - |
| Written exam | Exams can be attended by students who have sufficient teaching attendance. Students solve tasks and answer asked questions. The written exam is evaluated and participates in the final grade. | Exam terms | - |
| Oral exam | Students who pass written exam are asked for questions from different parts of the teaching program content. The final grade is obtained according to the formula: (WEx50 + OEx50/100) | | |

Technology of wood building components

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|---------------------------|---|
| Interpretation and evaluation of technological operations for full utilization of wood advantages and reduction of wood shortcomings when used as a construction material, relating wood properties to specific technical requirements for particular construction product (windows and french doors, panel and entrance doors, flooring elements, wood structures and buildings). | exam | B1 |
| Definition and interpretation of function and technical requirements (serving, lighting, ventilation, mechanical requirements) as well as basics of building physics: description and interpretation of acoustic, thermal and hygrotechnical phenomena for wood building components. | exam | B1 |
| Comparison and evaluation of the function, economic feasibility and technical concept of wood building components. | exam | C2 |
| Interconnect and interpret the technical design and technology of production of wood building components, formulate and organize the technological process for particular product (production layout and definition of operational steps) | practice exercises, exam | C2 |
| Measure and evaluate technological parameters in the production line and evaluate the fitness of measured properties for particular wood building product (accuracy and smoothness of machined surfaces, wood material properties, glue application rate, pressure, temperature and curing time in gluing, application of coating and curing process of the finish in production of wood building components). | practice exercises, exam | C3 |



| | | |
|--|------|----|
| Define, analyse and evaluate the physical conditions during production and installation of wooden floors, windows and french doors, glulam beams | exam | C4 |
| Select and interpret the measurement and testing methods for quality control of wood building components and control of production parameters. | exam | C4 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|----------|
| Lectures (L) | - | - | - | 30 | 15 | 1,5 |
| Exercises (E) | 25% | Mostly inaccurate, with major corrections | Sufficient (2) | 30 | 60 | 3 |
| | | Mostly accurate, with corrections | Good (3) | | | |
| | | Exact, with minor corrections | Very good (4) | | | |
| | | Accurate and error-free | Excellent (5) | | | |
| Exam (PE) | 75% | 60-70% | Sufficient (2) | | 45 | 1,5 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex25+ PEx75)/100 | | 60 | 120 | 6 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|--|--------------|
| Attendance of lectures and exercises | The attendance is checked and recorded. Exercises are attended by groups. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester (60 hours of direct lecturer) | - |
| Exercises | Exercises are organised in groups. As part of the exercise, 6 practical exercises from the topic subject of technological and structural development of construction products made of wood. At the beginning of the first exercise, students are | - | |



| | | | |
|--------------|---|------------|--|
| | introduced to the rules of preparation, teaching and assessment of exercises. The accuracy, regularity and regularity (time-honored exercises) | | |
| Written exam | The exam can be attended by students whose exercises were evaluated positively. The written exam is evaluated and participates in the final grade of the subject. | Exam terms | |
| Oral exam | Students get questions from different part of the subject program. Final mark of subject is achieved from the formula: (Ex5+PEx75)/100 | | |

Processes of wood finishing

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|---|--------------------------------------|
| Distinguish the composition and properties of decorative coatings ("do it yourself") and industrial coatings for wood. | Laboratory work, partial exam, exam | C2 |
| Explain surface phenomena at the coating-wood interface and connect their influence (wetting, spreading, surface tension, surface energy, penetration coating adhesion). | Laboratory work, partial exam, exam | C2 |
| Distinguish the adhesion theories and the method of measuring the coating adhesion on the wood. | Laboratory work, partial exam, exam | C2 |
| Recommend materials for finishing of furniture, building joinery elements (windows) and wooden floors and design the technological process of finishing. | Laboratory work, partial exam, project task, exam | C2, C6 |
| Recommend environmentally friendly technological processes of surface treatment. | Laboratory work, partial exam, exam | C7, C6, C2 |
| Analyze the causes of failures on the coated wood surfaces | Laboratory work, partial exam, exam | C2, C4, B1 |
| Use equipment to test the quality of coated surfaces | Laboratory work, partial exam, exam | C4, C2, B1 |
| Differentiate the test methods for the durability of exterior coatings and examine the durability of exterior coatings for wood. | Laboratory work, partial exam, exam | C4, B1 |
| Suggest measures for reduction of volatile organic compounds (VOCs) in finishing room. | Laboratory work, partial exam, exam | C7, C6, C2 |
| Collect information about the professional topic, synthesize and present them. | seminar | A2, E3 |



Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|-------------------------------|---------------------|---|----------------|-----------------------|---|----------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 15 % | 1,5 points for each task (worksheet) that was submitted on time | - | 30 | 15 | 1,5 |
| Partial exam (PE) | 30 % | Students can achieve a maximum of 30 points. To gain access to the second partial exam must achieve a minimum of 15 points. | - | 1 | 26 | 0,9 |
| Partial exam (PE) | 30 % | Students can achieve a maximum of 30 points. | - | 1 | 26 | 0,9 |
| Homework | 5 % | 1 point for each homework that was submitted on time | - | - | 6 | 0,2 |
| Seminar paper or project task | 20 % | The maximum possible number of points scored is 20 | - | - | 45 | 1,5 |
| TOTAL | 100% | From all the elements of monitoring and checking the student can achieve a maximum height of assessment of 100 points, which makes 100 % of the grade. For the passing grade, the student must have a minimum of 60 points or 60 % of the grades. Scale rating is as follows: | | 62 | 118 | 6 |
| | | 60 % - 70 % | Sufficient (2) | | | |
| | | 71 % - 80 % | Good (3) | | | |
| | | 81 % - 90 % | Very good (4) | | | |
| | | 91 % - 100 % | Excellent (5) | | | |

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|--------------------|----------------------------|-----------------------|---|------|
| Final exam (FE)* | 100 % | 60-70 % 71-80 % | Sufficient (2) Good (3) | 2 | 43 | 1,5 |



| | |
|--|---------------|
| 81-90 % | Very good (4) |
| 91-100 % | Excellent (5) |
| UKUPNO | 100% |
| * A student who failed to pass an examination by continuous collection of points during the semester has the right to attend the exam. The exam consists of a written and oral part. Prior to exam seminar paper and exercise worksheets must be submitted for review. | |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|---|---|------------------------------------|---------------------|
| Attendance of lectures and exercises | The attendance of the students is recorded. Students are allowed 20 % absence from lectures and 10 % from exercises. Exercises are attending in groups. Exercises tasks are submitted within a predefined time limit, and timely delivery of the correct work sheets is scored. | semester | - |
| Submission of worksheets from laboratory work (exercises) | Exercises are attended in groups. Students must submit worksheets in a predefined period of time and timely submitted worksheets are scored. | According to weekly class schedule | - |
| Partial exams | There are two partial exams. Each brings 30 points. At the first partial exam a student must achieve at least 50 % to gain access to second partial exam. | VIII week XV week | - |
| Homework | Each on-time delivered homework brings 1 point | According to weekly class schedule | - |
| Seminar paper/project task | Students choose the theme of the seminar work from the proposed themes in MERLIN. Seminars are scored according to the given criteria. | According to weekly class schedule | - |
| Written exam | A student who failed to pass an examination by continuous collection of points during the semester has the right to attend the exam. Prior to exam seminar paper and exercise worksheets must be submitted for review. | Exam terms | - |
| Oral exam | Prerequisite for oral exam is minimum score of 60 in written exam | Exam terms | - |



Technology of Wood Protection

Learning Outcomes and Methods of Verification

| Learning Outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|--|--------------------------------------|
| Based on the results of laboratory tests, independently determine the biological resistance of wood to the applicable standards and to recommend hazard class in which such wood can be used. | exercises 1 and 2, 1 st colloquium, final exam | C5 |
| Assess the risk of using biodegraded wood in the production and / or use of wooden products. | exercises 1 and 2, 1 st colloquium, final exam | D6 |
| Explain the difference between decontamination and wood protection procedures and propose the required procedure in the given example. | exercises 3 – 7, 1 st colloquium, final exam | B4 |
| Differentiate and define wood preservatives according to the aggregation state, the origin of the active component and the nature of the solvent. | exercises 3 – 7, 1 st colloquium, final exam | C4 |
| Propose the appropriate wood preservative and procedure for the given product (in the given hazard class), respecting the ecological principles of wood protection and describe the advantages and disadvantages of the proposed. | exercises in general, 2 nd colloquium, final exam | D6 |
| For the selected product and the conditions of use, in which the wood product is used, to recommend adequate physical, structural (and chemical) protection. | exercises in general, 2 nd colloquium, final exam | D5 |
| Recommend steps of restoration, adequate preventive or repressive protection procedures and choose adequate protective agent(s) depending on the type of wood product(s), the place of use and the degree of destruction. | exercises in general, 2 nd colloquium, final exam | D6 |
| Distinguish modified wood from natural and explain their advantages and disadvantages. | exercise 6, 2 nd colloquium, final exam | C5 |
| When designing new products from wood to anticipate the conditions of its use and possible mechanisms of degradation and to choose wood with needed natural resistance and to the recommend needed protection. | exercises in general, 2 nd colloquium, final exam | D6 |
| Independently or in a team develop a project (expert opinion) and present it in front of a group of people. | seminar paper, final exam | D6 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|----------------------|---------------------|--|----------------|-----------------------|---|------|
| Lectures (L) | – | – | – | 30 | | 1 |
| Making Exercises (E) | 20% | Correct exercises with less than 15 % of acceptable deficiencies | Sufficient (2) | 15 | 30 | 1.5 |



| | | | | | | |
|--|---------------|---|----------------|----|-----|-----|
| | | Correct exercises with less than 10 % of acceptable deficiencies | Good (3) | | | |
| | | Correct exercises with less than 5 % of acceptable deficiencies | Very good (4) | | | |
| | | Correct exercises with less than 1 % of acceptable deficiencies | Excellent (5) | | | |
| 1 st and 2 nd Colloquium in written form | 40% | 60-70% | Sufficient (2) | 2 | 28 | 1 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Final exam – oral exam (OE) or Seminar paper – SEM* | 40% | 60-70% | Sufficient (2) | 2 | 43 | 1.5 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| | | Seminar paper with less than 8 % of acceptable deficiencies | Very good (4) | | | |
| Seminar paper with less than 1 % of acceptable deficiencies | Excellent (5) | | | | | |
| TOTAL | 100% | $(E \times 20 + (C1+C2) \times 40 + OE \times 40) / 100$ or $(E \times 20 + (C1+C2) \times 40 + SEM \times 40) / 100$ | | 49 | 101 | 5 |

* students who pass both colloquia and choose to do seminar papers don't need to complete the final exam; the defended seminar paper changes the final oral exam.

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|--------------------------------------|----------------|-----------------------|---|------|
| Final Exam* (FE) | | 60-70% | Sufficient (2) | | | |
| Written part (W) | 80 % | 71-80% | Good (3) | 2 | 43 | 1.5 |
| + | | 81-90% | Very good (4) | | | |
| Oral part (O) | | 91-100% | Excellent (5) | | | |
| | | | | | | |
| TOTAL | 100% | $(E \times 20 + FE \times 80) / 100$ | | | | |

* students who don't pass both colloquia during the semester have to take final exam consisting of a written and oral part, and they make up to 80 % of the total grade, while the remaining 20 % make a grade of exercises

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--|---|-------------------------------------|--------------|
| Lectures + Exercises (laboratory work) | The presence of students is checked and recorded during the lectures. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester (45 direct teaching hours) | - |



| | | | |
|------------------------------|--|--|--|
| Making Exercises (E) | Exercises are attended by groups. As part of the exercise, 7 practical exercises are carried out, of which 2 are part of field work. At the beginning of the first exercise, students will receive templates with the look of the file, inserts and worksheets on which the students will handle and teach their exercises. Each exercise is reviewed twice. If the grade is inadequate or not reviewed, it can be submitted within the probationary period (the student has the right to submit a maximum of two exercises within the probationary period, otherwise the right to sign the course is lost). | according to the agreed delivery dynamics | One probationary period for submitting the exercises for revision. |
| First Colloquium (C1) | The first colloquium contains the following material: the methods and role of monitoring the wood health, wood preservatives, preventive and repressive protection of wood. Both colloquia have 20 questions and each question equals one point. Partially correct answers (semi-points) or negative points does not exist. The minimum number of points for passage the colloquium is 12 (12 of 20 = 60%). | 6 th week | - |
| Second Colloquium (C2) | Second Colloquium are available to students who have passed the first colloquium. The second colloquium contains the following material: Wood modification and sterilisation, phytosanitary standard, classification, reuse and recycling of chemically preserved wood waste. Both colloquia have 20 questions and each question equals one point. Partially correct answers (semi-points) as well as negative points does not exist. The minimum number of points for the passage each colloquium is 12 (12 points of 20 = 60%). Both colloquia are scored with a total of 40 points, with a total minimum of 24 of 40 points being needed for the pass (60%). Students who get enough points from both colloquia only access the oral part of the exam, and if they successfully defend the seminar paper (the minimum grade is very good (4)), they get a final grade on the subject with no need of taking oral part of the exam. The final grade is the sum of Exercises (E), Colloquia (C1 and C2) and Oral Exam (OE) or Seminar (SEM): $(E \times 20 + (C1 + C2) \times 40 + OE \times 40) / 100$ or $(E \times 20 + (C1 + C2) \times 40 + SEM \times 40) / 100$ | 14 th week | - |
| Seminar paper | Seminar work are available to all students. Seminar work is submitted for review by arrangement with the teachers throughout the semester. The final version is submitted to the 14 th week and defending in the 14 th or 15 th week of the semester, provided that the student has passed both colloquia. A written part of the seminar and oral presentation are evaluated (defence in front of the whole group of students). Overall rating of the seminar paper should not be less than very good (4) in order to replace the oral exam. The final grade is the sum of Exercises (E), Colloquia (C1 and C2) and Seminar (SEM) $(E \times 20 + (C1 + C2) \times 40 + SEM \times 40) / 100$ | 14 th and 15 th week | - |
| Final exam (FE) written part | The written exam consists of 40 questions, and each question carries one point. Partially correct answers (half- | examination periods | - |



| | | | |
|---------------------------|--|---------------------|---|
| | points) and negative points does not exist. The minimum number of points for the passage is 24 (24 of 40 = 60%). After completing the written part of the exam, students have a break (how much is needed for the teacher to review the written assignments) and afterwards (the same day) students that passed written part of exam approach the oral part of exam in groups of two to four students. | | |
| Final exam (FE) oral part | The requirement for the oral part of the exam is enough points collected either in colloquia or on the written part of the exam. Theoretical and practical knowledge of the student is checked through questions from practical examples / real problems. The final grade is obtained according to the formula: $(E \times 20 + FE \times 80) / 100$ | examination periods | - |

Applied Statistics

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--------------------------------------|--------------------------------------|
| Identify, implement and perform a statistical test based on sample for testing population mean | Partial exams, written and oral exam | A2 |
| Identify, implement and perform a statistical test based on sample for testing population proportion | Partial exams, written and oral exam | A2 |
| Identify, implement and perform a statistical test based on sample for testing population variance. | Partial exams, written and oral exam | A2 |
| Identify, implement and perform a statistical test for testing difference between two population proportions (test of proportions) | Partial exams, written and oral exam | A2 |
| Identify, implement and perform a statistical test for testing difference between two population variances (F test) | Partial exams, written and oral exam | A2 |
| Identify, implement and perform a statistical test for testing difference between two population means (t test, Mann Whitney test) | Partial exams, written and oral exam | A2 |
| Identify, implement and perform a statistical test for testing equality more than two population means (ANOVA) | Partial exams, written and oral exam | A2 |
| Identify, implement and perform a statistical test for testing two dependent population means (t paired test) | Partial exams, written and oral exam | A2 |
| Calculate population correlation and estimate coefficient of the correlation and perform statistical test (Pearson's and Spearman rank correlations) with computer support.. | Partial exams, written and oral exam | A2 |
| Analyze and interpret the results of univariate and multivariate linear regression with the help of computer support. | Partial exams, written and oral exam | A2 |
| Analyze the contingency table implement the chi2 test | Partial exams, written and oral exam | A2 |



Methods of grading

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|--------------------|----------------|-----------------------|---|------|
| Lectures | - | | - | 30 | 15 | 1,5 |
| Exercises | - | - | - | 15 | 45 | 2 |
| Partial exams | 100% | 65-74 | Sufficient (2) | 4 | 40 | 1,5 |
| | | 75-84 | Good (3) | | | |
| | | 85-94 | Very good (4) | | | |
| | | 95-100 | Excellent (5) | | | |
| TOTAL | 100% | | | 49 | 101 | 5 |

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|--------------------|----------------|-----------------------|---|----------|
| Final exam | 100% | 60-70% | Sufficient (2) | 3 | 5 | |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | | | | | 5 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|--|--------------|
| Attendance of lectures and exercises | The attendance of students on lectures and exercises is checked. The student may not attend a maximum of 4 hours of lecture classes and 4 hours of. Exercises. | semester (45 hours of direct lecturer) | - |
| Partial exams | During the course, students write two partial exams each with 5 tasks total 100 (2 * 50) points. The minimum number of points that can be obtained by the partial exam is 20. If they collect at least 65 points in two partial exams they can pass exam without the final exam. | During the semester | |
| Written exam | Exams can be accessed by students who have received a signature. The written part of the exam consists of 5 tasks totaling 100 points. | Exam terms | |
| Oral exam | Students who have passed the written part of the exam access the oral exam. | Exam terms | |



Timber harvesting

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|-----------------------|--------------------------------------|
| To differentiate and correlate the limiting and influential factors of the forest utilization in the environment (legal restrictions, proprietary relationships, terrain and stand characteristics and link the theory and procedures in tree felling: finding the tree marked for felling, determine the felling direction, prepare the surrounding environment, shape the butt swelling, create and control the cuts, place cutting wedges and guide the tree to the fall, release blocked trees. Explain the concept of tree cutting, the mechanisation level in tree cutting, working with the motor chainsaw in different conditions | Exercises, Final exam | B4, D2 |
| Differentiate between methods of timber processing and connecting them with terrain characteristics and vehicle types, cutting branches, measuring assortments and bucking, scaling and pilling forest residue and analyse and compare old HRN-JUS and new HRN-EN standards for round wood of broadleaved species and conifers. | Exercises, Final exam | D1, C4 |
| Compare mechanised tree felling and processing with motor-manual felling (pros and cons of harvesters, limitations, productivity, factors of efficiency and environmental benefits, mechanised felling in Croatia). | Exercises, Final exam | D1 |
| Compare and link the theoretical approach and division of timber transport: collecting, extracting and long distance transport, timber transport cycles, the basic parameters of forest accessibility through: road density, the distance between forest roads and the average extraction distance and calculate the optimal distance between forest roads, the dependence of the distance between forest roads on costs based on the theoretical model for determining optimal forest accessibility, the calculation of the costs of forest road construction and the costs of timber extraction.. | Exercises, Final exam | B2, B4 |
| Evaluate ground-based timber extraction systems with regard to mechanisation level (manual, animal or mechanised system) and evaluate the features, limitations and benefits of individual vehicles (adopted agricultural tractor, tractor with trailer, cable skidder, grapple skidder, clam-bunk skidder, forwarder, rigid and flexible tracks skidder). Calculate the cost of machine work and productivity of the system. | Exercises, Final exam | C6 |
| Explain the division and features of the long distance timber transport, the types of landing sites, the characteristics of the timber transport by waterways, railway, trucks and calculate costs of long distance truck transport, analyse the factors affecting the transport in the form of legal restrictions in public transport, features and characteristics of trucks and load. | Exercises, Final exam | B4 |
| Re-examine the utilisation of forest biomass through the analysis of fuel wood as a traditional energy supplier compared to other energy sources. Valorise the features of forest biomass for | Exercises, Final exam | B2 |



energy, influential factors of the utilisation technologies for forest biomass.

Compare the systems and benefits of forest biomass utilisation: chipping, chipping on landing sites – open and closed production chain, bundling, biomass from short-rotation cultures, chipping in the plant and compare forest utilisation systems in Croatian forestry and worldwide (system definitions and models – mathematical model Löffler (1989), theory of production systems simulation (Heiniman (2003))).

Exercises, Final exam

B4

Examine the environmental suitability of timber harvesting systems regarding stand damage and pollution (soil, water, standing trees, young growth). Identify the causes of damage and pollution and select the measures for their avoidance or reduction. Differentiate the level of planning operation in forest utilisation (from strategic to operational level – harvesting plan and working-site study)

Exercises, Final exam

B4

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--------------------------|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 20% | 60-70% | Sufficient (2) | 15 | 15 | 1 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Test I, II and III | 80% | 60-70% | Sufficient (2) | | 30 | 1 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Final exam (FE) | 80% | 60-70% | Sufficient (2) | 0 | 30 | 1 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex20 + FE80)/100 | | 45 | 75 | 4 |

* Students who during the semester do not pass the subject by a written test shall attend the exam, that makes 80% of the grade, and the remaining 20% make a grade out of the exercise.



Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|--|--------------|
| Attendance of lectures and exercises | The attendance is checked and the attendance of the students is recorded. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Test I | All students can attend the first test. Students answer the questions, circle the correct answers, describe the pictures on a pre-prepared printed exam or via the Merlin platform. The test is graded and participates in the final grade of the course. | 5 th week | |
| Test II | Students who have passed the first test can attend the second test. Students answer the questions, circle the correct answers, describe the pictures on the pre-made printed exam. The written test is graded and participates in the final grade of the course. | 10 th week | |
| Test III | Students who have passed the first and the second test can attend the third test. Students answer the questions, circle the correct answers, describe the pictures on the pre-made printed exam. The written test is graded and participates in the final grade of the course. | 15 th week | |
| Written exam | Examinations can be attended by students who have completed exercises and field teaching. The students in the printed exam answer the questions asked. The written exam is evaluated and participates in the final grade of the subject. | Exam terms | - |
| Oral exam | Students who pass a written exam are asking questions from different parts of the program content. | Exam terms | - |

Quality management and assurance

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|------------------------|--------------------------------------|
| Interpret and understand basic concepts in the field of quality management. | exercises, tests, exam | A1 |
| Distinguish and analyze quality management systems. | exercises, tests, exam | A2 |
| Distinguish and interpret quality management tools, methods and techniques. | exercises, tests, exam | B1 |
| Explain and analyze the quality management system certification and integrated management system. | exercises, tests, exam | D2 |
| Define and explain business excellence models. | exercises, tests, exam | D1 |
| Analyze and distinguish quality indicators, types of quality control and points of quality control. | exercises, tests, exam | D4 |



| | | |
|---|------------------------|----|
| Identify and decompose quality costs. | exercises, tests, exam | D5 |
| Select and apply some quality management tools, methods and techniques on specific examples from the wood industry. | exercises, tests, exam | D5 |

Methods of grading=Taking exam

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 20% | Partly disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 15 | 30 | 1,5 |
| | | Neat, legible, with major corrections and on time | Good (3) | | | |
| | | Neat, legible, with minor corrections and on time | Very good (4) | | | |
| | | Neat, legible, accurate and on time | Excellent (5) | | | |
| Test 1 (T1) | 40% | 60-70% | Sufficient (2) | 1 | 21,5 | 0,75 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Test 2 (T2) | 40% | 60-70% | Sufficient (2) | 1 | 21,5 | 0,75 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| | | 60-70% | Sufficient (2) | | | |
| TOTAL | 100 % | (Ex20 + T1x40 + T2x40)/100 | | 47 | 73 | 4 |

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|-------------------------------|---|-----------------------|---|------|
| Final exam (FE) | | 60-70 % 71-80 % 81-90 % | Sufficient (2) Good (3) Very good (4) | | | 1,5 |



| | | |
|--|--------------|-------------------------|
| | 91-100 | Excellent (5) |
| TOTAL | 100 % | (FEx80+Ex20)/100 |
| * Students who during the semester do not pass the subject by a written test shall attend the exam, that makes 80% of the grade, and the remaining 20% make a grade out of the exercise. | | |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|--|
| Attendance of lectures and exercises | The attendance of the students was checked and recorded. Student may justifiably be absent with a maximum of 15 % of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. For each exercise, students receive individual templates - tasks. The deadline for the exercise is two weeks and if the exercise is not timely submitted and the positive evaluation is not obtained, the student gets an additional task. The accuracy, tidiness and regularity of exercise are evaluated (time-honoured exercises). | in accordance with the agreed terms | Exceptionally, in the case of a justified reason. |
| Test 1 | Students who have a positive assessment of the first half of exercises and who have not abstained from teaching more than 15% can access the first test. Test 50% comprise the knowledge acquired in lectures (theory), and 50% on the knowledge acquired exercises (tasks). | 8 th week | Students who pass the first test can access the second test. |
| Test 2 | Students who have a positive assessment of all exercises and who have not abstained from teaching more than 15% can access the second test. Test 50% comprise the knowledge acquired in lectures (theory), and 50% on the knowledge acquired exercises (tasks). | 15 th week | Students who pass 1 st and 2 nd test are exempted from the exam. |
| Written exam | Students who have a positive assessment of all exercises can attend the exam. The exam consists of three computational and theoretical tasks. To pass, students must acquire a minimum of 60% of the points. | Exam terms | - |
| Oral exam | Students who pass a written exam are asked questions from different parts of the program. The final grade of the subject is obtained according to the formula (Wx40+OAx40+Ex20)/100 | | - |

Designing wood industry plants

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|--------------------|--------------------------------------|
| to explain basic concepts of production (material preparation, inner transport, the manufacturing of parts, surface treatment, assembly etc.) and technological (qualitative changes of the input material in the end product) processes in wood and wood panel processing and the manufacture of furniture | final examination | C3 |



| | | |
|--|---|----|
| to distinguish and categorise basic project types (pre-project, preliminary design, investment programme, executive project, the survey of completed works etc.) in the business system | exercises, correction, exercise evaluation, final examination | C3 |
| to explain and use basic principles in the approach when building and reconstructing (adapting the technological process to science and technology development) wood industry plants in relation to the proper use of new equipment, production volume increase and environmental protection | exercises, correction, exercise evaluation, field report, final examination | C3 |
| to select machinery, equipment and tools based on the criteria of increased productivity, tool cost reduction, increased machine life cycle (the choice of a suitable processing schedule, proper machinery and tool maintenance) improved product quality, rejects reduction etc. | exercises, correction, exercise evaluation, field report, final examination | C3 |
| to analyse the production programme, production resources and suppliers for a more rational use of machinery and tools, increased production and reduced manufacture costs | exercises, correction, exercise evaluation, field report, final examination | C3 |
| to recommend a suitable technological procedure and wood processing technology based on needs determined by means of an analyses while taking into account the safety of employees, increased machine efficacy and wood and wood panel utilization | exercises, correction, exercise evaluation, field report, final examination | C3 |
| to assess and recommend the optimum manner of using existing technology to increase productivity, utilisation and product quality while taking into account market demands (eg. new product introduction) | exercises, correction, exercise evaluation, field report, final examination | C3 |
| to design the work space and working areas in the work industry plant in order to ensure ergonomics (adequate machinery height), safety at work (noise, protection against dust, smoke, vapour and alike, working area illumination, vibrations etc.) and the proper arrangement of machinery | exercises, correction, exercise evaluation, field report, final examination | C3 |
| to gather, group and process information about the assigned topic and present it | exercises, correction, exercise evaluation, field report, final examination | C3 |
| to apply the knowledge acquired during the studies from other courses (final wood processing technology, conveyor technology in wood industry, technological processes of the surface treatment of wood etc.) to designing wood industry plants | exercises, correction, exercise evaluation, field report, final examination | C3 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--|----------------|-----------------------|---|------|
| Lectures (L) | - | | | 30 | - | 1 |
| Exercising (E) | 30% | Partly neat and partly correct, corrected twice, | Sufficient (2) | | | |



| | | | | | | |
|-----------------------|-------------|---|----------------|----|----|-----|
| | | not submitted on time | | 15 | 54 | 2,3 |
| | | Neat and partly correct, corrected twice, submitted on time | Good (3) | | | |
| | | Neat, correct, complete, not submitted on time | Very good (4) | | | |
| | | Neat with minor corrections, complete, submitted on time | Very good (4) | | | |
| | | Neat, correct, complete, submitted on time | Excellent (5) | | | |
| Oral examination (OE) | 35% | 60-70% | Sufficient (2) | - | 36 | 1,2 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (OEx70 + Ex30)/100 | | 45 | 75 | 4 |

Detailed description of evaluation elements for lectures, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------|--|---------------------------------|--------------|
| Lectures | Student's class attendance is checked and recorded. Student may be absent from no more than 20% of lectures. | in accordance with the syllabus | - |
| Exercises and making exercises | Student's attendance is checked and recorded. Student may be absent from no more than 10% of exercises. Exercises are checked and graded. The grade is the arithmetic mean. The requirements for taking the examination (oral part) are positively graded exercises which are included in the overall grade. | in accordance with the syllabus | - |
| Oral examination (OE) | Students whose exercises have been graded and who regularly attended classes may take the examination. Students' theoretical knowledge and their understanding of designing methods and procedures as well as of a given technological process will be examined. The final grade will be calculated by the formula (OEx70 + Ex30)/100 | examination period | - |



Protection of Industrial Environment

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|-------------------------------------|--------------------------------------|
| recommend cleaner energy and raw materials, methods, techniques and technologies of wood processing and wood products design according to the 4R principles of cleaner production (reduce, replace, reuse and recycle); | Evaluation a short report | C7, E3 |
| suggest activities in wood processing companies for implement regulations and norms related to the protection of industrial environment; | Evaluation a short report | C7, E3 |
| propose and implement legislation on the safety at wood production working places and suggest precautions and protective equipment at the workplace, and opportunities to reduce exposure; | Evaluation a short report | C7, E3 |
| determine the worker's exposure to wood dust by using a photometric method and evaluate and interpret the obtained measurement results; | Evaluation laboratory exercises | C7 |
| measure, analyze and evaluate the noise level at the workplace in woodworking, apply the appropriate noise reduction methods, investigate the worker's noise exposure, and apply the optimal methods of protecting the worker from excessive noise; | Evaluation laboratory exercises | C7 |
| interpret the impact of wood processing on the carbon cycle and the issue of greenhouse gases; | Evaluation of debate | C7 |
| calculate the quantities of pollutants (CO, CO ₂ , NO _x , SO _x , PM ₁₀) from the discharge of wood waste, the amount of carbon dioxide from combustion of fossil fuels used for transport in the production and the amount of accumulated carbon in the wood product; | Evaluation of calculation exercises | C7 |
| to propose and describe the optimal protection technology for a number of protective products for wood products, to anticipate and describe possible human and environmental hazards for the selected protective agent and to propose possible recovery and recycling processes of treated wood products; | Evaluation a short report | B3, C7, E3 |
| to interpret the problem of wastewater in the production of wood fibers and paper | Evaluation laboratory exercises | C1, C7 |
| evaluate the emission of free formaldehyde wood materials; | Evaluation laboratory exercises | C1, C7 |
| distinguish hazardous substances in the wood varnish process and the basic method of purifying air and water in paint shops; | Evaluation a short report | C2, C7, E3 |
| design measures to reduce volatile organic compounds in the surface treatment of wood and wood materials and make solvent management plans; | Evaluation a short report | C2, C7, E3 |
| to recommend an integrated environmental management system, quality system and safety at work; | Evaluation a short report | C7, D1, E3 |



Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|------------------------------|---------------------|---|----------------|-----------------------|---|----------|
| Lectures (L) | 10% | - | - | 30 | - | 1 |
| Exercises (short report) (E) | 20% | The report does not have the default format and has a contribution to the already well-known knowledge | Sufficient (2) | 15 | 45 | 2 |
| | | The report has given form and in addition to contributions already known knowledge has a smaller original contribution. | Good (3) | | | |
| | | The report has the default format but has a medium original contribution. | Very good (4) | | | |
| | | The report has the default form and high original contribution. | Excellent (5) | | | |
| Final exam (FE) | 70% | 60-70% | Sufficient (2) | 3 | 27 | 1 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (Lx10+Ex20 + FEx70)/100 | | 48 | 72 | 4 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|--|
| Attendance of lectures and exercises | The presence of students on the class is recorded. A student may justifiably be absent with a maximum of 15% of direct teaching hours. The student activity is recorded by the task and presentations in the student group. | semester (45 hours of direct lecturer) | - |
| Short tasks | Concerning the topic of lectures, students receive short research tasks which need to present in the course. Reports are evaluated. | according to the agreement | It is possible to bring the task next week and present it later. |
| Written exam | The written exam consists of 22 theoretical and computational questions of 28 points. It is necessary to have more than 16.8 points (60%) for a positive rating. | Exam terms | |



| | | | |
|-----------|--|------------|--|
| Oral exam | The requirement for the oral part of the exam is sufficient number of points collected on the written part of the exam. Verification of theoretical knowledge (from scripts), understanding of environmental protection. The final grade is obtained according to the formula: $(Lx10+Ex20 + FEx70)/100$ | Exam terms | |
|-----------|--|------------|--|

Professional project

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--------------------|--|
| Interdisciplinary solve a given problem in defined conditions | Project evaluation | A2, B1, C6, C7, D1, D2, D3, D4, E3, E5 |
| Solve design-technical-technological larger problems independently or as a team by applying multicriteria decision-making (choose the optimal shape, wood and non-wood materials, construction, technological process) and propose variants of rationalization-innovation of products or processes | Project evaluation | B2, B3, C1, C2, C3, C6, D1, D2 |
| Develop self-awareness and self-criticism and motivation in the form of assessing their abilities and weaknesses in the team | Project evaluation | A2, D4 |
| Test your own abilities for an analytical or holistic approach to work and develop a sense of constructive criticism of colleagues and superiors and a sense of personal and collective responsibility for the execution of assigned tasks in compliance with deadlines | Project evaluation | A2, D4 |
| Make a technological map with a sequence of operations according to the given technology and specifics of wood products | Project evaluation | B4, C3 |
| Define critical points in the wood technology process, suggest improvements and speed-up of the process | Project evaluation | C1, C2 |
| Apply digital technologies in production processes | Project evaluation | C2, C3, C4, C5, C6. |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|--------------------|-------|-----------------------|---|------|
| Total: | | | | 60 | 60 | 4 |

| Evaluation elements | Description | Deadline | Compensation |
|---------------------|-------------|----------|--------------|
|---------------------|-------------|----------|--------------|



| | | | |
|--|---|--|--|
| The work performance of a student during professional project | a) High work performance b) Satisfactory work performance c) Weaker performance than expected without justified reasons | | |
| Application of theory in practical work during professional project | a) It demonstrates the extraordinary skill of applying the theory in practical work b) Recognizes the theoretical framework in practical work c) Does not link the theoretical framework with practical work | | |
| The students' skill of solving problems during professional project | a) Very skilled in solving problems, innovative and creative b) It is possible to solve the default problem in a familiar way c) Does not show satisfactory problem solving skills | | |
| Ability of a student to make decisions during professional project | a) Decides independently, based on thorough analysis of (changing) circumstances b) Decisions are satisfactory in known situations c) It often makes wrong decisions without analysis of the situation | | |
| Ability to collaborate in the team during professional project | a) Works in line with others, contributes to group relationships and efficiency b) Relationships with others are in accordance with normal circumstances, but does not stand out c) Uncommunicative and withdrawn to the extent of negatively affecting the group | | |
| Communication skills of a student during professional project | a) Extremely clear, well-organized and convincing communication, written and spoken b) Satisfying skills of written and spoken communication c) Poor writing skills and speech communication | | |
| Motivation and responsibility of a student during professional project | a) High degree of motivation in work and collective and social responsibility b) Satisfactory motivation for work and accountability c) Poor motivated, uninterested and lack of sense of responsibility towards the job | | |

Diploma work

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods |
|---|--|
| apply the current knowledge to define a scientific and professional problem in choosing the topic of work | Master thesis |
| create a schedule of work in accordance with the deadlines of making the graduate thesis in stages | Master thesis |
| independently devise a methodology of research work | Master thesis |
| apply the methodology of writing a professional and scientific work | Master thesis |
| present their work in written and oral form, using skills succinct interpretation of the results and conclusion of these guidelines to predict the future development of the topics of work | Master thesis, public defense of master thesis |



Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|--------------------------------------|---------------------|--------------------|----------------|-----------------------|---|------|
| Master thesis (MT) | 90% | See description | Sufficient (2) | | 390 | 13 |
| | | | Good (3) | | | |
| | | | Very good (4) | | | |
| | | | Excellent (5) | | | |
| Public defense of master thesis (PD) | 10% | See description | Sufficient (2) | | 30 | 1 |
| | | | Good (3) | | | |
| | | | Very good (4) | | | |
| | | | Excellent (5) | | | |
| TOTAL | 100% | | | | 420 | 14 |

| Evaluation elements | Description | Deadline |
|--------------------------------------|---|----------|
| Master thesis (MT) | <p>sufficient (2) - There are substantial deficiencies in the work, the basic concepts are superficial and no deeper knowledge of the subject</p> <p>good (3) - Only some of the relevant aspects of the topic are presented in this paper, the literature is processed correctly but only partially. The scientific and professional vocabulary is basic</p> <p>very good (4) - The work is well-structured with facts, relevant theories and up-to-date data are presented, the literature is correctly elaborated, but the approach lacks creativity.</p> <p>excellent (5) - The work is logically well structured factually correct and conceptually well-defined, the entities are related, the relevant and recent literature is used and the approach to the topic from different perspectives is visible.</p> | |
| Public defense of master thesis (PD) | <p>sufficient (2) - The presentation is a retelling of the read text, the answers to the questions are scarce.</p> <p>good (3) - The presentation is clear and informative, but without the ability to link theory to practice. Ability to answer only simple questions.</p> <p>very good (4) - The presentation is clear and substantive, the answers to the questions are just correct and do not indicate a deeper reflection on the topic.</p> <p>excellent (5) - The presentation is clear, highly informative, answers the questions right and creative.</p> | |



Wood biorefinery technologies

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|--|--------------------------------------|
| identify and explain different sources of lignocellulosic biomass suitable for biorefinery technologies in the production of various bioproducts, | laboratory and practical classes, project task, final exam | A1, B2, B3, C1, C6 |
| critically evaluate different biorefinery technologies for the production of different bioproducts (bioenergy, biofuels, biogas and biochemicals) from lignocellulosic biomass and analyze potential future price reductions through technological development, | laboratory and practical classes, project task, final exam | A1, B2, B3, C1, C6 |
| explain and present the basic technical-technological concepts of various biorefinery technologies and their practical applications related to engineering systems for the production of organic products, | laboratory and practical classes, project task, final exam | A1, B2, B3, C1, C6 |
| identify and describe bio-products with higher added value obtained by biorefinery technologies from lignocellulosic biomass, | laboratory and practical classes, project task, final exam | A1, B2, B3, C1, C6 |
| draw and construct simple schemes of biorefinery technologies and critically assess the potential of biorefinery processes, | laboratory and practical classes, project task, final exam | A1, B2, B3, C1, C6 |

Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 20% | Partially disordered and incomprehensible, with major corrections and on time | Sufficient (2) | 15 | 15 | 1 |
| | | Orderly, legible, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and on time | Excellent (5) | | | |
| Project task (PT) | 10% | Partially disordered, incomprehensible and illogically conceived text, with major corrections and on time | Sufficient (2) | - | 30 | 1 |



| | | | | | | |
|--------------|-------------|---|----------------|----|----|---|
| | | Orderly, legible and logically conceived text, with major corrections and on time | Good (3) | | | |
| | | Orderly, legible and logically conceived text, with minor corrections and on time | Very good (4) | | | |
| | | Orderly, legible and logically conceived text, without corrections and on time | Excellent (5) | | | |
| Exam (EX) | 70% | 50-61% | Sufficient (2) | - | 30 | 1 |
| | | 62-73% | Good (3) | | | |
| | | 74-85% | Very good (4) | | | |
| | | 86-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex20 + PTx10 + PEx70)/100 | | 45 | 75 | 4 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|-------------------------------------|---|--|--|
| Attendance of lectures and exercise | The attendance is checked and the attendance of the students is recorded. Student may justifiably be absent with a maximum of 10% of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Exercises | Exercises are attended in groups. All exercises are of practical character and are carried out in laboratory. At the beginning of the first exercise, students receive templates for all exercises; they are acquainted with the details of each exercise, and how to submit the exercises report. The accuracy, legibility and regularity (submission on time) is evaluated. | in accordance with the agreed terms | Exceptionally, in the case of a justified reason, the student is allowed to compensate his/hers absence on the individual exercise |
| Project task | In their Project tasks the students examine specific areas of wood biorefinery technologies. Practical part of the project task is done by the students during the course (on exercises) which are carried out in the laboratory, as well as in plants and internal laboratories biorefinery instalations. Theoretical part is performed through the study of relevant literature that they define in coordination with the course lecturer. The project task is submitted at the end of the semester, in the form of a written report. | 15. week | Students who submit and their project task report is evaluated positively can access the exam |
| Written exam | Only the students which have submitted their exercises reports and whose project task report is evaluated positively, can take the final written exam. The students are given the printed exam form and they answer the | Exam terms | |



| | | | |
|-----------|---|--|--|
| | questions asked. The written exam is evaluated and participates in the final grade of the subject. | | |
| Oral exam | Students that pass the written exam are asked questions from different parts of the program content. The final grade of the subject is obtained according to the formula $(Ex20 + PTx10 + EXx70)/100$ | | |

Design of wood materials production process

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|---|---------------------------|--------------------------------------|
| Know and evaluate conventional materials technologies in the wood processing industry. | exercises, lectures, exam | B2 |
| Distinguish the processes of production and design of wood materials. | exercises, lectures, exam | C2 |
| Detect, analyze and distinguish between present and possible problems in wood production processes. | exercises, lectures, exam | C3 |
| Prepare and propose the wood production process. | exercises, lectures, exam | C2 |
| Valorize and standardize and integrate the developed process of wood production. | exercises, lectures, exam | C6 |

Methods of grading=Taking exam

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|----------------------------|----------------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 30 | 2 |
| Exercises (E) | - | | | 15 | 15 | 1 |
| Written exam (WE) | 50 % | 60-70 % | Sufficient (2) | | 30 | 1 |
| | | 71-80 % | Good (3) | | | |
| | | 81-90 % | Very good (4) | | | |
| | | 91-100 % | Excellent (5) | | | |
| Oral exam (OE) | 50 % | 60-70 % | Sufficient (2) | | | |
| | | 71-80 % | Good (3) | | | |
| | | 81-90 % | Very good (4) | | | |
| | | 91-100 % | Excellent (5) | | | |
| TOTAL | 100 % | (WEx50 + OEx50)/100 | | 45 | 75 | 4 |



Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Elementi praćenja | Opis | Rok | Nadoknada |
|----------------------|--|--|-----------|
| Lectures + exercises | The teaching attendance is checked and recorded. Students may be absent with a maximum share of 10 % of direct teaching. | semester (45 hours of direct lecturer) | - |
| Written exam | Exams can be attended by students who have sufficient teaching attendance. Students solve tasks and answer asked questions. | Exam terms | - |
| Oral exam | Students who pass written exam are asked for questions from different parts of the teaching program content. The final grade is obtained according to the formula: (WEx50 + OEx50/100) | | - |

Biomass and solid wood biofuels production

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|-------------------------|--------------------------------------|
| Comprehend the basic principles of binding wood raw material into compact solid biofuel and to analyze the impact of certain production parameters on product quality and energy consumption in order to increase productivity and reduce energy consumption | written exam, oral exam | A1, A2 |
| Apply the acquired knowledge in the production of solid biofuels and lead the production process | written exam, oral exam | A2, B1 |
| Design a system for combustion of solid biofuels (selection of the boiler, calculation of the required amount of material and size of the tank and fuel feeding system in the furnace) | written exam, oral exam | C6 |
| Conduct research on selected raw materials and with technological solutions increase system productivity and biofuel quality (influence of raw material, particle size, moisture, additives, pressing temperature and pressure, cooling to quality and productivity) | written exam, oral exam | A2, B1, C6 |

Methods of grading

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|--------------------|-------|-----------------------|---|------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |



| | | | | | | |
|-------------------|--------------|---|--|-----------|-----------|----------|
| Exercises (E) | - | - | - | 15 | 0 | 0,5 |
| Written exam (WE) | 50 % | 50 - 67 % 68 - 78 % 79 - 89 % 90 - 100 % | Sufficient (2) Good (3) Very good (4) Excellent (5) | | 45 | 1,5 |
| Oral exam (OE) | 50 % | 50 - 67 % 68 - 78 % 79 - 89 % 90 - 100 % | Sufficient (2) Good (3) Very good (4) Excellent (5) | | 30 | 1 |
| TOTAL | 100 % | (WEx50 + OEx50)/100 | | 45 | 75 | 4 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|----------------------|--|--|--------------|
| Lectures + exercises | The teaching attendance is checked and recorded. Students may be absent with a maximum share of 20 % of direct teaching. | semester (45 hours of direct lecturer) | - |
| Written exam | Exams can be attended by students who have sufficient teaching attendance. Students solve tasks and answer asked questions. The written exam is evaluated and participates in the final grade. | Exam terms | - |
| Oral exam | Students who pass written exam are asked for questions from different parts of the teaching program content. The final grade is obtained according to the formula: (WEx50 + OEx50)/100 | | |

Wood machining optimization

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--------------------------|--------------------------------------|
| Investigate and explain the relationships between the most influential factors in wood machining. | partial exam, final exam | A2 |
| Recognize, analyze and apply economic, energy, ergonomic and environmental requirements in modern wood machining. | partial exam, final exam | A2, C3 |
| Calculate the maximum feed speed obtainable with the given parameters of the workpiece material, tools and machine, with a constrain related to the required machined surface quality. | partial exam, final exam | A2, C3 |
| Calculate the required amount of air for extraction of wood chips in a unit of time depending on the wood machining parameters and the type of machine. | partial exam, final exam | C3 |



State the goals of wood machining process, define the function to be optimized and determine the parameters that limit the space of possible solutions of the function. partial exam, final exam C3

Apply simpler optimization methods for choosing optimal wood machining parameters. partial exam, final exam A2, C3, E3

Methods of grading

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|----------------------|---------------------------------------|------------------------------|----------------|-----------------------|---|----------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | - | - | - | 13 | 20 | 1,1 |
| Partial exam 1 (PE1) | 50% | 50-60% | Sufficient (2) | 1 | 26 | 0,9 |
| | | 61-75% | Good (3) | | | |
| | | 76-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| Partial exam 2 (PE2) | 50% | 50-60% | Sufficient (2) | 1 | 29 | 1 |
| | | 61-75% | Good (3) | | | |
| | | 76-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| UKUPNO | 100% | (PE1x50 + PE2x50)/100 | | 45 | 75 | 4 |

| Evaluation elements | Maximum points or Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------------------------|---------------------|----------------|-----------------------|---|------|
| Final exam (FE) | 100 % | 50-60% | Sufficient (2) | 2 | 55 | 1,9 |
| | | 61-75% | Good (3) | | | |
| | | 76-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (FEx100)/100 | | | | |



Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|---|--|--------------|
| Attendance of lectures and exercises | The attendance is checked and the attendance of the students is recorded. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester (45 hours of direct lecturer) | - |
| Partial exam 1 (PE1) | The partial exam can be accessed by all students. | 9. week | |
| Partial exam 2 (PE2) | The second partial exam can be accessed by students who have passed the first partial exam. Students who get enough points from both partial exams get a final score. | 14. week | |
| Written exam | The written exam consists of five numerical tasks. For the passage it is necessary to have at least 50% of the total number of points. | Exam terms | |
| Oral exam | The requirement for the oral part of the exam is sufficient number of points collected on the written part of the exam. Theoretical knowledge, ie. understanding and detailed examination of the subjects studied in the lectures, is checked. The final grade is obtained according to the formula (FEx100)/100 | Exam terms | |

Quality of wood building products

Learning outcomes and evaluation methods

| Learning outcomes (LO) | Evaluation methods | Connection with the study program LO |
|--|--------------------------|--------------------------------------|
| Connect the product with the appropriate regulation and standard and propose an appropriate system of factory production control | exam | B1 |
| Recognize the specifics of the product and select the appropriate testing or evaluation methods for wood construction product | practice exercises, exam | B1 |
| Define activities for the purpose of obtaining / placing a certain product quality or safety mark (e.g. CE mark) | practice exercises, exam | B1 |
| Define spatial, technical and environmental conditions, documentation and requirements for personnel in the own factory control system | practice exercises, exam | C4 |
| Interpret the test report and evaluate the achieved results | exam | C4 |
| Propose measures to eliminate the non-conformity of wood construction products | exam | C4 |



Methods of grading

| Evaluation elements | Share in evaluation | Grade rating scale | Grade | Direct teaching hours | Number of average students workload outside the direct teaching | ECTS |
|---------------------|---------------------|---|----------------|-----------------------|---|----------|
| Lectures (L) | - | - | - | 30 | 0 | 1 |
| Exercises (E) | 25% | Mostly inaccurate, with major corrections | Sufficient (2) | 15 | 45 | 2 |
| | | Mostly accurate, with corrections | Good (3) | | | |
| | | Exact, with minor corrections | Very good (4) | | | |
| | | Accurate and error-free | Excellent (5) | | | |
| Exam (PE) | 75% | 60-70% | Sufficient (2) | | 30 | 1 |
| | | 71-80% | Good (3) | | | |
| | | 81-90% | Very good (4) | | | |
| | | 91-100% | Excellent (5) | | | |
| TOTAL | 100% | (Ex25+ PEx75)/100 | | 45 | 75 | 4 |

Detailed description of evaluation elements for lecturer, exercises, partial or final exams:

| Evaluation elements | Description | Deadline | Compensation |
|--------------------------------------|--|---|---|
| Attendance of lectures and exercises | The attendance is checked and recorded. Exercises are attended by groups. A student may justifiably be absent with a maximum of 15% of direct teaching hours. | semester | - |
| Exercises | Exercises are organised in groups. As part of the exercises, 5 practical exercises are performed on the topic of ensuring the quality of wooden products for construction. At the beginning of the first exercise, students are introduced to the rules of preparation, teaching and assessment of exercises. The accuracy, regularity and regularity (time-honored exercises) | according to instruction at the beginning of semester | Exceptionally, in the case of a justified reason, the student makes up the absence from a particular exercise |
| Written exam | The exam can be attended by students whose exercises were evaluated positively. The written exam is evaluated and participates in the final grade of the subject. | exam terms | |



| | | | |
|-----------|--|--|--|
| Oral exam | Students get questions from different part of the subject program. Final mark of subject is achieved from the formula: (Ex5+PEx75)/100 | | |
|-----------|--|--|--|