SYLLABUS

1. Course title:

Material Handling II

2. Code:

3. Cycle of study:

1

4. ECTS credits:

5

5. Type of course:

Mandatory

6. Prerequisites:

No prerequisites

7. Class restrictions:

None

8. Duration / semester(s):

I VII

9. Weekly contact hours and student workload:

	Semester (1)	Semester (2)	(for two-semester courses)	Workload: (hours)	
9.1. Lectures	2			Classes:	45,00
9.2. Seminars	1			Individual work:	104,9
9.3. Laboratory / Practice classes	1			In total:	149,9

10. Faculty:

Faculty of Mechanical Engineering Tuzla

11. Department/study program:

Production Engineering / Production Engineering

12. Lecturer:

Alan Topčić PhD, Full Professor

13. Course aims:

Mastering theoretical and practical knowledge and skills related to the technical and technological characteristics and management of manipulative devices and automated material handling/transport systems in production facilities/systems. Understanding the role of manipulative devices and automated material handling/transport systems in

production facilities/systems in realisation of production processes, ways of interconnection and coordination of their operation, and their integration into the material handeling system in industry in accordance with production process requirements. Understanding of inventory management and warehouse processes, as well as their practical implementation. Mastering the basic methods and concepts of applying modeling and simulation of material handling/transport systems in industry.

14. Learning outcomes:

Upon successful completion of the course, the student will be able to:
Identify and categorize the components of industrial manipulative devices-manipulators and automated material handeling/transport systems in industry; Differentiate the components and calculate the technical and technological characteristics of industrial manipulatorss and automated systems for material handling/transport in industry; Design and integrate industrial manipulator and automated material handling/transport systems into the appropriate material flow system in accordance with the requirements of the production process; Inventory menagement; Design a warehouse, and organize and manage storage processes; Understand and apply basic concepts and approaches to modeling and simulation of material movement/material handling systems in industry.

15. Course content:

1. Basic principles of selection and design of industrial manipulative devices-manipulators and automated devices for material handling /transport in industry;
2. Material handling/transport flows in automated production;
3. Continuous type of automated devices for materala handling/ transport in industry;
4. Ciclic type of automated devices for material handling/transport in industry;
5. Industrial manipulative devices - manipulators;
6. Industrial robots;
7. Integration of industrial robots into the production process; Test 1;
8. Automatically guided vehicles (AGV); Test 1;
9. Integration of automatically guided vehicles into the production process;
10. Management of the system for the movement of materials/transportation in industry;
11. Safety aspects when working with industrial manipulative devices and automated materials handling/transport devices/systems in industry;
12. Inventory management;
13. Storage and storage processes;
14. Basics of modeling of systems for material handling/transportation in industry;
15. Basics of simulation of systems for material handling/transportation in industry; Test 2.

16. Learning methods:

LECTURES (PR) – Theoretical lectures using multimedia tools, along with active two-way communication between student and professor;
AUDITORIUM EXERCISES (AV) – Solving practical problems and tasks related to the subject matter, with active two-way communication between student and teaching assistant;
LABORATORY EXERCISES (LV) – Work in the laboratory and in the field aimed at acquiring practical skills related to the subject matter; Preparation and presentation of seminar and graphical assignments;
CONSULTATIONS – Additional sessions that allow students to clarify specific segments of the lectures/exercises with the professor or assistant after their completion.

17. Assessment methods:

PRE-EXAM OBLIGATIONS: Students are required to take two written tests from the theoretical part (PR) and two from the auditorium exercises (AV). Theoretical tests (PR) are scheduled as follows:
- After the first third of the semester – First midterm,
- At the end of the semester – Second midterm.
Auditorium exercise tests (AV) are scheduled as follows:
- After the middle of the semester – First midterm,
- At the end of the semester – Second midterm.
The tests cover the material presented up to that point in lectures and exercises. Theoretical tests (PR) consist of multiple-choice questions, short answer questions, and essay-type questions. Students can earn a maximum of 8 points per midterm — totaling 16 points for all two theoretical tests. Auditorium exercise tests (AV) consist of problems solving, and students can earn a maximum of 5 points per test — totaling 10 points. All students take the tests at the same time, ensuring uniform knowledge evaluation and consistent testing conditions.
As part of the pre-exam obligations, students are required to prepare an individual Seminar paper and a Graphical assignment on a topic related to the course content. These must be submitted in written form to the course professor/assistant for review and evaluation, and then defended orally. Each successfully completed and defended Seminar and Graphical assignment is worth up to 5 points.
In addition, students must prepare, submit, and defend a Laboratory Exercise Report (LV), for which they may earn a maximum of 4 points.
For continuous participation during lectures and exercises throughout the semester, students may earn:

- Up to 15 points from lectures,
- Up to 15 points from exercises (7,5 ponts from Auditorium + 7,5 pointa from Laboratory exercises).
The final exam is oral.
Only students who have successfully fulfilled more than 50% of the pre-exam obligations and attended more than 70% of lectures and exercises are eligible to take the final exam. In the final exam, students must answer five questions from the course material covered in lectures and exercises. The maximum score for the final exam is 30 points.
All forms of knowledge assessment are recognized as part of the cumulative grading system. To pass the course, a student must earn a minimum of 54 cumulative points.
If a student misses lectures/exercises, they are required to provide valid justification.
The condition for signing is the student's attendance at a minimum of 70% of lectures and exercises.

Grading Scale:

Grade	Descriptive	Letter	Points
5 (five)	Does not meet minimum criteria	F, FX	<54
6 (six)	Meets minimum criteria	E	54÷64
7 (seven)	Generally good, but with significant shortcomings	D	65÷74
8 (eight)	Average, with noticeable errors	C	75÷84
9 (nine)	Above average, with occasional errors	B	85÷94
10 (ten)	Exceptional success with no errors or with minor errors	A	95÷100

18. Assessment components:

The exam grade is based on the total number of points that the student earned by fulfilling pre-exam obligations and taking the exam, and contains a maximum of 100 points. It is determined according to the following scale:

- **Attendance at Lectures (PR): 15 points**
- **Theory tests (PR): 2 tests × 8 points = 16 points**
- **Seminar paper (PR): 5 points**
- **Attendence at Auditorium exercises (AV): 7,5 points**
- **Attendence to Laboratory exercises (LV): 7,5 points**
- **Tests with tasks (AV): 2 tests × 5 points = 10 points**
- **Graphic work (AV): 5 points**
- **Report form Laboratory exercise (LV): 4 points**

Prerequisites total: 70 points
Final exam: 30 points
TOTAL: 100 points

19. Mandatory reading list:

Vladić J. (2005) „Transportna i pretovarna sredstva i uređaji“, FTN Izdavaštvo, Novi Sad
Šelo R. (2002) „Fleksibilni transport“, Mašinski fakultet Tuzla, Tuzla
Zrnić Đ. (1997) „Simulacija procesa unutrašnjeg transporta“, Mašinski fakultet Beograd

20. Additional reading list:

G.Ullrich , T.Albrecht (2023) „Automated Guided Vehicle Systems A Guide - With Practical Applications - About The Technology - For Planning“, Springer
T.Aized (2012) "Material Handling in Flexible Manufacturing System", IntechOpen
J. Vladić (2005) "Transportna i pretovarna sredstva i uređaji" FTN Izdavaštvo
R.E. Compton (2005) "Robotic Material Handling Applications in a Flexible Manufacturing System", Society of Manufacturing Engineers
J. Vladić (2005) "Mehanizacija i tehnologija pretovara" FTN Izdavaštvo, Novi Sad,
Č. Dundović (2004) "Prekrcajna sredstva prekidnog transporta", Pomorski fakultet u Rijeci, Rijeka
K.L. Kerstetter (2000) "Flexible Materials Handling for Industrial Robots", Society of Manufacturing Engineers
Č. Dundović (1996) "Metode projektiranja sustava unutarnjeg transporta", Ekonomski fakultet Rijeka, Rijeka
S.B. Tošić (1999) "Transportni uređaji - mehanizacija transporta", Univerzitet u Beograd, Mašinski fakultet, Institut za mehanizaciju, Beograd

21. Web sources:

https://www.iibms.org/pdf/e-library/essentials_of_inventory_management.pdf
https://afifnurichwan.wordpress.com/wp-content/uploads/2015/06/inventory-control-and-management-second-edition.pdf
https://babel.hathitrust.org/cgi/pt?id=mdp.39015004484427&seq=17

22. Applicable from the academic year:

2025/2026.

23. Adopted in the Faculty/Academy session:

25.04.2025.