

## SYLLABUS

**1. Course title:**

TECHNOLOGY OF PLASTICITY I

**2. Code:**

**3. Cycle of study:**

1

**4. ECTS credits:**

5

**5. Type of course:**

Mandatory

**6. Prerequisites:**

**7. Class restrictions:**

**8. Duration / semester(s):**

1

5

**9. Weekly contact hours and student workload:**

	Semester (1)	Semester (2)	(for two-semester courses)	Workload: (hours)
9.1. Lectures	5	<input type="text"/>		Classes: <input type="text" value="45"/>
9.2. Seminars	2	<input type="text"/>		Individual work: <input type="text" value="102,9"/>
9.3. Laboratory / Practice classes	1	<input type="text"/>		In total: <input type="text" value="147,9"/>

**10. Faculty:**

Faculty of Mechanical Engineering Tuzla

**11. Department/study program:**

Manufacturing Mechanical Engineering

**12. Lecturer:**

prof. Emir Šarić, PhD

**13. Course aims:**

It is to understand and explain fundamentals of plastic deformation: dislocations, yield conditions, stress and strain relation, temperature effects on microstructural changes and hardening, friction and wear due to plastic deformation, formability and forming limit diagrams

This knowledge will be prerequisites to design and analyze metal forming processes

#### 14. Learning outcomes:

After learning course the students should be able to:

- explain yield mechanisms of metals
- explain strain-stress relation and effects of strain rate and temperature on the flow curve
- construct flow curve based on experimental data from tensile and compression experiments
- determine friction factor and friction coefficient experimentally using the ring compression and compression test by conical tools
- construct forming limit diagrams based on experimental data

#### 15. Course content:

1. Introduction,
2. Dislocations, slip systems,
3. Monocrystal and Polycrystal Plasticity,
4. Superplasticity, High-speed deformation and Quasi-static Deformation,
5. Friction in Forming,
6. Basic concepts of Strain, Deformation tensor, Strain tensor and rotation tensor, Principal strains,
7. Stress tensor, Strain tensor, Principal Stresses,
8. von-Mise's and Tresca yield criteria, First Exam,
9. Plastic stress-strain relations, Prandtl Roeuss Saint Venant, Levy - Von Mises relations,
10. Flow rule, Principle of Normality, Strain hardening, Bushinger-s effect,
11. Tension and Compression tests, Plane strain compression test,
12. Friction Tests,
13. Formability and its Testing,
14. Analysis methods: Slab method, Slip line field method,
15. Application of Slab and Slip line method, (second part) Exam

#### 16. Learning methods:

The learning activities will be realized through a combination of lectorials, discussion groups, practical case studies by use of appropriate techniques and consultations. Independent learning includes hours engaged with essential reading and assignment preparation.

#### 17. Assessment methods:

- Lectures – theoretical lectures, active two-way communication between student and professor, compulsory attendance of students;
- Theory tests - solving tests;
- Tests with tasks - solving tests;
- Seminar/graphic works – independent work of the student to solve the problem;
- Oral final exam - interactive conversation with the student in order to validate the acquired knowledge;
- Consultations – clarification of any ambiguities related to the topic of the studied subject.

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:

Individual and group activities 20 bod.  
Semestral work 30 bod.  
Written and/or oral exam 50 bod,  
Total 100 bod.

#### 19. Mandatory reading list:

1. E: Šarić, S. Butković: Izvodi iz teorije plastičnosti metala, 2021
2. J. Chakrabarty, Theory of Plasticity, 2nd edition, McGraw Hill Publications 1998

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**20. Additional reading list:**

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| <ol style="list-style-type: none"><li>1. B.Musafija: Obrada metala plastičnom deformacijom, MF Sarajevo.</li><li>2. H.Đukić, P.Popović: Obrada Deformisanjem, MF Mostar</li></ol> |
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**21. Web sources:**

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**22. Applicable from the academic year:**

2025/2026
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**23. Adopted in the Faculty/Academy session:**

25.04.2025
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