

# SYLLABUS<sup>1</sup>

## 1. Information about the program

1.1 Higher education institution	Universitatea Politehnica Timișoara
1.2 Faculty <sup>2</sup> / Department <sup>3</sup>	Mecanica / Mecanică și Rezistența Materialelor
1.3 Chair	—
1.4 Field of study (name/code <sup>4</sup> )	Mecanic
1.5 Study cycle	Master
1.6 Study program (name/code/qualification)	Inginerie Mecanica Avansata/inginer

## 2. Information about the discipline

2.1 Name of discipline	Fatigue and Integrity of Structures						
2.2 Coordinator (holder) of course activities	Prof. Dr. Ing. Liviu MARSAVINA						
2.3 Coordinator (holder) of applied activities <sup>5</sup>	Prof. Dr. Ing. Liviu MARSAVINA						
2.4 Year of study <sup>6</sup>	1	2.5 Semester	2	2.6 Type of evaluation	Exam	2.7 Type of discipline	Obligatorie

## 3. Total estimated time (hours / semester of didactic activities)

3.1 No. of hrs. / week	3 , of which:	3.2 course	2	3.3 seminar/laboratory/ project/training	2
3.4 Total no. of hrs. in the education curricula	42 , of which:	3.5 course	28	3.6 applied activities	28
3.7 Distribution of time for individual activities related to the discipline					hrs.
Study using a manual, course materials, bibliography and lecture notes					10
Additional documentation in the library, on specialized electronic platforms and on the field					
Preparation for seminars / laboratories, homeworks, assignments, portfolios, and essays					6
Tutoring					6
Examinations					6
Other activities					
<b>Total hrs. of individual activities</b>					<b>28</b>
3.8 Total hrs. / semester <sup>7</sup>	84				
3.9 No. of credits	10				

## 4. Prerequisites (where applicable)

4.1 Curriculum	<ul style="list-style-type: none"> <li>Strength of Materials, Finite Element Analysis</li> </ul>
4.2 Competencies	<ul style="list-style-type: none"> <li></li> </ul>

## 5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> <li></li> </ul>
5.2 to conduct practical activities	<ul style="list-style-type: none"> <li></li> </ul>

## 6. Specific competencies acquired

<sup>1</sup> The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex3).

<sup>2</sup> The name of the faculty which manages the educational curriculum to which the discipline belongs.

<sup>3</sup> The name of the department entrusted with the discipline, and to which the course coordinator / holder belongs.

<sup>4</sup> Fill in the code provided in GD no. 493/17.07.2013.

<sup>5</sup> The applied activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

<sup>6</sup> The year of study to which the discipline is provided in the curriculum.

<sup>7</sup> It is obtained by summing up the number of hrs. from 3.4 and 3.7.

Professional competencies <sup>8</sup>	<ul style="list-style-type: none"> <li>• Understanding and ability to apply the theoretical fundamentals for integrity and durability structures</li> <li>• Utilization of information systems for processing and management of data (MDSolids, ANSYS, FRANC software)</li> <li>• Conceptions, design, evaluation, reliability of mechanical structures</li> </ul>
Transversal competencies	<ul style="list-style-type: none"> <li>• Team work</li> <li>• Communication skills</li> <li>• Computer skills</li> </ul>

### 7. Objectives of the discipline (based on the grid of specific competencies acquired)

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>• Understanding of the principles for estimating the integrity and durability of structures</li> </ul>
7.2 Specific objectives	<ul style="list-style-type: none"> <li>• Applications of Strength, Fracture Mechanics and Fatigue concepts for mechanical components.</li> <li>• Understanding the causes of the failure in mechanical engineering components.</li> <li>• Numerical durability analysis for mechanical components.</li> </ul>

### 8. Content

8.1 Course	No. of hours	Teaching methods
Strength of Materials concepts	4	Ppt presentation
Mechanical Properties of mechanical materials	4	Ppt presentation
Fracture Mechanics and Structural Integrity concepts	4	Ppt presentation
Fracture toughness	2	Ppt presentation
Buckling failure	2	Ppt presentation
Fatigue of materials: fatigue limit, experimental determination	2	Ppt presentation
High cycle fatigue	2	Ppt presentation
Low cycle fatigue	4	Ppt presentation
Fatigue crack propagation - Durability estimation	4	Ppt presentation

<sup>8</sup> The professional competencies and the transversal competencies will be treated according to the Methodology of OMECTS 5703/18.12.2011. The competencies listed in the National Register of Qualifications in Higher Education [Registrul Național al Calificărilor din Învățământul Superior RNCIS] ([http://www.rncis.ro/portal/page?\\_pageid=117,70218&\\_dad=portal&\\_schema=PORTAL](http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL)) will be used for the field of study from 1.4 and the program of study from 1.6 of this form, involving the discipline.

Bibliography<sup>9</sup> M. Janssen, J. Zuidema, R. Wanhill - Fracture Mechanics, 2nd Edition. Spon Press, 2002.  
 G. Pluvinage - Fracture and Fatigue Emanating from Stress Concentration, Kluwer Academic Publishers, 2004.  
 S. S. Manson, G. R. Halford - Fatigue and Durability of Structural Materials, ASM International, 2006.  
 W. N. Sharpe Jr. – Handbook of Experimental Solid Mechanics, Springer, New York, 2008  
 I. Dumitru, L. Marsavina – Introducere in Mecanica Ruperii, Ed. Mirton, Timisoara, 2001  
 L. Marsavina – Metode experimentale de determinare a tenacității la rupere, Ed. Politehnica, Timișoara, 2006.

8.2 Applied activities <sup>10</sup>	No. of hours	Teaching methods
Strength for simple loads (Tensile, Compression, Bending, Torsion)	4	MD Solids software
Strength of complex loads	4	MD Solids software
Stress concentration	2	MD Solids software
Experimental determination of mechanical properties of materials	4	Experimental tests
Stress distributions in mechanical components	6	ANSYS software
Estimation of durability in mechanical components	4	ANSYS software
Fatigue crack propagation	2	FRANC 2D software
Determination of critical load for buckling	2	ANSYS software

Bibliography<sup>11</sup> R. D. Cook, W. C. Young - Advanced mechanics of materials. Second Edition, Prentice Hall, 1999  
 J.M. Gere - Mechanics of Materials, 5th Edition, Brooks /Cole, Pacific Groove, 2001  
 ANSYS manual  
 FRANC2D manual

**9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program**

- Structural Integrity, Imperial College of London, Marea Britanie
- Structural Analysis, Loughborough University, Loughborough, Marea Britanie
- Advanced Solid Mechanics, The University of Sheffield, Sheffield, Marea Britanie

**10. Evaluation**

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Exam	<b>Written Exam with three subjects (two theoretical and one application).</b>	67%
10.5 Applied activities	<b>S:</b>		
	<b>L:</b>		
	<b>P:</b> Project	A simulation in Finite Element Method for determination of durability	33%
	<b>Pr:</b>		

<sup>9</sup> At least one title must belong to the department staff teaching the discipline, and at least 3 titles must refer to national and international works relevant for the discipline, and which can be found in the Politehnica University Library.

<sup>10</sup> The types of applied activities are those specified in footnote 5. If the discipline contains several types of applied activities, then these will be written consecutively in the lines of the table below. The type of activity will be written in a distinct line, as „Seminar:”, „Laboratory:”, „Project:” and/or „Practice/Training:”.

<sup>11</sup> At least one title must belong to the staff teaching the discipline.

**10.6** Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified)

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**Date of completion**

**Course coordinator  
(signature)**

**Coordinator of applied activities  
(signature)**

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**Head of Department  
(signature)**

**Date of approval in the Faculty  
Council<sup>12</sup>**

**Dean  
(signature)**

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<sup>12</sup> Avizarea este precedată de discutarea punctului de vedere al board-ului de care aparține programul de studiu cu privire la fișa disciplinei.