

## Syllabus

### Course description

<b>Course title</b>	Technical Physics for Mechatronics
<b>Course code</b>	42165
<b>Scientific sector</b>	ING-IND/11
<b>Degree</b>	Ingegneria Industriale Meccanica
<b>Semester</b>	2
<b>Year</b>	2
<b>Academic Year</b>	2020-21
<b>Credits</b>	6
<b>Modular</b>	no

<b>Total lecturing hours</b>	36
<b>Total lab hours</b>	0
<b>Total exercise hours</b>	24
<b>Attendance</b>	Not mandatory
<b>Prerequisites</b>	
<b>Course page</b>	

<b>Specific educational objectives</b>	<p>During the course, the issues related to heat transfer will be presented and analyzed and in particular: Analytical models of heat transmission in its forms like:</p> <ul style="list-style-type: none"> <li>✓ first law of thermodynamics</li> <li>✓ mechanisms of heat transfer</li> <li>✓ conduction</li> <li>✓ convection</li> <li>✓ irradiance</li> <li>✓ Initial and boundary conditions</li> <li>✓ steady state heat transfer</li> <li>✓ heat exchangers</li> <li>✓ second law of thermodynamics</li> <li>✓ acoustics: principles and applications</li> </ul>
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<b>Lecturer</b>	Dr. Marco Caniato
<b>Scientific sector of the lecturer</b>	ING-IND/11
<b>Teaching language</b>	English
<b>Office hours</b>	Appointment by email
<b>Teaching assistant (if any )</b>	
<b>Office hours</b>	18
<b>List of topics covered</b>	<p>FUNDAMENTALS OF THERMODYNAMICS  Units of measure and fundamentals of Thermometry.  First Law of Thermodynamics  Application Areas of Heat Transfer  Modeling in Heat Transfer  Specific Heats of Gases, Liquids, and Solids 7  Energy Transfer  HEAT TRANSFER</p>

	<p>Heat transfer mechanisms. Thermal heat conduction in monodimensional systems in steady state.          Thermal Conductivity          Thermal Diffusivity          Thermal heat convection and dimensional analysis.          Boundary and Initial Conditions          Thermal Contact Resistance          Global heat transfer and heat exchangers. Thermal radiation.          Numerical models for heat transfer          Second law of thermodynamics          Wave propagations in solids and fluids          Psychoacoustics          Sound pressure level and Sound Power level          Sound Intensity          Sound absorption and sound Insulation          The measures in acoustics</p>
<b>Teaching format</b>	<p>Class lectures (Videos and slides)          exercises using spreadsheets and numerical simulations          Lecture material (slides and videos) will be available for download by the students.</p>

<b>Learning outcomes (ILOs)</b>	<p>The learning outcomes need to refer to the Dublin Descriptors:</p> <p>(1) <u>Knowledge and understanding</u></p> <ul style="list-style-type: none"> <li>- energy balance terms</li> <li>- heat transfer mechanism influences and different efforts on dissipations</li> <li>- heat transfer behaviors</li> <li>- heat exchangers functions and design</li> <li>- Acoustics and sound wave propagation</li> </ul> <p>(2) <u>Applying knowledge and understanding</u></p> <ul style="list-style-type: none"> <li>- the ability to solve the main heat transfer models applied to the different heat transfer behaviors</li> <li>- the ability to apply basic heat transfer mechanism to the design of simple heat exchangers</li> <li>- The ability to apply and solve simple problems in acoustics</li> </ul> <p>(3) <u>Making judgements</u></p> <p>The student will be able to understand and compare and then choose the appropriate heat transfer behaviour in relation to a simple final application and sizing also using numerical simulations</p> <p>(4) <u>Communication skills</u></p> <ul style="list-style-type: none"> <li>- Using the appropriate technical vocabulary related to the topic</li> </ul>
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	<ul style="list-style-type: none"> <li>- Preparing a report representing and summarizing complex results and providing appropriate interpretation</li>   <li>(5) <u>Ability to learn</u></li> <li>- Lifelong learning capability through the acquisition of critical tools and critical evaluation of product and systems specifications</li> <li>- finding the analytical expression and the correct numerical solution, comparing different methodologies and sources</li> </ul>
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<b>Assessment</b>	Formative assessment											
	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 25%;">Form</th> <th style="width: 25%;">Length /duration</th> <th style="width: 25%;">ILOs assessed</th> <th style="width: 25%;"></th> </tr> </thead> <tbody> <tr> <td>Development of the assigned design work</td> <td>During the course</td> <td>(2), (3), (5)</td> <td></td> </tr> </tbody> </table>				Form	Length /duration	ILOs assessed		Development of the assigned design work	During the course	(2), (3), (5)	
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Development of the assigned design work	During the course	(2), (3), (5)										
	Summative assessment											
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<b>Assessment language</b>	English
<b>Evaluation criteria and criteria for awarding marks</b>	<p>To the admission to the second part, the first one has to be successfully passed.</p> <p>The first part (numerical exercise) consists of numerical questions. The answer is correct when the result provided falls within a given tolerance with respect to the reference value. The evaluation is based on the accuracy of the numerical result of each question. The minimum mark is 12 out of 30 suitable to pass to the second part. The score of this part contributes for 1/2 to the final mark.</p> <p>In the second part, each question concerns a different section of the program. They equally contributes to the final mark. The evaluation is based on the completeness of the answer in terms of 1) definition of the subject 2) analytical description 3) graphical and mathematical representations 4) proof (if required)</p> <p>The score of this second part contributes for 1/2 of the</p>

	final mark.
<b>Required readings</b>	Teaching material, handouts, videos provided by the teacher
<b>Supplementary readings</b>	Yunus A. Cengel, Heat Transfer: A Practical Approach, McGraw-Hill Education, 2002 T.L. Bergman, A.S. Lavine, Fundamentals of heat and mass transfer, Wiley and Sons F. Alton Everest, K.C. Pohlmann – Master Handbook of acoustics, Sixth Edition, 2014, Mc. Graw - Hill