

## Percorso Autonomo Autorizzato

<b>Title (Titolo)</b>	<b>Hydraulic Engineering (Idraulica)</b>
<b>Coordinator</b>	• DICA, PoliMi: prof. Stefano Malavasi
<b>Supporting coordinators</b>	• DICA, PoliMi: prof. Francesco Ballio; • DIS, PoliMi: prof. Alberto Taliercio
<b>Scientific collaborations and partnerships</b>	<ul style="list-style-type: none"> <li>• (DMEC, PoliMi): prof. Fabio Fossati, prof. Emanuele Zappa, prof. Alfredo Cigada</li> <li>• (DICA, PoliMi): prof. Federico Perotti, prof. Raffaele Ardito</li> <li>• (DMAT, PoliMi): prof. Simona Perotto; prof. Luca Formaggia</li> <li>• (DICATeCh, PoliBa): prof. Umberto Fratino</li> <li>• (Norwegian University of Science and Technology, Trondheim): prof. Helge I. Andersson, prof. Pettersen Bjørnar, Tufan Arslan PhD</li> <li>• (University of Aberdeen, Scotland): prof. Vladimir Nikora</li> <li>• (Cham Ltd, London): dr. Mike Malin</li> <li>• (University of Victoria, Canada): prof. Peter Oshkai</li> <li>• (University of Arizona): prof. S. P. Neuman</li> <li>• (Imperial College Londo): prof. M. Blunt</li> <li>• (UPC of Barcelona): prof. X. Sanchez-Vila</li> </ul>
<b>Description and scopes</b>	<p>The student of Mathematical Engineering, with a curriculum similar to that in the “Computational Science” track, will acquire skills which are typical of the students of the Civil Hydraulic Engineering curriculum. The student will also have the opportunity of getting a second master’s degree after an additional year of study within which he/she will gain improved knowledge on construction-related issues which are key to a civil hydraulic engineer.</p> <p>The objective of this track is to create a professional profile with high proficiency in computational tools and fitting the Civil Hydraulic Engineering field consistent with the growing needs for applied numerical modelling skills.</p>
<b>Study Plan</b>	The study program is analog to that of the “Computational Science” track of the M.Sc. in Mathematical Engineering with additional courses providing the basis of ground-water and surface-water hydraulics. The list of courses can be found in a separate document.
<b>Advised MSc theses in Mathematical Engineering at Politecnico di Milano</b>	<ul style="list-style-type: none"> <li>▪ I. Ingrosso, <i>Una strategia per lo studio dell’erosione con modelli Euler-Euler</i>, 2014</li> <li>▪ L. Oldani, <i>Implementazione di un modello per la previsione dell’emissione acustica in dispositivi di regolazione</i>, 2014</li> <li>▪ F. Agresti, <i>Upscaling e permeabilità per flussi bifase in mezzi porosi</i>, 2014</li> <li>▪ L. Fenini, <i>Previsione dell’emissione acustica in dispositivi idraulici</i>, 2015</li> </ul>
<b>MSc theses in progress (by students from Math. Eng.)</b>	▪
<b>Available subjects for an MSc thesis</b>	<ul style="list-style-type: none"> <li>• <i>V.I.V. of oscillating structures (numerical / experimental)</i></li> <li>• <i>Energy recovery from water systems (numerical / experimental)</i></li> <li>• <i>Modeling of the fluid dynamic noise in control valves (numerical / experimental)</i></li> <li>• <i>Modeling of the impact wear of pipeline components (numerical)</i></li> <li>• <i>Modeling of the multiphase flow in porous media (numerical)</i></li> <li>• <i>Geostatistical upscaling of hydraulic processes (numerical)</i></li> </ul> <p>and other topics can be agreed with the students.</p>
<b>Internal/ external stages</b>	Various internal and external stages have been set up in recent years. In most cases these were linked to the theses simultaneously or subsequently developed. Recent stages were held at: University of Aberdeen; UPC Barcelonatech (Barcelona); CNRS Strasburgo; CESI Ricerca; Pibiviesse srl; Breda Energia Spa; ARPA Bologna.
<b>Professional opportunities</b>	Private companies and public institutions where fluid mechanics and computational hydraulics play a strategic role for the development, control, and management of processes

	and products.
<b>Second M.Sc. Degree in Civil Engineering</b>	A student with the MSc Degree in Mathematical Engineering who has completed the “Hydraulic Engineering” track and has discussed a MSc thesis in the field of Hydraulic Engineering/Fluid Mechanics can obtain a second MSc Degree in Civil Engineering. To this end, he/she must acquire a total amount of additional 58 CFU from courses (attended in a sixth year of study). For the final degree test, the student will be allowed to produce the thesis already discussed in the context of the M.Sc. Degree in Mathematical Engineering. Registration to the sixth year involves a study program consisting of 58 CFU associated with courses and 14 CFU associated with a final degree test, for a total of 72 CFU (listed in the following table).

Table for the second M.Sc. Degree in Civil Engineering – Hydraulics

CS	SEM	SSD	COD	INSEGNAMENTO	CFU
LP	1	ICAR/02	088500	Costruzioni idrauliche	10
LP	1	ICAR/07	088499	Geotecnica	10
LP	1-2	ICAR/09	088498	Tecnica delle costruzioni	12
LP	2	ICAR/04	088501	Elementi di tecnica stradale	10
LM	1	ICAR/02	090859	<i>At least 16 CFU to be chosen among:</i> Costruzioni idrauliche 2 (6 CFU) Impianti speciali idraulici (10 CFU) Sistemazione dei bacini idrografici (10 CFU) Ocean and Coastal Engineering (10 CFU) Ocean Engineering (6 CFU)	16
	1	ICAR/02	090869		
	1	ICAR/02	088624		
	1	ICAR/01	095891		
	1	ICAR/01	095892		
LM	1-2		090864	Final work	14
<b>Total CFU sixth year</b>					<b>72</b>