



# Luca Di Stasio

## Early Stage Researcher

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## Background

I am currently employed as a full-time PhD candidate in Polymeric Composite Materials at the Division of Materials Science, Department of Engineering Sciences and Mathematics, Luleå tekniska universitet (LTU) in Luleå, Sweden. I teach in 4 graduate-level courses offered in the subject of Polymeric Composite Materials. The courses are offered as part of the LTU-offered Master programme in Composite Materials and the international joint Master programmes in Materials Science and Engineering EEIGM/EUSMAT (European School of Materials Science and Engineering) and AMASE (Advanced Materials Science and Engineering).

Previously, I taught at the École Européenne d'Ingénieurs en Génie des Matériaux (EEIGM) in Nancy, France in undergraduate- and graduate-level courses in Solid Mechanics, Viscoelasticity, Linear Elastic Fracture Mechanics, Mechanics of Composite Materials.

I also contribute to the research activities of the Polymeric Composite Materials subject at LTU, working on integrated computational and experimental mechanics of polymers and polymer composites with a focus on fatigue, fracture and damage (see my Research Statement for more details).

In addition, I am involved in the supervision of graduate students in the context of Master theses and project courses. I am actively involved in the continuous improvement of teaching practices in the subject of Polymeric Composite Materials by proposing new experimental activities for students (composites repair laboratory, bi-axial strain gauge measurements) as well as improving the virtual learning space of the courses offered in the subject. Furthermore, I actively contribute to the pedagogical research in Higher Education; currently I am working on a contribution (article and oral presentation) to the upcoming *Development Conference for Swedish Engineering Education 2019*.

## Higher Education Courses and Study Programmes

### Subject Related Courses

As detailed in my resumé, I have received a BSc in Aerospace Engineering (2010) from Politecnico di Milano (Milan, Italy), a MSc in Mechanical Engineering (2012) from Drexel University (Philadelphia, USA), a MSc in Space Engineering (2013) from Politecnico di Milano (Milan, Italy), a PhD in Materials Science and Engineering (exp. Dec. 2019) from Université de Lorraine (Nancy, France) and a PhD in Polymeric Composite Materials (exp. Dec. 2019) from Luleå tekniska universitet (Luleå, Sweden).

The courses I attended in these programs qualify me to teach within the specializations of Polymeric Composite Materials, Computational Mechanics, Experimental Mechanics, Computational Materials Science. I have also published peer-reviewed journal articles and conference papers and given several oral presentations in international conferences and seminars on Polymeric Composite Materials and Computational Mechanics (see my full list of publications for a more detailed account).

### Pedagogic Courses

I have successfully completed the 7.5 ECTS course *Qualifying course for university teachers* at Luleå tekniska universitet (Luleå, Sweden) in February 2019.

During my stay at the École Européenne d'Ingénieurs en Génie des Matériaux (EEIGM) in Nancy, France, I also completed the following courses (in-presence or online) on Higher Education: Teaching in Higher Education (4 ECTS), Teaching Sustainability and Sustainable Development (2 ECTS), Oral Communication and Body Language in the Workplace (3.5 ECTS).

Furthermore, in 2017 I completed the *Software Carpentry Instructor Training Program* proposed by *The Carpentries* to become a Certified Workshop Instructor. *The Carpentries* is non-profit association whose aim is to teach software development and data science skills to researcher and to promote Open Science values and best practices.

## Experience of Teaching and Supervision within Higher Education

### Teaching

*Solid Mechanics, École Européenne d'Ingénieurs en Génie des Matériaux (Nancy, France), 2017, Spring Term, Bachelor's Level (2<sup>nd</sup> year)*

I was in charge of the laboratory sessions devoted to tensile testing of aluminum, strain gauge measurements and thermomechanical measurements. I was also responsible for the examination (oral exam) and grading on this part of the course.

*Mechanics of Materials I, École Européenne d'Ingénieurs en Génie des Matériaux (Nancy, France), 2017, Autumn Term, Bachelor's Level (3<sup>rd</sup> year)*

I taught tutorials to groups of 15-20 students on problems of viscoelasticity and linear elastic fracture mechanics in the form of interactive problem solving sessions. I also conducted workshops on the use of Finite Elements in materials modeling using the software Abaqus to groups of 15-20 students.

*Composite Materials, École Européenne d'Ingénieurs en Génie des Matériaux (Nancy, France), 2017, Autumn Term, Master's Level (1<sup>st</sup> year)*

I conducted workshops on the use of Finite Elements in composite materials modeling using the software Abaqus to groups of 15-20 students.

*T7020T - Composites: Design and Numerical Methods, 7.5 ECTS, Luleå tekniska universitet (Luleå, Sweden), 2018, Autumn Term, Master's Level*

I was responsible for the laboratory sessions devoted to Mode I delamination testing (Double Cantilever Beam) of composites and calculation of Uni-Directional (UD) elastic properties from experimental data.

*T7005T - Aerospace Materials, 7.5 ECTS, Luleå tekniska universitet (Luleå, Sweden), 2018 - 2019, Spring Term, Master's Level (1<sup>st</sup> year)*

The course was divided into 3 main thematic sections: fatigue, fracture and damage in fiber-reinforced composites; joining techniques for composites; advanced metallic alloys. The first part, on fatigue, fracture and damage of composites, involved laboratory sessions of which I was in charge. In the 2019 edition of the course, I also defined the research topic of the laboratory session and designed the corresponding learning activities. I also improved the virtual learning space of the course by restructuring its content and appearance. Furthermore, I helped the design of the seminar activity in the section on advanced metallic alloys.

*T7012T - Composite Materials, 7.5 ECTS, Luleå tekniska universitet (Luleå, Sweden), 2018 - 2019, Autumn and Winter Term, Master's Level (1<sup>st</sup> year)*

I was responsible for the laboratory sessions devoted to manual manufacturing of composites, mechanical testing and calculation of Uni-Directional (UD) elastic properties from experimental data.

*T7011T - Mechanics of Fiber Composites, 7.5 ECTS, Luleå tekniska universitet (Luleå, Sweden), 2019, Winter Term, Master's Level (1<sup>st</sup> year)*

I was in charge of the laboratory sessions devoted to mechanical testing of composites and calculation of Uni-Directional (UD) elastic properties from experimental data.

## **Supervision**

### Bachelor and Master's theses and project courses

*E7009T - Degree Project, Materials Technology, 30 ECTS, Luleå tekniska universitet (Luleå, Sweden) and Università di Padova (Padova, Italy), 2019, Spring Term, Master's Level (2<sup>nd</sup> year)*

I co-supervised the Master's thesis work of an exchange student from Università di Padova (Padova, Italy). I met the student for 2-3 hours every week over 4 months and supported his activity by introducing him to experimental techniques, methods of design of experiments, programming languages and data analysis strategies. The student and I met with the main supervisor at Luleå tekniska universitet once every month.

*T7009T - Project Course, Materials Science and Engineering, 30 ECTS, Luleå tekniska universitet (Luleå, Sweden), 2019, Autumn Term, Master's Level (2<sup>nd</sup> year)*

I co-supervised the Project Course work of a Master level student. I formulated the research question of the project and designed the main learning activities.

## **Pedagogic Activities: Description, Reflection and Development**

### **Development of Teaching Materials and Student Learning Resources**

*T7005T - Aerospace Materials, 7.5 ECTS, Luleå tekniska universitet (Luleå, Sweden), 2018 - 2019, Spring Term, Master's Level (1<sup>st</sup> year)*

I participated in the preparation of the hand-out, in the form of a presentation, describing the tasks of the group-based project. I worked on improving the virtual learning space of the course by organizing its content and structuring its appearance.

### **Experience of Leading, Administering and Developing Courses and Study Programs**

As part of the coursework for the 7.5 ECTS course *Qualifying course for university teachers* at Luleå tekniska universitet (Luleå, Sweden), I re-designed the 7.5 ECTS

course *T7005T - Aerospace Materials* (see attachment for more details). To this end, I proposed a new format of flipped-classroom learning for the theoretical part of the course and a more articulated management of the group-based project. The core idea of this new design is to bring passive-active (with respect to the ICAP framework), lower taxonomy level activities outside of the classroom and focus the in-class work on constructive and interactive behaviors aimed to the construction of new knowledge. As this course is propedeutic to independent research projects in the last year of studies, the new version of the course would provide a fail-safe training ground similar to the daily activity of the researcher and the engineer, who develop projects with uncertain initial boundaries and need to interact with co-workers, team leaders, customers and stakeholders.

### Development, Depth of Study, Research and Dissemination of Knowledge

I am currently preparing a contribution in the form of conference article and oral presentation, which has been accepted for the upcoming *Development Conference for Swedish Engineering Education 2019* to be held at Luleå tekniska universitet (Luleå, Sweden) in November 2019. In this contribution I present, in the form of a work in progress, a reflection on the relation between the signature pedagogy of mechanics of materials and its threshold concepts, and I further propose a revised flipped-classroom format for lectures on mechanics of materials based on the signature pedagogy. In the long-term, the goal is to be experiment this revised flipped-classroom format in a course on mechanics of materials and verify its effectiveness through students' feedback and review from peers. The results would then be amenable for publication in a peer-reviewed international journal to get feedback from the wider community of practitioners in Higher Education.

### Pedagogic Activities outside the University

I am an active member of the non-profit organization *The Carpentries*, with which I collaborate on a volunteer basis. The main objective of the organization is to teach foundational skills in software development and data analysis to researchers and academics at all levels (from students to professors) and to promote Open Science values and best practices. To achieve this goal, it offers free online tutorials on different technical topics and organizes, upon request from local institutions, in-person workshops. To this end, the organization trains its volunteer members on active learning strategies. To distinguish members who have acquired such skills, *The Carpentries* proposes a specific training path which, upon successful completion, provides the status of *Certified Instructor* and the possibility to teach in workshops. I completed the instructor training in 2017 and I am, since then, a *Certified Instructor*. In October 2018, I participated as main instructor in a Carpentry workshop offered by the High Performance Computing Center North (HPC2N) at Umeå University (Umeå, Sweden), where I taught the use of bash, bash scripting, Git and Github. In addition, I contributed to the development of the workshop lessons material, which is freely available on Github. I contributed also to a Task Force to develop recommendations on handling incidents outside the Code of Conduct of the *The Carpentries*.