

Politecnico di Milano
Department of Mechanical Engineering
Applied Mechanics Group

Proposed MSc thesis topics

(for more information please contact the underlined professor)

SPORTS

1. Development of a monitoring system for safer helmets (Prof. Braghin, Ing. Frigerio)
numerical-experimental thesis

In Europe, as in any modern mechanised society, traumatic head injury is a major cause of death and disability. To enhance the performance of today's helmets, it is of fundamental importance to assess the performances of existing helmets as well as how ageing affects these performances. The present study will focus on the development of a miniaturized monitoring device to be inserted into existing helmets without affecting the comfort of the tester. Focus is placed on ski and bicycle helmets.

2. Review of the available literature on the winter sports (Prof. Braghin)
numerical thesis

The physics and chemistry has been studied since the early 20th century from an engineering point of view. A massive literature is therefore available. The aim of this work is to carry out a thorough literature survey on this topic in order to have a complete state of the art on this topic

3. Improving ski edges for skiddest skis with high wear resistance on compact, competition snow (Prof. Braghin, Ing. Belloni)
numerical-experimental thesis

Comparative analysis (morphology, composition, structure) and testing, both lab and field, of edge steels utilized in competition skis. Design and test of innovative coatings for high performance ski edges (in cooperation with Chemical Department and Blossom ski)

4. Advanced sail tactics using CFD analysis (Prof. Fossati)
numerical thesis

Development of Computational fluid-dynamics methodologies for the assessment of sailing boat performances during Windward-leeward races. The aim of the work is the definition of the wind on the race area during some key moments of a sailing race. The output of the simulations will help skippers to make the more convenient choice during the race. Some applications are planned, using as reference class RC44 boats. The analysis will be conducted using the open-source framework OpenFOAM.

5. New Schooner Design Project: analysys of the sail-plan of a 35m boat (Prof. Fossati)
numerical thesis

The design and optimization of the sail-plan of a 35m schooner with a displacement of 300 tons will be performed using computational fluid-dynamics models. The work will first validate the numerical model against the available wind tunnel tests results, then the validated method will be used in support to the design of the sail plan. The analysis will be conducted using the open-source framework OpenFOAM. There is the possibility for experimental wind tunnel tests.

6. Small Craft Aerodynamics (Prof. Fossati)

numerical thesis

Development of computational fluid-dynamics models for the analysis of high-speed crafts, comparing the numerical results with experimental wind tunnel tests data. The aim of the work is to help develop water-tank procedures for the testing of hydro-dynamic forces on high-speed crafts and to analyse the performances and the trim of ITTC high-speed crafts and planing hulls. The analysis will be conducted using the open-source framework OpenFOAM. There is the possibility for experimental wind tunnel tests.

7. Dynamic characterization of tennis rackets and balls (Prof. Casolo)

numerical-experimental thesis.

Dynamic simulation and experimental test on a collection of tennis rackets (new and old) can help to classify their performances and comfort, taking into account the strings parameters. The same tests can also be helpful for tennis traumas prevention and for the fine tuning of the devices.

8. Analysis and tuning of lower limbs prostheses for running (Prof. Casolo)

numerical-experimental thesis.

The idea is that the dynamic and vibratory behaviour of these rather simple devices can be analysed in order to enhance their performances during a specific kind of race.

9. Performance analysis on an instrumented rowing ergometers (Ing. Cazzulani)

numerical thesis

Rowing ergometers are commonly used as indoor training facilities. The aim of this study is to investigate how athletes' performances are influenced by the various set-ups of the rowing ergometer. Tests will be carried out with the national rowing team.

10. Optimized re-design of a 3D force trap for football training (Prof. Braghin, Ing. Milani)

numerical thesis

In order to evaluate the performances of football players, as well as their health status, a dedicated lab is being built at Milanello testing facility. The aim of the thesis is re-design the already available force trap in order to improve performances, reduce costs and simplify assembly.