

**Course offered for the PhD program
in Civil, Chemical and Environmental Engineering
Curriculum in Wind Science and Engineering
A.Y. 2019/2020 (XXXV cycle)**

(possibility of participation for students in other PhD cycles or other PhD courses)

1. Title

High Impact Weather and Thunderstorm Systems

2. Course description

This course aims at introducing the students to thunderstorms and the severe weather phenomena associated with thunderstorms. Thunderstorms are the most vigorous clouds (cumulonimbus clouds) in the Earth's atmosphere and they are responsible for hail, lightning, intense rainfall, downburst winds, and tornadoes. Thunderstorm winds and tornadoes cause the major damages around the globe. For instance, according to the Munich Re insurance company, the damage inflicted by thunderstorm winds including tornadoes in the United States in 2017 resulted in \$18 billion in insured losses.

3. Course Organization

The course will cover the topics of atmospheric structure and composition, atmospheric thermodynamics with particular focus on thunderstorm development, formation and lifecycle of single- and multi-cell thunderstorms, as well as the supercells. The formation and dynamics of thunderstorm downbursts and tornadoes will be examined and discussed in terms of full scale data, numerical models, and physical wind simulations. The course will also describe the basic mechanisms of lightning and hail formation, as well as the hail suppression mechanisms. At the end of each 2-hour lecture the students will be given an assignment that is directly related to the topic covered in the lecture.

4. Lecturer

Dr. Djordje Romanic
University of Genoa, Italy
Western University, Canada
dromanica@uwo.ca

5. Duration and credits

12 hours (2.5 credits)

6. Activation mode and teaching period

The course will start on November 25th, 2019, and will be held between the last week of November and the first week of December, 2019. A 2-hour lecture per day over a span of 2 weeks will be organized. The lecturing days will be Monday, Wednesday and Friday. The lectures will be held between 14:30 h and 16:30 h local time. The minimum number of participants to activate the course is 3. Therefore, the lecturing times will be:

- Monday, November 25th, 2019 (14:30–16:30)
- Wednesday, November 27th, 2019 (14:30–16:30)

- Friday, November 29th, 2019 (14:30–16:30)
- Monday, December 2nd, 2019 (14:30–16:30)
- Wednesday, December 4th, 2019 (14:30–16:30)
- Friday, December 6th, 2019 (14:30–16:30)

7. Deadline for registration

The deadline for course enrolment applications is November 20th, 2019. Please send an e-mail to confirm your enrolment into this course to Dr. Romanic at dromanica@uwo.ca.

8. Final exam

In order to successfully complete the course, the students have to submit all the assignments and take the final oral examination. The final exam shall take place one week after the last lecture (i.e., on Friday, December 13th, 2019).

Note on assignments: The assignments will require from students to process and analyze data using a computer and a data processing software/program. The usage of MATLAB is recommended, but the students can choose any software package they prefer. All assignments shall be submitted electronically (pdf document) via e-mail to Dr. Romanic at dromanica@uwo.ca.

9. Recommended references

The lectures in this course do not strictly follow any particular textbook. References to specific textbooks and journal/conference articles will be provided in the lectures.