Course name	Numerical modeling of weather and climate						
Code	PMP263	Year of study	2.				
Course teacher	prof. dr. sc. Darko Koračin	Credits (ECTS)	5				
Associate teacher		Instruction type (number of hours)	P	S	V	T	
			30		20		
Course status	Elective	Percentage of application of e-learning	30				

COURSE DESCRIPTION

Course objective	Provide knowledge on: • Theoretical basis and practical applications of using mathematical formalism describing atmospheric dynamics and thermodynamics • Basic physics conservation laws and their representation by differential equations • Numerical solution of differential equations describing atmospheric dynamics and thermodynamics • Basic concepts of atmospheric models
Course enrolment requirements and entry competences required for the course	Requirements • Basic physics • Basic mathematics including tensor calculus
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Understanding theoretical concepts of atmospheric models Knowledge on tensor calculus Practical knowledge on numerical techniques Application of numerical schees in solving differential equations Knowledge on structure of atmospheric models
Course content broken down in detail by weekly class schedule (syllabus)	1. Basic conservation laws applied to the atmosphere 3 2. Surface forces 2 3. Stress tenzor 3 4. Navier – Stokes equation 2 5. Decomposition of basic equations of atmospheric dynamics and thermodynamics 1 6. Reynolds averaging 1 7. Equations for turbulent fluxes and the turbulence kinetic energy 3 8. Scale analysis of the basic equations 1 9. Numerical solution of the basic equations 4 10. Finite differences, finite elements, semi-lagrangian methods 2 11. Stability of numerical schemes 1 12. Chaotic behavior of atmospheric processes 1 13. Basic concepts of numerical weather prediction 2 14. Operational forecasts of weather and climate 4
Instruction format	Lectures, seminars, exercises, e-learning, homeworks
Student responsibilities	
Screening student work (name the proportion of ECTS	Classes 2 Essay and presentations 1 Final Exam 1

credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)	
Grading and evaluating student work in class and at the final exam	During each term, the student's knowledge is tested.. The final score is based on the knowledge shown during classes, essay and presentations and a final exam
Required literature (available in the library and via other media)	• Pielke, R. A., Sr., 2002: Mesoscale Meteorology Modeling. Academic Press. 676 pp. • Randall, D., 2003: An introduction to atmospheric modelling. Department of Atmospheric Science, Colorado State University 2003. Available at http://kiwi.atmos.colostate.edu/group/dave/at604.html. • Stull, R., 1988: An Introduction to Boundary Layer Meteorology. Kluwer. 666 pp.
Optional literature	• R.W. Riddaway (revised by M. Hortal): Numerical methods. Revised March 2001. • Meteorological Training Course Lecture Series. WCMWF, 2002 (Free) • E. Kalnay: Atmospheric modelling, data assimilation and predictability. Cambridge university press 2003. • S. Pal Arya (1999): Air pollution meteorology and dispersion
Quality assurance methods that ensure the acquisition of exit competences	• 1. Analysis of the acquired learning outcomes at the end of the class, compared with the work of students. 2. Monitoring the development of students in the subjects who followed the links with the success of the case 3. Other surveys of students
Other (as the proposer wishes to add)	