1. COURSE SYLLABUS OF

MODELLING METHODS FOR APPLIED PHYSICS

Accad. year 2016/17

2. PROFESSOR	Andrea Gasparella	**3. ECTS CREDITS**	
OFFICE	K0.08	**SCIENTIFIC FIELD**	ING-IND/11
E-MAIL ADDRESS	andrea.gasparella@unibz.it	**OFFICE PHONE**	0471-017200
WEB PAGE	http://www.unibz.it/en/sciencetechnology/people/StaffDetails.html?personid=30619&hstf=30619		
COURSE PAGE			

4. COURSE HOURS	**LECTURES**	30
	EXERCISES AND LABS	//
	OTHERS	

5. STUDY PROGRAMME	PhD Program Sustainable Energy and Technology	**6. MAJOR IN**	//
7. YEAR	1st	**SEMESTER**	
8. PROGRAMME STATUS	optional	**9. COURSE LANGUAGE**	English

10. DESCRIPTION	The dynamic behaviour of thermotechnical systems is strongly dependent on the thermal heat transfer and in particular on thermal heat conduction in solids in non steady state conditions. The course gives to the student the fundamentals fo Heat Transfer in unsteady state and deals with the numerical tools It proposes the analysis of the numerical techniques for solution of unsteady state of thermal conduction problemsa with application in the field of engineering and in particular of building physics. The course proposes an insight to the methods of calculation of the heat transfer and heat and mass balance within buildings. Specific examples and lab practice will enable the students to practically apply and evaluate the topics of the class lessons.
11. TEACHING FORMAT and ORGANIZA-TION	Front lesson with slides and blackboard. Practical examples at the blackboard and on the pc

12. LEARNING OUTCOMES	• Knowledge and understanding of the dynamic building simulation methods. • Knowledge of the main differences between numerical tools. • Operative skills in solving by numerical methods the heat transfer problem.
13. TOPICS	Part 1) Unsteady state heat transfer Heat transfer fundamentals. Fundamentals of conduction heat transfer. Numerical methods for non steady state thermal heat conduction. Finite difference methods for 2 and 3D problems in steady and unsteady state. Use of the electronic sheet for finite difference schemes solution. Applications example and practice to building components. Part 2) Simulation methods for complex systems: building and plant system Energy balance and thermal fluxes. Detailed and simplified methods. “Air heat balance method”. Part 3) Application of building simulation methods. Examples and practice on the building simulation. Management of the plant components simulation. Software for building simulation and dynamic simulation lab. Personal practice.
14. BASIC BIBLIOGRAPHY	Suggested Books • F. P. Incropera, D. P. DeWitt, T. L. Bergman, A. S. Lavine. Fundamentals of Heat and Mass Transfer. Wiley, 6 edition (2006) • G. Comini, S. Del Giudice and C. Nonino, Finite Element Analysis in Heat Transfer -- Basic Formulation and Linear Problems, Taylor and Francis, Washington (DC), 1994 • M. Necati Ozisik, Heat conduction, John Wiley & Sons, New York, 1980.
15. ELIGIBILITY	
16. RECOMMAN-DATIONS	
17. STUDENT ASSESSMENT	Written numerical project Evaluation based on a 30 points scale