

Semester 3
Major Energetics and Propulsion (EPROP)

Turbulence			
Course code: ATU3		ECTS Credits: 2.5	
Department	: MFA	Lectures	: 15h00
Lecturers	: J. Borée	Tutorials	: 15h00
Year of study	: 2 nd year	Laboratory sessions	:
Semester	: 3 rd semester	Project	:
Assessment method(s)	: 1 written test	Home works	:
Language of instruction	: English	Total hours	: 30h00
Type of courses	: Compulsory		

Objective: To give the students a good physical and phenomenological understanding and to introduce the strength and limitations of standard and advanced turbulence models

Prerequisites: Advanced fluid mechanics

Content of courses

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|---------------------------------------------------|------------------------------------------------|
| 1. Introduction | 5. The scales of turbulent motion |
| 2. Statistical description of the turbulent flows | 6. Free shear flows |
| 3. Mean-flow equations | 7. Wall flows |
| 4. Mean and turbulent kinetic energy budgets | 8. Modelling and simulation of turbulent flows |

Content of the classes

1. Turbulent mixing: application to the internal combustion engine
2. Statistical convergence for the measurement of a turbulent flow
3. Energy cascade and Kolmogorov hypotheses
4. Budgets of the Reynolds stresses
- 5/6. Homogeneous turbulence. Its distortions in liaison with the development of models
- 7/8. Self-preserving turbulent plane wake
- 9/10. Wall flows. Physical analysis and modelling
- 11/12. Numerical computation of a plane channel flow. On the use of law of the wall closures

Recommended reading:

- S.B. Pope, *Turbulent flows*, Cambridge University Press, 2000
P. Chassaing, *Turbulence en mécanique des fluides*, Editions Cepadues, 2000

