# UNIVERSITÀ DEGLI STUDI DI PALERMO

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| **DEPARTMENT** | Ingegneria |
| **ACADEMIC YEAR** | 2016/2017 |
| **BACHELOR'S DEGREE (BSC)** | MECHANICAL ENGINEERING |
| **SUBJECT** | AERODYNAMICS |
| **TYPE OF EDUCATIONAL ACTIVITY** | B |
| **AMBIT** | 50294-Ingegneria aerospaziale |
| **CODE** | 01129 |
| **SCIENTIFIC SECTOR(S)** | ING-IND/06 |
| **HEAD PROFESSOR(S)** | MARRETTA ROSARIO Professore Associato Univ. di PALERMO |
| **OTHER PROFESSOR(S)** | |
| **CREDITS** | 9 |
| **INDIVIDUAL STUDY (Hrs)** | 144 |
| **COURSE ACTIVITY (Hrs)** | 81 |
| **PROPAEDEUTICAL SUBJECTS** | |
| **MUTUALIZATION** | |
| **YEAR** | 2 |
| **TERM (SEMESTER)** | 2° semester |
| **ATTENDANCE** | Not mandatory |
| **EVALUATION** | Out of 30 |
| **TEACHER OFFICE HOURS** | **MARRETTA ROSARIO**<br>Monday 15:00 17:00 Proprio Ufficio<br>Wednesday 15:00 17:00 Proprio Ufficio |

**DOCENTE:** Prof. ROSARIO MARRETTA

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| **PREREQUISITES** | Fundamentals of: Math Analysis; Physics and Industrial Physics |
| **LEARNING OUTCOMES** | General theory about mechanics and study of aerodynamic fields. Vorticity and boundary layer theory.<br>Learning<br>Be able to recognize, apply, share and organize the contents for the whole aerodynamic pre-processing of a complete aircraft.<br>Synthesis<br>Be able to evaluate design variables of aerodynamic post-processing.<br>Communications<br>Be able to share and compare learning and managing in aerospace context.<br>Learning<br>Be able to acquire basic state of the art and literature. Be able to apply methods of fluid dynamic to research and development |
| **ASSESSMENT METHODS** | Speech meeting (set of 3 questions with multiple answers) 30 minutes |
| **EDUCATIONAL OBJECTIVES** | Scopes are the acknoledgement and correlation all the math-physical aspects of fluid dynamic with particular focus on actions and forces of aerodynamic field around a body in inviscid and viscid flows in sub-supersonic fields. Sweep-angled wings; propellers theories; basic info about aeroacoustics and aeroelasticity (galloping and vortex shedding) |
| **TEACHING METHODS** | Lessons, Excercises |
| **SUGGESTED BIBLIOGRAPHY** | Katz-Plotkin: Low Speed Aerodynamics, McGraw Hill; Anderson: Fundamentals of Aerodynamics, McGraw Hill; Buresti: Dispense di Fluidodinamica (fornite dal docente) |

## SYLLABUS

| Hrs | Frontal teaching |
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| 1 | Aims and scope of discipline |
| 2 | Criteria and Hypotheses |
| 1 | D'Alembert paradox and potential math process |
| 4 | Incompressible boundary layers |
| 5 | Vorticity dynamics |
| 2 | Numerical aspects and approaches for boundary layers |
| 4 | Aerodynamic forces |
| 3 | Airfoil sections characteristics and aerodynamics |
| 4 | Aerodynamic singularities and entities |
| 2 | Models and modulus of calculations |
| 4 | Supersonic aerodynamics |
| 4 | Bodies and wings in supersonic flows. |
| 3 | Compressible boundary layers (basics) |
| 1 | Vortex breakdown |
| 12 | Propellers |
| 3 | Aeroacoustics |
| 3 | Aeroelasticity |

| Hrs | Practice |
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| 10 | Calculation and evaluation with post analysis of aerodynamic bodies with and without wake. Evaluation of lift and drag |
| 20 | Complete calculation and post analysis of a wing polar; Design of a propeller and evaluation of performances; cockpit design in compressible flow. |

| Hrs | Others |
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| 2 | BEM applied on potential solutions |