

General information	
Academic subject	Nuclear fusion technologies
Degree course	Physics
Academic Year	2022-2023
European Credit Transfer and Accumulation System (ECTS)	3
Language	English
Academic calendar (starting and ending date)	1 st semester
Attendance	Yes

Professor/ Lecturer	
Name and Surname	Nicola Colonna
E-mail	Nicola.colonna@ba.infn.it
Telephone	080 5442351
Department and address	INFN – Sez. di Bari, V. Orabona 4, 70125 Bari
Virtual headquarters (Microsoft Teams code)	
Tutoring (time and day)	Friday, from 10:00 to 12:00, in room R41

Syllabus	
Learning Objectives	To provide a qualitative and quantitative understanding of the physical principles at the basis of controlled nuclear fusion, as well as a basic knowledge of the nuclear technologies involved in the energy production by nuclear fusion. The course will mostly be focused on magnetic confinement, but hints of inertial fusion will also be given. Monographic parts of the course will be devoted to negative ion sources for nuclear fusion heating by neutral beam injections, plasma-wall interaction in the tokamac, and neutron damage in structural materials.
Course prerequisites	
Contents	<ol style="list-style-type: none"> 1. Basic properties of plasmas for controlled nuclear fusion 2. Magnetic confinement of toroidal plasmas 3. Physics and technology of tokamaks 4. Plasma heating: ohmic heating, wave heating, alpha heating, neutral beam injection 5. Negative ion source for heating by neutral beam injection 6. Neutron damage in structural material of fusion reactors 7. Plasma-wall interaction 8. The ITER and DTT projects 9. Inertial fusion, the NIF project
Books and bibliography	J. Wesson: Tokamaks J. Freidberg: Plasma Physics and Fusion Energy E. Morse: Nuclear Fusion
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
31	16	15	
ECTS			
3			



Teaching strategy	

Expected learning outcomes	
Knowledge and understanding on:	<ul style="list-style-type: none"> <input type="radio"/> XXXXXXXXXXXX <input type="radio"/> XXXXXXXXXXXX <input type="radio"/> XXXX <input type="radio"/> XXXXXXXX
Applying knowledge and understanding on:	<ul style="list-style-type: none"> <input type="radio"/> XXXXXXXXXXXX <input type="radio"/> XXXXXXXXXXXX <input type="radio"/> XXXXXXXXXXXX
Soft skills	<ul style="list-style-type: none"> • Making informed judgments and choices <ul style="list-style-type: none"> <input type="radio"/> XXXXXXXX <input type="radio"/> XXXXXXXXXXXX <input type="radio"/> XXXXXXXXXXXXXX <input type="radio"/> XXXXXXXX • Communicating knowledge and understanding <ul style="list-style-type: none"> <input type="radio"/> XXXXXXXXXXXXXXXXXXXX, <input type="radio"/> XXXXXXXXXXXXXXXXXXXX • Capacities to continue learning <ul style="list-style-type: none"> <input type="radio"/> XXXXXXXX.

Assessment and feedback	
Methods of assessment	
Evaluation criteria	<ul style="list-style-type: none"> • Knowledge and understanding <ul style="list-style-type: none"> <input type="radio"/> XXXX • Applying knowledge and understanding <ul style="list-style-type: none"> <input type="radio"/> XXXXX • Autonomy of judgment <ul style="list-style-type: none"> <input type="radio"/> XXXX • Communicating knowledge and understanding <ul style="list-style-type: none"> <input type="radio"/> XXXXXXXXXXXXXXXXXXXX • Communication skills <ul style="list-style-type: none"> <input type="radio"/> XXXXXXXXXXXXXXXXXXXX • Capacities to continue learning <ul style="list-style-type: none"> <input type="radio"/>
Criteria for assessment and attribution of the final mark	Oral examination
Additional information	