

# Testi del Syllabus

Resp. Did. **CUCCAGNA SCIPIO** **Matricola: 015277**

Docente **CUCCAGNA SCIPIO, 6 CFU**

Anno offerta: **2023/2024**

Insegnamento: **527SM - DIFFERENTIAL EQUATIONS**

Corso di studio: **SM34 - MATEMATICA**

Anno regolamento: **2022**

CFU: **6**

Settore: **MAT/05**

Tipo Attività: **C - Affine/Integrativa**

Anno corso: **2**

Periodo: **Secondo Semestre**

Sede: **TRIESTE**



## Testi in italiano

**Lingua insegnamento** INGLESE

**Contenuti (Dipl.Sup.)** The course considers advanced topics in partial differential equations. After an introductory part focused on harmonic analysis, the course introduces various equations, such as Navier Stokes and nonlinear Schroedinger, and looks at the initial value problem.

This year the course will be focused on the theory of defocusing semilinear pure power Schroedinger equations and on the asymptotic behavior of their solutions

**Testi di riferimento** Cazenave, Semilinear Schroedinger Equations, AMS  
Dodson, Defocusing Nonlinear Schrödinger Equation, Cambridge Univ. Press.

**Obiettivi formativi** The purpose of the course is to introduce the students to the rigorous analytic theory of nonlinear time dependent PDE's in Euclidean space and to show the deep differences between the notion of PDE and of ODE. PDE's are intrinsically more complex and in modern Mathematical Analysis are understood and treated through the framework of Functional Analysis. In particular, students of Mathematics will see in this course various application of ideas of Functional Analysis, like the notion of weak topology, that can be fully appreciated only when applied to concrete problems. The course assumes some background in the theory of Banach spaces, Fourier transform, distributions, tempered distributions, which are taught in the master course Advanced Analysis . Interested students who don't have such a mathematical background shouldn't be discouraged to attend the course, because to get a sense of what will be taught in the course it is not necessary to have rigorous understanding but rather an intuitive grasp of such background that the lecturer can provide to these students upon request. However, to fully benefit from this course, especially in view of an autonomous elaboration of the mathematical formalism in their future research, it is necessary that the students

fill the background gaps. The course is aimed mainly to 5th year students of Mathematics. The emphasis is on depth of analysis rather than on width of material treated.

1) Knowledge and understanding

At the end of the course, after an in depth analysis of some case studies, the students will have a clear sense of how the time dependent nonlinear PDE work.

2)Applying knowledge and understanding

After the course, by proceeding by analogy, the students will be able to apply in new contexts the understanding gained in the examples discussed during the course and they will need to show this skill during the exam.

3) Making judgements

After the course, they will have a basic idea of what it means to understand a time dependent nonlinear PDE and will get a critical sense of what to look for when facing new problems

4) Communication Skills

Contingent on the communication abilities of the Instructor, the students will see how an expert of PDE's talks and thinks about them and will have a chance, during the seminar, to demonstrate their own communications skills in the subject of PDE's.

5) Learning skills

The subject of time dependent Nonlinear PDE's is large and deep and requires a long training. The course will touch only few aspects of it. The course, nonetheless, has the ambition of giving an in depth introduction to the subject, so that, at the end of the course, the students will have a clear sense on how to proceed when facing new problems.

<b>Prerequisiti</b>	Functional analysis, specifically Sobolev spaces and, broadly speaking, the topics of the 1st year courses ADVANCED ANALYSIS parts A e B.
<b>Metodi didattici</b>	The course consists of lectures during which the Instructor discusses all the details of the topics covered, answers student's questions and tries to get them involved. The students will receive before the lectures the lecture notes of the Instructor
<b>Modalità di verifica dell'apprendimento</b>	The exam consists of a student seminar of about 30 minutes on a topic arranged with the Instructor, during which the student will show whether or not is able to apply the main ideas presented during the lectures by the Instructor in specific and analogous contexts. The Instructor might ask some questions on the topics covered during the course in class.

## Obiettivi per lo sviluppo sostenibile

<b>Codice</b>	<b>Descrizione</b>
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## Testi in inglese

	English
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