UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

CONSIGLIO INTERCLASSE IN MATEMATICA

COURSE OF STUDY TWO-YEAR MASTER OF SCIENCE PROGRAMME IN MATHEMATICS

ACADEMIC YEAR 2024-2025

ACADEMIC SUBJECT METHODOLOGY AND TECHNOLOGY FOR MATHEMATICS EDUCATION 1

General information	
Programme year	Second
Term	First semester (September 23, 2024 – December 20, 2024)
European Credit Transfer and Accumulation System credits (ECTS)	7
SSD	MAT/04 – Complementary Mathematics
Language	Italian
Mode of attendance	Not mandatory

Lecturers		
Name and surname	Roberto Capone (instructor of record)	Eleonora Faggiano
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Telephone	+39 080 544 2652	+39 080 544 2668
Department and office	Department of Mathematics room 3 second floor	Department of Mathematics room 4 second floor
Virtual meeting room		
Web page	https://www.dm.uniba.it/it/members/capone	https://www.dm.uniba.it/it/members/faggiano
Office hours		

Work schedule				
	Total	Lectures	Hands-on learning	Self-study
Hours	175	56		119
ECTS credits	7	7		

Learning objectives	
	The aim of the course is to address issues related to the learning and teaching of mathematics under consideration of the main theoretical frameworks in mathematics education. Part of the course are elements of Semiotics, Linguistic Pragmatics, Sociology of Education and Educational Psychology from which the main theories used in mathematics education have their origin. The study of methods and tools for competence-based instructional design is addressed by framing current mathematics education through its historical evolution and related school legislation. Finally, instructional design through the use of technologies are addressed, including in relation to Generative Artificial Intelligence.

Course prerequisites	
	We suggest that students of master degree in Mathematics attend the

	course.

Syllabus	
Course contents	Introduction to the major theories of learning: Behaviorism, Cognitivism, Constructivism, Enactivism. Piaget, Bruner, Vygotskij. Elements of Semiotics: Pierce, Sausurre, Greimas, Sebeok, Lotman, Eco. Applications in Didactics of Mathematics: Duval's theory of semiotic representations. The theory of semiotic mediation. Radford's theory of objectification. Elements of Sociology of Education: Edgar Morìn. Elements of Linguistic Pragmatics. Theories and Research in Mathematics Didactics: Brousseau's theory of didactic situations; Chevallard's theory of didactic transposition; From didactic transposition to meta-didactic transposition. From planning to design: outlines of the history of mathematics teaching in Italy; the birth and evolution of research in mathematics education in Italy. Outlines of the history of schooling in Italy. Mathematics curricula. Changes in perspective of mathematics teaching: from teacher, to content, to student. Inclusion teaching: current regulations; individualized and personalized teaching. Technologies for mathematics teaching: use of dynamic geometry software, use of spreadsheet, moodle, dropbox, google drive, desmos, GenAI.
Reference books	Lecture notes Reading of scientific articles related to lecture topics Others recommended readings: D'Amore, B. Elementi di Didattica della Matematica, Pitagora Editrice. Edgar Morìn, The well-made head, Raffaello Cortina Editore
Additional course materials	
Repository	Students will be provided with course handouts and scientific articles

Expected learning outcomes	
Knowledge and understanding	Knowledge of the main theories of mathematics teaching and learning; historical framing of the epistemological references of mathematics topics useful for teaching; knowledge of the basics of the main theoretical lines of research in mathematics education.
Applying knowledge and understanding	Knowledge of how to design innovative educational paths according to an appropriate theoretical framework, using appropriate tools for collecting and analyzing experimental data
Soft skills	*Making judgements*: Knowing how to interpret data collected from an educational experiment according to an appropriate theoretical framework.
	Communication skills: argue mathematically and draw conclusions by formulating educational strategies in both written and oral form, including in English.
	Learning skills: Tailoring the basic knowledge of mathematics education to different educational and research contexts.

Teaching methods	
	Interactive lectures will be mixed with seminars and laboratory experiences of simulated teaching activities

Assessment

<table>
<tr><td>Assessment methods</td><td>Role Playing activities are planned during the course for formative assessment. Oral test is scheduled for summative assessment at the end of the course.</td></tr>
<tr><td>Evaluation criteria</td><td>

Knowledge and understanding: knowledge of the main theories of learning-teaching mathematics
Applying knowledge and understanding: ability to adapt an appropriate theoretical framework to a didactic phenomenon
Making judgement: know how to choose, among the theoretical frameworks studied, the most suitable one to analyze the data of a didactic activity
Communication skills: know how to choose, among the theoretical frameworks studied, the most suitable one to analyze the data of a didactic phenomenon
Learning skills: know how to adapt an appropriate theoretical framework to an educational context; know how to autonomously design a learning unit also in the light of current school regulations

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<tr><td>Grading policy</td><td>
<table>
<tr><th>A
Advanced</th><th>B
High</th><th>C
Medium</th><th>D
Beginning</th></tr>
<tr><td>The Student has a perfect command of the topics covered in teaching. Master the theoretical frameworks studied, adapting them appropriately to a didactic phenomenon. Appropriately use discipline-specific language to communicate the content studied. Will be able to use competency-based design to design educational activities, starting from the contents studied, in full autonomy and with originality</td><td>The Student is well acquainted with all the topics covered in the teaching. He/she makes appropriate use of theoretical frameworks and knows how to choose the most suitable one to interpret the data of a didactic phenomenon. It uses the specific language of the discipline to communicate the contents studied. He/she is able to prepare didactic activities, starting from the contents studied, independently and correctly.</td><td>The Student Knows the topics covered in the teaching. Use theoretical frameworks in an appropriate educational context. It uses a correct language of the discipline to communicate the contents studied. He/she is able to prepare didactic activities, starting from the contents studied, sometimes with the support of auxiliary aids</td><td>The Student He knows almost all the topics covered in teaching. He knows the theoretical frameworks but does not always know how to adapt them to an appropriate didactic phenomenon. It uses the language of the discipline to communicate the contents studied, even if with some uncertainty about the presentation. He/she is able to prepare didactic activities, starting from the contents studied, only if supported by auxiliary aids.</td></tr>
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<tr><th>Grade</th><th>TAXONOMIC correspondance</th><th>Grade of competence</th></tr>
<tr><td>A</td><td>27-30</td><td>ADVANCED</td></tr>
<tr><td>B</td><td>23-26</td><td>HIGH</td></tr>
<tr><td>C</td><td>20-22</td><td>MEDIUM</td></tr>
<tr><td>D</td><td>18 - 19</td><td>BEGINNING</td></tr>
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Further information	