

Course Title	Mathematics & Sciences in STEAM Education				
Course Code	EDE630				
Course Type	Elective				
Level	Master (2 <sup>nd</sup> Cycle)				
Year / Semester	2 <sup>nd</sup> / 3 <sup>rd</sup>				
Teacher's Name	TBA				
ECTS	10	Lectures / week	3 Hours/14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	<p>The purpose of this course is to study the current thinking and theories of learning for the development of mathematical and scientific thinking in early childhood education in the context of STEAM education. The course aims in developing the main concepts and theories of learning with emphasis on the development and study of learning environments in early childhood education. Through a comparative approach, it analyzes the commonalities and differences between theories of learning in the various versions of the nature of learning in early childhood education. At the same time, the course aims at studying the theories of learning, in order to understand the relationship between theory and research with the nature of learning in math and sciences in early childhood STEAM education.</p>				
Learning Outcomes	<p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Discuss dialectically the theoretical framework that includes all the current trends of theories of learning, math and science early childhood education, and the use of emerging digital tools as means of learning math and science early childhood STEAM education.</li> <li>• Redefine dialectically and reflectively the concept of learning in math and science early childhood education and the role of teachers as professionals and research in STEAM education.</li> <li>• explain and document the connections between creative and active learning as it appears in the literature, play and the nature of mathematical scientific knowledge and the way all these are connected to STEAM education</li> <li>• design, apply, and evaluate learning programs in math and science early childhood STEAM education following interdisciplinary approaches and epistemological and methodological issues related to science and mathematics as well as more particular fields such as astronomy, biology, biochemistry and statistics</li> <li>• Use their cognitive, reflective and critical skills to manage the theoretical knowledge and their daily practices within the context of STEAM education in science and mathematics education</li> <li>• Collect, analyse, interpret, evaluate and make use of data from the children's experiences, ideas, reactions and questions regarding phenomena of the natural and mathematical world so as to create opportunities for learning that is meaningful for the children</li> <li>• Use cognitive skills for designing, implementing, evaluating and analyzing educational practices regarding mathematics and science within STEAM education and connecting these with learning theories and contemporary research and literature</li> </ul>				
Prerequisites	None		Co-requisites	None	
Course Content	<ul style="list-style-type: none"> <li>• Current trends in Math, Science and STEAM education</li> </ul>				

	<ul style="list-style-type: none"> <li>• Theories of learning (Constructivism, Constructionism, Social Constructivism, Radical Constructivism) in Math, Science and STEM education, inquiry-based teaching and learning in STEAM education</li> <li>• The common ground between Creative/Active Learning, play and the nature of mathematical and scientific knowledge within STEAM Education</li> <li>• The role of digital tools in Math, Science and STEAM education</li> <li>• The role of representations in modeling-based teaching and learning</li> <li>• Modelling, Investigative learning and Problem solving</li> <li>• Inquiry-based teaching and conceptual understanding</li> <li>• Practices against the fragmentation of knowledge in mathematics and the natural sciences</li> <li>• The development of scientific thinking skills</li> <li>• Epistemological awareness in early childhood education and the role of mathematics and the natural sciences in social development</li> <li>• The demands of the 21<sup>st</sup> century and the main aims of STEAM Education</li> <li>• Inquiry based learning in STEAM education</li> <li>• Curriculum development in STEAM education</li> <li>• Social and communicative learning in STEAM education</li> </ul>						
Teaching Methodology	Face- to- face						
Bibliography	<p>Capraro, R. M., Capraro, M. M., &amp; Morgan, J. R. (Eds.). (2013). STEM project-based learning: An integrated science, technology, engineering, and mathematics (STEM) approach. Springer Science &amp; Business Media.</p> <p>Moomaw, S. (2013). Teaching STEM in the early years: Activities for integrating science, technology, engineering, and mathematics. St. Paul, MN: Redleaf Press.</p> <p>Counsell, S. (2016). STEM learning with young children: Inquiry teaching with ramps and pathways.</p> <p>Honey, M., Pearson, G., &amp; Schweingruber, H. A. (Eds.). (2014). STEM integration in K-12 education: Status, prospects, and an agenda for research. Washington, DC: National Academies Press..</p>						
Assessment	<table border="1"> <tr> <td>Exams</td> <td>50%</td> </tr> <tr> <td>Assignments</td> <td>40%</td> </tr> <tr> <td>Class Participation and Attendance</td> <td>10%</td> </tr> </table>	Exams	50%	Assignments	40%	Class Participation and Attendance	10%
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Language	English						