



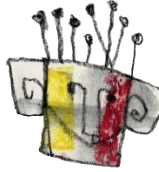
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Developing Teaching Materials for Preschool Teaching Undergraduates on  
Computational Thinking and Introduction to Coding  
[EARLYCODE] 2018-1-TR01-KA203-058832

# COMPUTATIONAL THINKING & CODING FOR CHILDREN

## COURSE CURRICULUM



early years  
the organisation for young children





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## COMPUTATIONAL THINKING & CODING FOR CHILDREN - COURSE CURRICULUM

Course Title: Computational Thinking & Coding for Children		Program: Early Childhood Education	
Course Code: ..... (Elective)	ECTS Credit: 5	Lectures: 2	Seminar: 1
Level of Study: Undergraduate		Offered Semester: 6 <sup>th</sup>	Duration: 14 weeks

### COURSE DESCRIPTION

This course is developed for Early Childhood teacher undergraduates to develop an understanding of the current needs in Computational Thinking (CT) and Coding in Early Childhood Education. Today, CT is critical in terms of empowering problem solving, critical thinking, decision-making skills, and understanding the limits of human and machine intelligence. Pupils with CT skills are better at understanding and using computer-based technologies, which are necessary for today's world and the future. Enhancing CT and knowledge in coding, encourages pupils to create and develop new products instead of just being passive technology users. The teacher's role in this process is to encourage children to recognize patterns, develop step-by-step schemas etc. using screen-based and screen-free digital technologies as well as didactic materials and simple everyday toys. This course aims to provide Early Childhood Education pre-service teachers with basic CT and coding skills and also encourage them to think of ways on how to improve children's knowledge and skills in this subject area.

### COURSE PREREQUISITES

Students should have taken basic ICT courses such as "Information Technology in Education", "Introduction to Computers" or "ICT".

Students should have taken courses related to teaching methods, instructional material development and assessment & evaluation in Early Childhood Education.

### RATIONALE

In 21<sup>st</sup> century, fostering CT and coding skills will provide children to be effective decision makers, problem solvers and developers. By this way, it will be easy for children to adapt technology-intensive learning environments in their educational lives. This course will help pre-service teachers acquire skills and knowledge to improve their digital competences and also enhance their Pedagogical-Digital Competences. Therefore, they will be able to establish technology enhanced learning environments and develop teaching materials to help students obtain CT and coding skills. The course is unique since no curricula haven't been developed so far to improve Early Childhood Education undergraduates' knowledge and skills to foster CT and coding skills of preschool children. It is also innovative as it takes into account the latest European Commission recommendations on the development of teachers' pedagogical digital competences.



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## COURSE OBJECTIVES

This course aims to provide Early Childhood Education pre-service teachers with basic CT and coding skills and encourage them to think of ways on how to improve children's knowledge and skills in this subject area.

## COURSE OUTCOMES

Upon successfully completion of this course, the student will be able to:

### Knowledge

- ✓ explain CT concept and its relevance in Early Childhood education,
- ✓ list components of CT,
- ✓ describe basic algorithms and coding process,
- ✓ provide information on Educational robotics and the ways to implement it in Early Childhood education,
- ✓ support children motivation in learning algorithmic and CT,
- ✓ apply basic rules and principles of CT and coding in Early Childhood education,
- ✓ encourage children to make meaningful collaboration with others,

### Skills

- ✓ solve simple coding tasks,
- ✓ solve tasks based on understanding algorithmic concepts and sequences,
- ✓ illustrate basic algorithms, sequences, loops, conditionals etc.,
- ✓ explain basic algorithms, sequences, loops, conditionals etc.,
- ✓ use screen-free digital devices that are developed for Early Childhood education,
- ✓ use screen-based digital devices benefiting existing app's and tools developed to acquire CT and coding skills in Early Childhood education,
- ✓ explore tools and resources for developing CT and coding in Early Childhood education,
- ✓ adapt CT teaching materials for different age groups and situations.

### Competences

- ✓ prepare lesson plans for development of CT and coding acquisition by



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- setting appropriate learning objectives and learning outcomes ,
  - choosing corresponding learning tasks and didactic materials,
  - taking into account children's ages and previous experience
- ✓ develop new screen-free didactic materials for CT and coding acquisition appropriate for children age group and previous experience as well as certain learning objectives.



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TOPICAL UNIT OUTLINE

UNIT	OBJECTIVES	CONTENT	DURATION	TEACHING METHODS (COURSE DELIVERY METHOD)	EVALUATION
<b>Unit I. Introduction to CT</b>	This unit aims to help pre-service teachers; <ol style="list-style-type: none"> <li>understand concept of CT</li> <li>explain components of CT and the relationship among them</li> <li>summarize pedagogical principles of CT</li> <li>identify relationship between CT and problem solving process</li> <li>understand what kind of learning materials can be used to develop CT</li> </ol>	<ol style="list-style-type: none"> <li>What is CT?</li> <li>History of CT</li> <li>Components of CT (Abstraction, Decomposition, Pattern Recognition, Algorithm)</li> <li>Pedagogical Bases of CT</li> <li>CT &amp; Problem Solving Process</li> <li>How to use existing teaching materials specifically to improve CT skills</li> </ol>	2 weeks (4 lectures & 2 seminars)	<ul style="list-style-type: none"> <li>Direct Instruction / Presentation</li> <li>Questioning</li> <li>Class discussion</li> </ul>	<ul style="list-style-type: none"> <li>Oral Examination</li> <li>Written examination</li> </ul>
<b>Unit II. Introduction to Coding</b>	This unit aims to help pre-service teachers; <ol style="list-style-type: none"> <li>examine algorithm concept (which is among the basic components of CT)</li> <li>create an algorithm for a given problem</li> <li>comprehend the concept of coding</li> <li>understand pedagogical strategies about how to teach children coding</li> <li>prepare unplugged coding activities for children</li> </ol>	<ol style="list-style-type: none"> <li>What is algorithm?</li> <li>Algorithm presentation techniques               <ul style="list-style-type: none"> <li>Flowchart</li> <li>Pseudo code</li> </ul> </li> <li>What is coding?</li> <li>Pedagogical strategies for teaching children coding</li> <li>Unplugged coding activities</li> </ol>	2 weeks (4 lectures & 2 seminars)	<ul style="list-style-type: none"> <li>Direct Instruction / Presentation</li> <li>Questioning</li> <li>Class discussion</li> <li>Case study</li> </ul>	<ul style="list-style-type: none"> <li>Performance Based Activity</li> <li>Problem scenario</li> <li>Written examination</li> </ul>



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<p><b>Unit III. Introduction to Educational Robotics</b></p>	<p>This unit aims to help pre-service teachers;</p> <ol style="list-style-type: none"> <li>understand the concept of educational robotics</li> <li>list different kinds of educational robots</li> <li>explain how to develop CT by using educational robotics</li> <li>illustrate robot movement principles</li> <li>make use of robot sensors</li> <li>understand pedagogical strategies about how to teach children robotics</li> </ol>	<ol style="list-style-type: none"> <li>What is educational robotics?</li> <li>Kinds of educational robots</li> <li>How to program robots</li> <li>CT &amp; educational robotics</li> <li>Robot movements and control</li> <li>Sensors for robots</li> <li>Pedagogical strategies for teaching children robotics</li> </ol>	<p>2 weeks (4 lectures &amp; 2 seminars)</p>	<ul style="list-style-type: none"> <li>Direct Instruction / Presentation</li> <li>Demonstration</li> <li>Problem-based learning</li> <li>Individual projects</li> </ul>	<ul style="list-style-type: none"> <li>Oral Examination</li> <li>Performance Based Activity</li> </ul>
<p><b>Unit IV. Screen based / free Technologies and Block-based Coding</b></p>	<p>This unit aims to help pre-service teachers;</p> <ol style="list-style-type: none"> <li>identify screen based / free technologies</li> <li>explain differences between screen based and screen free technologies for learning</li> <li>explain block-based coding</li> <li>list block-based coding platforms</li> <li>understand principles of block-based coding to be used for children</li> <li>develop learning scenarios with screen free technologies for children</li> <li>develop learning scenarios with screen based technologies for children</li> </ol>	<ol style="list-style-type: none"> <li>Screen free technologies for learning</li> <li>Screen based technologies for learning</li> <li>Block-based coding</li> <li>Block-based coding platforms</li> <li>Principles of block-based coding</li> <li>How to develop learning scenarios with screen free technologies for children</li> <li>How to develop learning scenarios with screen based technologies for children</li> </ol>	<p>2 weeks (4 lectures &amp; 2 seminars)</p>	<ul style="list-style-type: none"> <li>Case study</li> <li>Demonstration</li> <li>Problem-based learning</li> <li>Hands on activity</li> </ul>	<ul style="list-style-type: none"> <li>Performance Based Activity</li> <li>Problem scenario</li> <li>Observation / Rubric</li> </ul>



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<b>Unit V. How to Improve CT Skills of Children?</b>	<p>This unit aims to help pre-service teachers;</p> <ol style="list-style-type: none"> <li>i. develop learning scenarios to improve CT skills of children</li> <li>ii. organize learning process for children to develop CT</li> <li>iii. prepare lesson plans (activities) for children to develop CT</li> </ol>	<ol style="list-style-type: none"> <li>i. How to improve CT of children</li> <li>ii. Learning scenario creation for CT</li> <li>iii. Planning and organization of learning process to support CT</li> <li>iv. How to prepare lesson/activity plans for children to develop CT</li> </ol>	<p>2 weeks (4 lectures &amp; 2 seminars)</p>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Demonstration</li> <li>• Questioning</li> <li>• Class discussion</li> <li>• Individual projects</li> </ul>	<ul style="list-style-type: none"> <li>• Problem scenario</li> <li>• Observation / Rubric</li> <li>• Performance Based Activity</li> </ul>
<b>Unit VI. How to Improve Coding Skills of Children?</b>	<p>This unit aims to help pre-service teachers;</p> <ol style="list-style-type: none"> <li>i. develop learning scenarios to develop coding skills of children</li> <li>ii. organize learning process to develop coding skills of children</li> <li>iii. prepare lesson plans (activities) to develop coding skills of children</li> </ol>	<ol style="list-style-type: none"> <li>i. How to improve coding skills of children</li> <li>ii. Learning scenario creation for teaching coding</li> <li>iii. Planning and organization of learning process to support coding skills of children</li> <li>iv. How to prepare lesson/activity plans to develop coding skills of children</li> </ol>	<p>2 weeks (4 lectures &amp; 2 seminars)</p>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Demonstration</li> <li>• Questioning</li> <li>• Class discussion</li> <li>• Individual projects</li> </ul>	<ul style="list-style-type: none"> <li>• Problem scenario</li> <li>• Observation / Rubric</li> <li>• Performance Based Activity</li> </ul>
<b>Unit VII. Preparing Instructional Materials and Games on CT and Coding for Children</b>	<p>This unit aims to help pre-service teachers;</p> <ol style="list-style-type: none"> <li>i. explain the importance of instructional materials and games in terms of teaching CT and coding</li> <li>ii. understand the principles of game-based learning</li> <li>iii. develop materials to improve CT and coding skills of children</li> <li>iv. develop games to improve children's CT and coding skills</li> <li>v. make use of existing materials &amp; games to improve children's CT and coding skills</li> </ol>	<ol style="list-style-type: none"> <li>i. Instructional materials specifically for CT and coding</li> <li>ii. Game-based Learning</li> <li>iii. Games for improving children's CT and coding skills</li> <li>iv. How to use existing materials &amp; games to improve children's CT and coding skills</li> </ol>	<p>2 weeks (4 lectures &amp; 2 seminars)</p>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Class discussion</li> <li>• Problem-based learning</li> <li>• Hands on activity</li> <li>• Individual projects</li> </ul>	<ul style="list-style-type: none"> <li>• Performance Based Activity</li> <li>• Portfolio</li> <li>• Observation / Rubric</li> </ul>



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## ASSESSMENT MEASURES

		Percentage
Final mark (components)	Exam (Practical/Theoretical)	50%
	Portfolio	30%
	Activity during semester	20%

## RESOURCES

- Handbook of Teaching Materials
- Manual for Computational Thinking and Introduction to Coding