

## Doctor of Philosophy (Ph.D.) in Computer Sciences and Engineering

Course group	ECTS total	Course code	Course name	Course type	ECTS	Pre-requisite
Breadth area 1: Theory and Algorithms		CS 602	Cryptography and Network Security	elective	6	
		CS 603	Advanced Machine Learning	elective	6	
		CS 606	Advanced Algorithms	elective	6	
		CS 612	Nonlinear System Identification	elective	6	
		CS 613	Computational Techniques for Genomics	elective	6	
		CS 614	Advanced Analysis of Numerical Algorithms	elective	6	
Breadth area 2: Architecture, Systems, and Software		CS 615	Compilers	elective	6	
		CS 616	Advanced Topics in Operating Systems	elective	6	
		CS 617	Advanced Topics in Software Engineering	elective	6	
		CS 618	Advanced Topics in Parallel Computing	elective	6	
		CS 619	Advanced Topics in Database Systems	elective	6	
		CS 620	Advanced Topics in Computer Architecture	elective	6	
		CS 621	Advanced Topics in Computer Networks	elective	6	
Breadth area 3: Applications		CS 601	Advanced Computer Vision	elective	6	
		CS 604	Data Mining	elective	6	
		CS 605	Wavelet and Applications	elective	6	
		CS 607	Fuzzy Logic with Applications	elective	6	
		CS 608	Social and Information Network Analysis	elective	6	
		CS 609	Neural Networks	elective	6	
		CS 610	Genetic Algorithms for Engineers and Scientists	elective	6	
		CS 611	Support Vector Machines	elective	6	
		CS 622	Advanced Methods in Artificial Intelligence	elective	6	
		CS 623	Advanced Pattern Recognition	elective	6	
		CS 624	Intelligent Robotics Systems	elective	6	
		CS 625	Information Retrieval and Web Search	elective	6	
		CS 626	Advanced Computer Graphics	elective	6	
		CS 627	Multimedia Software Systems	elective	6	
		CS 628	Advanced Social Network Analysis	elective	6	
		CS 629	Advanced Computer and Network Security	elective	6	
CS 630	Advanced Topics in Internet Programming	elective	6			
General course		CS 600	Quantitative Methods of Scientific Research	elective	6	
PhD Thesis		CS790	PhD Thesis	required	120	
<b>total</b>						
<b>Graduate Studies: summary of conditions for successful completion of studies</b>						
Category	ECTS	Note:				

Courses	48	<p>PhD candidates must earn 180 ECTS points in the following way:</p> <ol style="list-style-type: none"> <li>1. complete courses that have a minimum 48 ECTS credits in total</li> <li>2. scientific activities that have a minimum 12 ECTS credits, and</li> <li>3. defence of the PhD thesis, which totals 120 ECTS credits.</li> </ol> <p>Students of the PhD program are required to complete 48 ECTS credits of coursework. At most 12 ECTS coursework credits (corresponding to 2 courses) can be applied from master level CSE courses, with previous approval decision of the program coordinator, provided that the student in question did not take those courses at the master level.</p>
Scientific Activity (Research Seminar)	12	<p>Students are also allowed to apply 6 ECTS (1 course) from other related PhD programs, with the approval decision of the program coordinator.</p> <p>The student must complete at least one course in each of 3 different breadth areas:</p> <ul style="list-style-type: none"> <li>• Breadth area 1: Theory and Algorithms</li> <li>• Breadth area 2: Architecture, Systems, and Software</li> <li>• Breadth area 3: Applications</li> </ul>
PhD thesis	120	<p><b>Scientific activities</b></p> <ul style="list-style-type: none"> <li>• 12 ECTS credits intended for the scientific activities can be obtained by any of the following means:</li> <li>• 6 ECTS – scientific paper published in the IEEE/ACM conference proceedings</li> <li>• 12 ECTS – scientific paper published/accepted in the journal listed in the Science Citation Index Expanded database</li> </ul> <p>In above mentioned scientific papers, the student must be counted as the first author.</p>
Total	180	<p><b>PhD thesis</b></p> <p>Before scheduling the defence of the PhD thesis, third cycle students are obliged to publish (or at least have their paper accepted) their main findings from a doctoral dissertation in a journal listed in the Science Citation Index Expanded database or in the IEEE/ACM conference proceedings where the rate of acceptance of papers in the last two years (the last two conferences) was below 35%.</p> <p>Detailed procedures for writing and defence of the thesis are proscribed in Study Rules of the Third Study Cycle at IUS.</p>

