

COURSE INFORMATION					
Course Title	Code	Semester	L+P Hour	Credits	ECTS
ADVANCED PROBABILITY FOR DISCRETE SYSTEMS	CSE 505	1	3 + 0	3	10

<b>Prerequisites</b>	
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<b>Language of Instruction</b>	English
<b>Course Level</b>	Graduate (Second/Cycle Programmes)
<b>Course Type</b>	Compulsory
<b>Course Coordinator</b>	
<b>Instructors</b>	Prof.Dr. Adnan Kavak
<b>Assistants</b>	
<b>Goals</b>	The goal of this course is to cover the advanced topics at the core of probability theory and its application to discrete systems. The focus is given to classical limit theorems in probability, methods in probabilistic analysis, and applications to random walks, random graphs, Martingales, and Markov Chains.
<b>Content</b>	Probability Theory, Discrete and Continuous Random Variables, Expectation and Variance, Laws of Large Numbers and Convergence of Random Variables, Central Limit Theorem and Characteristic Functions, Martingales and Conditional Expectation, Markov Chains

Learning Outcomes	Program Outcomes	Teaching Methods	Assessment Methods
1. Knows Discrete and Random Variables, classical probability theory	3	1,2,	A,C
2. Knows advanced probability theories	3	1,2	A,C
3. Can apply probability theory to computer science and engineering problems	3	1,2	A,C

<b>Teaching Methods:</b>	1: Lecture, 2: Question-Answer, 3: Project
<b>Assessment Methods:</b>	A: Testing, B: Presentation, C: Homework, D: Term Project

COURSE CONTENT		
Week	Topics	Study Materials
1	Introduction and Basics	
2	Probability Spaces and Measures	
3	Discrete Random Variables	
4	Continuous Random Variables	
5	Expectation and Variance of Random Variables	
6	Midterm I	
7	Laws of Large Numbers	
8	Central Limit Theorem	
9	Martingales and Conditional Expectation	
10	Midterm II	
11	Markov Chains	
12	Case Studies	
13	Case Studies	
14	Case Studies	

RECOMMENDED SOURCES	
<b>Textbook</b>	Probability and Random Processes, Grimmett and Stirzaker
<b>Additional Resources</b>	

MATERIAL SHARING	
<b>Documents</b>	
<b>Assignments</b>	
<b>Exams</b>	

ASSESSMENT		
IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	2	70

Assignment	5	30
<b>Total</b>		<b>100</b>
<b>CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE</b>		40
<b>CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE</b>		60
<b>Total</b>		<b>100</b>

<b>COURSE CATEGORY</b>	Expertise/Field Courses
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<b>COURSE'S CONTRIBUTION TO PROGRAM</b>						
No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Knowledge on advanced computer architectures					
2	Knowledge on advanced computer system design issues					
3	Knowledge on theory of computer science					X
4	Ability to read, understand, present and critique research work from the literature.					
5	Knowledge on advanced telecommunications and next generation computer networks					

<b>ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION</b>			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	3	42
Mid-terms	2	30	60
Homework	5	10	50
Final examination	1	60	60
<b>Total Work Load</b>			254
<b>Total Work Load / 25 (h)</b>			10,1
<b>ECTS Credit of the Course</b>			10