



SULEYMAN DEMIREL UNIVERSITY

2018 - 2019 **ACADEMIC YEAR**

SYLLABUS

Course Instructor: Nurlan Ismailov
Date: 1/22/2019 6:46:16 PM
Email: nurlan.ismailov@sdu.edu.kz
Phone no.: 434 Office no.: 308

	Days	Time of office hour	Place of office hour
1	Tuesday	11:00-12:50	308
2	Thursday	11:00-12:50	308
3	Friday	11:00-12:50	308

Time and place of lessons Please follow up the schedule of the classes

1. Course information

Course Code: MAT 362 Class: 3 Term: Spring
Course Title: Topics in combinatorics Status: Elective
Credit no.: 3 Laboratory/Studio: 0 Language of Instruction: English
ECTS: 5 Practical/Seminar: 1 Level: Bachelor
Lecture: 2 Total hours: 45 Form of Education: On campus

2. Short description of the course

The course includes topics such as principles of enumerative combinatorics such as counting principles, multisets, combinations, combinatorial statistics and relations between them, avoidance, partitions, Stirling numbers, Foata bijection, Rota's twelvefold ways, formal power series, compositional formulas and trees.



3.a Pre-requisites (fill in if applicable)

**Including the list of topics that student must know to gain the understanding of the course*

	Course Code	Course Title
1	MAT 107	Linear Algebra
2	MAT 108	Algebra
3	MAT 156	Discrete Mathematics
4	MAT 207	Abstract Algebra

Additional topics, paragraph, laws, etc.

3b. Post-requisites (fill in if applicable)

**Including the list of topics that student must learn after completion of the course to gain competence*

	Course Title
1	MAT 416 Enumerative combinatorics
2	MAT 417 Contemporary Algebra
3	MAT 425 Galois Theory

3c. Co-requisites (fill in if applicable)

	Course Title

4. Course Objectives (or Learning Outcomes)

	The student should know
1	School mathematics
2	mathematical reasoning
3	algorithmic thinking

	The student must be able to do
1	solving combinatorial problems
2	combinatorial analysis

5. Teaching Methods (Learning Activities)

Since we consider a lot of combinatorial objects which are usually discrete in our course, we pay attention to a lot of examples and try to understand main theorems by doing a lot of calculations. After that we can easily have proofs of theorems.

6. Curriculum Plan (or Course Content or Weekly Distribution of Themes)

WEEK	DETAILED TOPICS			
1	Introduction to Enumerative Combinatorics: Enumerative Combinatorics is about counting. Types of counting.	[1] Ch1. Pages 9-23.		
2	Two basic counting principles. Multiplication and addition principles. Compositions. Multisets.	[1] Ch1. Pages 22-28.		
3	Multisets, Multisets and Combinatorial identities.	[1] Ch1. Pages 29-37.		
4	Permutations statistics. Cycles. Stirling numbers of first kind. The fundamental bijection. Records. Inversions.	[1] Ch1. Pages 38-47.		
5	Descents. Eulerian numbers. Excedence. Major index. Foato bijection.	[1] Ch1. Pages 48-53.		
6	Pattern Avoidance. Avoidance. Catalan numbers. Dyck paths.	[1] Ch1. Pages 54-55.		
7	Tree representations of permutations. Tree representations of permutations. q-binomials.	[1] Ch1. Pages 56-57.		
8	Partitions. Partitions. Number of partitions of different types. Euler's pentagonal number theorem	[1] Ch1. Pages 62-67.		
9	Formal power series. Formal power series. Set partitions. q-binomial coefficients.	[1] Ch1. Pages 57-61. [1] Ch1. Pages 68-78.		
10	Balls into boxes. Stirling number of the 3rd kind. Rota's twelvefold ways.	[1] Ch1. Pages 79-88.		
11	Formal power series. Combinatorial meaning of operations on ordinary generating functions. Operations over them.	[1] Ch1. Pages 89-100.		
12	The symbolic methods for labelled structures. Main definitions and properties.	[3] Sec 5.1, 5.2		
13	Compositional formulas. Compositional formulas. Derivatives. Rooted structures.	[3] Sec 5.3		
14	Trees. Rooted trees. Lagrange inversion formula. Parking functions.	[3] Sec 5.3		
15	Trees. Counting spanning trees. Matrix-Tree Theorem. Eulerian walks.	[3] Sec 5.6		

7. Recommended Resources

7a. Main Textbook(s)

	Author	Year	Title	Publisher
1	Richard Stanley	2011	Enumerative Combinatorics vol 1	Cambridge University Press
2	Richard Stanley	2009	Bijjective Proofs Problems	preprint
3	Richard Stanley	1999	Enumerative combinatorics vol.2	Cambridge University Press

7b. Additional Resources

	Author	Year	Title	Publisher
1	R. Sedgweic and Ph. Flajolet	2011	Analytic Combinatorics	Cambridge University Press
2	Miklos Bona	2015	Handbook of Enumerative Combinatorics	Chapman and Hall/CRC

7c. Online Sources

	Online learning materials
1	http://math.sfsu.edu/federico/Clase/EC/texts.html
2	https://www.youtube.com/playlist?list=PL-XzhVrXIVe
3	https://oeis.org

8. Grading Policy (or Assessment Criteria)

8a. University's normative rules regarding the assessment policies. These norms set the boundary conditions for all instructors of university

Look in a guideline

8b. Instructors assessment criteria

Mid-term 1

	Type of assignment	Description	Number of points (total score / 30)
1	Midterm	10 problems for 2 hours	30

Mid-term 2

	Type of assignment	Description	Number of points (total score / 30)
1	Pre-Final	10 problems for 2 hours	30

Final exam




	Type of assignment	Description	Number of points (total score / 40)
1	Final	8 problems for 90 minutes	40

8c. Proposed system of assessment by MES RK

Баға			
Пайызбен	Өріппен	Балмен	Дәстүрлі жүйемен
95 - 100	A	4	Өте жақсы
90 - 94	A-	3.67	
85 - 89	B+	3.33	
80 - 84	B	3	Жақсы
75 - 79	B-	2.67	
70 - 74	C+	2.33	
65 - 69	C	2	Қанағаттанарлық
60 - 64	C-	1.67	
55 - 59	D+	1.33	
50 - 54	D	1	
0 - 49	F	0	Қанағаттанарлықсыз
0 - 49	FC	0	

9. Other Policies

Try to not to miss lessons. Do not cheat at midterm, pre-final and final exams.

	User	Action	Date
	Nurlan Ismailov	Create	1/22/2019 6:46:16 PM
	Madina Alimanova	Approve	2/3/2019 1:33:43 AM
	Meirambek Zhaparov	Approve	2/5/2019 10:08:23 AM