Algebra

Basic course information	
Academic unit:	FSHMN, Department of Mathematics
Title of the course:	Algebra
Level:	Master
Course Status:	O
Year of studies:	I
Number of hours per week:	3+3
ECTS:	8
Time/location:	Department of Mathematics
Course Instructor:	Qëndrim Gashi
Contact Details:	qendrim.gashi@uni-pr.edu
Course Description:	In this course we study groups, including Sylow theorems, then rings and ideal theory, and lastly fields, terminating with the Fundamental theorem of Galois theory.
Course Goals:	The aim of the course is for the students to get introduced to the algebraic structures of groups, rings and fields, as well as some of their fundamental properties, and for them to use these notions and abstract thinking in further studies or in applications outside mathematics.
Expected outcomes:	After completing this course the students will be able to: • Identify, explain, use and analyze groups, rings and fields. • Analyze some of the basic properties of solvable groups, p-groups and Sylow theorems. • Define and prove basic propositions in rings, ideals and factor-rings. • Use the notions of field, field extension, polynomial factorization and extension field, automorphisms of fields and the fundamental theorem of Galois. • Apply outside mathematics the said notions and use independently scientific literature for independent study and scientific research.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	3	15	45
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	3	2	6
Homework	2	15	30
Self-study	3	15	45

Final exam preparation	11	1	11
Time spent in exams (tests, quizzes, final exam)	3	1	3
Projects, presentations, etc.	1	15	15
Total			**200**
Teaching methodology:	Lectures, discussions, exercises, office hours, homework, midterms, exams.		
Assessment methods:	Attendance (5%) Homework (10%) Midterm 1 (15%) Midterm 2 (15%) Project (15%) Final exam (40%)		
Literature	E. Ademaj dhe E. Gashi, Algjebra e Përgjithshme, Prishtinë (1986); D. S. Dummit and R. M. Foote, Abstract Algebra, Wiley (2004); J. B. Fraleigh, A First Course in Abstract Algebra, Pearson (2013)		

Detailed teaching plan:

Week	**Lecture**
1	Introduction. Groups.
2	Subgroups
3	Factor-groups and homomorphisms
4	Isomorphism theorems
5	Group actions
6	Direct products
7	p-groups, nilpotent groups and solvable groups
8	Sylow Theorems
9	Introduction to ring theory
10	Ideals in rings and factor-rings
11	Polynomial rings
12	Introduction to module theory
13	Elements of field theory
14	Elements of field theory (continued)
15	Fundamental theorem of Galois theory

Academic policies and rules of comportment:

Students should be punctual and attend all lectures, exercise sessions and exams. Students are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they write down the names of the colleagues with whom they have discussed the homework and/or resources used.

Course title: Artificial Intelligence

Course Basic Information	
Academic Unit:	Faculty of Mathematical and Natural Sciences (FMNS)
Course title:	Artificial Intelligence
Level:	Master (Mathematics with applications)
Course Status:	Elective
Year of Study:	First Year / Second Semester
Number of Classes per Week:	2+2
ECTS Credits:	6
Time /Location:	N/A, Department of Mathematics, FMNS
Teacher:	Dr. Eliot Bytyçi
Contact Details:	eliot.bytyci@uni-pr.edu
Course Description:	Students amongst other, in this subject will learn: introduction to Artificial Intelligence, intelligent agents, solving problems by search, search strategies, heuristic functions, genetic algorithms, constraint satisfaction problems, logical agents, knowledge representation, learning from examples, natural language processing. **Prerequisites:** Programming and algorithms, Data structures
Course Goals:	The course is intended primarily for students to understand and use notions and basic techniques of artificial intelligence, as well as its application to concrete problems.
Expected Learning Outcomes:	On successful completion of the course, students are capable of: - gain basic knowledge of general algorithms on artificial intelligence; - identify types of artificial intelligence problems; - formulate personally problems of artificial intelligence; - compare different versions of problems and apply them; - evaluate and compare the performance of various artificial intelligence algorithms.

Student Workload (should be in compliance with student's Learning Outcomes)			
Activity	**Hours**	**Day/ Week**	**Total**
Lectures	2	15	30
Theory/ Lab Work/Exercises	2	15	30
Practical Work	-	-	-
Consultations with the teacher	1	15	15
Field Work	-	-	-
Test, seminar paper	15	1	15

Homework	2	10	20
Self-study (library or home)	2	15	30
Preparation for final exam	15	1	15
Assessment time (test, quiz, final exam)	4	1	4
Projects, presentations, assignments, etc.	1	1	1
Total			**160**

Teaching Methods:	Lectures, lab work and individual work in projects/assignments/seminars.
Assessment Methods:	Quizzes in classroom: 10% Assignment/Project 1: 10% Assignment/Project 2: 10% Periodic exam: 20% Final exam: 50%
Primary Literature:	Russell Stuart and Peter Norvig, Artificial intelligence: A modern approach, Prentice hall (latest edition).
Additional Literature:	P. Joshi, Artificial Intelligence with Python. Packt, 2017 Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann (latest edition)

Designed teaching plan

Week	**Title of the Lecture**
Week 1:	Lecture: Introduction to Course / Syllabus Review Readings: Course Syllabus
Week 2:	Lecture: Introduction, history and foundations of artificial intelligence Readings: Primary literature, Chapter 1 Seminars/Assignments: Seminar Paper Out
Week 3:	Lecture: Agents and environment Readings: Primary literature, Chapter 2
Week 4:	Lecture: Solving problems by searching Readings: Primary literature, Chapter 3.1-3.3
Week 5	Lecture: Search strategies Readings: Primary literature, Chapter 3.4 - 3.5
Week 6:	Lecture: Local search algorithms Readings: Primary literature, Chapter 4.1 Seminars/Assignments: Presentation of first projects
Week 7:	Lecture: Optimization problems – genetic algorithm Readings: Additional literature 1, Chapter 8
Week 8:	Lecture: Constraint satisfaction problems Readings: Primary literature, Chapter 6
Week 9:	Lecture: Periodic exam
Week 10:	Lecture: Logical agents Readings: Primary literature, Chapter 7
Week 11:	Lecture: First order logic Readings: Primary literature, Chapter 8

***Week 12*:**	Lecture: Introduction to regression and classification Readings: Primary literature, Chapters 18.6 Readings: Additional literature 1, Chapter 2
***Week 13*:**	Lecture: Artificial neural networks Readings: Primary literature, Chapter 18.7
***Week 14*:**	Lecture: Learning with complete data Readings: Primary literature, Chapter 20.2
***Week 15*:**	Lecture: Natural language processing Readings: Primary literature, Chapter 22 Seminars/Assignments: Presentation of second projects

Academic Policies and Code of Conduct

Students should attend lectures, exercises and exams regularly and on time. They should contribute to a constructive learning process and follow the instructor's instructions. Students are encouraged to come to consultations. Homework should be written individually, but students are encouraged to talk to colleagues about assignments provided the names of colleagues with whom they are discussed and / or the resources used are noted. Academic dishonesty will be punished according University regulations. Attendance of lectures and laboratory exercises is mandatory.

Chapters from Combinatorics

Basic subject data	
Academic Unit	FMNS
Title of subject:	Chapters from Combinatorics
Level:	Master
Status of the subject:	Elective
Study year:	II
Number of hours per week:	2+2
Value on credits – ECTS:	6 ECTS
Time/Location:	
Professor of subject:	Armend Shabani
Contact details:	armend.shabani@uni-pr.edu
Description of the subject	The course covers some methods of combinatorics, elaborated in different chapters. Among others, the 'sieve' methods, the principle of involution and the method of determinants for counting the paths in the network will be included. Various aspects of partially ordered set theory will be examined, for example lattice theory, Möbius inversion in partially ordered sets, and connections to topology. Counting through symmetric and quasi-symmetric functions and connections to representation theory will be explained.
Goals of the subject:	In order to solve numerous problems involving combinatorial structures, such as permutations, words, compositions, set decompositions, partially ordered sets, symmetric functions, etc., the course aims to familiarize students with advanced combinatorial methods.
Expected results:	After successful completion of this course students should be able to: - Define and prove the properties of standard combinatorial objects and number sequences. - To reformulate and thus solve combinatorics problems through standard combinatorics objects. - To make calculations and prove the properties of formal power series. - To build and solve recurrent relations, generating functions and explicit expressions for combinatorially defined strings. - Use Mobius inversion, inclusion-exclusion principle and sieve methods to solve counting problems.

	- To determine and prove the properties of partially ordered communities - Solve counting problems by counting symmetric and quasi-symmetric functions.

Contribution in the student load (something that should correspond with the results of student learning)			
Activity	Hour	Day/Week	In total
Lectures	2	15	30
Theoretical exercises / laboratory	2	15	30
Tutorial			
Kontacts with teacher / consultations	1	15	15
Field Exercises			
Colloquiums, seminars	2	2	4
Homework	2	15	30
Self study time student (at the library or at home)	1	15	15
Preparation for final exam	1	15	30
Time spent on assessment (test, quiz, final exam)	2	2	4
Projects, presentations, etc.	2	1	2
Total			**160**

Methodology of teaching:	Lectures, exercises, individual work in projects/assignments/seminars.
Evaluation Methods:	Seminar: 20%, Assignment/Individual projects 20%: First assessment: 30% Second assessment: 30%
Literature	
Literature:	[1] Bruce Sagan, Combinatorics: The Art of Counting, AMS 2021. [2] Ö. Eğecioğlu, A. M. Garsia, Lessons in Enumerative Combinatorics, Springer, 2021 [3] M. Aigner, A course in Enumeration, 2007
Additional literature:	[4] S. Heubach, T. Mansour, Combinatorics of Compositions and Words, CRC Press, 2010 [5] M. Bóna, Combinatorics of Permutations, CRC Press, 2012

The lesson plan designed:	
Week	Lecture to be held

First week:	Basic counting – part I
Second week:	Basic counting – part II
Third week:	Counting with signs – part I
Forth week:	Counting with signs – part II
Fifth week:	Counting with generating functions – part I
Sixth week:	Counting with generating functions – part II
Seventh week:	Midterm exam
Eighth week	Counting with exponential generating functions
Ninth week:	Counting with partially ordered sets – part I
Tenth week:	Counting with partially ordered sets – part II
Week Eleven:	Counting with symmetric functions – part I
Week Twelve:	Counting with symmetric functions – part II
Week thirteen:	Counting with quasisymmetric functions – part I
Week Fourteen:	Students presentations
Week Fifteen:	Second exam

Academic policies and rules of conduct:
Students should be punctual and attend all lectures, exercise sessions and exams. They should contribute to a constructive teaching process and should follow the instructions of the instructor. Students are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they write down the names of the colleagues with whom they have discussed homework and/or resources used. Academic dishonesty will be penalized severely.

Chapters from Representation Theory

Basic course information	
Academic unit:	FSHMN, Department of Mathematics
Title of the course:	Chapters from Representation Theory
Level:	Master
Course Status:	Elective
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time/location:	Department of Mathematics
Course Instructor:	Qëndrim Gashi
Contact Details:	qendrim.gashi@uni-pr.edu
Course Description:	This course gives an overview of the basic theory of representations of groups, Lie algebras and associative algebras, as well as some applications of this theory in other fields of mathematics (number theory, algebraic geometry, combinatorics, etc.) and outside mathematics (theoretical physics, quantum mechanics, etc.).
Course Goals:	The aim of this course is for students to understand some fundamental results in the representation theory of groups, Lie algebras and associative algebras, and to use them in their further studies as well as in applications outside mathematics.
Expected outcomes:	By the end of the course, students are expected to: • Use and prove important results on quivers, Lie algebras, representations of finite dimensional algebras, characters; • Use theorems of Jordan-Holder, Krull-Schmidt, Maschke and Burnside, as well as Frobenius reciprocity; • Understand quiver representations, Gabriel's theorem and elements of category theory; • Apply outside mathematics the said notions and use independently scientific literature for independent study and scientific research.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	3	2	6

Homework	2	15	30
Self-study	1	15	15
Final exam preparation	6	1	6
Time spent in exams (tests, quizzes, final exam)	3	1	3
Projects, presentations, etc.	1	15	15
Total			**150**

Teaching methodology:	Lectures, discussions, exercises, office hours, homework, midterms, exams.
Assessment methods:	Attendance (5%) Homework (10%) Midterm 1 (15%) Midterm 2 (15%) Project (15%) Final exam (40%)
Literature:	Pavel Etingoff et al., Introduction to Representation Theory, AMS (2011). W. Fulton and J. Harris, Representation Theory: A First Course, Springer (1991). Jean-Pierre Serre, Linear Representations of Finite Groups, Springer (1977).

Detailed teaching plan:

Week	**Lecture**
1	Algebras. Representations. Quivers.
2	Lie algebras. Tensor products.
3	Representations of sl_2.
4	Finite-dimensional algebra representations. Characters.
5	Jordan-Holder and Krull-Schmidt theorems. Representations of tensor products.
6	Finite group representations: basic results. Maschke's Theorem.
7	Burnside's Theorem.
8	Frobenius reciprocity
9	Representations of S_n.
10	Schur-Weyl duality
11	Representations of GL_2(F_q).
12	Quiver representations
13	Gabriel Theorem
14	Some Category Theory: representable, adjoint, abelian and exact functors.
15	Structure of finite-dimensional algebras.

Academic policies and rules of comportment:

Students should be punctual and attend all lectures, exercise sessions and exams. Students are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they write down the names of the colleagues with whom they have discussed the homework and/or resources used.

Course title: Data analysis

Course Basic Information	
Academic Unit:	Faculty of Mathematical and Natural Sciences (FMNS)
Course title:	Data analysis
Level:	MSc
Course Status:	Mandatory
Year of Study:	First Year / Second Semester
Number of Classes per Week:	2+2
ECTS Credits:	6
Time /Location:	N/A, Department of Mathematics, FMNS
Teacher:	Dr. Ermir Rogova
Contact Details:	ermir.rogova@uni-pr.edu
Course Description:	The course consists of five main parts, starting with data pre-processing, which takes most of the time during data analysis, then continues with visualization, predictive models, associative data analysis, data clustering and anomaly detection. **Prerequisites:** Programming and algorithms, data structures
Course Goals:	Familiarize students with the basic concepts and algorithms assigned to each major part of the course, thus giving them the ability to apply models of data analysis to real problems.
Expected Learning Outcomes:	On successful completion of the course, students are capable of: - manipulate data used for analysis; - understand predictive models and their algorithms; - find the links between the data and the use of their algorithms; - group data based on common characteristics; - detect the occurrence of anomalies and - visualize the results of all the mentioned techniques.

Student Workload (should be in compliance with student's Learning Outcomes)			
Activity	**Hours**	**Day/ Week**	**Total**
Lectures	2	15	30
Theory/ Lab Work/Exercises	2	15	30
Practical Work	-	-	-
Consultations with the teacher	1	15	15
Field Work	-	-	-
Test, seminar paper	15	1	15

Homework	2	10	20
Self-study (library or home)	2	15	30
Preparation for final exam	15	1	15
Assessment time (test, quiz, final exam)	4	1	4
Projects, presentations, assignments, etc.	1	1	1
Total			**160**

Teaching Methods:	Lectures, lab work and individual work in projects/assignments/seminars.
Assessment Methods:	Quizzes in classroom: 10% Assignment/Project 1: 10% Assignment/Project 2: 10% Periodic exam: 20% Final exam: 50%
Primary Literature:	P. Tan, M. Steinbach, A. Karpatne, Y. Kumar, Introduction to data mining (2nd edition), Pearson 2018
Additional Literature:	J. Han, Data mining: Concepts and techniques, Morgan Kaufman, 2012

Designed teaching plan

Week	Title of the Lecture
Week 1:	Lecture: Introduction to Course / Syllabus Review Readings: Course Syllabus
Week 2:	Lecture: Introduction, history and fundamentals of data analysis Readings: Primary literature, Chapter 1 Seminars/Assignments: Seminar Paper Out
***Week 3*:**	Lecture: Know your data Readings: Additional literature, Chapter 2
Week 4:	Lecture: Data preprocessing Readings: Additional literature, Chapter 3
Week 5	Lecture: Classification – elementary techniques Readings: Primary literature, Chapter 3
Week 6:	Lecture: Classification – alternative techniques Readings: Primary literature, Chapter 4 Seminars/Assignments: Presentation of first projects
***Week 7*:**	Lecture: Classification – alternative techniques Readings: Primary literature, Chapter 4
Week 8:	Lecture: Classification – alternative techniques Readings: Primary literature, Chapter 4
Week 9:	Lecture: Periodic exam
Week 10:	Lecture: Association analysis – elementary concepts Readings: Primary literature, Chapter 5
Week 11:	Lecture: Association analysis – elementary concepts Readings: Primary literature, Chapter 5
***Week 12*:**	Lecture: Cluster analysis – elementary concepts Readings: Primary literature, Chapter 7
***Week 13*:**	Lecture: Cluster analysis – elementary concepts

	Readings: Primary literature, Chapter 7
Week 14:	Lecture: Anomaly detection Readings: Primary literature, Chapter 9
Week 15:	Lecture: Trends and research frontiers Readings: Additional literature, Chapter 13 Seminars/Assignments: Presentation of second projects

Academic Policies and Code of Conduct
Students should attend lectures, exercises and exams regularly and on time. They should contribute to a constructive learning process and follow the instructor's instructions. Students are encouraged to come to consultations. Homework should be written individually, but students are encouraged to talk to colleagues about assignments provided the names of colleagues with whom they are discussed and / or the resources used are noted. Academic dishonesty will be punished according University regulations. Attendance of lectures and laboratory exercises is mandatory.

Econometrics

Basic course information	
Academic unit:	FMNS, Department of Mathematics
Title of the course:	Econometrics
Level:	Master
Course Status:	Elective
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time/location:	Departament of Mathematics
Course Instructor:	Prof. Ass. Dr. Edmond Aliaga
Contact Details:	edmond.aliaga@uni-pr.edu
Course description:	Diagnostics and alternative regression methods. Resistant and quantile regression. Diagnostic tests and robust standard error tests. ANOVA - one and two way tests (with and without replication). Generalized linear models. Time series. Classical model-based analysis. Time series regression. Self analysis programming – different simulations.
Course Goals:	This course is intended for students to reinforce and advance the knowledge gained from the course of Statistics and Econometrics during their Bachelor's studies. Also, they will gain new knowledge related to different types of regressions which they will apply practically through the R programming language. The use and implementation of different packages within R that are at the service of processing and statistical analyses, will be one of the priorities within this course.
Expected outcomes:	After completing this course the students will be able to: ➢ understands the importance of a proper connection between econometric analysis and theory; ➢ begins to explore extensions of the classic general linear regression model; ➢ acquires the basics of the classical general linear regression model; ➢ further strengthen skills in the use of statistical/econometric software; ➢ makes relevant connections between theory and real-world examples, through references to various materials.

Student workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work	10	2	20
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	2	4
Homework			
Self-study			35
Final exam preparation	10	1	10
Time spent in exams (tests, quizzes, final exam)	2	3	6
Projects, presentations, etc.	2	2	4
Total			**154**

Teaching methodology:	Lecture, consultations, discussions.
Assessment methods:	Seminar work 60% Final exam: 40% **Total: 100%**
Literature	
Principal resource:	• Kleiber, Christian and Zeileis Achim. (2008), “Applied Econometrics with R”, Springer • Verbeek, M. (2017). A Guide to Modern Econometrics (Vol. 5th edition). Hoboken, NJ: Wiley.
Additional resources:	• Gujarati, Damodar “Basic Econometrics”, Fourth edition. The McGraw –Hill.Saeed Ghahramani.

Teaching plan:	
Week	**Lecture**
First week:	Course syllabus. Introduction to the subject of Econometrics.
Second week:	Alternative regression methods.
***Third week*:**	Diagnostic tests. Examples.
Fourth week:	Tests for robust standard errors.
Fifth week:	One way ANOVA test. Examples.
Sixth week:	Two-way ANOVA test without replication.
Seventh week:	Two-way ANOVA test with replication.
Eighth week:	Generalized linear models.
Ninth week:	Time series. Classical model-based analysis.
Tenth week:	Time series regression
Eleventh week:	Various simulations using R.
Twelfth week:	One-parametric models. The Monte Carlo method.
Thirteenth week:	Monte Carlo approximation.
Fourteenth week:	The MCMC algorithm. Discussions and references.
Fifteenth week:	General examples.

Academic policy and rules of conduct:
The students shall follow the lecture regularly and shall contribute to the college and proffesional atmosphere respecting the Statute of the University of Prishtina and the rules of the Faculty. Especially the students shall not do any form of plagiaturism, untolerated cooperation, copying, deception or use of any equipment for this reason.

Internship

Basic course information	
Academic unit:	FSHMN, Department of Mathematics
Title of the course:	Internship
Level:	Master
Course Status:	Elective
Year of studies:	II
Number of hours per week:	1+2
ECTS:	5
Time/location:	Department of Mathematics
Course Instructor:	Qëndrim Gashi
Contact Details:	qendrim.gashi@uni-pr.edu
Course Description:	This is a course where students will be able, through a structured and supervised work, to develop an internship experience in an institution or company, public or private. The course contains guiding lectures and preparations for interviews as well as essays and discussions on the acquired experience.
Course Goals:	The aim of the course is to prepare students to bridge their studies with the job market, for presentations and professional communication, increasing the level of their professional responsibility and autonomy, as well as analyzing opportunities of professional development.
Expected outcomes:	By the end of the course students should be able to: • Advance their critical thinking and skills to solve problems, their capacity for working in groups, for using digital technology for work, their leadership skills, ethical work and values of openness and inclusion. • Apply experiences and knowledge on professional communication and presentation; • Analyze and evaluate possibilities for their professional development; • Understand dynamics at a workplace. • Use the gained internship experience to reflect on the relationship between academic life and the job market; • Estimate what will be necessary to integrate an unknown professional environment; • Increase their professional responsibility and autonomy.
Student Workload	

Activity	**Hours**	**Days/weeks**	**Total**
Lectures	1	15	15
Exercise sessions	2	15	30
Practical work	8	5	40
Office hours	1	15	15
Fieldwork			
Midterms, seminars	3	2	6
Homework			
Self-study	1	5	5
Final exam preparation			
Time spent in exams (tests, quizzes, final exam)			
Projects, presentations, etc.	2	7	14
Total			**125**

Teaching methodology:	Lectures, discussions, office hours, field work, essay.
Assessment methods:	Attendance (15%), Projects (55%), Final presentation (30%)
Literature	H. Frederick Sweitzer and Mary A. King, *The Successful Internship* (4th Edition), Brooks/Cole (2013) Barbara Pachter, *The Essentials of Business Etiquette*, McGraw Hill (2013)

Detailed teaching plan:

Week	**Lecture**
1	Preparation for internship – introduction
2	Resume
3	Online and direct communication
4	Ethics
5	Digital technologies
6	Values of openness and inclusion
7	Understanding the workplace
8	Internship
9	Internship
10	Internship
11	Internship
12	Internship
13	Discussion of projects
14	Discussion of projects
15	Reflecting on the internship experience

Academic policies and rules of comportment:

Students should be punctual and attend all lectures and exercise sessions and exams. Students are encouraged to attend office hours.

Methodology of scientific research

Basic subject data	
Academic Unit	FMNS
Title of subject:	Methodology of scientific research
Level:	Master
Status of the subject:	Mandatory
Study year:	I
Number of hours per week:	2+2
Value on credits – ECTS:	7 ECTS
Time/Location:	
Professor of subject:	Armend Shabani
Contact details:	armend.shabani@uni-pr.edu
Description of the subject	This course focuses on the development of research and writing skills in Mathematics and its applications. Its main parts are: 1. Empirical methods and their application in research problems. 2. Concepts related to other sciences. 3. Research methodologies: their advantages and disadvantages. 4. Legal, Social and Ethical issues applicable to the field of computer science
Goals of the subject:	The aim of this course is to acquaint students with the basic ideas, challenges, techniques and problems during scientific research.
Expected results:	Upon completion of the course the student is able to: - Present research and research methodologies in mathematics and its applications. - Understand the strengths and weaknesses of each of these methods. - Choose the different choice/s for the analysis? - Do research using these methods? - Write technical articles / research papers, taking into account social, legal and ethical constraints. - Report the results of the research.

Contribution in the student load (something that should correspond with the results of student learning)			
Activity	Hour	Day/Week	In total
Lectures	2	15	30
Theoretical exercises / laboratory	2	15	30
Tutorial			
Kontacts with teacher / consultations	1	15	15
Field Exercises			
Colloquiums, seminars	2	2	4
Homework	2	15	30
Self study time student (at the library or at home)	2	15	30
Preparation for final exam	1	15	30
Time spent on assessment (test, quiz, final exam)	2	2	4
Projects, presentations, etc.	2	1	2
Total			**175**

Methodology of teaching:	Lectures and individual work on projects/assignments / seminars.
Evaluation Methods:	Seminar work: 30%, Tasks/Individual projects (total: 70%): Tasks/Project 1: 35% and Tasks/ Project 2: 35%
Literature	
Literature:	[1] John W. Creswell, Research Design. Qualitative, Quantitative, and Mixed Methods Approaches, Fourth Edition. SAGE Publication, 2014. [2] Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams , Joseph Bizup, William T. Fitzgerald, The Craft of Research, Third Edition, The University of Chicago Press, 2008. [3] William Strunk Jr. and E. B. White, The Elements of Style, Forth Edition, Pearson, 1999.
Additional literature:	[1] Christian W. Dawson: Projects in Computing and Information Systems (A Student's Guide). Addison Wesley, 2005. [2] Justin Zobel: Writing for Computer Science. Springer, 2004. Harold Cohen Library, Class No 378.962.Z81. [3] R. Kumar, Research Methodology-A step-by-step

	guide for beginners, Pearson Education, Singapore, 2005. [4] **U. Hustadt**, COMP516 - Research Methods in Computer Science (2008-2009), Course notes (**https://cgi.csc.liv.ac.uk/~ullrich/COMP516/adm.html**).

The lesson plan designed:	
Week	Lecture to be held
First week:	Introduction and Overview
Second week:	What is Research?
Third week:	Research Methods
Forth week:	Research in Computer Science
Fifth week:	Reading research paper
Sixth week:	Literature review
Seventh week:	Acknowledging sources. Presentations
Eighth week	Choosing and planning a project (1)
Ninth week:	Midterm exam
Tenth week:	Risk management in computer science projects
Week Eleven:	Social, legal and ethical Issues in computer science
Week Twelve:	Practical Activities - I
Week thirteen:	Practical Activities - II
Week Fourteen:	Practical Activities - III
Week Fifteen:	Students presentations

Academic policies and rules of conduct:
Students should be punctual and attend all lectures, exercise sessions and exams. They should contribute to a constructive teaching process and should follow the instructions of the instructor. Students are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they write down the names of the colleagues with whom they have discussed homework and/or resources used. Academic dishonesty will be penalized severely.

Basic subject data	
Academic Unit	The Faculty of Mathematics and Natural Sciences
Title of subject:	Actuarial mathematics
Level:	Master (Mathematics with applications)
Status of the subject:	Elective
Study year:	I / Second semester
Number of hours per week:	2+2
Value on credits – ECTS:	6
Time/Location:	N/A, FShMN
Professor of subject:	Dr.sc. Behar Baxhaku
Contact details:	behar.baxhaku @ uni-pr.edu
Description of the subject:	This course studies actuarial models of survival, life insurance including multiple life models, then contingent annuity models, calculation of premium benefits, and finally, the inclusion of expenses in insurance models.
Goals of the subject:	The primary goal of the course is to increase students' understanding of the topics covered in this subject, and the second goal is to prepare students for a career in actuarial science.
Expected results:	After completing this course, the student will be able to: • Explain and interpret the effects of transition between states, survival patterns, and their interactions; • Describe some of the models that are applied in actuarial mathematics; • Calculate and interpret standard probability functions including the probability of survival and mortality; • Explain the random variables associated with multiple life patterns; • Interprets and calculates probabilities and marginal and conditional moments; • Apply the concepts covered in this course to actuarial science and scientific research.

Contribution in the student load (something that should correspond with the results of student learning)			
Activity	Hour	Day/Week	In total
Lectures	2	15	30
Theoretical exercises / laboratory	2	15	30
tutorial	-	-	-
Kontacts with	1	5	5

teacher / consultations			
Field Exercises	-	-	-
Colloquiums, seminars	2	2	4
Homework	2	5	10
Self study time student (at the library or at home)	2	10	20
Preparation for final exam	5	1	5
Time spent on assessment (test, quiz, final exam)	2	3	6
Projects, presentations, etc.	-	-	-
Total			110

Methodology of teaching:	Lectures, discussions, consultations, homework, seminar, colloquia, final exam.
Evaluation Methods:	The subject will be assessed on the basis of homework 10%; Midterm I: 20%, Midterm II: 20% and the final exam 50%. Points received will be cumulative. Exams will not be repeated. If you miss an exam without a major reason then you will lose points for that exam you did not appear. In order to concretize knowledge, during seminars and lectures, a large number of exercises will be carried out.
Literature	
Literature:	• Marcel B. Finan. A Reading of the Theory of Life Contingency Models: A Preparation for Exam MLC/3L (2011) • David C.M. Dickson, Mary R Hardy, Howard R. Waters, Actuarial Mathematics for Life Contigent Risk, Cambridge (2019)
Additional literature:	• Andrew Leung, Lifetables and Mortality Models, Elselvier (2022)

The lesson plan designed :	
Week	Lecture to be held
First week:	Lecture: Introduction to Course / Syllabus Review Readings: Course Syllabus
Second week:	Lecture: Introduction to the Interest Theory
Third week:	Lecture: Actuarial Survival Models
Forth week:	Lecture: The Life Table
Fifth week:	Lecture: Life Insurance
Sixth week:	Lecture: Contingent Payment Models

Seventh week:	Lecture: Contingent Annuity Models
Eight week	Lecture: Calculating Benefit Premiums
Nine week:	Lecture: Benefit Reserves
Tenth week:	Lecture: Competing risk models
Week Eleven:	Lecture: Multiple Life Models
Week Twelve:	Lecture: Competing risk models
Week thirteen:	Lecture: Transition Models
Week Fourteen:	Lecture: Probability Models
Week Fifteen:	Lecture: Application of probabilistic models

Academic policies and rules of conduct:
Students with the aim of achieving high success in studies should: 1. To attend lectures and exercises regularly provided 2. To participate actively in lectures through questions, debates, and other forms of interactive activities. 3. To take part in the tests intermediate and final tests 4. During the period of the lectures, exercises, tests and exams are obliged to submit to the Code of Conduct (silence during work time, an entry in the hall on time, releasing the hall with the consent of the teacher, etc.).

SYLLABUS for Macroeconomics

Basic data for the course	
Academic unit:	Faculty of Mathematics and Natural Sciences
Title of the course:	Advanced Macroeconomics
Level:	Master
Status of the course:	Elective
Year of studies:	II
Number of hours per week:	2+2
ECTS credits:	6
Time/location:	
Tutor:	
Tutor's contact details:	
Content of the course	'Macroeconomics' is an introductory course aiming at providing students with basic concepts concerning macroeconomics. In particular, this course analyses the following issues: aggregate demand, aggregate supply, gross domestic product and its estimation methods, inflation, unemployment, business cycles and growth theories, monetary and fiscal policy, trade relations etc. The discussion of this topics enables to analyse the issues such as growth related policies, the functioning of financial system and fiscal policy and foreign trade policies.
Course's objectives:	This course aims at: 1. Equipping the students with the basic concepts regarding the functioning of the national and international economy as well as the applicable economic policies. 2. Equipping the students with the contemporary macroeconomic concepts, which can be used to critically discuss and evaluate the current macroeconomic policies. 3. Providing an overview of the ongoing discussion concerning the current developments in international markets.
The expected outcomes:	Upon finishing this course, the students are expected to:

	1. Establish their own opinion with regard to the current economic situation and growth related
	issues using the macroeconomic indicators developed in this course. 2. Asses the effect of a particular fiscal or monetary policy on macroeconomic indicators in a given economic context. 3. Asses the effect of foreign trade on the domestic economy. 4. Be able to present their opinions over the economy using graphical and mathematical models. 5. Be able to analyse, compare and contrast different national economics making use of macroeconomic indicators.

The students' workload ***(hours per semester, ECTS)***			
Activity	**Week**	**Hours**	**Total**
Lectures	15	3	45
Seminars (theoretical and practical)	1	15	15
Case studies			
Direct contact with tutor	1	15	15
Homework			
Individual study (at library or at home)			50
Final preparation for the exam			
Evaluation			
Projects, presentation etc.			
Total			**125**

Teaching methods:	Each week, 3 hours of lectures and 2 hours of seminars/discussions are organised. Case studies and homework are given after each lecture for students to study and research in their own time. Results from such activities are then discussed in the following week. Students are being encouraged to follow the current economic developments, through reading relevant articles, economic newspapers and other materials. They can identify issues/topics for

	discussions from such readings. Essays prepared by students are then discussed. Individual and group presentations are also
	encouraged.
Assessment methods:	In order to have a fair and appropriate assessment of students throughout the semester, the final mark consists of points that students earned in all activities throughout the semester in lectures, seminars, presentations, essays etc. These are calculated as follows: - Firs assessment 15% - Second assessment 15% - Seminars 20% - Final exam 50 % Total 100% The following aspects are being considered during the assessment: - The interpretation of the topic, - The depth of understanding the topic, - The use of literature, - Evaluation of the evidence, - Critical analysis and - The logic of building arguments. In addition, the following are also considered toward the final mark: - Academic writing, - Presentation of data and references, - The length of writing and - Overall presentation.
Literature	
Basic literature:	Mançellari, A., Hadëri, S., Kule, Dh. dhe Qirici, S. (1999): *Hyrje ne Ekonomi*. Shtëpia botuese Pegi, Tiranë.
Additional literature:	1. Sloman, J. (2006). *Economics*. Prentice Hall. 2. Reports from Central Bank of Kosova, Statistical Office of Kosova, Government's report on economic issues etc.
The detailed plan of work:	
Week	**Topic**
Week 1	Introduction to Macroeconomics

Week 2	Demand, Supply and Macroeconomic Equilibrium
Week 3	Consumption and Investment
Week 4	Expenditure and Income
Week 5	Business Cycles and Economic Growth
Week 6	Inflation
Week 7	Discussion and first assessment
Week 8	Unemployment
Week 9	The relationship between Inflation and Unemployment
Week 10	Money and Banking
Week 11	Central Bank and Monetary Policy
Week 12	Fiscal Policy
Week 13	Foreign Economic Relations
Week 14	Discussions/Seminars
Week 15	Discussions and second assessment
Academic policies and code of conduct:	
Students are expected to participate in lectures, seminars and group discussions. Tutor is available for individual consultations as well. Students are required to read the literature before each lecture. Students are not obliged to undertake the intermediate assessments during the semester. They should respect the code of conduct during lectures and exams and in communication with the academic staff.	

Chapters from Finite Geometry

Basic course information	
Academic unit:	FMNS, Department of Mathematics
Title of the course:	Chapters from Finite Geometry
Level:	Master
Course Status:	E
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time/location:	Departament of Mathematics
Course Instructor:	Prof. Asoc. Dr. Menderes Gashi
Contact Details:	menderes.gashi@uni-pr.edu
Course description:	In this course, will be elaborated basic concepts and statements related to Designs, Incidence Matrices, Isomorphisms and Automorphisms, Necessary Conditions for Existence, Basic Design Constructions, Symmetric Designs, Constructions Using Difference Sets, Hadamard Matrices and Designs, Finite Projective and Affine Planes, Bruck - Ryser– Chowla Theorem, Collineation (automorphism) group, Error correcting codes, connections of Design and linear codes, Steiner triple systems and quasi-groups, Latin squares, orthogonality and generalizations.
Course Goals:	The aim of the course is to provide an overview of the theory of designs, with an emphasis on connections with related geometric, combinatorial, and algebraic structures, and applications to coding theory.
Expected outcomes:	After completing the course, the student will be able to: • define the design, incidence matrix and isomorphisms between designs. • to formulate and prove the necessary conditions for the existence of designs. • distinguish the basic constructions of designs. • define symmetrical designs and distinguish series of symmetrical designs. • identify the relationship between Hadamard matrices and symmetric designs. • define projective planes and affine planes • know the connections between design and linear codes.

Student workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work	-	-	-
Office hours	1	15	15
Fieldwork	-	-	-

Midterms, seminars	2	2	4
Homework	1	15	15
Self-study	3	15	45
Final exam preparation	10	1	10
Time spent in exams (tests, quizzes, final exam)	2	3	6
Projects, presentations, etc.			
Total			**155**

Teaching methodology:	Lecture , consultations.
Assessment methods:	Mid-term test 20% End-of-term test 20% Homework 10% Attendance: 10% Final exam: 55% Total: 100%
Literature	
Principal resource:	1. D. R. Stinson: Combinatorial designs. Contruction and analysis, 2004 2. C. C. Lindner, C. A. Rodger: Design theory, 2004 3. D. R. Hughes, F. C. Piper: Projective planes, 1973 4. D. R. Hughes and F. C. Piper, Design Theory, Cambridge University Press, Cambridge (1985). 5. T.Beth, D. Jungnickel and H.Lenz, Design Theory, Cambridge University Press, 1999. 6. J. Y. Ionin, S. M. Shrikhande, Combinatorics of Symmetric Designs. Cambridge University Press, 2006.
Additional resources:	

Teaching plan:

Week	Lecture
First week:	Block designs
Second week:	Incidence matrices
Third week:	Isomorphisms and automorphisms
Fourth week:	Necessary conditions for the existence of the Block design
Fifth week:	Basic Block design constructions
Sixth week:	Symmetrical Block designs
Seventh week:	Constructions with the help of difference sets
Eighth week:	Hadamard matrices and Block designs
Ninth week:	Finite projective and affine planes
Tenth week:	Bruck - Ryser – Chowla theorem
Eleventh week:	Group of collineations (automorphisms)
Twelfth week:	Error-correcting codes
Thirteenth week:	Conection between Block designs and linear codes
Fourteenth week:	Steiner triple systems and quasi-groups

Fifteenth week:	Latin squares, orthogonality and generalizations

Academic policy and rules of conduct:
The students shall follow the lecture regularly and shall contribute to the college and proffesional atmosphere respecting the Statute of the University of Prishtina and the rules of the Faculty. Especially the students shall not do any form of plagiaturism, untolerated cooperation, copying, deception or use of any equipment for this reason.

Basic course information	
Academic Unit	Faculty of Mathematical and Natural Sciences, Departament of Mathematics
Title of the course	Chapters from Number Theory
Level	MSc
Course Status	Elected
Year of studies	II
Number of hours per week	2+2
ECTS	6
Time / location	
Course Instructor	Kajtaz H. Bllaca
Contact details	kajtaz.bllaca@uni-pr.edu
Course description:	Analytic number theory is the branch of number theory which uses real and complex to investigate various properties of integers and prime numbers. Examples of topics falling under analytic number theory include Dirichlet *L*-function the Riemann zeta function and the prime number theorem.
Course goals:	The objective of the course is to explain the method of constructing Riemann's zeta function, explaining in what way Riemann's zeta function is associated with classical arithmetic problems, especially the theorem on the distribution of prime numbers. The aim is to present the construction of the Dirichlet's *L*-function and show how it is connected with the distribution of prime numbers in arithmetic progression and thus lay the foundations for understanding the construction of the zeta and *L*-functions in more general settings.
Expected learning outcomes:	After successfully completing this course the student will be able to: • Apply analytical methods in the number theory; • Analyze and understand the Riemann's zeta function • understand the significance of Riemann hypothesis, • understand the principles of the construction of the zeta function. • have knowledge of the construction of *L*-

	functions associated with different arithmetic and algebraic objects.		
Student workload –Semester I			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions (with TA)	2	15	30
Practical work	-	-	-
Office hours	1	15	15
Fieldwork	-	-	-
Midterms, seminars	-	-	-
Homework	-	-	-
Self-study	3	15	45
Final exam preparation	3	5	15
Time spent in exams	1	15	15
Projects, presentations, etc.	-	-	-
Total			150
Teaching methods:	Lectures, discusssions, tutorials, tests, final exam.		
Assessment:	Periodic tests, Homework and seminar work, Activity, Final exam. **Periodic tests** Two tests, each with maximum points 60; Exams are in writing. The first test includes the content that is dealt with in the chapter exercises for divisibility and congruence. The second test includes elaborate content in exercises for arithmetic, quadratic, quadratic, and quadratic functions, and Diophantine equations. **Homework and seminar work** There will be two homework problems (which will be evaluated), one in the period before the first test and one before the second test. They will be problems of the same type as those to be done in exercises.		

	The deadline for submission will be one week. The maximum number of points for each problem is 10 points. Problems are not mandatory. Those who do not choose will have zero points. **Activity** During exercises regularly, and in lectures occasionally will be given problems to solve independently. Students who are successful in solving these problems receive 5 points for each problem. The maximum number of points that can be collected in this section is 20. With 10 points collected, students will have the option of exemption from the final exam. Class attendance is not mandatory (it will not be checked). Of course, those who will not attend the lesson will not be able to get points for classroom activity. **Final exam** The exam is oral; verifies the understanding of the content discussed in the lectures. The requirement to enter the final exam is a total of at least 50 points collected in two tests, homework and classroom activities. The maximum number of points possible to get to the final exam is 40 points. Students who through classroom activities collect at least 10 points are not required to enter the final exam, but can take grades based on two periodic tests, tasks and classroom activity. **Improvement Exam** Improvement of points can be done mostly in one of the tests or the final exam. After the second test, students can choose which test they want to improve their score. Students who are not satisfied with the outcome of the final exam and who have not been subjected to the corrective test as above may enter the final exam test. This test will be at the same time the final exam for students who have requested an upgrade test in one of the two periodic tests.

	Final grade Points will be collected from the first test (max 60 points), the second test (max 60 points), the homework (max 20 points), the classroom activity (max 20 points) and the final exam (max 40 points). (Students who are exempt from the final exam will only collect points from the first four components. **Grades:** > 90% nota 10; > 80% nota 9; > 70% nota 8; > 60% nota 7; >= 45% nota 6.
Main book:	[1] G. J. O. Jameson, The prime number theorem, LMS Student texts 53, Oxford University Press, 2003.
Additional books:	[2] E. C. Titchmarsh, The theory of the Riemann zeta-function, 2nd ed., revised by D. R. Heath-Brown, Oxford University Press, 1986. [3] M. R. Murty, Problems in analytic number theory, GTM Springer, 2001.

Teaching detailed plan:	
Week	**Lecture**
First week	1. Dirichlet series and the Riemann zeta function.
Second week	2. Möbius function, von Mangoldt function and Möbius inversion formula.
Third week	3. Important Dirichlet series and arithmetic functions. Relation with Riemann zeta function.
Fourth week	4. Meromorphic cuntinuation of the Riemann zeta function and functional equations.
Fifth week	5. Entire functions, the entire line and meromorphic functions.
Sixth week	6. Hadamard factorization theorem.
Seventh week	7. Zeros of Riemann zeta function and factorization formula. Hamburger inversion theorem.
Eighth week	8. Theorem of Hadamard and de la Vallée Poussin.
Ninth week	9. Prime Number Theorem.
Tenth week	10. Zero free regions of Riemann's zeta function.

Eleventh week	11. Riemann hypothesis and some of its consequences.
Twelfth week	12. Dirichlet L-functions.
Thirteenth week	13. Meromorphic continuation and functional equation for Dirichlet L-function.
Fourteenth week	14. Dirichlet theorem on primes in arithmetic progressions.
Fifteenth week	15. The distribution of primes in arithmetic progressions.

Academic policies and student behaviour:
Students have to regularly attend lectures and they are asked to respect the Statute of Prishtina University and other official written regulations that come from the University, Faculty or Department. In particular, they are asked not to cheat in tests or exams, and not to allow other students to cheat from them. The use of moblie phones, or other electronic devices that could lead to misusing of them during lectures, tests or exams is strictly forbidden.

SYLLABUS of the course: Complex Analysis

Basic course information			
Academic unit:	FSHMN, Department of Mathematic		
Major	Mathematics		
Title of the course:	**Complex Analysis**		
Level:	Master		
Course Status :	Elective		
Year of studies:	I		
Number of hours per week:	2+2		
ECTS:	6		
Time / location:	Department of mathematics		
Course Instructor:	Dr. sc. Elver Bajrami		
Contact details:	Elver.bajrami@uni-pr.edu		
Course description:	This course provides a continuation of the undergraduate level coursework with special emphasis on more advanced topics of complex analysis. Here we will mainly discuss: the analytic extension of complex functions, functions with many complex variables, subharmonic and log subharmonic functions, factorization of complete and meromorphic functions, the maximum modulus principle, some applications of Riemann's Gamma and Zeta function - its application to the fundamental theorem of prime numbers.		
Course objective:	Students will expand on basic understandings of complex analysis and apply them in special courses for the following semester.		
Learning outcomes:	After completing this course, students should be able to: • know how to apply the analytical extension of a function with a complex variable; • describe the meanings of multivariable functions and their factorization; • identify and classify the basic properties of Riemann's Zeta function; • apply the new techniques acquired to apply them to the proof of the fundamental theorem of prime numbers.		
Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions (with TA)	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	2	4
Homework	1	15	15

Self-study	3	15	45
Final exam preparatin	10	1	10
Time spent in exams	2	3	6
Projects, presentations, etc			
Total			155

Teaching methodology:	Lectures, discussions, exercises, consultations, homework, colloquiums, exams.
Assessment methods:	Participation (10%), Homework (10%), first periodic test (20%), second periodic test (20%), final test (40%). The passing criterion is over 50% of the overall evaluation points.

Teaching plan:	
Week	Lecture
First week:	Course syllabus, introduction
Second week:	The concept of analytic extension of functions
***Third week*:**	Analytical expansion using curve
Fourth week:	The principle of symmetry
Fifth week:	Schwartz's principle
Sixth week:	Generalization of the uniqueness theorem
Seventh week:	Quasiconformal reflection
Eighth week:	Analytical functions with many complex variables
Ninth week:	Koshy's integral formula
Tenth week:	Polynomial series for multivariable functions
Eleventh week:	Analytical expansion for multivariable functions
Twelfth week:	Subharmonic and log subharmonic functions
Thirteenth week:	Factorization of complete and meromorphic functions
Fourteenth week:	Maximum modulus principle

Fifteenth week:	Some applications of Riemann's Gamma and Riemann's Zeta function - its application to the fundamental theorem of prime numbers

Literature	
Principle literature:	1. S. Lang, *Complex analysis*, Graduate texts in mathematics, fourth edition, Springer 1999. 2. L. V. Ahlfors, *Complex analysis*, McGraw-Hill, New York, 1979. 3. H. Turku, *Teoria e funksioneve të variablit kompleks*, Prishtinë, 2001.

Academic policies and rules of conduct:
Regular attendance at lectures and exercises is obligatory. Students should be present in the classroom before starting the lecture. Cell phones during classes should be excluded.

Basic course information	
Academic unit:	FMS, Department of Mathematics
Title of the course:	Computation theory
Level:	Master
Course Status:	E
Year of studies:	II
Number of hours per week:	3+2
ECTS:	7
Time/location:	The course will be offered in English
Course Instructor:	Faton Berisha
Contact Details:	faton.berisha@uni-pr.edu
Course Description	Introduction to computation theory: Algorithms, Unsolved problems a motivation for formal definition of algorithm. RAM-machine. Partially recursive function. Coding finite arrays. Goedel's beta function. Indices. Arithmetical hierarchy. Recursively countable sets. Goedel's theorem of incompleteness.
Course Goals:	Students will study several formal definitions of the notion of algorithm (RAM-machine, partially recursive functions, Turing's machine). The fundamentals of theory of recursive functions will be studied.
Expected outcomes:	Upon successful completion of this course, the student will: • be able to explain and apply mathematical computation models; • be able to explain and apply the studied notions of computation theory; • understand and be able to explain incomputability and incompleteness issues.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	1	2
Homework	2	15	30
Self-study	6	15	90
Final exam preparation	11	1	11
Time spent in exams (tests, quizzes, final exam)	2	1	2
Projects, presentations, etc.			
Total			**210**

Teaching methodology:	Lectures, discussions, homework, beamer presentations.

Assessment methods:	Class participation (10%), Homework (30%), Midterm (30%), Final exam (30%)
Literature	
Principal resource:	1. J. R. Shoenfiled: Recursion Theory 2. R. Smullyan: Gödel's Incompleteness Theorems
Additional resources:	1. Mendelson: Introduction to Mathematical Logic 2. P. Odifreddi: Classical Recursion Theory 3. M. Sipser: Introduction to the Theory of Computation
Detailed teaching plan:	

Week	**Lecture**
1	Introduction to computation theory
2 – 4	Regular languages
5	Nonregular languages
6	Context-free languages
7	The Church–Turing Thesis
8	The Definition of Algorithm
9	Decidable Languages
10	Undecidability
11	Reducibility
12 – 15	Advanced Topics in Computability Theory

Academic policies and rules of comportment:
Attendance to lectures, exercises and exams is compulsory. Students are expected to contribute with their discussions and homework. They are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they give credit to all the contributors to a solution. Academic honesty is mandatory.

Basic course information	
Academic unit:	FMNS, Department of Mathematics
Title of the course:	Computational Topology
Level:	Master
Course Status:	Mandatory
Year of studies:	I, second semester
Number of hours per week:	3+2
ECTS:	7
Time/location:	N/A
Course Instructor:	Ramadan Limani
Contact Details:	Ramadan.limani@uni-pr.edu
Course Description	This course covers the notion of topological space and some characteristic examples of such spaces. The basic notions in topology will be defined (base, sub-base, neighborhood, interior, closure, and boundary of a given set). The notion of continuity of function between two topological spaces and some of its characterizations will be studied. Operations with topological spaces (product, sum and factor-space). Separation axioms (T0, T1, T2 regular and normal spaces etc.), compactness and connectivity of topological spaces are studied as well. In the sequel, some topics from Computational Topology will be introduced, like: Curves, (introduction – planar curves, Jordan curve/polygon Theorem, Monge property and applications); homotopy, invariance – regular homotopy, rotation number, Whitney-Graustein Theorem. Surfaces and Complexes – surfaces, triangulations, polygonal schemata, homeomorphism, classification of surfaces – surface graphs, rotation system, dual graphs, Euler's formula. Complexes, Cech complex, Vietoris-Rips complex, Delaunay triangulation, alpha shape and alpha complex. Homotopy – testing homotopy, crossing sequence, shortest homotopic path, funnel algorithm. Covering spaces, fundamental groups, induced homomorphisms, Brouwer fixed-point Theorem, homotopy equivalence – fundamental groups of surfaces, group presentations. Homology – chain complex, boundary maps, cycles and boundaries, simplicial homology – singular homology, homotopy invariance, Sperner's lemma and Borsuk-Ulam Theorem.
Course Goals:	The main goals of this course are: introducing students with basic notions from General Topology, Graph Theory and geometric interpretation of them. The students will also be acquainted with some elements of Computational Topology.

Learning outcomes:	After completing the course, students will be able to: • Define the topological space and discern some characteristic topological spaces (discrete space; indiscret space; cofinite space; Euclidean space); • Identify basic notions (interior, closure, boundary of sets) in different examples of spaces. • Define the continuity of functions of topological spaces and apply this in solving various problems. • Apply homeomorphism as a tool to find topological properties of a topological space (X, τ), knowing the same properties of another topological space (Y, σ), being homeomorphic with the space (X, τ). • Define the product (Tychonov) topology, the sum topology and factor topology and to illustrate them with different examples. • Define compactness and connectedness of a topological space. • Apply Kuratowsk's Theorem to determine whether a given graph is planar. • Apply Jordan's Theorem on planar curves and polygones. • Further develop the ability of expressing accurately and clearly the notions used in this course in both ways: orally and in a written form.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	3	15	45
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars			
Homework	1	15	15
Self-study	3	15	45
Final exam preparation	2	15	30
Time spent in exams (tests, quizzes, final exam)	2	2	4
Projects, presentations, etc.			
Total			184 hrs

Teaching methodology:	Lectures, tutorials, discussions, consultations.
Assessment:	Regular attendance: 10% First test: 20% Second test: 20% Final exam: 50% Total: 100% In case a student does not pass the exam according to the above policy, then he or she will have to take the written and oral exams. The written exam weighs 40%, while the oral one weighs 50%, and regular attendance 10%. Final grading policy will be:
Literature	
Main books:	• *Haxhibeqiri, Q.: Topologjia, ETMM, Prishtinë, 1989.* • *Haxhibeqiri, Q.: Përmbledhje detyrash nga Topologjia, Prishtinë, 1996.* • *Herbert Edelsbrunner and John Harer: Computational Topology (an introduction), Departments of Computer Science and Mathematics Duke University, 2008.* • *Tamal Krishna Dey, Yusu Wang Halıcıoglu: Computational Topology for Data Analysis Department of Computer Science Purdue University West Lafayette, Indiana, USA, 2016.*
Additional books:	• *Dugundji, J.: Topology, Allyn and Bacon, INC, Boston, 1972.* • *Francis Lazarus and Arnaud de Mesmay: Computational Topology, Lecture notes 2016-2018.*

Score (in %)	Grade
0-49	5 (fail)
50-59	6 (six)
60-69	7 (seven)
70-79	8 (eight)
80-89	9 (nine)
90-100	10 (ten)

Detailed teaching plan:	
Week	**Lecture**
1	The definition of topological space; Examples: Comparison of topologies of spaces. Base and sub-base of topology; equivalent bases. Neighborhood and system of neighborhood, local basis; The first and second axiom of countability.
2	Basic concepts in topology, closed sets; interior, boundary and derivative set . The dense sets and everywhere non-dense sets; separable spaces.
3	Continuous functions; examples. Some characterizations of continuity. Open and closed functions, homeomorphism; topological properties; combined functions.
4	Operations with topological spaces. The sum and product of topological spaces; continuous functions of topological products.
5	Identification topology and factor-spaces. Quotient spaces; examples. Continuous functions of factor-spaces.
6	Separation axioms. Spaces T0, T1, T2; characterization and their properties. Regular spaces, normal spaces; characterization and their properties. Urysohn's lemma.
7	Compactness. Definition, examples; main properties of compact spaces. Continuous functions of compact spaces. Product of compact spaces (Tychonov's Theorem). Characterization of compact sets in R^n (Haine-Borel-Lebeg Theorem.)
8	Connectedness. Definition, examples; their main properties.
9	Test I
10	Introduction to Computational Topology. Planar curves; Jordan's Theorem on planar curves and polygones. Monge property and applications; homotopy, invariance – regular homotopy; Whitney-Graustein Theorem.
11	Surfaces and Complexes – surfaces, triangulations, polygonal schemata, homeomorphism, classification of surfaces – surface graphs, rotation system, dual graphs, Euler's formula. Complexes, Cech complex, Vietoris-Rips complex, Delaunay triangulation, alpha shape and alpha complex.
12	Homotopy – definition, testing homotopy, crossing sequence, shortest homotopic path, funnel algorithm.
13	Covering spaces, fundamental groups, induced homomorphisms, Brouwer fixed-point Theorem, homotopy equivalence – fundamental groups of surfaces, group presentations.
14	Homology – definition, chain complex, boundary maps, cycles and boundaries, simplicial homology – singular homology, homotopy invariance, Sperner's lemma and the Borsuk-Ulam Theorem.
15	Test II

Academic policies and rules of comportment:

Students have to regularly attend lectures and they are asked to respect the Statute of Prishtina University and other official written regulations that come from the University, Faculty or Department. In particular, they are asked not to cheat in tests or exams, and not to allow other students to cheat from them. The use of moblie phones, or other electronic devices that could lead to misusing of them during lectures, tests or exams is strictly forbidden. Academic dishonesty will be severely penalized.

Basic course information	
Academic unit:	FMS, Department of Mathematics
Title of the course:	Computer programming
Level:	Master
Course Status:	O
Year of studies:	I
Number of hours per week:	2+2
ECTS:	7
Time/location:	The course will be offered in English
Course Instructor:	Faton Berisha
Contact Details:	faton.berisha@uni-pr.edu
Course Description	The notion of complexity and notation. Recursive algorithms: Complexity. Sorting: Algorithm analysis, Average-case complexity. Designing efficient algorithms. Complex problems: P and NP classes. Object oriented programming paradigm in Java. Basics of object oriented software engineering: UML.
Course Goals:	Students will learn efficient algorithms design and their precise theoretical and practical complexity analysis. Also, complex problems and efficient approximate algorithms will be studied. Design patterns in object oriented programming paradigm and MVC architecture will be applied.
Expected outcomes:	Upon successful completion of this course, the student will: • be able to design efficient algorithms for different generical programming problems and analyze their complexity; • be able to apply approximate algorithms to solve complex problems; • show that they have advanced programming skills regarding OOP paradigm by applying generic design patterns and standard MVC architecture.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	1	2
Homework	2	15	30
Self-study	6	15	90
Final exam preparation	11	1	11
Time spent in exams (tests, quizzes, final exam)	2	1	2
Projects, presentations, etc.			

Total			**210**

Teaching methodology:	*Lectures, discussions, homework, beamer presentations.*
Assessment methods:	Class participation (10%), Homework (30%), Midterm (30%), Final exam (30%)
Literature	
Principal resource:	1. G. Brassard, P. Bratley: Algorithmics 2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein: Introduction to Algorithms
Additional resources:	3. M. H. Alsuwaiyel: Algorithms - Design Techniques and Analysis 4. E. Knuth: The Art of Computer Programming, Vols. 1, 2, 3 5. H. S. Wilf: Algorithms and Complexity

Detailed teaching plan:

Week	**Lecture**
1	The notion of complexity and notation
2 – 4	Recursive algorithms: Complexity
5 – 6	Sorting: Algorithm analysis
7 – 8	Average-case complexity
9 – 10	Designing efficient algorithms
11 – 12	Complex problems: P and NP classes
13	Object oriented programming paradigm in Java
14 – 15	Basics of object oriented software engineering: UML

Academic policies and rules of comportment:

Attendance to lectures, exercises and exams is compulsory. Students are expected to contribute with their discussions and homework. They are encouraged to attend office hours.
Homework should be written individually, but students are encouraged to discuss with one another as long as they give credit to all the contributors to a solution.
Academic honesty is mandatory.

Basic course information	
Academic Unit	Faculty of Mathematical and Natural Sciences, Departament of Mathematics
Title of the course	Cryptography
Level	MSc
Course Status	Elected
Year of studies	I
Number of hours per week	2+2
ECTS	6
Time / location	
Course Instructor	Kajtaz H. Bllaca
Contact details	kajtaz.bllaca@uni-pr.edu
Course description:	Cryptography is an indispensable tool used to protect information in computer systems. Cryptography is derived from the Greek word kryptos, meaning hidden, and graphein, meaning to write. Examples of topics covered in this short stay course are: Some topics from elementary number theory (Division and Euclid's algorithm, Congruence's, finite fields and quadratic residues) and topics from Cryptography such as: From Caesar's Cipher to Public Key Cryptography..
Course goals:	The purpose of this course is to familiarize the student with arithmetical topics, ancient and very modern, which have been at the center of interest in applications, especially in cryptography.
Expected learning outcomes:	After successfully completing this course the student will be able to: • To know the development of cryptography, • Know how cryptographic systems work, • Understand why cryptographic systems are secure. • Understand the importance of cryptographic systems; • To know how to apply the solved problems in solving new problems, and finally to create ideas and methods to increase the degree of

	abstraction of cryptography problems.		
Student workload –Semester I			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions (with TA)	2	15	30
Practical work	-	-	-
Office hours	1	15	15
Fieldwork	-	-	-
Midterms, seminars	-	-	-
Homework	-	-	-
Self-study	3	15	45
Final exam preparation	3	5	15
Time spent in exams	1	15	15
Projects, presentations, etc.	-	-	-
Total			150
Teaching methods:	Lectures, discusssions, tutorials, tests, final exam.		
Assessment:	Periodic tests, Homework and seminar work, Activity, Final exam. **Periodic tests** Two tests, each with maximum points 60; Exams are in writing. The first test includes the content that is dealt with in the chapter exercises for divisibility and congruence. The second test includes elaborate content in exercises for arithmetic, quadratic, quadratic, and quadratic functions, and Diophantine equations. **Homework and seminar work** There will be two homework problems (which will be evaluated), one in the period before the first test and one before the second test. They will be problems of the same type as those to be done in exercises. The deadline for submission will be one week. The		

	maximum number of points for each problem is 10 points. Problems are not mandatory. Those who do not choose will have zero points. **Activity** During exercises regularly, and in lectures occasionally will be given problems to solve independently. Students who are successful in solving these problems receive 5 points for each problem. The maximum number of points that can be collected in this section is 20. With 10 points collected, students will have the option of exemption from the final exam. Class attendance is not mandatory (it will not be checked). Of course, those who will not attend the lesson will not be able to get points for classroom activity. **Final exam** The exam is oral; verifies the understanding of the content discussed in the lectures. The requirement to enter the final exam is a total of at least 50 points collected in two tests, homework and classroom activities. The maximum number of points possible to get to the final exam is 40 points. Students who through classroom activities collect at least 10 points are not required to enter the final exam, but can take grades based on two periodic tests, tasks and classroom activity. **Improvement Exam** Improvement of points can be done mostly in one of the tests or the final exam. After the second test, students can choose which test they want to improve their score. Students who are not satisfied with the outcome of the final exam and who have not been subjected to the corrective test as above may enter the final exam test. This test will be at the same time the final exam for students who have requested an upgrade test in one of the two periodic tests.

	Final grade Points will be collected from the first test (max 60 points), the second test (max 60 points), the homework (max 20 points), the classroom activity (max 20 points) and the final exam (max 40 points). (Students who are exempt from the final exam will only collect points from the first four components. **Grades:** > 90% nota 10; > 80% nota 9; > 70% nota 8; > 60% nota 7; >= 45% nota 6.
Main book:	[1] Neal Koblitz, A Course in Number Theory and Cryptography-Springer US (1987).
Additional books:	[2] Thomas Baigneres, Pascal Junod, Yi Lu, Jean Monnerat, Serge Vaudenay, A Classical Introduction to Cryptography, Exercise Book-Springer (2006). [3] David M. Burton, Elementary number theory, McGraw-Hill (2002).

Teaching detailed plan:

Week	Lecture
First week	- Divisibility of integers. Divisibility Algorithm. Prime numbers. The Fundamental Theorem of Arithmetic
Second week	- Linear congruence. Systems of linear congruence. The Chinese Remainder Theorem. Tests of divisibility
Third week	– Some applications to factoring
Fourth week	– Finite fields
Fifth week	– Quadratic residues
Sixth week	- The Quadratic Reciprocity Law
Seventh week	– Some simple cryptosystems
Eighth week	- Enciphering matrices
Ninth week	- The idea of public key cryptography
Tenth week	-RSA
Eleventh week	– Disdrete log. Knapscak
Twelfth week	- Pseudoprimes
Thirteenth week	– The rho method
Fourteenth week	- Fermat factorization
Fifteenth week	– The continued fraction method

Academic policies and student behaviour:
Students have to regularly attend lectures and they are asked to respect the Statute of Prishtina University and other official written regulations that come from the University, Faculty or Department. In particular, they are asked not to cheat in tests or exams, and not to allow other students to cheat from them. The use of moblie phones, or other electronic devices that could lead to misusing of them during lectures, tests or exams is strictly forbidden.

Basic dates of the course	
Academic Unit	FMNS, Departament Mathematics
Direction	Mathematic
Course Title:	Elements of spectral theory
Level	Master
Status of the course:	Elective
Year of study	II (semester III)
Number of house per week:	2+2
ECTS:	6
Location	**Department of Mathematics**
Professor of the course	Prof. Dr. Muhib Lohaj
Contact details	E-mail: muhib_lohaj@yahoo.com, Tel.: (0) 44 220-015
Course description	The presentation of Sesquilinear functionals in Hilbert spaces. Adjoint operators as well as positive selfadjoint operators. Partial isometries and polar form of the operator. Elements of spectral theory on normed algebra (the spectrum and the resolvent in the Banach algebra). The spectrum of the bounded operator (the spectrum of unitary operator, self adjoint operator, normal operator, compact operator etc.). Compact operators, normal compact operators and their spectral properties.
The purpose of the course	Dealing with operators theory, it is highly important for the students to get familiar with elements of spectral theory of normed algebras. Further on, spectrum and spectrum types of some operators in Hilbert spaces like the spectrum of unitary operator, self adjoint operator, normal operator, compact operator etc. and also the spectrum of induced operator in relation to the spectrum.
Learning outcomes	After completing this course, students will be able to: • Solve concrete problems conectid with spectrum of elements in normed algebra,

	• Solve the problems conected with positive operators, • Finde spectrum of selfadjoint operators, unitary operators, normal and compact operators, etc., • Aplay spectral maping theorem of spectra on concrete problems.

Contribution comitment of the student –Semester II			
Activities	**Haurs**	**Day/Week**	**In total**
Lectures with the professor	2	15	30
Exercises with the assistant	2	15	30
Tutorial			
Consultation	1	15	15
Field exercises			
Kollokfiume, seminars	2	2	4
Homework			
Time self learning	4	15	60
Final preparation for the exam			10
Time spent on evaluation (tests, Quiz, the final exam)			3
Projects, presentations, etc.			
In total			**152**

Designed plan of the course	
	Lecture
Week One:	Represantion of bilinear funksional in Hilbert space
Week Two:	Conjugate operators. Projectors
Week Three:	Positive selfadjoint operators
Week Four:	Partial isometries. Polar form of the operator

Week Five:	Normed algebras. Spectral radius
Week six:	Regular elements of normed algebras
Week seven:	Regular operators
Week eight:	Spectrum and resolvent of Banach algebras
Week Nine:	Spectrum of bounded operators
Week ten:	Spectrum of weighted shift
Week Eleven:	Spectrum of unitary operator and a normal operator
Week Twelve:	Spectrum of the operator induced by spectrum of operator
Week thirteen:	Compact operators in Hilbert space
Week fourteen	Teorema spektrale për operatorët normal kompakt Spectral theorem for compact normal operators

Literatura	
Base literature	• W. Rudin, *Functional Analysis*, Mc Fraw-Hill Book Company, New York, 1973, • W. Rudin, *Real and complex analysis*, Mc Graw-Hill Book Company, New york, 1973, • Kurepa S., Funkcionalna analiza, Elementi teorija operatora, Školska knjiga, Zagreb, 1981, • C. Apostol, L.A.Fialkov, D.A.Herrero and D.Voiculescu, *Aproximation of Hilbert space operators, Vol II, Research Notes in Mathematics* 102, Pitman, Boston, 1984,

	• R. Zejnullahu, *Analiza funksionale,* Prishtinë 1998.

SYLLABUS of the course: Financial Mathematics

Basic course information	
Academic unit:	FSHMN, Department of Mathematic
Major	Mathematics
Title of the course:	**Financial mathematics**
Level:	Master
Course Status:	Obligatory
Year of studies:	I
Number of hours per week:	2+2
ECTS:	6
Time / location:	Department of mathematics
Course Instructor:	Dr. sc. Elver Bajrami
Contact details:	Elver.bajrami@uni-pr.edu
Course description:	This course will primarily serve to assess financial security and make investment risk assessments. Topics include the value of money through the time, annuities and cash flows, loans, bonds, general cash flows and portfolios, immunizations, swaps, and hedging and investment strategies. Also, here will be shown the wide application of derivatives as is the case with the Black-Scholes models as well as the use of different computer programs to make the calculations.
Course objective:	The aim of the course is to provide the student to understand how to use mathematical models for various financial and actuarial problems.
Learning outcomes:	After completing this course, students should be able to: • Describe some of the models that are applied in financial mathematics, • Identify the use of adequate formulas in certain problems, • Apply the knowledge gained in models to risk assessment, • Investigate specific models through differential equations in financial mathematics.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions (with TA)	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	2	4
Homework	1	15	15

Self-study	3	15	45
Final exam preparatin	10	1	10
Time spent in exams	2	3	6
Projects, presentations, etc			
Total			155

Teaching methodology:	Lectures, discussions, exercises, consultations, homework, colloquiums, exams.
Assessment methods:	Homework (20%), First colloquium (20%), Second colloquium (20%), Final test (40%). The passing criterion is over 50% of the overall evaluation points.

Teaching plan:	
Week	Lecture
First week:	Syllabus and introduction to financial mathematics
Second week:	Time value of money
Third week:	Annuities and cash flows
Fourth week:	Loans
Fifth week:	BONDS
Sixth week:	General cash flows and portfolios
Seventh week:	Immunization
Eighth week:	Exchanges and hedging and investment strategies
Ninth week:	Asset pricing model
Tenth week:	Ito's lemma
Eleventh week:	The Black-Scholes problem
Twelfth week:	Black-Scholes analysis
Thirteenth week:	Black-Scholes formula
Fourteenth week:	Boundaries and final conditions of the Black-Scholes model
Fifteenth week:	Application programs of the application of financial mathematics

Literature	
Principle literature:	• Sh. Axler, P. Bourdon and W. Ramey, *Harmonic function theory*, Springer-Verlage New York, 2001. • P. Duren, *Theory of H^p spaces*, Academic Press, New York and London, 1970

Academic policies and rules of conduct:
Regular attendance at lectures and exercises is obligatory. Students should be present in the classroom before starting the lecture. Cell phones during lectures should be excluded.

Basic course information	
Academic unit:	FMS, Department of Mathematics
Title of the course:	Functional programming
Level:	Master
Course Status:	E
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time/location:	The course will be offered in English
Course Instructor:	Faton Berisha
Contact Details:	faton.berisha@uni-pr.edu
Course Description	The course offers a comprehensive introduction to the field of functional programming. It will touch upon some of the methods of programming analysis and the relying theories, as well as the contemporary techniques and applications.
Course Goals:	Students will study the fundamentals of pure functional programming and the applications of concepts of functional programming for efficient programming in the mainstream programming languages.
Expected outcomes:	Upon successful completion of this course, the student will: • understand the basic principles of pure functional programming and solve problems by applying these principles; • posses skills to code in Haskell functional programming language; • be able to investigate, evaluate and compare programs in Haskell with respect to syntactic and semantic correctness, generalization, reusage, efficiency and performance properties; • be able to apply the functional programming techniques to object oriented paradigm in Java programming language.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	1	2
Homework	2	15	30
Self-study	4	15	60
Final exam preparation	11	1	11
Time spent in exams (tests, quizzes, final exam)	2	1	2
Projects, presentations, etc.			

Total			**180**
Teaching methodology:	Lectures, discussions, homework, beamer presentations.		
Assessment methods:	Class participation (10%), Homework (30%), Midterm (30%), Final exam (30%)		
Literature			
Principal resource:	1. S. Thompson, Haskell: The Craft of Functional Programming 2. Nielson, H. R. Nielson, C. Hankin, Principles of Program Analysis		
Additional resources:	3. D. Schmidt, Programming principles in Java: Architecture and interfaces		
Detailed teaching plan:			

Week	**Lecture**
1	Introduction to functional programming
2	Getting started with Haskell
3	Basic types and definitions
4	Designing and writing programs
5	Data types, tuples and lists
6	Programming with lists
7	Defining functions over lists
8	I/O in Haskell
9	Reasoning about programs
10	Generalization: patterns of computation
11	Higher-order functions
12	Developing higher-order programs
13	Overloading, type classes and type checking
14	Algebraic types
15	Functional, imperative and OO programming

Academic policies and rules of comportment:
Attendance to lectures, exercises and exams is compulsory. Students are expected to contribute with their discussions and homework. They are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they give credit to all the contributors to a solution. Academic honesty is mandatory.

SYLLABUS of the course: Harmonic function theory

Basic course information	
Academic unit:	FSHMN, Department of Mathematic
Major	Mathematics
Title of the course:	**Harmonic function theory**
Level:	Master
Course Status :	Elective
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time / location:	Department of mathematics
Course Instructor:	Dr. sc. Elver Bajrami
Contact details:	Elver.bajrami@uni-pr.edu
Course description:	In this course we will elaborate analogous problems with analytical functions. Starting with the basic properties of harmonic functions, limited harmonic functions, harmonic positive functions, Kelvin transformations and harmonic polynomials.
Cource objective:	The aim of the course is to provide the student with new knowledge for harmonic functions which are applied in Physic and differential equation .
Learning outcomes:	After completing this course, students should be able to: • Describe some of the basic meanings of harmonic functions • Identify the common properties of analytical and harmonic functions • Prove the basic properties of harmonic functions • Apply gained knowledge in other math disciplines • Research special classes of functions which uses harmonic functions

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions (with TA)	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	2	4
Homework	1	15	15
Self-study	3	15	45
Final exam preparatin	10	1	10

Time spent in exams	2	3	6
Projects, presentations, etc			
Total			155

Teaching methodology:	Lecture, exercise, consultations.
Assessment methods:	First test (30%), Second test (30%), Final test (40%), Total (100%)

Teaching plan:	
Week	Lecture
First week:	A basic properties of harmonic functions
Second week:	Liouville's Theorem for bounded Harmonic functions
***Third week*:**	Isolated singularity and Cauchy's Estimates
Fourth week:	Maximum principles
Fifth week:	Bounded harmonic functions on the Ball
Sixth week:	Positive harmonic functions
Seventh week:	Harnack Principle
Eighth week:	The Kelvin transform
Ninth week:	Inversion in the unit sphere
Tenth week:	Harmonicity at infinity
Eleventh week:	The exterior Dirichlet problems
Twelfth week:	Symmetry and Schwartz Reflection Principle
Thirteenth week:	Harmonic polynomials
Fourteenth week:	Polynomial decomposition
Fifteenth week:	Zonal Harmonics
Literature	
Principle literature:	• Sh. Axler, P. Bourdon and W. Ramey, *Harmonic function theory*,Springer-Verlage New York, 2001. • P. Duren, *Theory of H^p spaces*, Academic Press, New York and London, 1970

Academic policies and rules of conduct:
Regular attendance at lectures and exercises is obligatory. Students should be present in the classroom before starting the lecture. Cell phones during classes should be excluded.

History of mathematics

Basic course information	
Academic unit:	FMNS, University of Prishtina
Title of the course:	History of mathematics
Level:	Master
Course Status:	E
Year of studies:	II (Sem. III)
Number of hours per week:	2+2
ECTS:	6
Time/location:	Departament of Mathematics
Course Instructor:	dr. sc. Bujar Fejzullahu
Contact Details:	bujar.fejzullahu@uni-pr.edu
Course description:	In this course we will explore some major themes in mathematics - calculation, number, geometry, algebra, infinity, formalism--and their historical development in various civilizations, ranging from the antiquity of Babylonia and Egypt through classical Greece, the Middle and Far East, and on to modern Europe.
Course Goals:	The aim of this course is to introduce students to the basic historical facts of mathematics, understand the development of mathematics and mathematical thought.
Expected outcomes:	After completing this course the students will be able to: • understand the history of mathematics; • describe the development of various areas of mathematics within and across various civilizations; • describe the changing character of mathematics over time; • explain major results of mathematics; • give examples of significant applications of mathematics.

Student workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work	-	-	-
Office hours	2	15	30
Fieldwork	-	-	-
Midterms, seminars	2	2	4
Homework	2	15	30
Self-study	2	15	30
Final exam preparation	5	1	5
Time spent in exams (tests, quizzes, final exam)	2	3	6
Projects, presentations, etc.			

Total			**165**
Teaching methodology:	Lecture , consultations.		
Assessment methods:	Mid-term test 20% End-of-term test 20% Homework 10% Attendance: 5% Final exam: 45% **Total: 100%**		
Literature			
Principal resource:	C. B. Boyer, *A history of mathematics*, John Wiley & Sons, New York, 1991. V. J. Katz, *A history of mathematics: an introduction*, Addison-Wesley, New York, 2009.		
Additional resources:	*Monografia e Departamentit të Matematikës*, Universiteti i Prishtinës, Prishtinë, 2021.		

Teaching plan:	
Week	**Lecture**
First week:	Mathematics in early civilizations
Second week:	The beginnings of greek mathematics
Third week:	The alexandrian school: Euclid
Fourth week:	Archimedes and Apollonius
Fifth week:	Greek trigonometry and mensuration
Sixth week:	Revival and decline of greek mathematics
Seventh week:	China and india
Eighth week:	The arabic hegemony
Ninth week:	Europe in the middle ages
Tenth week:	The renaissance
Eleventh week:	Geometry, algebra, and probability in the seventeenth century
Twelfth week:	The beginnings of calculus
Thirteenth week:	Modern mathematics: analysis and probability
Fourteenth week:	Modern mathematics: geometry, algebra and number theory
Fifteenth week:	Mathematics in Kosovo

Academic policy and rules of conduct:
The students shall follow the lecture regularly and shall contribute to the college and proffesional atmosphere respecting the Statute of the University of Prishtina and the rules of the Faculty. Especially the students shall not do any form of plagiaturism, untolerated cooperation, copying, deception or use of any equipment for this reason.

Basic course information	
Academic unit:	FMNS, Department of Mathematics
Title of the course:	Introduction to approximation theory
Level:	Bachelor
Course Status:	O
Year of studies:	I
Number of hours per week:	3+0
ECTS:	6
Time/location:	
Course Instructor:	Dr. sc. Behar Baxhaku
Contact Details:	Behar.baxhaku@uni-pr.edu
Course Description	In this course the fundamental aspects in the theory of apoximation will be explored, mainly by polynomial and trigonometric functions.
Course Goals:	-Equipping the student with knowledge of algebraic and trigonometric polynomials of best approximation. -Equipping the student with knowledge of the relationship between the properties of the function and its alignment with algebraic or trigonometric polynomials. -Equipping the student with knowledge of alignment with the Fourier series, the amounts of Fejér's and de la Vallée-Poussin's.
Expected outcomes:	After completion of the course, student will be able to: • formulate and apply the Weierstrass's theorems; • apply trigonometric and algebraic polynomial for better approximation for solving different problems; • describe interrelation between structural properties of functions and the degree of their approximation by algebraic polynomials; • find approximation of functions by Fourier series and its modifications; • describe properties of the orthogonal systems.

Student Workload

Activity	**Hours**	**Days/weeks**	**Total**
Lectures	3	15	45
Exercise sessions	-	-	-
Practical work	-	-	-
Office hours	1	15	15
Fieldwork	-	-	-
Midterms, seminars	2	2	4
Homework	3	15	45
Self-study	3	15	45
Final exam preparation	5	1	5
Time spent in exams (tests, quizzes, final exam)	2	3	6

Projects, presentations, etc.			
Total			**165**

Teaching methodology:	Lectures, discussions, homework, usage of audiovisuals.
Assessment methods:	Class participation (10%), Homework (10%), First Midterm (20%), Second Midterm (20%), Final exam (40%)
Literature	
Principal resource:	1. P. Natanson, Constructive function theory, Vol 1. Frederick Ungar Publishing Co., New York, 1964.
Additional resources:	2. N. I. Achieser, Theory of approximations, Dover, New York, 1992. 3. E. W. Cheney, An Introduction to approximation theory, McGraw-Hill, 1966.

Detailed teaching plan:

Week	**Lecture**
1	Weierstrass' theorems
2	Algebraic polynomial of the best approximation
3	Trigonometric polynomials of the best approximation
4	Interelation between structural properties of functions and the degree of their approximation by trigonometric polynomials
5	Bernstein's inequality. Bernstein's theorems
6	Zygmund's theorems
7	Interrelation between structural properties of functions and the degree of their approximation by algebraic polynomials
8	Approximation by means of Fourier series
9	The sums of Fejér and de la Vallée-Poussin
10	The best approximation to analytic functions
11	Properties of some analytic expressions
12	The $L^2(X,\mu)$ space
13	Orthogonal systems
14	The Fourier coefficients
15	Linearly independent systems of functions

Academic policies and rules of comportment:
Students should be punctual and attend all lectures, exercise sessions and exams. They should contribute to a constructive teaching process and should follow the instructions of the instructor. Students are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they write down the names of the colleagues with whom they have discussed homework and/or resources used. Academic dishonesty will be penalized severely.

The syllabus of the subject: Mathematical Analysis

Basic dates of the course	
Academic Unit	Department of Mathematics and Computer Sciences, FMNS, University of Prishtina
Course Title:	Mathematical Analysis
Level	Master
Status of the course:	Mandatory
Year of study	I
Number of house per week:	3+2
ECTS:	7
Location	Wednesday , 9.45 – 12.15, Laborator V.
Professor of the course	Dr. Sc. Naim Braha
Contact details	nbraha@yahoo.com
Course description	In this course are given, the basic concepts of metric spaces, the theory of measure and integration according to Lebesgue, normed spaces, Hilbert spaces, linear transformations, Banach spaces, locally convex spaces, duality, operators in Banach spaces (the three basic theorems, Theorem of the open graph, Hahn-Banach, Banach-Steinhauss).
The purpose of the course	• knowledge about the metric spaces, • the integral of Riman Stieltes, • Lebeg's measure and integral, • normed spaces, • Hilbert spaces, • Banach spaces, • locally convex spaces, • dual spaces, • operators in Hilbert and Banach spaces, • Hanh-Banachut theorem, closed Graph theorem, Banach-Steinhauss theorem
Learning outcomes	After completing this course, the student must: • to know the concept of metric spaces, • to know the Riman Stieltesi's integral, • to know the measure and the integral of Lebesgue, • to know about normed spaces, Hilbertian spaces, Banach spaces, locally convex spaces, dual spaces, • know about linear operators in Hilbert and Banach spaces, • To know the fundamental theorems, Hahn-Banach, closed Graph theorem, Banach-Steinhauss theorem.

Contribution comitment of the student –Semester II			
Activities	**Hours**	**Day/Week**	**In total**
Lectures	3	15	45
Theoretical/laboratory exercises	2	15	30
Practical work			
Contacts with the teacher/consultations	1	15	15
Field exercises			
Colloquiums, seminars	4	6	24
Homework			
Student's independent study time (in the library or at home)	4	15	60
Final exam preparation			30
Time spent on assessment (tests, quizzes, final exam)			9
Projects, presentations, etc			
In total			**213**

Teaching methodology:	Lectures, discussions during lectures, group or individual consultations, periodical test, final exam.
Evaluation methods:	First periodic test (colloquium): 45% Second periodic test (colloquium): 45% Regular attendance and activity in the lectures 10% Total: 100% If the student does not take part in the periodic tests, he/she gets the final test, which has 90% of the total points of the test, and 10% are from activity and attendance in the teaching hours.
Literature	
Basic literature:	John B. Conway , A Course in Abstract Analysis, Ams, 2012 H.L. Royden and P.M. Fitzpatrick, Real Analysis, fourth editon,2010, Pearson Education **Boules, Adel N.** Fundamentals of mathematical analysis. *Oxford University Press, Oxford,* 2021. xviii+462 pp. ISBN: 978-0-19-886879-8; 978-0-19-886878-1
Extended literature:	E. Kreyszig, *Introductory Functional Analysis with*

	Applications, John Wiley & Sons, 1978 W. Rudin, *Functional Analysis*, McGraw-Hill, 1978 *John Conway, A course in functional analysis, Second edition, Springer, 1990.* *Edwin Hewitt and Karl R. Stromberg, Real and Abstract Analysis, Springer , 1975.* *Robert Magnus, Metric Spaces, Springer, 2021*

Designed lesson plan:	
Weeks	**The lecture that will take place**
First week:	Real numbers, sets, sequences and functions
Second week:	Knowledge of the basic concepts of metric spaces
***Third week*:**	Convergence and compactness in metric spaces
Fourth week:	Topological spaces, general properties
Fifth week:	The integral of Riman -Stieltes
***Six week*:**	Lebeg's measure
***Seven week*:**	Measurable functions and their properties
Eight week:	Lebeg's integral
Ninth week:	Normed spaces
Tenth week :	Hilbert spaces
***Eleventh week*:**	Banach spaces
***Twelfth week*:**	Locally convex spaces
***Thirtieth week*:**	Dual spaces
***Fortieth week*:**	Operators in Hilbert and Banach spaces
***Fiftieth week*:**	Hahn-Banach theorem, closed graph theorem, Banach-Steinhauss theorem

Academic policies and rules of conduct::
Regular attendance at lectures and exercises is mandatory (with three or more unexcused absences, the student will attend the subject, again next year). Students must be in the classroom before the start of the lecture. Respecting the Statute of the University of Pristina and other rules of the University and the Faculty. Likewise, the use of cell phones or other electronic devices that hinder the learning process is prohibited.

Basic course information	
Academic Unit	FMNS, Departament of Mathematics
Title of the course	Mathematical modeling and optimization
Level	Master
Course Status	Elective
Year of studies	I, second semester
Number of hours per week	2+2
ECTS	6
Time / location	**N/A**
Course Instructor	Ramadan Limani
Contact details	ramadan.limani@uni-pr.edu
Course description:	This course is an Introduction to Mathematical modeling and Optimization. It contains different examples of mathematical modeling by using different techniques and math tools like elementary methods, graphical methods, the method of the difference equations, the least square method, the Lagrange multipliers, some ODE and PDE). This course contains some topics form non-linear programming (quadratic and conic programming) to finding an optimal solution to a given problem. The transport problem, the problem of the traffic flow, the heat equation, the wave equation are also some of topics of this course.
Main goal of the course:	The primary goal of this course is to help the student develop the skills necessary to effectively employ the ideas of mathematics to solve real life problems.
Learning outcomes:	After successfully completing the course, students will be able to: • Build a suitable mathematical model for a given problem from mathematics, physics, economy, finance, business, biology, etc. which can be effectively applied to solve it. • Effectively use their mathematical knowledge to solving a problem. • Effectively use the method of the least squares in modeling. • Apply different known models and mathematical tools of multivariable functions and ODE and PDE to solving problems from mathematics, physics, economics, business or

	finance. • Effectively apply nonlinear programming to first mathematically build a model for e given problem, and then solve it. • Further develop analytical and mathematical view towards problems that they can face in the future while doing their job. • Clearly exppress the definitions, theorems and other material taught in this course both oraly and in a written form.

Student workload –Semester III			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions (with TA)	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	2	4
Homework			
Self-study	3	15	45
Final exam preparation			8
Time spent in exams			4
Projects, presentations, etc.			
Total			**136**

Teaching method:	Lectures, discusssions, tutorials, tests, final exam.
Assessment:	Regular attendance: 10% First test: 20% Second test: 20% Final exam: 50% Total: 100% In case a student does not pass the exam according to the above policy, then he or she will have to take the written and oral exams. The written exam weighs 40%, while the oral one weighs 50%, and regular attendance 10%. Final grading policy will be:

Score (in %)	Grade

0-49	5 (fail)
50-59	6 (six)
60-69	7 (seven)
70-79	8 (eight)
80-89	9 (nine)
90-100	10 (ten)

Literature	
Main books:	1. *Edward A. Benger: An Introduction to Mathematical Modeling, University of California, 1978.* 2. *Wenyu Sun, Ya-Xiang Yuan: Optimization Theory and Methods, 2006.* 3. *Dimitri P. Bertseks: Non-Linear Programming, 2004.* 4. *David G. Luenberger, Yinue Ye: Linear and Non-Linear Programming, 2007.* 5. *Gerald B. Folland: Introduction to Partial Differential Equations, 1995.*
Additional books:	1. *Edward T. Dowling, PhD: Mathematical methods for busines and economics, Schaum's outline series, Mc-Graw Hill, 2009.* 2. *V. K. Balakrishnan: Graph Theory, Schaum's outline series, Mc-Graw Hill, 1997.*

Teaching detailed plan:

Week	Topic
First week	*Introducing the syllabus of the course to students and informing them for all academic procedures. Introduction to mathematical modeling. Examples from modeling ov some everyday life problems.*
Second week	*Math modeling to solve the problem of the population growth or capital growth.*
Third week	*The least square method. Modeling through difference equations of first and second order.*
Fourth week	*Application of the Lagrange multipliers to finding the extrema of a multivariable function and solving different problems from everyday life by using this method.*
Fifth week	*Convex Geometry in a vectorial space.*
Sixth week	*Introduction to nonlinear programming. Quadratic and conic programming. Modeling using nonlinear programming.*
Seventh week	*Test I*
Eighth week	*Introduction to algorithm complexity. The complexity of the simplex algorithm.*

Ninth week	*Method of the interior points.*
Tenth week	*Convex and concave functions and their properties. Minimum and maximum values of convex functions.*
Eleventh week	*Modeling using PDE. The transport problem.*
Twelfth week	*Math modeling of the traffic flow problem, and its solution.*
Thirteenth week	*The heat equation in bounded domains, and its solution.*
Fourteenth week	*The wave equation.*
Fifteenth week	*Test II*

Academic policies and student behaveur:
Students have to regularly attend lectures and they are asked to respect the Statute of Prishtina University and other official written regulations that come from the University, Faculty or Department. In particular, they are asked not to cheat in tests or exams, and not to allow other students to cheat from them. The use of moblie phones, or other electronic devices that could lead to misusing of them during lectures, tests or exams is strictly forbidden.

MICROECONOMICS

Basic data for the course	
Academic unit:	Faculty of Mathematics and Natural Sciences
Title of the course:	Microeconomics
Level:	Master
Status of the course:	Elective
Year of studies:	I (Sem. II)
Number of hours per week:	2+2
ECTS credits:	6
Time/location:	
Tutor:	
Tutor's contact details:	
Content of the course	The course will cover: scare resources in the society, consumer choices, supply and demand, market equilibrium, prices, production, costs, monopoly position, competition, oligopoly etc.
Course's objectives:	The course objectives are to inform students and increase their knowledge's about the principles of Microeconomics such as: supply, demand, prices, equilibrium, firms, consumer choices and their interaction with other economic stakeholders.
The expected outcomes:	At the end of the semester students will: 1. Understand the role of incentives in individual decision making. 2. Apply the workings of supply and demand to a number of real-world examples. 3. Utilize key economic ideas such as opportunity costs, elasticities, externalities, and efficiency.

The students' workload ***(hours per semester, ECTS)***			
Activity	**Week**	**Hours**	**Total**
Lectures	15	3	45
Seminars (theoretical and practical)	1	15	15
Homework	1	15	15

Individual study (at library or at home)	1		50
Final preparation for the exam			
Evaluation			
Projects, presentation etc.			
Total			**125**

Teaching methods:	Lectures, presentations, team work
Assessment methods:	The assessment will be organised through two tests during the semester.
Literature	
Basic literature:	Mançellari, A., Hadëri, S., Kule, Dh. dhe Qirici, S. (1999): *Hyrje ne Ekonomi*. Shtëpia botuese Pegi, Tiranë.
Additional literature:	1. Sloman, J. (2006). *Economics*. Prentice Hall. 2. Reports from Central Bank of Kosova, Statistical Office of Kosova, Government's report on economic issues etc.

The detailed plan of work:	
Week	**Topic**
Wee 1	Introduction to economics
Wee 2	Demand and supply
Wee 3	Market equilibrium
Wee 4	Price elasticity (supply and demand)
Wee 5	Consumer Choices
Wee 6	Theory of Production
Wee 7	Costs
Wee 8	Firms
Wee 9	The price system (Price ceiling and floors)
Wee 10	Competition
Wee 11	Monopoly
Wee 12	Monopolistic Competition
Wee 13	Oligopoly
Wee 14	Externalities
Wee 15	Information asymmetry

Academic policies and code of conduct:

Any student who participates in cheating in ANY WAY including, but not limited to: (1) Using lecture/study notes or summaries in any form during examinations, (2) Copying examination answers, (3) Failing to cover answers on an examination, (4) Giving and/or receiving examination questions and/or answers, (5) Removing an examination from the classroom, and/or (6) Giving or receiving assistance on an assignment that goes beyond that allowed by your instructor, WILL RECEIVE A FAILING GRADE IN THIS COURSE. ALL ASSIGNMENTS AND EXAMINATIONS FOR THIS CLASS ARE TO BE DONE INDEPENDENTLY UNLESS STATED OTHERWISE BY YOUR INSTRUCTOR

Basic course information	
Academic unit:	FMS, Department of Mathematics
Title of the course:	Numerical analysis
Level:	Master
Course Status:	E
Year of studies:	I
Number of hours per week:	2+2
ECTS:	6
Time/location:	The course will be offered in English
Course Instructor:	Faton Berisha
Contact Details:	faton.berisha@uni-pr.edu
Course Description	Iterative methods for linear systems: SOR, conjugate gradients, approximations in Krylov spaces. Eigenvalues problems. Systems of non-linear equations: Newton's method. Optimization problems. Numerical integration and differentiation.
Course Goals:	Students will study in detail analysis of core methods in linear algebra. Details of methods development are emphasized, their numerical analysis and practical application in chosen real engineering applications. Nonlinear systems of equations and related optimization problems will be discussed. Also, numerical integration and differentiation concepts will be studied. Special attention will be paid to the application of mathematical software for numerical computations.
Expected outcomes:	Upon successful completion of this course, the student will: • be equipped with basic knowledge of fundamental concepts of numerical approximation, stability etc.; • learn how to analyze these by using numerical analyses apparatus; • be able to apply the studied methods for solving mathematical and practical problems from chosen engineering and scientific problems; • be able to use computer software for implementation of the studied numerical methods and for their applications.

Student Workload

Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	1	2
Homework	2	15	30
Self-study	4	15	60
Final exam preparation	11	1	11

Time spent in exams (tests, quizzes, final exam)	2	1	2
Projects, presentations, etc.			
Total			**180**

Teaching methodology:	Lectures, discussions, homework, beamer presentations.
Assessment methods:	Class participation (10%), Homework (30%), Midterm (30%), Final exam (30%)
Literature	
Principal resource:	1. J. Demmel: Applied Numerical Linear Algebra 2. R. L. Burden, J. D. Faires, A. M. Burden: Numerical analysis
Additional resources:	3. R. Plato: Concise Numerical Mathematics 4. A. Greenbaum: Iterative methods for solving linear systems 5. B. Parlett: The symmetric eigenvalue problem 6. G. Golub, Ch. Van Loan: Matrix computations

Detailed teaching plan:	
Week	**Lecture**
1	Interpolation and approximation by polynomials.
2	Splines
3	Iterative methods for linear systems: SOR
4	Conjugate gradients
5	Approximations in Krylov spaces.
6 – 8	Eigenvalues problems.
9	Systems of non-linear equations
10 – 11	Newton's method.
12 – 13	Optimization problems
14	Numerical integration
15	Numerical differentiation

Academic policies and rules of comportment:
Attendance to lectures, exercises and exams is compulsory. Students are expected to contribute with their discussions and homework. They are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they give credit to all the contributors to a solution. Academic honesty is mandatory.

Basic course information	
Academic unit:	FMS, Department of Mathematics
Title of the course:	Numerical and scientific computing
Level:	Master
Course Status:	E
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time/location:	The course will be offered in English
Course Instructor:	Faton Berisha
Contact Details:	faton.berisha@uni-pr.edu
Course Description	Software implementation of iterative methods for solving linear algebra problems. Parallelization. Software implementation of numerical methods for eigenvalues problems. Least square method. Applications of numerical solutions of integral equations. Software implementation of numerical methods for solving differential equations. Applications of discreet and fast Fourier transformations. Software implementation of numerical methods for solving systems of non-linear equations.
Course Goals:	Students will study software implementation of numerical methods. Better understanding of the following notions is emphasized: approximation, perturbation, stability. Students will train implementation of the methods in programming languages with usage of existing software libraries. Advancement of skills for development of mathematical software libraries is encouraged. Also, a graphical environment (e.g. Octave/MATLAB) is applied in order to experiment with more complex case studies. Knowledge of mathematical modeling is offered.
Expected outcomes:	Upon successful completion of this course, the student will: • posses skills for software implementing of different numerical methods in a programming environment and for application of implementations for problem solving; • be able to use graphical software environments for analyzing complex case studies; • posses skills for using existing mathematical software libraries; • be able to solve practical situation problems by applying knowledge of mathematical modeling.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			

Midterms, seminars	2	1	2
Homework	2	15	30
Self-study	4	15	60
Final exam preparation	11	1	11
Time spent in exams (tests, quizzes, final exam)	2	1	2
Projects, presentations, etc.			
Total			**180**

Teaching methodology:	Lectures, discussions, homework, beamer presentations.
Assessment methods:	Class participation (10%), Homework (30%), Midterm (30%), Final exam (30%)
Literature	
Principal resource:	1. J. Demmel: Applied Numerical Linear Algebra 2. R. Plato: Concise Numerical Mathematics
Additional resources:	3. J. Stoer, R. Bulirsch: Introduction to numerical analysis 4. A. Iserles: A first course in the numerical analysis of differential equations 5. G. Golub, Ch. Van Loan: Matrix computations

Detailed teaching plan:

Week	Lecture
1	Discrete Fourier transform and Its applications
2	Solution of linear systems of equations
3	Nonlinear systems of equations
4	Numerical integration of functions
5	Explicit one-step methods for initial value problems in ordinary differential equations
6	Multistep methods for initial value problems of ordinary differential equations
7	Boundary value problems for ordinary differential equations
8	Methods for the solution of linear systems of equations
9	The conjugate gradient and GMRES Methods
10 – 11	Eigenvalue problems
12	Peano's error representation
12 – 15	Computer Arithmetic

Academic policies and rules of comportment:
Attendance to lectures, exercises and exams is compulsory. Students are expected to contribute with their discussions and homework. They are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they give credit to all the contributors to a solution. Academic honesty is mandatory.

Basic course information	
Academic unit:	FMS, Department of Mathematics
Title of the course:	Numerical approximation theory
Level:	Master
Course Status:	E
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time/location:	The course will be offered in English
Course Instructor:	Faton Berisha
Contact Details:	faton.berisha@uni-pr.edu
Course Description	Introduction to numerical approximations. Least square method. Numerical solutions of ordinary differential equations. Discrete and fast Fuorier transformations. General approximation theory. Partial differential equations.
Course Goals:	Students will study discretization, stability and convergence of numerical solutions to ordinary differential equations. They will analyze the Fourier transformation. The importance of Fourier transform in different applications will be emphasized. Classical methods for solving differential equations will be presented. Finite difference methods for solving partial differential equations will be presented. Special attention will be paid to the application of mathematical software for numerical computations.
Expected outcomes:	Upon successful completion of this course, the student will: • posses basic knowledge about fundamental issues in the theory of numerical approximation of functions; • learn how to apply and analyze the studied numerical methods for solving ordinary and partial differential equations; • be able to apply numerical methods for solving mathematical problems and practical problems from selected engineering and scientific applications; • be able to use computer software for implementation of the studied numerical methods and for their applications.

Student Workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	2	15	30
Exercise sessions	2	15	30
Practical work			
Office hours	1	15	15
Fieldwork			
Midterms, seminars	2	1	2
Homework	2	15	30
Self-study	4	15	60

Final exam preparation	11	1	11
Time spent in exams (tests, quizzes, final exam)	2	1	2
Projects, presentations, etc.			
Total			**180**

Teaching methodology:	Lectures, discussions, homework, beamer presentations.
Assessment methods:	Class participation (10%), Homework (30%), Midterm (30%), Final exam (30%)
Literature	
Principal resource:	1. R. Plato: Concise Numerical Mathematics 2. A. Iserles: A first course in the numerical analysis of differential equations
Additional resources:	3. J. Stoer, R. Bulirsch: Introduction to numerical analysis 4. R. L. Burden, J. D. Faires, A. M. Burden: Numerical analysis

Detailed teaching plan:

Week	**Lecture**
1 – 2	Introduction to numerical approximations
3	Least square method
4 – 7	Numerical solutions of ordinary differential equations.
8	Discrete Fuorier transformation
9	Fast Fuorier transformation
10 – 12	General approximation theory
13 – 15	Numerical solutions of partial differential equations.

Academic policies and rules of comportment:
Attendance to lectures, exercises and exams is compulsory. Students are expected to contribute with their discussions and homework. They are encouraged to attend office hours. Homework should be written individually, but students are encouraged to discuss with one another as long as they give credit to all the contributors to a solution. Academic honesty is mandatory.

The syllabus of the subject: Operator Theory

Basic dates of the course	
Academic Unit	Department of Mathematics and Computer Sciences, FMNS, University of Prishtina
Course Title:	Operator Theory
Level	Master
Status of the course:	Elective
Year of study	II
Number of house per week:	3+2
ECTS:	7
Location	Wednesday , 9.45 – 12.15, Laborator V.
Professor of the course	Dr. Sc. Naim Braha
Contact details	nbraha@yahoo.com
Course description	In this course, the basic concepts from the theory of operators in Hilbert and Banach spaces are given. Starting from sesquilinear forms, scalar product, Hilbert spaces, orthogonality, linear operators and their adjoint, closed linear operators, special classes of operators, spectral theorem for adjoint and normal operators, perturbation theory for self-adjoint operators.
The purpose of the course	The main goals of this course are: • knowledge about the vector spaces, • Hilbertian spaces, •the concept of linear operators in Hilbert spaces, • orthogonality in Hilbert spaces, • Continuity of operators and their different classes.
Learning outcomes	After completing this course, the student must: • Have knowledge of the vector spaces • To know the basic concepts on Hilbertian spaces • To know the basic concepts regarding linear operators in Hilbert spaces • To know about the continuity of linear operators in Hilbert spaces

Contribution comitment of the student –Semester II			
Activities	**Hours**	**Day/Week**	**In total**
Lectures	3	15	45
Theoretical/laboratory exercises	2	15	30
Practical work			
Contacts with the teacher/consultations	1	15	15
Field exercises			

Colloquiums, seminars	4	6	24
Homework			
Student's independent study time (in the library or at home)	4	15	60
Final exam preparation			30
Time spent on assessment (tests, quizzes, final exam)			9
Projects, presentations, etc			
In total			**213**

Teaching methodology:	Lectures, discussions during lectures, group or individual consultations, periodical test, final exam.
Evaluation methods:	First periodic test (colloquium): 45% Second periodic test (colloquium): 45% Regular attendance and activity in the lectures 10% Total: 100% If the student does not take part in the periodic tests, he/she gets the final test, which has 90% of the total points of the test, and 10% are from activity and attendance in the teaching hours.
Literature	
Basic literature:	Joachim Weidmann, Linear operators in Hilbert spaces, Springer, 1980. Israel Gohberg, Seymour Goldberg , Marinus A. Kaashoek, Basic classes of linear operators, Birkhauser, 2003
Extended literature:	Nelson Dunford, Jacob Schwartz, Linear operators, part I, II, Interscience Publishers, INC., New York, 1957. Tosio Kato , Perturbation theory for linear operators, Springer , 1980. *Kosako Yosida, Functional Analysis, Springer-Verlag, 1966.*

Designed lesson plan:

Weeks	The lecture that will take place
First week:	Sesquilinear forms, scalar product and norms, convergence and completeness
Second week:	The projection theorem, orthonormal systems and orthonormal basis, existence of orthonormal basis, dimension of Hilbert spaces, tensor products of Hilber spaces
Third week:	Linear operators-basic concepts, bounded operators and functionals
Fourth week:	Isomorphism and completion of operators, adjoint operators
Fifth week:	Orthogonal projections, isometric and unitary operators
Six week:	Closed linear operators, the closed graph theorem, the fundamentals of spectral theory
Seven week:	Symmetric and self-adjoint operators, self-adjoin extension of symmetric operators
Eight week:	Operatrs defined by sesquilinear forms and normal operators
Ninth week:	Finite rank and compact operators, ,Hilbert-Schmidt operators
Tenth week :	Matrix operators and integral operators
Eleventh week:	The spectral theorem for compact operators
Twelfth week:	Integration with respect to a spectral family
Thirtieth week:	The spectral theorem for self-adjoint operators, Spectra of self-adjoint operators and spectral theorem for normal operators
Fortieth week:	One parameter unitary groups
Fiftieth week:	Self-adjoint extension of symmetric operators

Academic policies and rules of conduct::
Regular attendance at lectures and exercises is mandatory (with three or more unexcused absences, the student will attend the subject, again next year). Students must be in the classroom before the start of the lecture. Respecting the Statute of the University of Pristina and other rules of the University and the Faculty. Likewise, the use of cell phones or other electronic devices that hinder the learning process is prohibited.

Basic dates of the course	
Academic Unit	FMNS, Departament Mathematics
Direction	Mathematic
Course Title:	Partial differential equations
Level	Bachelor
Status of the course:	Mandatori
Year of study	II (semester III)
Number of house per week:	3+2
ECTS:	7
Location	**Department of Mathematics**
Professor of the course	Prof. Dr. Muhib Lohaj
Contact details	E-Mail: muhib_lohaj@yahoo.com, Tel.: (0) 44 220-015
Course Description	At the beginning it will be studied systems of homogeneous and nonhomogeneous linear differential equations then will move on to the study of partial differential equations. Initially we give the meanings of the partial differential equations then we see how can be formed partial differential equations. Types of solutions of partial differential equations. Then it will be studied homogeneous equations, linear partial differential equations of first order, homogenous and nonhomogeneous and their solutions. Further, it will be studied nonlinear partial differential equations of second order. Transformation of linear partial differential equation of second order in canonical form and its solution.
Purposes of the course	Learning partial differential equations has a special significance for further study not only of mathematics but also many other areas of science especially physics and Technical Sciences.
Learning outcomes	After completing this course, students will be able to: • Solve systems of homogeneous and nonhomogeneous linear differential equations • Use methods for solving of linear and

	nonlinear partial diferfential equations of first order • Solve Pfaf equations • Transform the partial differential equation os second order in the canonical form, • Solve partial differential equations of second order.

Contribution comitment of the student –Semester II			
Activities	**Haurs**	**Day/Week**	**In total**
Lectures with the professor	3	15	45
Exercises with the assistant	2	15	30
Tutorial			
Consultation	1	15	15
Field exercises			
Kollokfiume, seminars	2	2	4
Homework			
Time self learning	4	15	60
Final preparation for the exam			18
Time spent on evaluation (tests, Quiz, the final exam)			3
Projects, presentations, etc.			
In total			**175**

Designed learning plan

Week	Lecture
Week One:	Systems of linear differential equations
Week Two:	Nonhomogeneous linear systems
Week Three:	Systems of differential equations with constant coefficients
Week Four:	Systems of differential equations with constant coefficients
Week Five:	Partial differential equations. Definitions and basic properties
Week six:	Homogenous Partial differential equations
Week seven:	Nonhomogenous Partial differential equations
Week eight:	Equations with total diferential of the form DZ=A(X,Y,Z)DX+B(X,Y,Z)DZ
Week Nine:	Pfaf's equation
Week ten:	Nonlinear partial differential equation of first order
Week Eleven:	Solution of nonlinear partial differential equation of first order
Week Twelve:	Partial differential equations of second order
Week thirteen:	Transformation of Partial differential equations of second order In the canonical form.
Week Fourteen	Transformation of Partial differential equations of second order In the canonical form.
Week fiften	Examples of partial differential equations of the second order and their solution.

Base literature	• Copson .E.T., Partial Differential Equations , New York, London, Melbourne, 1975, • Kreyszig. E, Advanced Engineering Mathematics, Wiley, International Edition, 2006, • Ravi P.Agarwal, Donal O'Regan., An Introduction to Ordinary Diferential Equations, New York 2008, • Hamiti. E., Matematika IV, Prishtine, 2004.

Special functions

Basic course information	
Academic unit:	FMNS, University of Prishtina
Title of the course:	Probability and statistics
Level:	Master
Course Status:	E
Year of studies:	II (Sem. III)
Number of hours per week:	3+2
ECTS:	6
Time/location:	Departament of Mathematics
Course Instructor:	dr. sc. Bujar Fejzullahu
Contact Details:	bujar.fejzullahu@uni-pr.edu
Course description:	This course provides the understanding of basic concepts, terms and results of probability theory and mathematical statistics as well as the correct understanding and application of statistical testing patterns and regression.
Course Goals:	The aim of this course is to provide the students with practical knowledge of the principles and concept of probability and statistics and their applications in modeling and solving problems from different fields.
Expected outcomes:	After completing this course the students will be able to: • Recognize the conditional probability and the meanings associated with it; • Define the dependence of random variables and analyze the correlation between them; • Formulate the limit theorems; • Identify distributions derived from the normal distribution; • Recognize the basic concepts and mathematical statistics results; • Identify tests on confidence measurement; • Apply statistical test patterns, regression models, and non-parametric analysis methods. • Build regular models; • Analyze the effects of the impact of the coefficients; • Apply acquired knowledge, in solving problems from different fields; • Use software and simulation to do statistics.

Student workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	3	15	45
Exercise sessions	2	15	30
Practical work	-	-	-

Office hours	1	15	15
Fieldwork	-	-	-
Midterms, seminars	2	2	4
Homework	2	15	30
Self-study	2	15	30
Final exam preparation	5	1	5
Time spent in exams (tests, quizzes, final exam)	2	3	6
Projects, presentations, etc.			
Total			**165**

Teaching methodology:	Lectures, discussions, exercises, consultations, homework, seminars, colloquiums, exams.
Assessment methods:	Homework 10% Seminars 10% Mid-term test 20% End-of-term test 20% Final exam: 40% **Total: 100%**
Literature	
Principal resource:	• B. Fejzullahu, Bazat e teorisë së gjasës, Universiteti i Prishtinës, Prishtinë, 2021.
Additional resources:	• J. Rice, Mathematical statistics and data analysis, Duxbury Press, California, 2007. • H. T. Nguyen, G. S. Rogers, Fundamentals of Mathematical Statistics, Springer Verlag, 1989. • G. Schay, Introduction to probability with statistical applications. Birkhäuser, Boston, 2007.

Teaching plan:	
Week	**Lecture**
First week:	Probability and conditional probability
Second week:	Independent and dependent random variables
***Third week*:**	Conditional distributions
Fourth week:	Distributions of functions of random variables
Fifth week:	Covariance and correlation
Sixth week:	Conditional parameters
Seventh week:	Limit theorems
Eighth week:	Distributions derived from the normal distribution
Ninth week:	Sampling distribution
Tenth week:	Estimation of parameters
Eleventh week:	Testing hypotheses
Twelfth week:	The analysis of variance
Thirteenth week:	Linear regression
Fourteenth week:	The analysis of categorical data
Fifteenth week:	Software packages for statistics

Academic policy and rules of conduct:
The students shall follow the lecture regularly and shall contribute to the college and proffesional atmosphere respecting the Statute of the University of Prishtina and the rules of the Faculty. Especially the students shall not do any form of plagiaturism, untolerated cooperation, copying, deception or use of any equipment for this reason.

Basic subject data	
Academic Unit	Faculty of Mathematics and Natural Sciences
Title of subject:	Recommender Systems and Network Analysis
Level:	Master
Status of the subject:	Elective
Study year:	Second Year / Third Semester
Number of hours per week:	2+2
Value on credits – ECTS:	6
Time/Location:	N/A, FMNS
Professor of subject:	Dr.sc. Artan Berisha
Contact details:	artan.berisha@uni-pr.edu
Description of the subject	**Introduction to recommender systems.** **Recommender Systems techniques** **Evaluation of Recommender Systems.** **Introduction to network analysis**. Graphs. Networks. **Node position**. Spectral and distance node centrality. Clustering coefficients. Link analysis algorithms. **Link importance**. Betweenness and bridgeness link centrality. Embeddedness and topological overlap. **Node similarity**. Local and global node similarity. Structural and regular equivalence. Block models. **Node fragments**. Egonets analysis. Network motifs and graphlets. Convex subgraphs. Node orbit distributions. **Graph partitioning**. Graph bisection. Spectral analysis. Hierarchical clustering. Core-periphery structure. **Network clustering**. Modularity optimization. Community detection. Role discovery. Blockmodeling. **Network modeling**. Erdos-Renyi. Watts-Strogatz. Price, Barabasi-Albert and configuration models. **Network abstraction**. Structural network comparison. Network layout algorithms. Network visualization. **Network mining**. Node classification and ranking by equivalence and position. Link prediction by similarity. **Selected applications of network analysis**. Fraud detection. Software engineering. Information science.
Goals of the subject:	The course aims at familiarizing the student with the theoretical fundamentals of network science and Analysis, with focus on Recommender Systems, and the practicalities of applying network analysis to real-world problems.
Expected results:	After successfully completing the course, students should be able to: • Apply the network science approach to data analysis. • Evaluate different types of methods and models. • Choose the correct approach for the problem at hand. • Interpret network analysis results

	• Identify potential issues.		
Contribution in the student load (something that should correspond with the results of student learning)			
Activity	Hour	Day/Week	In total
Lectures	3	15	45
Theoretical exercises / laboratory	1	15	15
Tutorial	2	15	30
Kontacts with teacher / consultations	0.5	15	7.5
Field Exercises	-	-	-
Colloquiums, seminars	2	3	6
Homework	1.5	6	9
Self study time student (at the library or at home)	1.5	15	22.5
Preparation for final exam			10
Time spent on assessment (test, quiz, final exam)			3
Projects, presentations, etc.			2
Total			**150**
Methodology of teaching:	Lectures, Exercises, Quizzes, Laboratory Work, Laboratory Work, discussions, mid-term exams, final exam		
Evaluation Methods:	attendance and class activity (10%), semesterly practical project I (30%), laboratory work & exercises (15%), final exam (45%)		
Literature			
Literature:	Barabási, A.-L., **Network Science** (Cambridge University Press, 2016).		
Additional literature:	Recommender Systems Handbook - Francesco Ricci · Lior Rokach · Bracha Shapira Paul B. Kantor		
	Easley, D. & Kleinberg, J., **Networks, Crowds, and Markets** (Cambridge University Press, 2010)		

The lesson plan designed:	
Week	Lecture to be held
First week:	Introduction to Course / Syllabus Review
Second week:	Introduction to Recommender Systems
Third week:	Recommender system techniques
Forth week:	Evaluation of recommender systems
Fifth week:	Graph theory
Sixth week:	Evolving networks
Seventh week:	laboratory work & exercises – part I
Eighth week	Human computer interaction in recommender systems

Ninth week:	Network robustness
Tenth week:	Communities
Week Eleven:	Spreading phenomena
Week Twelve:	Strong and Weak Ties
Week thirteen:	Networks in Their Surrounding Contexts
Week Fourteen:	laboratory work & exercises – part II
Week Fifteen:	Semesterly practical project I

Academic policies and rules of conduct:
Attending lectures and lab work is mandatory.

Të dhëna bazike të lëndës			
Basic subject data	Faculty of Mathematics and Natural Sciences		
Academic Unit	Security in computer systems		
Title of subject:	Master		
Level:	Elective		
Status of the subject:	Second Year / Third Semester		
Study year:	2+2		
Number of hours per week:	6		
Value on credits – ECTS:	N/A, FMNS		
Time/Location:	Dr.sc. Artan Berisha		
Professor of subject:	artan.berisha@uni-pr.edu		
Description of the subject	In this course, topics include theoretical introductions to cryptography, symmetric key cryptosystems, asymmetric key cryptosystems, one-way functions, digital signatures, elliptic curves, cryptographic protocols, and the mathematical background necessary to explain them.		
Goals of the subject:	Students will learn the application of data security theory including recognition of potential threats to confidentiality and integrity. They will learn about simple algorithms used since the time of the Romans, symmetric DES and AES algorithms, asymmetric algorithms RSA (factorization of prime numbers), EL-Gamal (discrete logarithm), elliptic curves, one-way functions SHA-1, SHA -2 and SHA-3. In addition to algorithms, they will learn the application of knowledge from mathematics and its application in the construction of modern algorithms.		
Expected results:	After completing this course, the student is able to: ➢ to have basic knowledge of data security, ➢ be able to elaborate on the strengths and weaknesses, as well as the limitations of the main theories for data security, ➢ evaluate current trends in data security, ➢ to understand the historical development of data security and issues related to it, ➢ to understand the application of mathematical theory for data security.		
Contribution in the student load (something that should correspond with the results of student learning)			
Activity	**Hour**	**Day/Week**	**In total**
Lectures	2	15	30

<table>
<tr><td>Theoretical exercises / laboratory</td><td>2</td><td>15</td><td>30</td></tr>
<tr><td>Tutorial</td><td></td><td></td><td></td></tr>
<tr><td>Kontacts with teacher / consultations</td><td>1</td><td>15</td><td>15</td></tr>
<tr><td>Field Exercises</td><td></td><td></td><td></td></tr>
<tr><td>Colloquiums, seminars</td><td>1</td><td>7</td><td>7</td></tr>
<tr><td>Homework</td><td>2</td><td>15</td><td>30</td></tr>
<tr><td>Self study time student (at the library or at home)</td><td>2</td><td>15</td><td>30</td></tr>
<tr><td>Preparation for final exam</td><td>2</td><td>5</td><td>10</td></tr>
<tr><td>Time spent on assessment (test, quiz, final exam)</td><td>3</td><td>1</td><td>3</td></tr>
<tr><td>Projects, presentations, etc.</td><td>2</td><td>2</td><td>4</td></tr>
<tr><td>Total</td><td></td><td></td><td>159</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Methodology of teaching:</td><td colspan="3">This subject is explained through lectures, theoretical exercises, numerical exercises, homework and seminar work (where it is expected to be carried out with continuous supervision of the assistant and the lecturer of the subject).</td></tr>
<tr><td>Evaluation Methods:</td><td colspan="3">Assignments: 30 pikë,
Seminar: 15 pikë,
Final exam: 55 pikë.

Evaluation:
<table>
<tr><th>Points</th><th>Grade</th></tr>
<tr><td><50</td><td>5</td></tr>
<tr><td>>=50 dhe <60</td><td>6</td></tr>
<tr><td>>=60 dhe <70</td><td>7</td></tr>
<tr><td>>=70 dhe <80</td><td>8</td></tr>
<tr><td>>=80 dhe <90</td><td>9</td></tr>
<tr><td>>=90</td><td>10</td></tr>
</table>
The points from assignments and seminar work that have been achieved by the student during the course will be valid for each term. So the student always takes the exam with a maximum of 55 points.</td></tr>
<tr><td colspan="4">Literature</td></tr>
<tr><td>Literature:</td><td colspan="3">1. Cryptography and Network Security - Principles and Practice, William Stallings, Pearson, 2019</td></tr>
<tr><td>Additional literature:</td><td colspan="3">2. Understanding Cryptography A Textbook for Students and Practitioners,Christof Paar, Jan Pelzl 2010 Springer</td></tr>
</table>

The lesson plan designed:	
Week	**Lecture to be held**
First week:	**Information and Network Security Concepts**
Second week:	**Classical Encryption Techniques**
Third week:	**Block Ciphers and the Data Encryption Standard**
Forth week:	**Advanced Encryption Standard (AES)**
Fifth week:	**Block Cipher Operation**
Sixth week:	**Random Bit Generation and Stream Ciphers**
Seventh week:	**First assignment**
Eighth week	**Public-Key Cryptography and RSA**
Ninth week:	**Other Public-Key Cryptosystems**
Tenth week:	**Cryptographic Hash Functions**
Week Eleven:	**Message Authentication Codes (MAC)**
Week Twelve:	**Digital Signatures**
Week thirteen:	**Second assignment**
Week Fourteen:	**Seminar**
Week Fifteen:	**Final exam**

Academic policies and rules of conduct:
Students must come regularly and on time to lectures, exercises and exams. They should contribute to a constructive learning process and follow the instructions of the instructor. Students are encouraged to come to consultations. Homework should be written individually, but students are encouraged to discuss assignments with peers provided that the names of peers discussed and/or resources used are recorded. Academic dishonesty will be punished.

The syllabus of the subject: Selected chapters from functional analysis

Basic dates of the course	
Academic Unit	Department of Mathematics and Computer Sciences, FMNS, University of Prishtina
Course Title:	Selected chapters from functional analysis
Level	Master
Status of the course:	Elective
Year of study	III
Number of house per week:	3+2
ECTS:	7
Location	Wednesday , 9.45 – 12.15, Laborator V.
Professor of the course	Dr. Sc. Naim Braha
Contact details	nbraha@yahoo.com
Course description	Through this subject, it will be possible to learn the basic concepts of the geometry of Banach spaces, both in the spaces of sequences and those of functions.
The purpose of the course	Learning the subject selected chapters from functional analysis, has a special importance for the further study of functional analysis, and its applications in the theory of operators, the theory of fixed points - which also enables applications in economics, cryptography etc.
Learning outcomes	

Contribution comitment of the student –Semester II			
Activities	**Hours**	**Day/Week**	**In total**
Lectures	3	15	45
Theoretical/laboratory exercises	2	15	30
Practical work			
Contacts with the teacher/consultations	1	15	15
Field exercises			
Colloquiums, seminars	4	6	24
Homework			
Student's independent study time (in the library or at home)	4	15	60
Final exam preparation			30
Time spent on assessment (tests, quizzes, final exam)			9
Projects, presentations, etc			
In total			**213**

Teaching methodology:	Lectures, discussions during lectures, group or individual consultations, periodical test, final exam.
Evaluation methods:	First periodic test (colloquium): 45% Second periodic test (colloquium): 45% Regular attendance and activity in the lectures 10% Total: 100% If the student does not take part in the periodic tests, he/she gets the final test, which has 90% of the total points of the test, and 10% are from activity and attendance in the teaching hours.
Literature	
Basic literature:	1) Fernando Albiac and Nigel J.Kalton Topics in Banach Space, Springer 2006, 2) J. Diestel, Geometry of Banach spaces, Springer, 1975.
Extended literature:	1) J. Lindenstrauss and L. Tzafir, Classical Banach spaces, part I, II, 1979, Springer

Designed lesson plan:	
Weeks	**The lecture that will take place**
First week:	Schauder bases
Second week:	**Equivalence of Bases and Basic Sequences**
Third week:	The isomorphic structure of the l_p and c_0, complementary subspaces of l_p and c_0
Fourth week:	The space l_1, convergence of series and operators on c_0, **Complementability of** c_0
Fifth week:	**Unconditional Bases**
Six week:	**Bases and Duality: Boundedly Complete and Shrinking Bases**
Seven week:	**Nonreflexive Spaces with Unconditional Bases**
Eight week:	**A Litmus Test for Having Unconditional Bases**

Ninth week:	**Basic Facts About the Spaces *C.K/***
Tenth week :	**Isometrically Injective Spaces**
***Eleventh week*:**	**Spaces of Continuous Functions on Uncountable And countable Compact Metric Spaces**
***Twelfth week*:**	The spaces $L_1(\mu)$ and $C(K)$
***Thirtieth week*:**	**Weak Compactness in $M(K)$, the** Dunford-Pettis property, the Radon-Nikodym property
***Fortieth week*:**	**Subspaces of** $L_1(\mu)$ spaces and $C(K)$ spaces
***Fiftieth week*:**	The spaces L_p for $1\leq p<\infty$, their geometric aspects, Khinchine inequality

Academic policies and rules of conduct::
Regular attendance at lectures and exercises is mandatory (with three or more unexcused absences, the student will attend the subject, again next year). Students must be in the classroom before the start of the lecture. Respecting the Statute of the University of Pristina and other rules of the University and the Faculty. Likewise, the use of cell phones or other electronic devices that hinder the learning process is prohibited.

Special functions

Basic course information	
Academic unit:	FMNS, University of Prishtina
Title of the course:	Special functions
Level:	Master
Course Status:	E
Year of studies:	II (Sem. III)
Number of hours per week:	2+2
ECTS:	6
Time/location:	Departament of Mathematics
Course Instructor:	dr. sc. Bujar Fejzullahu
Contact Details:	bujar.fejzullahu@uni-pr.edu
Course description:	This course will study some important special functions, such as the gamma and beta functions, hypergeometric functions in particular hypergeometric of Gauss's function and the confluent, Bessel's functions, orthogonal polynomials and in particular the Jacob's, Laguerre's and Hermit's polynomials, integrals and elliptic functions.
Course Goals:	The aim of this course is to introduce students to the study of some important special functions and as well as variety of different methods to explore the properties of these functions.
Expected outcomes:	After completing this course the students will be able to: • define the basic special functions; • formulate mathematical properties of special functions by their series and/or integral representations; • describe the main features of the proofs of important properties; • determine types of differential equations which may be solved by application of special functions; • apply special functions to the solution of various problems from different fields

Student workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	3	15	45
Exercise sessions	-	-	-
Practical work	-	-	-
Office hours		15	30
Fieldwork	-	-	-
Midterms, seminars	2	2	4
Homework	3	15	45
Self-study	3	15	45
Final exam preparation	5	1	5

Time spent in exams (tests, quizzes, final exam)	2	3	6
Projects, presentations, etc.			
Total			**180**
Teaching methodology:	Lecture , consultations.		
Assessment methods:	Mid-term test 20% End-of-term test 20% Homework 10% Attendance: 5% Final exam: 45% **Total: 100%**		
Literature			
Principal resource:	• G. Andrews, R. Askey, and R. Roy, *Special functions*, Cambridge University Press, Cambridge, 1999.		
Additional resources:	• E. D. Ranvillie, *Special Functions* , Macmillan, New York, 1960. • N. Temme *Special functions: An introduction to the classical functions of mathematical physics*, John Wiley & Sons, Inc., New York, 1996.		

Teaching plan:	
Week	**Lecture**
First week:	Gamma function
Second week:	Functions related with Gamma function
Third week:	The hypergeometric functions
Fourth week:	Hypergeometric transformations and identities
Fifth week:	Confluent hypergeometric functions
Sixth week:	Generalized hypergeometric functions
Seventh week:	Bessel functions
Eighth week:	Modified Bessel functions
Ninth week:	Orthogonal polynomials
Tenth week:	Jacobi polynomials
Eleventh week:	Laguerre and Hermite polynomials
Twelfth week:	Incomplete gamma function
Thirteenth week:	Incomplete beta function
Fourteenth week:	Elliptic integrals
Fifteenth week:	Elliptic functions

Academic policy and rules of conduct:
The students shall follow the lecture regularly and shall contribute to the college and proffesional atmosphere respecting the Statute of the University of Prishtina and the rules of the Faculty. Especially the students shall not do any form of plagiaturism, untolerated cooperation, copying, deception or use of any equipment for this reason.

Theory of analytic functions

Basic course information	
Academic unit:	FMNS, Department of Mathematics
Title of the course:	Theory of analytic functions
Level:	Master
Course Status:	E
Year of studies:	II
Number of hours per week:	2+2
ECTS:	6
Time/location:	Departament of Mathematics
Course Instructor:	Prof. Ass. Dr. Edmond Aliaga
Contact Details:	edmond.aliaga@uni-pr.edu
Course description:	This course provides basic understandings and assumptions on the geometric function theory and certain classes of analytic functions, with particular emphasis on univalent functions as well as the fundamental issues of differential subordination.
Course Goals:	The purpose of the course is to provide the students with the knowledge of the univalent functions and their properties, the naturalness of the coefficients during the various decomposition, as well as the differential subordination and the treatment of the criteria for univalence.
Expected outcomes:	After completing this course the students will be able to: • Understands the fundamental properties of some of the main univalent functions; • Apply the differential subordination method in solving various problems of analytic functions; • Recognize and understand the hypotheses raised by many authors about analytical functions.

Student workload			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	3	15	45
Exercise sessions	-	-	-
Practical work	-	-	-
Office hours	1	15	15
Fieldwork	-	-	-
Midterms, seminars	2	2	4
Homework	1	15	15
Self-study	4	15	60
Final exam preparation	10	1	10
Time spent in exams (tests, quizzes, final exam)	2	3	6
Projects, presentations, etc.			
Total			**155**

Teaching methodology:	Lecture , consultations.
Assessment methods:	Mid-term test 20% End-of-term test 20% Attendance: 5% Final exam: 55% **Total: 100%**
Literature	
Principal resource:	• Duren P.L.: Univalent functions, Springer-Verlag, 1983. • Pommerenke Ch.: Univalent functions, Vandenhoeck & Ruprecht, Göttingen, 1975.
Additional resources:	• Pocanu P.T., Miller S.S.: Differential subordinations.Theory and applications., Marcel Dekker, New York-Basel, 2000.

Teaching plan:	
Week	**Lecture**
First week:	Introductory notions and definitions of geometric theory of functions.
Second week:	Local mapping properties. Normal families. Extremal problems.
Third week:	The Riemann Mapping Theorem. Analytic continuation. Green's functions.
Fourth week:	Introduction to theory of univanlent functions. The Area theorem.
Fifth week:	Growth and distortion theorems. Coefficients estimates.
Sixth week:	Different classes of functions and their properties: convex functions; close-to-convex functions, spiral functions, starlike functions.
Seventh week:	Functions of type Basilevich, functions with respect to symmetrical points.
Eighth week:	A primitive variational method. Odd univalent functions. Asymptotic Bieberbach conjecture.
Ninth week:	Univalence of solutions. Coefficients of odd functions. Successive coefficients.
Tenth week:	Generalizations of the area principle. The Grunsky inequalities.
Eleventh week:	Successive coefficients of several univalent functions.
Twelfth week:	Introduction to differential subordination. Univalent subordinate functions.
Thirteenth week:	Bounded univalent functions.
Fourteenth week:	Criteria for univalence. Univalent polynomials.
Fifteenth week:	General exercises.

Academic policy and rules of conduct:
The students shall follow the lecture regularly and shall contribute to the college and proffesional atmosphere respecting the Statute of the University of Prishtina and the rules of the Faculty. Especially the students shall not do any form of plagiaturism, untolerated cooperation, copying, deception or use of any equipment for this reason.