

Study Plan

School:	School of Sciences and Technology
Degree:	Bachelor
Course:	Applied Mathematics (cód. 164)

Specialization Major in Mathematics and Minor in Biology and Ecology

1st Year - 1st Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Laboratory of Mathematics	Mathematics	6	Semester	156
MAT00928					
	Discrete Mathematics	Mathematics	6	Semester	156
MAT00932L					
	Programming I	Informatics	6	Semester	162
INF00880L					
	Mathematical Analysis I	Mathematics	6	Semester	162
MAT00905L					
	Linear Algebra and Geometry I	Mathematics	6	Semester	156
MAT00900L					

1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Linear Algebra and Geometry II	Mathematics	7	Semester	181
MAT00901					
	Mathematical Analysis II	Mathematics	6	Semester	162
MAT00906L					
	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
GES00788L					
	Programming II	Informatics	6	Semester	162
INF00881L					
	Geometry I	Mathematics	6	Semester	156
MAT00922L					

2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	General Physics I	Physics	6	Semester	158
FIS00703L					
	Introduction to Probability and Statistics	Mathematics	6	Semester	154
MAT00925L					
	Mathematical Analysis III	Mathematics	6	Semester	162
MAT00907L					
	Algebra I	Mathematics	6	Semester	156
MAT00898L					
	Metrics and Topology	Mathematics	6	Semester	156
MAT00938L					



2nd Year - 4th Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Computational Methods	Mathematics	6	Semester	160
MAT00937L					
	Complements of Probability and Statistics	Mathematics	6	Semester	162
MAT00912L					
	Mathematical Analysis IV	Mathematics	6	Semester	162
MAT00908L					
	History and Phylosophy of Mathematics	Mathematics	6	Semester	157
MAT00924L					
	Computational Logic	Mathematics	6	Semester	156
MAT00929L					

3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Complex Analysis	Mathematics	6	Semester	156
MAT00903L					
	Mathematical Statistics	Mathematics	6	Semester	156
MAT00918L					
BIO00312	Introduction to Biology Studies	Biology	2	Semester	52
	Basic Ecology	Ecology	4	Semester	104
PAO00500					



3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area F	Scientific Area Field ECT		ion Hour
Group of Options					- -
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT00930L	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00921L	Differential Geometry	Mathematics	6	Semester	156
MAT00927L	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00926L	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00923L	Geometry II	Mathematics	6	Semester	156
MAT00943L	Topics of Group Theory	Mathematics	6	Semester	156
MAT00942L	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00941L	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00939L	Functional Optimization	Mathematics	6	Semester	156
MAT00902L	Sampling	Mathematics	6	Semester	156
MAT00899L	Algebra II	Mathematics	6	Semester	156
MAT00897L	Computational Algebra	Mathematics	6	Semester	156
MAT00910L	Numerical Analysis II	Mathematics	6	Semester	156
MAT00909L	Numerical Analysis I	Mathematics	6	Semester	156
MAT00904L	Functional Analysis	Mathematics	6	Semester	156
MAT00919L	Multivariate Statistics	Mathematics	6	Semester	156
MAT00920L	Fundaments of Operations Research	Mathematics	6	Semester	158
MAT00916L	Applied Statistics	Mathematics	6	Semester	157
MAT00914L	Partial Differential Equations	Mathematics	6	Semester	156
MAT00913L	Ordinary Differential Equations	Mathematics	6	Semester	156



3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area Field EC		CTS Durat	tion Hours
Group of Options		· ·		•	
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO00296	Populations Biology	Biology	3	Semester	78
BIO00308	Phytodiversity	Biology	6	Semester	156
BIO00309	Genetics	Biology	6	Semester	156
	Microbiology	Biological Scien-	6	Semester	156
BIO00408L		ces			
BIO00321	Fisheries Biology	Biology and Envi-	4	Semester	104
		ronment			
	Environmental Impact Assessment	Ecology	4	Semester	108
PAO00501					
	Introduction to Geographical Information Systems	Ecology	4	Semester	108
ERU00504					
	Ecological Modelling and Systems Analysis	Ecology	6	Semester	162
PAO00502					
	Man and Environment: Themes in Human Ecology	Ecology	4	Semester	108
PAO00503					



3rd Year - 6th Semester Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name		Scientific Area Field E		EC	ECTS Durati		ion	Hours	5				
Group of Options			•							_				
Component code	e Name	Sci	entific Area Field	EC	CTS	Du	ration	Ho	urs					
	Logic and Foundations of Mathematics	Ma	thematics	6		Sen	nester	156						
MAT00930L														
	Differential Geometry	Ma	thematics	6		Sen	nester	156						
MAT00921L	5													
	Introduction to Stochastic Processes	Ma	thematics	6		Sen	nester	156						
MAT00927L														
	Introduction to Quality Control and Reliability	Ma	thematics	6		Sen	nester	156						
MAT00926I						000								
	Geometry II	Ma	thematics	6		Sen	hester	156						
MAT000231		Ivia	thematics	0		Jen	ICSTCI	150						
WIAT 00923E	Topics of Croup Theory	Ma	thomatics	6		Son	aostor	156						
MAT000421	Topics of Group Theory	IVId	literialics	0		Jen	lester	150						
WAT00943L	Number Theory and Countermalia	N4-	+h +!	6		<u> </u>		156						
	Number Theory and Cryptography	IVIa	thematics	0		Sen	lester	150						
IVIA I 00942L				6		C		150						
MAT000411	Computability and Complexity Theory	Ma	thematics	6		Sen	nester	150						
MA100941L	5			_										
	Functional Optimization	Ma	thematics	6		Sen	nester	156						
MAT00939L						L								
	Sampling	Ma	thematics	6		Sen	nester	156						
MAT00902L														
	Algebra II	Ma	thematics	6		Sen	nester	156						
MAT00899L														
	Computational Algebra	Ma	thematics	6		Sen	nester	156						
MAT00897L														
	Numerical Analysis II	Ma	thematics	6 Se		Sen	nester	156						
MAT00910L														
	Numerical Analysis I	Ma	thematics	6 S		Sen	nester	156						
MAT00909L														
	Functional Analysis	Ma	thematics	6		Sen	nester	156						
MAT00904L														
	Multivariate Statistics	Ma	thematics	6	6		6		nester	156				
MAT00919L														
	Fundaments of Operations Research	Ma	thematics	6		Sen	nester	158						
MAT009201	·			-	Ũ		°		Ŭ					
	Applied Statistics	Ma	thematics	6		Sen	nester	157						
MAT00916I						000								
	Partial Differential Equations	Ma	thematics	6		Sen	nester	156						
MAT00014I		Ivia	thematics	0		Jen	ICSTCI	150						
MAT00914L	Ordinary Differential Equations	Ma	thematics	6		Son	actor	156						
MAT000121	Ordinary Differential Equations	IVId	thematics	0		Sen	lester	150						
MAL00912L						L								
 	During the Mathematics		Mathana C		6		<u> </u>		150					
	Project in Mathematics		iviatnematics		ю		Semes	ter	150					
IVIA100940L							-							
MATOOOCC	Measure, Probability and Integration		Mathematics		6		Semes	ter	156					
MAT00936L														



3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Biology and Ecology

Component code	Name	Scientific Area Fi	CTS Durat	ion Hours:	
Group of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO00296	Populations Biology	Biology	3	Semester	78
BIO00308	Phytodiversity	Biology	6	Semester	156
BIO00309	Genetics	Biology	6	Semester	156
	Microbiology	Biological Scien-	6	Semester	156
BIO00408L		ces			
BIO00321	Fisheries Biology	Biology and Envi-	4	Semester	104
		ronment			
	Environmental Impact Assessment	Ecology	4	Semester	108
PAO00501					
	Introduction to Geographical Information Systems	Ecology	4	Semester	108
ERU00504					
	Ecological Modelling and Systems Analysis	Ecology	6	Semester	162
PAO00502					
	Man and Environment: Themes in Human Ecology	Ecology	4	Semester	108
PAO00503					

Specialization Major in Mathematics and Minor in Computer Science

1st Year - 1st Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Laboratory of Mathematics	Mathematics	6	Semester	156
MAT00928					
	Discrete Mathematics	Mathematics	6	Semester	156
MAT00932L					
	Programming I	Informatics	6	Semester	162
INF00880L					
	Mathematical Analysis I	Mathematics	6	Semester	162
MAT00905L					
	Linear Algebra and Geometry I	Mathematics	6	Semester	156
MAT00900L					

1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Linear Algebra and Geometry II	Mathematics	7	Semester	181
MAT00901					
	Mathematical Analysis II	Mathematics	6	Semester	162
MAT00906L					
	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
GES00788L					
	Programming II	Informatics	6	Semester	162
INF00881L					
	Geometry I	Mathematics	6	Semester	156
MAT00922L					



2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	General Physics I	Physics	6	Semester	158
FIS00703L					
	Introduction to Probability and Statistics	Mathematics	6	Semester	154
MAT00925L					
	Mathematical Analysis III	Mathematics	6	Semester	162
MAT00907L					
	Algebra I	Mathematics	6	Semester	156
MAT00898L					
	Metrics and Topology	Mathematics	6	Semester	156
MAT00938L					

2nd Year - 4th Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Computational Methods	Mathematics	6	Semester	160
MAT00937L					
	Complements of Probability and Statistics	Mathematics	6	Semester	162
MAT00912L					
	Mathematical Analysis IV	Mathematics	6	Semester	162
MAT00908L					
	History and Phylosophy of Mathematics	Mathematics	6	Semester	157
MAT00924L					
	Computational Logic	Mathematics	6	Semester	156
MAT00929L					

3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Mathematical Statistics	Mathematics	6	Semester	156
MAT00918L					
	Complex Analysis	Mathematics	6	Semester	156
MAT00903L					



3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name	Scientific Area F	ield EC	TS Durat	ion Hours
Group of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT00930L	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00921L	Differential Geometry	Mathematics	6	Semester	156
MAT00927L	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00926L	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00923L	Geometry II	Mathematics	6	Semester	156
MAT00943L	Topics of Group Theory	Mathematics	6	Semester	156
MAT00942L	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00941L	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00939L	Functional Optimization	Mathematics	6	Semester	156
MAT00902L	Sampling	Mathematics	6	Semester	156
MAT00899L	Algebra II	Mathematics	6	Semester	156
MAT00897L	Computational Algebra	Mathematics	6	Semester	156
MAT00910L	Numerical Analysis II	Mathematics	6	Semester	156
MAT00909L	Numerical Analysis I	Mathematics	6	Semester	156
MAT00904L	Functional Analysis	Mathematics	6	Semester	156
MAT00919L	Multivariate Statistics	Mathematics	6	Semester	156
MAT00920L	Fundaments of Operations Research	Mathematics	6	Semester	158
MAT00916L	Applied Statistics	Mathematics	6	Semester	157
MAT00914L	Partial Differential Equations	Mathematics	6	Semester	156
MAT00913L	Ordinary Differential Equations	Mathematics	6	Semester	156

Group of Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
INF00867	Algorithms and Data Structures I	Informatics	6	Semester	162
	Computer and Systems Architecture I	Informatics	6	Semester	159
INF00862L					
	Databases	Informatics	6	Semester	157
INF00864L					
	Declarative Programming	Informatics	6	Semester	162
INF00879L					
	Programming Languages	Informatics	6	Semester	160
INF00872L					
	Computer Graphics	Informatics	6	Semester	160
INF00866L					



3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Computer Science

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Component code	Name	Scientific Area Field	ECTS	Duration	Hours

3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name		Scientific Area Field ECTS		Durat	ion H	lours					
Group of Options												
Component co	le Name	Sci	entific Area Field	EC	TS D	uration	Hours	\$				
MAT00930L	Logic and Foundations of Mathematics	Ma	thematics	6	50	emester	156					
MAT00921L	Differential Geometry	Ma	thematics	6	Se	emester	156					
MAT00927L	Introduction to Stochastic Processes	Ma	thematics	6	Se	emester	156					
MAT00926L	Introduction to Quality Control and Reliability	Ma	thematics	6	Se	emester	156					
MAT00923L	Geometry II	Ma	thematics	6	Se	emester	156	_				
MAT00943L	Topics of Group Theory	Ma	thematics	6	Se	emester	156					
MAT00942L	Number Theory and Cryptography	Ma	thematics	6	Se	emester	156					
MAT00941L	Computability and Complexity Theory	Ma	thematics	6	Se	emester	156					
MAT00939L	Functional Optimization	Ma	thematics	6	Se	emester	156					
MAT00902L	Sampling	Ma	thematics	6	5 Semest		6 Seme		6 Sem		156	
MAT00899L	Algebra II	Ma	thematics	6	Se	Semester						
MAT00897L	Computational Algebra	Ma	thematics	6	Semester		156					
MAT00910L	Numerical Analysis II	Ma	thematics	6	Se	emester	156					
MAT009091	Numerical Analysis I	Ma	thematics	6	Se	emester	156					
MAT009041	Functional Analysis	Ма	thematics	6	Se	emester	156					
MAT000101	Multivariate Statistics	Ма	thematics	6	Se	emester	156					
MAT009201	Fundaments of Operations Research	Ма	thematics	6	Se	emester	158					
MAT009202	Applied Statistics	Ма	thematics	6	Se	emester	157					
MAT00910L	Partial Differential Equations	Ma	thematics	6 5		emester	156					
MAT00914L	Ordinary Differential Equations	Ма	athematics 6		6 Semester		156					
WAT 00913E	Project in Mathematics	I	Mathematics		6	Some	tor 1					
MAT00940L			M		0	Semes						
MAT00936L	ivieasure, Probability and Integration		Wathematics		D	Semes	ter 1	00				



3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Computer Science

Component code	Name	Scientific Area F	Scientific Area Field ECTS Duration			on Hours
Group of Options						
Component code	Name	Scientific Area Field	EC1	TS D	uration	Hours
INF00867	Algorithms and Data Structures I	Informatics	6	Se	emester	162
	Computer and Systems Architecture I	Informatics	6	Se	emester	159
INF00862L						
	Databases	Informatics	6	Se	emester	157
INF00864L						
	Declarative Programming	Informatics	6	Se	emester	162
INF00879L						
	Programming Languages	Informatics	6	Se	emester	160
INF00872L						
	Computer Graphics	Informatics	6	Se	emester	160
INF00866L						

Specialization Major in Mathematics and Minor in Economics and Management

1st Year - 1st Semester

Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Laboratory of Mathematics	Mathematics	6	Semester	156
MAT00928					
	Discrete Mathematics	Mathematics	6	Semester	156
MAT00932L					
	Programming I	Informatics	6	Semester	162
INF00880L					
	Mathematical Analysis I	Mathematics	6	Semester	162
MAT00905L					
	Linear Algebra and Geometry I	Mathematics	6	Semester	156
MAT00900L					

1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Linear Algebra and Geometry II	Mathematics	7	Semester	181
MAT00901					
	Mathematical Analysis II	Mathematics	6	Semester	162
MAT00906L					
	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
GES00788L					
	Programming II	Informatics	6	Semester	162
INF00881L					
	Geometry I	Mathematics	6	Semester	156
MAT00922L					

2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Economics and Management

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Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	General Physics I	Physics	6	Semester	158
FIS00703L					
	Introduction to Probability and Statistics	Mathematics	6	Semester	154
MAT00925L					



2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Mathematical Analysis III	Mathematics	6	Semester	162
MAT00907L					
	Algebra I	Mathematics	6	Semester	156
MAT00898L					
	Metrics and Topology	Mathematics	6	Semester	156
MAT00938L					

2nd Year - 4th Semester

Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Computational Methods	Mathematics	6	Semester	160
MAT00937L					
	Complements of Probability and Statistics	Mathematics	6	Semester	162
MAT00912L					
	Mathematical Analysis IV	Mathematics	6	Semester	162
MAT00908L					
	History and Phylosophy of Mathematics	Mathematics	6	Semester	157
MAT00924L					
	Computational Logic	Mathematics	6	Semester	156
MAT00929L					

3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Economics and Management

	3				
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Mathematical Statistics	Mathematics	6	Semester	156
MAT00918L					
	Complex Analysis	Mathematics	6	Semester	156
MAT00903L					



3rd Year - 5th Semester Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Name Scientific Area Field ECTS Dura		Scientific Area Field ECTS Duration	
Group of Options					- -
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT00930L	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00921L	Differential Geometry	Mathematics	6	Semester	156
MAT00927L	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00926L	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00923L	Geometry II	Mathematics	6	Semester	156
MAT00943L	Topics of Group Theory	Mathematics	6	Semester	156
MAT00942L	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00941L	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00939L	Functional Optimization	Mathematics	6	Semester	156
MAT00902L	Sampling	Mathematics	6	Semester	156
MAT00899L	Algebra II	Mathematics	6	Semester	156
MAT00897L	Computational Algebra	Mathematics	6	Semester	156
MAT00910L	Numerical Analysis II	Mathematics	6	Semester	156
MAT00909L	Numerical Analysis I	Mathematics	6	Semester	156
MAT00904L	Functional Analysis	Mathematics	6	Semester	156
MAT00919L	Multivariate Statistics	Mathematics	6	Semester	156
MAT00920L	Fundaments of Operations Research	Mathematics	6	Semester	158
MAT00916L	Applied Statistics	Mathematics	6	Semester	157
MAT00914L	Partial Differential Equations	Mathematics	6	Semester	156
MAT00913L	Ordinary Differential Equations	Mathematics	6	Semester	156



3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Economics and Management

component coue	Name	Scientific Area Field E		Id ECTS Durat		ion F	lours	
Group of Options								
Component code	Name	Scie	entific Area Field	ECTS	S Duratio		Hours	
	Econometrics I	Eco	nomy	6	Sen	nester	159	
ECN00044								
ECN0004E	Econometrics II	Eco	nomy	6	Sen	nester	167	
ECIN00045		_		<u> </u>	-		150	_
ECN00052	Natural Resource Economics	Eco	nomy	6	Sen	nester	159	
	Financial Economics	Eco	nomy	6	Sen	nester	159	
ECN00053								
	Principles of Macroeconomics	Eco	nomy	6	Sen	nester	159	
ECN00149								
	Principles of Microeconomics	Eco	nomy	6	Sen	nester	159	
ECN00150								
	Decision and Negotiation Analysis	Mar	nagement	6	Sen	nester	156	
GES00010L								
GES00022	Financial and Actuarial Calculus	Mar	nagement	6	Sen	nester	161	
	Organizational Behaviour and Human Resources	Mar	nagement	6	Sen	nester	157	
GES00027L	Management							
GES00118	Marketing I	Mar	nagement	6	Sen	nester	161	
GES00119	Marketing II	Mar	nagement	6	Sen	nester	158	
	Decision Models	Mar	nagement	6	Sen	nester	156	
GES00128L								

3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Measure, Probability and Integration	Mathematics	6	Semester	156
MAT00936L					
	Project in Mathematics	Mathematics	6	Semester	156
MAT00940L					



3rd Year - 6th Semester Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Name Scientific Area Field ECTS Dura		Scientific Area Field ECTS Duration	
Group of Options					-
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT00930L	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00921L	Differential Geometry	Mathematics	6	Semester	156
MAT00927L	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00926L	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00923L	Geometry II	Mathematics	6	Semester	156
MAT00943L	Topics of Group Theory	Mathematics	6	Semester	156
MAT00942L	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00941L	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00939L	Functional Optimization	Mathematics	6	Semester	156
MAT00902L	Sampling	Mathematics	6	Semester	156
MAT00899L	Algebra II	Mathematics	6	Semester	156
MAT00897L	Computational Algebra	Mathematics	6	Semester	156
MAT00910L	Numerical Analysis II	Mathematics	6	Semester	156
MAT00909L	Numerical Analysis I	Mathematics	6	Semester	156
MAT00904L	Functional Analysis	Mathematics	6	Semester	156
MAT00919L	Multivariate Statistics	Mathematics	6	Semester	156
MAT00920L	Fundaments of Operations Research	Mathematics	6	Semester	158
MAT00916L	Applied Statistics	Mathematics	6	Semester	157
MAT00914L	Partial Differential Equations	Mathematics	6	Semester	156
MAT00913L	Ordinary Differential Equations	Mathematics	6	Semester	156



3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Economics and Management

Component code	Name	Scientific Area Field		CTS Durat	tion Hours
Group of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Econometrics I	Economy	6	Semester	159
ECN00044					
	Econometrics II	Economy	6	Semester	167
ECN00045					
	Natural Resource Economics	Economy	6	Semester	159
ECN00052					
	Financial Economics	Economy	6	Semester	159
ECN00053			_		
	Principles of Macroeconomics	Economy	6	Semester	159
ECN00149					
	Principles of Microeconomics	Economy	6	Semester	159
ECN00150					
050000101	Decision and Negotiation Analysis	Management	6	Semester	156
GES00010L					1.01
GES00022	Financial and Actuarial Calculus	Management	6	Semester	161
	Organizational Behaviour and Human Resources	Management	6	Semester	157
GES00027L	Management				
GES00118	Marketing I	Management	6	Semester	161
GES00119	Marketing II	Management	6	Semester	158
	Decision Models	Management	6	Semester	156
GES00128L					

Specialization Major in Mathematics and Minor in Statistics

1st Year - 1st Semester

Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Laboratory of Mathematics	Mathematics	6	Semester	156
MAT00928					
	Discrete Mathematics	Mathematics	6	Semester	156
MAT00932L					
	Programming I	Informatics	6	Semester	162
INF00880L					
	Mathematical Analysis I	Mathematics	6	Semester	162
MAT00905L					
	Linear Algebra and Geometry I	Mathematics	6	Semester	156
MAT00900L					

1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Linear Algebra and Geometry II	Mathematics	7	Semester	181
MAT00901					
	Mathematical Analysis II	Mathematics	6	Semester	162
MAT00906L					
	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
GES00788L					
	Programming II	Informatics	6	Semester	162
INF00881L					



1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Geometry I	Mathematics	6	Semester	156
MAT00922L					

2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	General Physics I	Physics	6	Semester	158
FIS00703L					
	Introduction to Probability and Statistics	Mathematics	6	Semester	154
MAT00925L					
	Mathematical Analysis III	Mathematics	6	Semester	162
MAT00907L					
	Algebra I	Mathematics	6	Semester	156
MAT00898L					
	Metrics and Topology	Mathematics	6	Semester	156
MAT00938L					

2nd Year - 4th Semester

Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Computational Methods	Mathematics	6	Semester	160
MAT00937L					
	Complements of Probability and Statistics	Mathematics	6	Semester	162
MAT00912L					
	Mathematical Analysis IV	Mathematics	6	Semester	162
MAT00908L					
	History and Phylosophy of Mathematics	Mathematics	6	Semester	157
MAT00924L					
	Computational Logic	Mathematics	6	Semester	156
MAT00929L					

3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Complex Analysis	Mathematics	6	Semester	156
MAT00903L					
	Mathematical Statistics	Mathematics	6	Semester	156
MAT00918L					



3rd Year - 5th Semester Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area F	ield EC	CTS Durat	tion Ho
Group of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00930L					
	Differential Geometry	Mathematics	6	Semester	156
MAT00921L					
	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00927L					
	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00926L					
	Geometry II	Mathematics	6	Semester	156
MAT00923L					
	Topics of Group Theory	Mathematics	6	Semester	156
MAT00943L					
	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00942L					
	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00941L					
	Functional Optimization	Mathematics	6	Semester	156
MAT00939L					
	Sampling	Mathematics	6	Semester	156
MAT00902L					
	Algebra II	Mathematics	6	Semester	156
MAT00899L					
	Computational Algebra	Mathematics	6	Semester	156
MAT00897L					
	Numerical Analysis II	Mathematics	6	Semester	156
MAT00910L					
	Numerical Analysis I	Mathematics	6	Semester	156
MAT00909L			-		
	Functional Analysis	Mathematics	6	Semester	156
MA100904L			6	6	150
	Multivariate Statistics	Mathematics	6	Semester	150
MAT00919L			6		150
	Fundaments of Operations Research	Wathematics	0	Semester	128
IVIA I 00920L	Analised Chestistics	Math an atian	6	C	157
	Applied Statistics	iviatnematics	0	Semester	157
	Deutial Differential Equations	Mathematics	6	Compete	156
	Paruai Differential Equations	iviatnematics	0	Semester	120
WIA100914L	Oudiners Differential Equations	Mathanatian	6	C and a set	156
	Ordinary Differential Equations	iviatnematics	0	Semester	120
WAT00913L					



3rd Year - 5th Semester Specialization Major in Mathematics and Minor in Statistics

Component code	Name		Scientific Area Fi	ield	ECTS	Durat	ion	Hours
Group of Options								
Component code	Name	Sci	entific Area Field	ECT	rs C	Juration	Hou	rs
	Introduction to Stochastic Processes	Ma	thematics	6	S	emester	156	
MAT00927L								
	Applied Statistics	Ma	thematics	6	S	emester	157	
MAT00916L								
	Fundaments of Operations Research	Ma	thematics	6	S	emester	158	
MAT00920L								
	Multivariate Statistics	Ma	thematics	6	S	emester	156	
MAT00919L								
	Introduction to Quality Control and Reliability	Ma	thematics	6	S	emester	156	
MAT00926L								
	Sampling	Ma	thematics	6	S	emester	156	
MAT00902L								
	•							



3rd Year - 6th Semester Specialization Major in Mathematics and Minor in Statistics

Component code	Name		Scientific Area Field		I ECTS Durat		ion	Hou	rs	
Group of Options			•							
Component code	e Name	Sci	ientific Area Field	EC	TS	Du	ration	Ho	urs	
	Logic and Foundations of Mathematics	Ma	thematics	6		Ser	nester	156		
MAT00930L										
	Differential Geometry	Ma	thematics	6		Ser	nester	156		
MAT00921L										
	Introduction to Stochastic Processes	Ma	thematics	6		Ser	nester	156		
MAT00927L										
	Introduction to Quality Control and Reliability	Ma	thematics	6		Ser	nester	156		
MAT00926L										
	Geometry II	Ma	thematics	6		Ser	nester	156		
MAT00923L										
	Topics of Group Theory	Ma	thematics	6		Ser	nester	156		
MAT00943L										
	Number Theory and Cryptography	Ma	thematics	6		Ser	nester	156		
MAT00942L										
	Computability and Complexity Theory	Ma	thematics	6		Ser	nester	156		
MAT00941L										
	Functional Optimization	Ma	thematics	6		Ser	nester	156		
MAT00939L	•									
	Sampling	Ma	thematics	6		Ser	nester	156		
MAT00902L										
	Algebra II	Ma	thematics	6		Ser	nester	156		
MAT00899L	0									
	Computational Algebra	Ma	thematics	6		Ser	nester	156		
MAT00897L										
	Numerical Analysis II	Ma	thematics	6		Ser	nester	156		
MAT00910L				-						
	Numerical Analysis I	Ma	thematics	6		Ser	nester	156		
MAT009091				-						
	Eunctional Analysis	Ma	thematics	6		Ser	nester	156		
MAT00904I						000				
	Multivariate Statistics	Ma	thematics	6		Ser	nester	156		
MAT009191						000				
	Fundaments of Operations Research	Ma	thematics	6		Ser	nester	158		
MAT009201	i undamento or operationo rescaren		linematics	Ŭ		501	lester	100		
11111000202	Applied Statistics	Ma	thematics	6		Ser	nester	157		
MAT00916I	Applied Statistics		linematics	Ŭ		501	lester	157		
	Partial Differential Equations	Ma	thematics	6		Sor	nester	156		
MAT00014I		Ivia	thematics	0		Jei	icster	150		
	Ordinany Differential Equations	Ma	thomatics	6		Sor	aostor	156		
MAT00013I	Ordinary Differential Equations	IVIA	litienatics	0		Jei	lester	150		
	Project in Mathematics		Mathematics		6		Semos	tor	156	
ΜΑΤΟΟΩΛΟΙ	i toject in Mathematics		wallematics		0		Jennes	olei	100	
WIA100940L	Massura Probability and Integration		Mathematics		6		Some	tor	166	
MAT000261	weasure, Frobability and integration		mathematics		0		Semes	bler	100	
WAT 00930L										



3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Statistics

Component code	Name	Scientific Area Fie		Name Scientific Area F		ECTS	Durat	ion Ho	urs
Group of Options		· ·							
Component code	Name	Scientific Area Field	EC	TS Dι	Iration	Hours			
	Introduction to Stochastic Processes	Mathematics	6	Se	mester	156	1		
MAT00927L									
	Applied Statistics	Mathematics	6	Se	mester	157			
MAT00916L									
	Fundaments of Operations Research	Mathematics	6	Se	mester	158	1		
MAT00920L									
	Multivariate Statistics	Mathematics	6	Se	mester	156	1		
MAT00919L									
	Introduction to Quality Control and Reliability	Mathematics	6	Se	mester	156			
MAT00926L									
	Sampling	Mathematics	6	Se	mester	156			
MAT00902L									

Specialization Major in Mathematics and Minor in Physics

1st Year - 1st Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Laboratory of Mathematics	Mathematics	6	Semester	156
MAT00928					
	Discrete Mathematics	Mathematics	6	Semester	156
MAT00932L					
	Programming I	Informatics	6	Semester	162
INF00880L					
	Mathematical Analysis I	Mathematics	6	Semester	162
MAT00905L					
	Linear Algebra and Geometry I	Mathematics	6	Semester	156
MAT00900L					

1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Linear Algebra and Geometry II	Mathematics	7	Semester	181
MAT00901					
	Mathematical Analysis II	Mathematics	6	Semester	162
MAT00906L					
	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
GES00788L					
	Programming II	Informatics	6	Semester	162
INF00881L					
	Geometry I	Mathematics	6	Semester	156
MAT00922L					

2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	General Physics I	Physics	6	Semester	158
FIS00703L					



2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Introduction to Probability and Statistics	Mathematics	6	Semester	154
MAT00925L					
	Mathematical Analysis III	Mathematics	6	Semester	162
MAT00907L					
	Algebra I	Mathematics	6	Semester	156
MAT00898L					
	Metrics and Topology	Mathematics	6	Semester	156
MAT00938L					

2nd Year - 4th Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Computational Methods	Mathematics	6	Semester	160
MAT00937L					
	Complements of Probability and Statistics	Mathematics	6	Semester	162
MAT00912L					
	Mathematical Analysis IV	Mathematics	6	Semester	162
MAT00908L					
	History and Phylosophy of Mathematics	Mathematics	6	Semester	157
MAT00924L					
	Computational Logic	Mathematics	6	Semester	156
MAT00929L					

3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Mathematical Statistics	Mathematics	6	Semester	156
MAT00918L					
	Complex Analysis	Mathematics	6	Semester	156
MAT00903L					



3rd Year - 5th Semester Specialization Major in Mathematics and Minor in Physics

component code	Name	Scientific Area F	ield EC	CTS Durat	ion Ho
roup of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00930L					
	Differential Geometry	Mathematics	6	Semester	156
MAT00921L					
	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00927L					
	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00926L					
	Geometry II	Mathematics	6	Semester	156
MAT00923L					
	Topics of Group Theory	Mathematics	6	Semester	156
MAT00943L					
	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00942L					
	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00941L					
	Functional Optimization	Mathematics	6	Semester	156
MAT00939L					
	Sampling	Mathematics	6	Semester	156
MAT00902L					
	Algebra II	Mathematics	6	Semester	156
MAT00899L					
	Computational Algebra	Mathematics	6	Semester	156
MAT00897L					
	Numerical Analysis II	Mathematics	6	Semester	156
MAT00910L					
	Numerical Analysis I	Mathematics	6	Semester	156
MAT00909L					
	Functional Analysis	Mathematics	6	Semester	156
MAT00904L					
	Multivariate Statistics	Mathematics	6	Semester	156
MAT00919L					
	Fundaments of Operations Research	Mathematics	6	Semester	158
MAT00920L					
	Applied Statistics	Mathematics	6	Semester	157
MAT00916L					
	Partial Differential Equations	Mathematics	6	Semester	156
MAT00914L					
	Ordinary Differential Equations	Mathematics	6	Semester	156
MAT00913L					



3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name		Scientific Area Fi	ield	ECT	S Durat	ion	Hours
Group of Options								
Component code	Name	Sci	entific Area Field	EC	TS	Duration	Hou	ſS
	Undulatory Phenomena	Ph	ysics	6		Semester	156	
FIS00689L								
	Physics of Cintinuous Matter	Ph	ysics	6		Semester	156	
FIS00700L								
	Statistical Physics and Thermodynamics	Ph	ysics	6		Semester	156	
FIS00701L								
	Classical Mechanics	Ph	ysics	6		Semester	156	
FIS00714L								
	Quantum Mechanics I	Ph	ysics	6		Semester	156	
FIS00715L								
	Relativity and Cosmology	Ph	ysics	6		Semester	157	
FIS00723L								

3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Measure, Probability and Integration	Mathematics	6	Semester	156
MAT00936L					
	Project in Mathematics	Mathematics	6	Semester	156
MAT00940L					



3rd Year - 6th Semester Specialization Major in Mathematics and Minor in Physics

Component code	Name	Scientific Area F	ield EC	CTS Durat	ion Ho
Group of Options		-			
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00930L					
	Differential Geometry	Mathematics	6	Semester	156
MAT00921L					
	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00927L					
	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00926L					
	Geometry II	Mathematics	6	Semester	156
MAT00923L					
	Topics of Group Theory	Mathematics	6	Semester	156
MAT00943L					
	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00942L					
	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00941L					
	Functional Optimization	Mathematics	6	Semester	156
MAT00939L					
	Sampling	Mathematics	6	Semester	156
MAT00902L					
	Algebra II	Mathematics	6	Semester	156
MAT00899L					
	Computational Algebra	Mathematics	6	Semester	156
MAT00897L					
	Numerical Analysis II	Mathematics	6	Semester	156
MAT00910L					
	Numerical Analysis I	Mathematics	6	Semester	156
MAT00909L					
	Functional Analysis	Mathematics	6	Semester	156
MAT00904L					
	Multivariate Statistics	Mathematics	6	Semester	156
MAT00919L					
	Fundaments of Operations Research	Mathematics	6	Semester	158
MAT00920L					
	Applied Statistics	Mathematics	6	Semester	157
MAT00916L					
	Partial Differential Equations	Mathematics	6	Semester	156
MAT00914L					
	Ordinary Differential Equations	Mathematics	6	Semester	156
MAT00913L					



3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Physics

Component code	Name		Scientific Area Fi	ield	ECTS	6 Durat	tion	Hours
Group of Options								
Component code	Name	Sci	ientific Area Field	ECT	ΓS Ι	Duration	Ηοι	ırs
	Undulatory Phenomena	Ph	ysics	6	9	Semester	156	
FIS00689L								
	Physics of Cintinuous Matter	Ph	ysics	6	9	Semester	156	
FIS00700L								
	Statistical Physics and Thermodynamics	Ph	ysics	6		Semester	156	
FIS00701L								
	Classical Mechanics	Ph	ysics	6		Semester	156	
FIS00714L								
	Quantum Mechanics I	Ph	ysics	6		Semester	156	
FIS00715L								
	Relativity and Cosmology	Ph	ysics	6		Semester	157	
FIS00723L								
s		•						

Specialization Major in Mathematics and Minor in Mathematics

1st Year - 1st Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Laboratory of Mathematics	Mathematics	6	Semester	156
MAT00928					
	Discrete Mathematics	Mathematics	6	Semester	156
MAT00932L					
	Programming I	Informatics	6	Semester	162
INF00880L					
	Mathematical Analysis I	Mathematics	6	Semester	162
MAT00905L					
	Linear Algebra and Geometry I	Mathematics	6	Semester	156
MAT00900L					

1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Linear Algebra and Geometry II	Mathematics	7	Semester	181
MAT00901					
	Mathematical Analysis II	Mathematics	6	Semester	162
MAT00906L					
	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
GES00788L					
	Programming II	Informatics	6	Semester	162
INF00881L					
	Geometry I	Mathematics	6	Semester	156
MAT00922L					

2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	General Physics I	Physics	6	Semester	158
FIS00703L					



2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Introduction to Probability and Statistics	Mathematics	6	Semester	154
MAT00925L					
	Mathematical Analysis III	Mathematics	6	Semester	162
MAT00907L					
	Algebra I	Mathematics	6	Semester	156
MAT00898L					
	Metrics and Topology	Mathematics	6	Semester	156
MAT00938L					

2nd Year - 4th Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Computational Methods	Mathematics	6	Semester	160
MAT00937L					
	Complements of Probability and Statistics	Mathematics	6	Semester	162
MAT00912L					
	Mathematical Analysis IV	Mathematics	6	Semester	162
MAT00908L					
	History and Phylosophy of Mathematics	Mathematics	6	Semester	157
MAT00924L					
	Computational Logic	Mathematics	6	Semester	156
MAT00929L					

3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Complex Analysis	Mathematics	6	Semester	156
MAT00903L					
	Mathematical Statistics	Mathematics	6	Semester	156
MAT00918L					



3rd Year - 5th Semester Specialization Major in Mathematics and Minor in Mathematics

omponent code	Name	Scientific Area F	ield EC	TS Durat	ion H
roup of Options					
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT00930L	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00921L	Differential Geometry	Mathematics	6	Semester	156
MAT00927L	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00926L	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00923L	Geometry II	Mathematics	6	Semester	156
MAT00943I	Topics of Group Theory	Mathematics	6	Semester	156
MAT00942I	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT009411	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00939I	Functional Optimization	Mathematics	6	Semester	156
	Sampling	Mathematics	6	Semester	156
MAT008001	Algebra II	Mathematics	6	Semester	156
MAT008071	Computational Algebra	Mathematics	6	Semester	156
MAT00037L	Numerical Analysis II	Mathematics	6	Semester	156
	Numerical Analysis I	Mathematics	6	Semester	156
ΜΔΤΩΩΩΩ/	Functional Analysis	Mathematics	6	Semester	156
	Multivariate Statistics	Mathematics	6	Semester	156
MAT000201	Fundaments of Operations Research	Mathematics	6	Semester	158
MAT00016	Applied Statistics	Mathematics	6	Semester	157
	Partial Differential Equations	Mathematics	6	Semester	156
WAT00914L	Ordinary Differential Equations	Mathematics	6	Semester	156



3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Are	a Field 🛛 E	CTS Dura	tion Ηοι
Group of Options					
Component code	Name	Scientific Area Fie	ld ECTS	Duration	Hours
	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00930L					
	Differential Geometry	Mathematics	6	Semester	156
MAT00921L					150
MATOOOOL	Geometry II	Mathematics	6	Semester	156
MAT00923L	Tania of Casure Theorem	NA - + +		Compartant.	156
MAT000421	Topics of Group Theory	IVIathematics	0	Semester	150
MAT00943L	Number Theory and Cryptography	Mathamatics	6	Somostor	156
MAT009421	Number Theory and Cryptography	Mathematics	0	Jemester	150
WIAT 00342L	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00941L	compatibility and complexity meery	indeficience of the second sec	Ũ	Semester	100
	Functional Optimization	Mathematics	6	Semester	156
MAT00939L					
	Algebra II	Mathematics	6	Semester	156
MAT00899L					
	Computational Algebra	Mathematics	6	Semester	156
MAT00897L					
	Numerical Analysis II	Mathematics	6	Semester	156
MAT00910L					
MATOOOOL	Numerical Analysis I	Mathematics	6	Semester	156
MAT00909L		NA 11			150
	Functional Analysis	Wathematics	ю	Semester	150
IVIA I 00904L	Partial Differential Equations	Mathamatics	6	Somoster	156
MAT00014I		mathematics	U	Semester	120
WAT00914L	Ordinary Differential Equations	Mathematics	6	Semester	156
MAT00913I		mathematics	v	Jemester	100

3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Measure, Probability and Integration	Mathematics	6	Semester	156
MAT00936L					
	Project in Mathematics	Mathematics	6	Semester	156
MAT00940L					



3rd Year - 6th Semester Specialization Major in Mathematics and Minor in Mathematics

omponent code	Name	Scientific Area Fie			ation Ho	
roup of Options						
Component code	Name	Scientific Area Field	ECTS	Duration	Hours	
MAT00930L	Logic and Foundations of Mathematics	Mathematics	6	Semester	156	
MAT00921L	Differential Geometry	Mathematics	6	Semester	156	
MAT00927L	Introduction to Stochastic Processes	Mathematics	6	Semester	156	
MAT00926L	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156	
MAT00923L	Geometry II	Mathematics	6	Semester	156	
MAT00943I	Topics of Group Theory	Mathematics	6	Semester	156	
MAT00942I	Number Theory and Cryptography	Mathematics	6	Semester	156	
MAT009411	Computability and Complexity Theory	Mathematics	6	Semester	156	
MAT00939I	Functional Optimization	Mathematics	6	Semester	156	
	Sampling	Mathematics	6	Semester	156	
MAT008001	Algebra II	Mathematics	6	Semester	156	
MAT008071	Computational Algebra	Mathematics	6	Semester	156	
MAT00037L	Numerical Analysis II	Mathematics	6	Semester	156	
	Numerical Analysis I	Mathematics	6	Semester	156	
	Functional Analysis	Mathematics	6	Semester	156	
	Multivariate Statistics	Mathematics	6	Semester	156	
MAT000201	Fundaments of Operations Research	Mathematics	6	Semester	158	
MAT00016	Applied Statistics	Mathematics	6	Semester	157	
	Partial Differential Equations	Mathematics	6	Semester	156	
WAT00914L	Ordinary Differential Equations	Mathematics	6	Semester	156	



3rd Year - 6th Semester

Specialization Major in Mathematics and Minor in Mathematics

Component code	Name	S	Scientific Area Field E		Scientific Area Field ECTS Du		CTS Dura	tion H	ours
Group of Options									
Component code	Name	Scient	tific Area Field	ECTS	Duration	Hours			
	Logic and Foundations of Mathematics	Mathe	ematics	6	Semester	156			
MAT00930L									
	Differential Geometry	Mathe	ematics	6	Semester	156			
MAT00921L									
	Geometry II	Mathe	ematics	6	Semester	156			
MAT00923L									
	Topics of Group Theory	Mathe	ematics	6	Semester	156			
MAT00943L							_		
	Number Theory and Cryptography	Mathe	ematics	6	Semester	156			
MAT00942L									
	Computability and Complexity Theory	Mathe	ematics	6	Semester	156			
MAT00941L				-			_		
	Functional Optimization	Mathe	ematics	6	Semester	156			
MAT00939L						150	_		
MATOOOOL	Algebra II	Mathe	ematics	6	Semester	156			
MAT00899L		N4 .1		6	<u> </u>	150	_		
	Computational Algebra	Mathe	ematics	6	Semester	156			
MAT00897L		N4 11		6	<u> </u>	150	_		
	Numerical Analysis II	Mathe	ematics	0	Semester	150			
MATUU910L	Numerical Analysis I	N 4 - + l		6	Constant	156	_		
	Numerical Analysis I	Mathe	ematics	0	Semester	150			
MAT00909L	Eurotional Analysia	Matha	mation	6	Comostor	156	_		
	Functional Analysis	wathe	ematics	0	Semester	150			
IVIAT 00904L	Partial Differential Equations	Matha	matics	6	Comoster	156	-		
MAT000141		Mathe	ematics	U	Semester	100			
WIAT 00914L	Ordinany Differential Equations	Matha	matics	6	Somostor	156	-		
MAT000131		watne	tinatics	U	Jemester	100			
WAT 00913L									

Specialization Major in Mathematics and Minor in Chemistry

1st Year - 1st Semester

Specialization Major in Mathematics and Minor in Chemistry

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Laboratory of Mathematics	Mathematics	6	Semester	156
MAT00928					
	Discrete Mathematics	Mathematics	6	Semester	156
MAT00932L					
	Programming I	Informatics	6	Semester	162
INF00880L					
	Mathematical Analysis I	Mathematics	6	Semester	162
MAT00905L					
	Linear Algebra and Geometry I	Mathematics	6	Semester	156
MAT00900L					

1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Chemistry

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Linear Algebra and Geometry II	Mathematics	7	Semester	181
MAT00901					



1st Year - 2nd Semester

Specialization Major in Mathematics and Minor in Chemistry

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Mathematical Analysis II	Mathematics	6	Semester	162
MAT00906L					
	Entrepreneurship and Corporate Innovation	Management	5	Semester	132
GES00788L					
	Programming II	Informatics	6	Semester	162
INF00881L					
	Geometry I	Mathematics	6	Semester	156
MAT00922L					

2nd Year - 3rd Semester

Specialization Major in Mathematics and Minor in Chemistry

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	General Physics I	Physics	6	Semester	158
FIS00703L					
	Introduction to Probability and Statistics	Mathematics	6	Semester	154
MAT00925L					
	Mathematical Analysis III	Mathematics	6	Semester	162
MAT00907L					
	Algebra I	Mathematics	6	Semester	156
MAT00898L					
	Metrics and Topology	Mathematics	6	Semester	156
MAT00938L					

2nd Year - 4th Semester

Specialization Major in Mathematics and Minor in Chemistry

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Computational Methods	Mathematics	6	Semester	160
MAT00937L					
	Complements of Probability and Statistics	Mathematics	6	Semester	162
MAT00912L					
	Mathematical Analysis IV	Mathematics	6	Semester	162
MAT00908L					
	History and Phylosophy of Mathematics	Mathematics	6	Semester	157
MAT00924L					
	Computational Logic	Mathematics	6	Semester	156
MAT00929L					

3rd Year - 5th Semester

Specialization Major in Mathematics and Minor in Chemistry

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Mathematical Statistics	Mathematics	6	Semester	156
MAT00918L					
	Complex Analysis	Mathematics	6	Semester	156
MAT00903L					
	General Chemistry	Chemistry	6	Semester	156
QUI01090L					



3rd Year - 5th Semester Specialization Major in Mathematics and Minor in Chemistry

.omponent code	Name Scientific Area Field ECT		Scientific Area Field EC		Name Scientific Area Field ECTS D		Name Scientific Area Field ECTS E		Name Scientific Area Field ECTS Duration		ation Hour	
Froup of Options					•							
Component code	Name	Scientific Area Field	ECTS	Duration	Hours							
	Logic and Foundations of Mathematics	Mathematics	6	Semester	156							
MAT00930L												
	Differential Geometry	Mathematics	6	Semester	156							
MAT00921L												
	Introduction to Stochastic Processes	Mathematics	6	Semester	156							
MAT00927L												
	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156							
MAT00926L												
	Geometry II	Mathematics	6	Semester	156							
MAT00923L												
	Topics of Group Theory	Mathematics	6	Semester	156							
MAT00943L												
	Number Theory and Cryptography	Mathematics	6	Semester	156							
MAT00942L	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,											
	Computability and Complexity Theory	Mathematics	6	Semester	156							
MAT00941L												
	Functional Optimization	Mathematics	6	Semester	156							
MAT00939L	'											
	Sampling	Mathematics	6	Semester	156							
MAT00902L												
	Algebra II	Mathematics	6	Semester	156							
MAT00899L												
	Computational Algebra	Mathematics	6	Semester	156							
MAT00897L												
	Numerical Analysis II	Mathematics	6	Semester	156							
MAT00910L												
	Numerical Analysis I	Mathematics	6	Semester	156							
MAT00909L												
	Functional Analysis	Mathematics	6	Semester	156							
MAT00904L												
	Multivariate Statistics	Mathematics	6	Semester	156							
MAT00919L												
	Fundaments of Operations Research	Mathematics	6	Semester	158							
MAT00920L	·											
	Applied Statistics	Mathematics	6	Semester	157							
MAT00916L												
	Partial Differential Equations	Mathematics	6	Semester	156							
MAT00914L												
	Ordinary Differential Equations	Mathematics	6	Semester	156							
MAT00913L												

Group of Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI01037	Fundamentals of Organic Chemistry	Chemistry	6	Semester	156
	Analytical Chemistry	Chemistry	6	Semester	156
QUI01038L					
QUI01082	Physical Chemistry	Chemistry	6	Semester	156
QUI01091	Inorganic Chemistry I	Chemistry	6	Semester	156



3rd Year - 6th Semester Specialization Major in Mathematics and Minor in Chemistry

Component code	Name	Scientific Area F	Scientific Area Field ECT		tion Hours
Group of Options					•
Component code	Name	Scientific Area Field	ECTS	Duration	Hours
	Logic and Foundations of Mathematics	Mathematics	6	Semester	156
MAT00930L					
	Differential Geometry	Mathematics	6	Semester	156
MAT00921L					
	Introduction to Stochastic Processes	Mathematics	6	Semester	156
MAT00927L					
	Introduction to Quality Control and Reliability	Mathematics	6	Semester	156
MAT00926L					
	Geometry II	Mathematics	6	Semester	156
MAT00923L					
	Topics of Group Theory	Mathematics	6	Semester	156
MAT00943L					
	Number Theory and Cryptography	Mathematics	6	Semester	156
MAT00942L			-		
	Computability and Complexity Theory	Mathematics	6	Semester	156
MAT00941L					
	Functional Optimization	Mathematics	6	Semester	156
MAT009391		Mathematics	Ŭ	Semester	100
	Sampling	Mathematics	6	Semester	156
MAT009021	eep8		Ŭ	000010.	100
	Algebra II	Mathematics	6	Semester	156
MAT008991		Wathematics	Ū	Semester	150
MAT00033E	Computational Algebra	Mathematics	6	Semester	156
MAT008071		Wathematics	U	Jemester	150
WAT 00097E	Numerical Analysis II	Mathematics	6	Somostor	156
MAT000101	Numerical Analysis II	Wathematics	0	Jemester	150
INIAT 00910L	Numerical Analysis I	Mathematics	6	Semester	156
		Wathematics	U	Jemester	150
WAT 00909L	Functional Analysis	Mathematics	6	Somostor	156
ΜΔΤΟΟΩΟ4Ι		Mathematics	U	Jemester	150
	Multivariate Statistics	Mathematics	6	Semester	156
MAT000101	Wultivariate Statistics	Wathematics	U	Jemester	150
WAT00919L	Fundaments of Operations Research	Mathematics	6	Somostor	158
MAT000201	Tundaments of Operations Research	Wathematics	0	Jemester	150
WAT 00920L	Applied Statistics	Mathematics	6	Somostor	157
MAT00016I	Applieu Statistics	Wathematics	U	Jemester	157
IVIAT 00910L	Partial Differential Equations	Mathematics	6	Somostor	156
MAT000141	Fartial Differential Equations	Wathematics	0	Jemester	150
WAT 00914L	Ordinany Differential Equations	Mathematics	6	Somostor	156
MAT000131	Ordinary Differential Equations	Wathematics	0	Jemester	150
WAT 00913L					
	Project in Mathematics	Mathematics	6	Somo	stor 156
	roject in Mathematics	Mathematics	0	Seme	150
WAT00940L	Massura Probability and Integration	Mathematics	6	Sama	stor 156
MAT00036I	Measure, Frobability and Integration	Mathematics	0	Serie	ster 150
Group of Options					
Component code	Nomo	Scientific Area Eigld	ECTE	Duration	Hours
	Fundamentals of Organia Chamister	Chemistre	6	Somester	156
QUIU1037		Chemistry	0	Semester	150
0111010201	Analytical Chemistry	Cnemistry	O	Semester	001
			6	<u> </u>	150
QUI01082	Physical Chemistry	Chemistry	6	Semester	150
A01010A1	inorganic Chemistry I	Cnemistry	Ø	Semester	150



Conditions for obtaining the Degree:

*** TRANSLATE ME: Matemática Aplicada cod 164

Para obtenção do grau de licenciado em Matemática Aplicada:

- Maior Matemática e menor Matemática é necessário obter aprovação a 144 ECTS em unidades de curriculares obrigatórias e 36 ECTS em unidades curriculares optativas;

- Maior Matemática e menor Estatística é necessário obter aprovação a 144 ECTS em unidades de curriculares obrigatórias e 36 ECTS em unidades curriculares optativas;

- Maior Matemática e menor Ciência da Computação é necessário obter aprovação a 144 ECTS em unidades de curriculares obrigatórias e 36 ECTS em unidades curriculares optativas;

- Maior Matemática e menor Biologia e Ecologia é necessário obter aprovação a 150 ECTS em unidades de curriculares obrigatórias e 30 ECTS em unidades curriculares optativas;

- Maior Matemática e menor Economia e Gestão é necessário obter aprovação a 144 ECTS em unidades de curriculares obrigatórias e 36 ECTS em unidades curriculares optativas;

- Maior Matemática e menor Física é necessário obter aprovação a 144 ECTS em unidades de curriculares obrigatórias e 36 ECTS em unidades curriculares optativas;

- Maior Matemática e menor Química é necessário obter aprovação a 150 ECTS em unidades de curriculares obrigatórias e 30 ECTS em unidades curriculares optativas;

Distribuídas da seguinte forma:

1º Ano 1º Semestre: 5 UC Obrigatórias num total de 30 ECTS 2º Semestre 5 UC Obrigatórias num total de 30 ECTS

2º Ano 3º Semestre 5 UC Obrigatórias num total de 30 ECTS 4º Semestre 5 UC Obrigatórias num total de 30 ECTS

3° Ano 5° Semestre

2 UC Obrigatórias num total de 12 ECTS

2 Obrigatórias do menor ou 2 Optativas num total 12 ECTS 1UC Optativa ou livre num total de 6 ECTS

6⁰ Semestre

2 UC Obrigatórias num total de 12 ECTS UC Optativas ou livre num total de 18 ECTS ***

Program Contents

Back Laboratory of Mathematics (MAT00928)

Back

Discrete Mathematics (MAT00932L) Sets Induction Combinatorics and counting Recurrence Graphs Euclid algorithm Modular arithmetic



Back Programming I (INF00880L)

Back Mathematical Analysis I (MAT00905L)

Back

Linear Algebra and Geometry I (MAT00900L) Systems of linear equations.

Systems of linear equations. Matrices. Determinants. Vector spaces. Linear applications. Eigenvalues and eigenvectors. Geometry of plane and space. Quadratic forms.

Back Linear Algebra and Geometry II (MAT00901)

Back Mathematical Analysis II (MAT00906L)

Back Entrepreneurship and Corporate Innovation (GES00788L)

Back Programming II (INF00881L)

Back Geometry I (MAT00922L)

Back General Physics I (FIS00703L)

Back

Introduction to Probability and Statistics (MAT00925L)

Descriptive StatisticsBasic Probability NotionsConditional probabilities and independence Random Variables and VectorsMore important Discrete and Continuous distributionsStatistical Inference (parametric and non parametric)Linear Regression Analysis



Mathematical Analysis III (MAT00907L)

- 1. Elements of Differential Geometry in R3
- 1.1. General information on the space Rn
- $1.2. \ \ Contours \ and \ parameterized \ curves$
- 1.3. Length of arc. Parameterization by arc length
- 1.4. Curvature and torsion. Frenet-Serret formulas
- 1.5. Surfaces.
- 1.6. Tangent plane and normal line to a surface. Orientability.
- 2. Introduction to Complex Analysis
- 2.1. General.
- 2.2. Complex functions and analytic functions.
- 2.3. Cauchy-Riemann equations.
- 2.4. Laplace equation. Harmonic functions.
- 2.5. Geometry of analytic functions. Conformal transformation.
- 2.6. Elementary complex functions.
- (I) Exponential function
- (li) trigonometric and hyperbolic functions
- (lii) logarithm function
- (Iv) Generalized complex powers functions
- 2.7. Complex integration
- (I) Path Integral
- (li) Elementary properties
- 2.8. Fundamental Theorem of Calculus.
- 2.9. Cauchys theorem and its evolution.
- 2.10. Cauchy integral formula and applications
- 3. Ordinary Differential Equations
- 3.1. Definitions and generalities.
- 3.2. Exact equations and integrating factors.
- 3.3. Basic equations of 1st order
- (I) equation with separable variables
- (li) homogeneous equation
- (lii) homographic Equation
- (Iv) linear equation of 1st order
- (V) Bernoulli Equation
- (Vi) Ricati Equation
- 3.4. Linear equations of 2nd order
- (I) reduction of order.
- (li) Particular solution of the nonhomogeneous equation
- (lii) homogeneous equation with constant coefficients
- 4. Systems of ordinary differential equations
- 4.1. Introduction and notations
- 4.2. Linear systems
- 4.3. Systems with constant coefficients
- 4.4. Linear periodic systems
- 4.5. Asymptotic behavior of solutions for linear systems.
- 4.6. Stability of solutions
- 4.7. Planar autonomous systems
- 5. Fourier series
- 5.1. Periodic functions.
- 5.2. Trigonometric series.
- 5.3. Euler formulas for Fourier coefficients.
- 5.4. Orthogonality.
- 5.5. Uniform convergence
- 5.6. Convergence and the sum of the Fourier series.
- 5.7. Functions with a generic period 2L
- 5.8. Expansion in series of sines and cosines
- 5.9. Periodic extensions
- 5.10. Complex Fourier series.
- 5.11. Fourier integrals.



Back Algebra I (MAT00898L)

Back Metrics and Topology (MAT00938L)

Back

Computational Methods (MAT00937L)

Back Complements of Probability and Statistics (MAT00912L)

Back Mathematical Analysis IV (MAT00908L)

Back History and Phylosophy of Mathematics (MAT00924L)

Back

Computational Logic (MAT00929L)

Valid arguments. Propositional Logic. Natural deduction. Semantic tableaux. Normal Forms. Metatheory. First order logic with equality. Natural deduction. Tableaux. Normal forms. Resolution.

Back

Complex Analysis (MAT00903L)

Complex plane geometry and topology; holomorphic functions (Cauchy-Riemann equations, harmonic functions); elementary functions; complex integration (theorem of Cauchy, Cauchy's integral formula, Liouville's theorem, the fundamental theorem of algebra and the maximum modulus theorem); Taylor and Laurent series, analytic continuation; zeroes and poles, residue theorem (applications to integral calculus); Rouché's theorem; conformal transformations; further on harmonic maps.

Back

Mathematical Statistics (MAT00918L)

Back Introduction to Biology Studies (BIO00312)

Back Basic Ecology (PAO00500)



Back

Logic and Foundations of Mathematics (MAT00930L)

Na axiomatization in Hilbert's style of first order logic withequality. Axiomatic theories. The axiomatic theory of sets of Zermelo-Fraenkel with choice. Sets, relations, functions, numbers, ordinals, cardinals. The continuum hypothesis.

Back

Introduction to Stochastic Processes (MAT00927L)

General concepts of stochastic processes Discrete-time Markov chains (including Monte Carlos simulation) Introduction to branching processes Continuous-time Markov chains (including Monte Carlo simulation) Poisson processes Bith-and-death processes Introduction to queueing theory

Back

Introduction to Quality Control and Reliability (MAT00926L)

Back

Number Theory and Cryptography (MAT00942L)

1.Introduction of the objectives, Notion of symmetricl cipher, Notion of Public-key: ciphers, signatures and protocols.

2. Number theory and cryptography. Prime divisibility, Numbers and factorization, congruences and residue class rings, function of Euler-Phi, Fermat?s little theorem, and Chinese theorem of, Cyclic Groups and discrete Logarithms.

3.Symmetrical ciphers. Study of the ciphers guided to the computational efficiency, sequential ciphers for processing of information in real time, ciphers for blocks; its ways and standards: DES and AES, linear Cryptoanalysis.

4. Cryptography of public key (based in the integer factorization and the Problem of the Discrete Logarithms). The techniques RSA, Rabin and ElGamal. Digital ciphers, signatures (RSA, ElGamal and DSA), the protocol of Diffie-Hellman.

5. Cryptography based in public key in elliptic curves.

Back

Functional Optimization (MAT00939L)

Historical introduction.

Weak and strong variations.

Proof of validity of the Euler-Lagrange equation for simple integrals with C1 lagrangian in spaces of functions in competition of class C1.

Generalizations of the Euler-Lagrange equation: simple integrals containing n-th order derivatives of the functions in competition; double integrals; piecewise C1 functions in competition (Weierstrass-Erdmann corner point conditions).

Sufficient conditions for existence of minimum for integrals with lagrangean depending only on the velocity variable: weak and strong minima.

Necessary conditions for the existence of minimum under isoperimetric conditions.

Special important examples: geodesics, brachistochrone, minimal surfaces of revolution.

Control theory. Controlability. Optimal control.

Minimal time linear autonomous problems: existence of an optimal control and extremal controls; normality and uniqueness of the optimal control.



Sampling (MAT00902L)

- 1. Basic notions on sampling and estimation.
- 2. Main steps about planning a sampling design and selection of sampling units.
- 3. Methods for data collection in survey sampling.
- 4. Simple random sampling.
- 5. Estimation of totals, means, proportions and ratios.
- ${\small 6. } {\small Ratio and regression estimation.}$
- 7. Stratified sampling.
- 8. Cluster and multi-step sampling designs.
- 9. Unequal probability sampling.

Back

Computational Algebra (MAT00897L)

Back

Numerical Analysis II (MAT00910L)

Back

Numerical Analysis I (MAT00909L)

Back

Functional Analysis (MAT00904L)

Finite and infinite dimensional Banach spaces. Hahn-Banach theorem. Strong and weak convergence. Hilbert spaces. Bounded linear operators. Compact operators. Fixed point theory. Integral equations. Fredholm alternative. Resolvent and spectrum.

Back

Multivariate Statistics (MAT00919L)

Exploratory Analysis of Multivariate Data Correspondence Analysis Multidimensional Scaling Decision Trees Software: SPSS and R

Back

Fundaments of Operations Research (MAT00920L)

Back

Applied Statistics (MAT00916L)



Partial Differential Equations (MAT00914L)

Linear and nonlinear equations. Hyperbolic, parabolic and elliptic equations: "classification and canonical forms". III- and well-posed problems. The problems for the wave, the diffusion and the Laplace equations. Separation of variables, Fourier series (a motivation to the Hilbert spaces). Introduction to the Fourier transform (a motivation to the Sobolev spaces). Distributions, weak solutions and Green functions. Characteristics and evolution (a motivation to the energy and variational methods; implications for the nonlinear equations).

Back

Ordinary Differential Equations (MAT00913L)

1. Ordinary Differential Equations. First order equations. Second order linear equations. Particular solution of non homogeneous equation. Homogeneous equation with constant coefficients.

2. Existence and Uniqueness of Solution. Inequalities and convergences. Picard's method of sucessive approximations. Solutions extension. Uniqueness theorems. Differential inequalities and extremal solutions. Continuous dependence of initial conditions.

3. Systems of Differential Equations. Existence and uniqueness of solutions. Linear systems. Systems with constant coefficients. Asymptotic behaviour of solutions

4. Stability of Solutions. Stability of quasi-linear systems. Planar autonomous systems. Limit cycles and periodic solutions. Lyapunov's method for autonomous and nonautonomous systems. Oscillatory equations

5. Boundary value problems. Green's functions. Maximum principle. Sturm-Liouville problems. Eigenfunction expansions. Nonlinear boundary value problems

Back

Populations Biology (BIO00296)

Back Genetics (BIO00309)



Back Microbiology (BIO00408L)

Theoretical:

- 1. Historical context and Ubiquity
- 2. Diversity of the Microbial World
- 3. Microbial Growth and Death
- 4. Metabolism
- 5. Basics of Molecular Microbiology: Microbial genetics, Virology, Immunology
- 6. Microbes and disease; Normal flora, Pathology, infection and disease, Mechanisms of pathogenicity, Principles of epidemiology
- 7. Food microbiology: Hygiene and concept of indicator. Processing and storage of food. Foodborne diseases

8. Ecology and environmental microbiology: Soil and water, Biogeochemical cycles, Agricultural applications, Wastewater treatment, Biotechnology applications

Lab Practice: Aseptic practice Observation of bacteria, fungi and protists. Demonstration of Ubiquity Preparation and sterilization of culture media. Isolation of pure culture. Colonial and cellular morphology. Staining methods Microbial counts Environmental conditions for growth (pH, temp., O2) Anaerobic Culture Antibiograms Microbial spreading simulation Water and milk analises Plant symbiosis.

Back

Fisheries Biology (BIO00321)

1. Main Portuguese halieutic resources: algae, molluscs, crustaceans and fish. 2. Fishing technology used in Portugal. 3. Aquaculture: aquaculture techniques, production of aquatic organisms in Portugal. 4. Fish transformation industry. 5. Population dynamics: distribution and abundance, growth, reproduction and recruitment, mortality. 6. Introduction to the yield models. 7. Assessment and monitoring of halieutic resources. 8. Impact of fisheries in the aquatic ecosystems.

Back

Environmental Impact Assessment (PAO00501)

Back Ecological Modelling and Systems Analysis (PAO00502)

Back Project in Mathematics (MAT00940L)

Back

Measure, Probability and Integration (MAT00936L)



Back Computer and Systems Architecture I (INF00862L)

Back Databases (INF00864L)

Back Declarative Programming (INF00879L)

Back Programming Languages (INF00872L)

Back

Computer Graphics (INF00866L)

Fundamental techniques in Computer Graphics Coordinate systems in 2D CG 2D Matrix Transformations: Rotation about an arbitrary point, Symmetry, Translation and Scaling. Homogeneous coordinates, 2D affine transformation 3D Transformation: Matrix Rotation, Homogeneous coords in 3D, 3D Rotation Euler angles and gimbal lock Line generation algorithms (problem analysis, DDA and Bresenham algorithm), Polygons and Circle generation algorithm, fonts generation, Area filling: 'ScanLine' Algorithm Line and polygons Clipping Introduction to modeling 2D curves implicit, explicit, parametric forms Parametric space curves Piecewise curves and continuity Matrix form for curves P=GMQ Bezier splines and blending functions Bezier and Bresenham's Algorithms Introduction to Surfaces Interpolating curves - Quadratic curve - Hermite curve and its derivation Simple surface sphere and plane - explicit, implicit, parametric Coordinate systems in 2D CG Modelling 3D Perspective and Projections Derivation of linear perspective Orthogonal perspective Viewing / Perspective transformations Visibility - Removing back-faces 3D clipping. Hidden points, lines and surfaces elimination (painter and depth buffer algorithm). Basic illumination models. Light and Illumination methods. Shadows Basic rendering Flat, Gourard and Phong shading, environment, texture and bump mapping, introduction to ray tracing. Virtual Environments. $\{ \setminus \}$ newline

Back

Econometrics I (ECN00044)

Regression With Cross-Sectional Data: SIMPLE REGRESSION MODEL;

MULTIPLE REGRESSION MODEL: OLS Estimation; Functional form

Effects of data scaling; Expected values of OLS estimators, Variances and properties, Multicolinearity, Inference, Prediction; Specification Analysis;

Regression with qualitative independent variables, OLS Asymptotics. HETEROSCEDASTICITY: Properties of OLS estimators, Heteroscedasticity - robust inference, Weighted least squares estimation, Tests for Heteroscedasticity. Linear Regression With Time Series Data: Models, Estimation, Inference and specification analysis, Trends and seasonality, Stationary and nonstationary time series, Asymptotic properties of OLS; SERIAL CORRELATION.



Econometrics II (ECN00045)

Dynamic Models and Forecasting: Heteroskedasticity, autocorrelation and dynamic specification, Auto-regressive conditional heteroskedasticity, Infinite distributed lag model, Stationarity and unit roots tests, Spurious regression and cointegration, Limited Dependent Variables Models: linear probability model, Logit, Probit and Tobit models, Maximum Likelihood estimation. Introduction to Panel data: Pooling cross-section across time, Fixed effects model, Random effects model. Instrumental Variables Regression: Estimation and inference with instrumental variables, Two-Step Least Squares, Endogeneity tests and overidentifying restrictions test. Simultaneous Equations Models: Reduced form and its estimation. The identification problem, Structural form estimation: 2SLS.

Back

Natural Resource Economics (ECN00052)

Economic exploitation of natural resources. Management of natural renewable resources. Economic management of fisheries. Economic management of forests. Economic management and distribution of hydro resources. Economics and environment

Back

Financial Economics (ECN00053)

The Intermediaries, Financial Markets and Products.

The Portuguese Financial System.

Interest Rate Theory: Parity and Term Structure.

Financial Investments and Risk: Default Risk and Financial Asset's Portfolio Management.

The Financial Instruments of Financial Risk's Management.

Back

Principles of Macroeconomics (ECN00149)

Sumary:

1. What is Macroeconomics?

- 2. Short-run Economics Fluctuations: sources and (possible) solutions.
- 3. The open Economy.
- 4. The trade-off between Inflation and Unemployment
- Detailed:

1. The Science of Macroeconomics. Macroeconomic variables and data. The time-dimension macroeconomic. Aggregate demand and aggregate supply (the sticky price hypothesis): a brief overview.

2. The short run economic fluctuations. The goods market and the IS curve. The fiscal policy and the multiplier. The government budget, budget deficits and public debt. The monetary system, kinds of money, the central bank, commercial banks and money supply. The ECB tools of money control. The money market and the LM curve. Fiscal and monetary policy. The aggregate demand.

3. The open economy; the bases for international trade, the flow of goods, services and capital, nominal and real exchange rates, the purchasing power parity hypothesis, the relative purchasing power parity, the uncovered interest rate parity, exchange rates regime.

4. Inflation, unemployment and the Curve of Phillips.



Principles of Microeconomics (ECN00150)

Sumary:

1. What is Microeconomics?

- 2. How markets work
- 3. Demand, Supply and government policies
- 4. The Theory of consumer choice
- Detailed:

1. A few basic principles of Economic. The scientific method in economics; hypothesis, models and the distinction between normative and positive analysis.

2. How markets work. Demand and Supply; determinants of the quantity demanded/supplied, the demand/supply schedule, shifts in the demand/supply curves and supply, market equilibrium. Elasticity and its application; Elasticity of Demand, price-elasticity and total revenue. Elasticity of supply.

3. Demand and Supply and the presence of the government. Control of prices (price ceiling and price floor; case studies: minimum wage and rent control. Taxes and subsidies: who pays the bill? Consumer and producer surplus, Market efficiency and market failure: Causes of market failure: market power and externalities. Public goods and common resources.

4. The Theory of consumer choice: From preferences to the Demand Curve: preferences, the instantaneous budget constrain and the consumer's optimal choice. How changes in income affect the consumer choice. How changes in relative prices affect the consumer choice: income and substitution effects. The decision between present and future consumption; can interest rates affect present and future consumption? The intertemporal choice. The trade-off between consumption and leisure: the dual decision of consumers and the link between the goods market and the labour market.

Back

Decision and Negotiation Analysis (GES00010L)

1. Introduction

- 2. Individual decision making under uncertainty
- 2.1. The elements of a decision problem
- 2.2. Representation of decision problems
- 2.3. Choice criteria without probabilities
- 2.4. Expected monetary value criterion
- 2.5. Expected utility theory
- 2.6. Methods for preferences extraction
- 2.7. Analysis of sequential decision problems
- 2.8. Software for decision analysis (Precision Tree)
- 3. Individual decision making with multiple objectives
- 3.1. Objectives and attributes
- 3.2. Efficient alternatives and tradeoffs among objectives
- 3.3. Utility function and selection of the best alternative
- 4. Decisions in the presence of strategic interdependency
- 4.1. Strategic and extensive form representation of a game
- 4.2. Static games with complete information
- 4.3. Dynamic games with complete information
- 4.4. Applications of game theory to management and economics
- 5. Negotiation Analysis
- 5.1. Characteristics of negotiation analysis
- 5.2. Bilateral negotiation with one issue and several issues



Financial and Actuarial Calculus (GES00022)

Fundamental concepts. Compounding and discounting. Equivalence of values. Annuities. Amortization and sinking funds. Investment decisions and investment appraisal. Actuarial instruments and operations.

- 1.General notions
- 2.Compounding regimes
- 3.Equivalence of values
- 4.Annuities
- 5.Amortization and sinking values
- 6.Actuarial instruments and operations
- 7.Other Financial and actuarial operations

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Organizational Behaviour and Human Resources Management (GES00027L)

Module 1. Organizational Behaviour and Human Resources Management: delimitation and areas of fork of the two areas

- Module 2. Leadership and Power
- Module 3. Motivation and satisfaction in the work
- Module 4. Organizational Communication
- Module 5. Participation and negotiation
- Module 6. Culture and ethical organizational
- Module 7. Tendencies of the organisational models
- Module 8. The development of the work face to the legislation in vigour
- Module 9. The human resources management (GRH) as sub-system of management system: Of the stages of the evolution of
- GRH to the main dimensions and politics of GRH
- Module 10. Strategic Plan of human resources
- Module 11. Recruitment, Selection and Integration
- Module 12. Management systems and evaluation of the performance
- Module 13. Reward Systems
- Module 14. Systems of Health and Safety in the Work
- Module 15. Formation Systems and Development of the human resources
- Module 16. Information Management Systems of human resources (SIGRH)



Marketing I (GES00118)

Module 1 - Introduction

- 1.1.Concepts of Marketing and its evolution
- 1.2. The importance of Marketing in the organizations
- $1.3. The attitude, the techniques and the models of Marketing <math display="inline">% \left({{{\rm{A}}_{\rm{B}}}} \right)$
- 1.4.Organization forms of the function Marketing in the organizations
- Module 2 The Marketing Planning
- 2.1. Analysis of diagnosis the situation
- 2.2. Fixation of objectives of Marketing
- 2.3. Marketing strategy
- 2.4. Marketing mix
- 2.5. Nature and Contents of the Marketing plan
- Module 3 The Market
- 3.1. Concept market
- 3.2. Types and mensuration methods and forecast for the search
- 3.3. The studies of Marketing
- 3.4. The Competition
- Module 4 -The Behaviour of Purchase of the Consumers and/or Buyers and the Organizations
- 4.1. Theories and explanatory models of the purchase behaviour
- 4.2. The process of taking decision of the consuming and/or buyer's purchase
- 4.3. The process of taking decision of purchase of organizations
- 4.4. Influences to the process of taking decision
- Module 5 The Segmentation and the Positioning
- 5.1. Approaches and segmentation methodology
- 5.2. Segmentation strategies
- 5.3. Forms of selections of the market-objective
- 5.4. Differentiation and positioning of the offer.

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Marketing II (GES00119)

Brand1.1. The identity-mix- Identity versus Image- Identity components1.2. Brand development- Brand extension- Brand ١. revitalization- Licensing II. Product 2.1. The role of product in the marketing-mix 2.2. Product-mix2.2.1. Basic product2.2.3. Packaging and labeling2.2.4. Additional services2.3. Investigation and development of new products2.4. Product life-cycle2.5 Price3.1. Barriers to price definition3.2. The role of price in the marketing-mix3.3. Methods for price Services III. Distribution 4.1. Distribution functions 4.2. The role of distribution in the producers' definition3.4. Price management IV. marketing-mix4.3. Organization of distribution channels4.4. Distribution remuneration4.5. Evaluation and selection of the distribution channel4.6. The Portuguese commercial sector4.7. The marketing of distributors4.8. Sales forceIV. Communication 5.1. Introduction 5.1.1. What is communication?5.1.2. The communication process 5.1.3. Communication of goods and services versus corporate communication5.1.4. Communication functions5.2. Model of the hierarchy of responses5.3. The message and creativity 5.4. Communication-mix5.4.1. Advertising5.4.2. Sales promotions and merchandising5.4.3. Public relations5.4.5. Sponsorship5.4.6. Sales force5.5. Rhetoric and advertising5.5.1. Techniques for creating attention and interest5.5.2. Techniques to facilitate understanding 5.5.3. Techniques for improving memorization 5.5.4. Techniques for improving remember5.6. Strategy and planning of communication channels



Decision Models (GES00128L)

- 1 Introduction
- 2 Linear Programming Model
- 3 Transportation and Transshipment Models
- 4 Integer Programming Model
- 5 Project Management
- 6 Queueing Models
- 7 Simulation Models

Back Undulatory Phenomena (FIS00689L)

Back

Statistical Physics and Thermodynamics (FIS00701L)

Back

Classical Mechanics (FIS00714L)

Back Quantum Mechanics I (FIS00715L)

Back Relativity and Cosmology (FIS00723L)

Back

General Chemistry (QUI01090L)

- 1. Constitution of matter
- 2. Periodic table
- 3. Chemical bonding
- 4. States of aggregation of matter
- 5. Solutions
- 6. Chemical thermodynamics
- 7. Chemical equilibrium
- 8. Equilibrium in heterogeneous systems
- 9. Ionic equilibria in homogeneous systems: acid-base
- 10. Electrochemistry
- 11. (Optional Chapter)
- Chemistry of life
- Chemical corrosion
- Chemical kinetics



Back Analytical Chemistry (QUI01038L)

Back

Physical Chemistry (QUI01082)

The properties of gases: the perfect gas, real gases, equations of state.
2- Key concepts in thermodynamics: First law of thermodynamics, thermochemistry.
3- Spontaneous change and entropy. Gibbs energy. Maxwell equations. Phase transitions and phase diagram of pure substances.
4- The properties of mixtures: ideal and real mixtures, colligative properties, phase diagrams of mixtures.
5- Principles of chemical equilibrium. Relationship between the equilibrium composition and the thermodynamic functions. Shifts in chemical equilibrium.
6- Chemical kinetics. Elementary and complex reactions. The steady-state approximation. Unimolecular reactions. Enzyme catalysis. Chain reactions.

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Inorganic Chemistry I (QUI01091)

Part A- Foundations 1. Introduction Inorganic Chemistry: scope and influences on actual chemistry panorama and general society. Review of the fundamental concepts of atomic and molecular structure and chemical bonding. Fundamental concepts of thermochemistry, thermodynamics and kinetics. 2. Acids and bases Brønsted acidity. Characteristics of Brønsted acidis: acidity and periodic trends of binary hydrides, simple oxoacids, oxides and aquo-cations. Lewis acidity: examples of Lewis acids and bases and periodicity. Reactions and properties of Lewis acids and bases: types of reaction, HSAB concept, thermodynamic acidity parameters and solvents as acid and bases. Heterogeneous acid-base reactions. Other acid-base concepts. 3. Oxidation and reduction Review of the fundamental concepts in redox chemistry: redox half-reactions, standard potentials, the electrochemical series and Nernst equation. Rates of redox reactions and overpotential. Redox stability in water. Disproportionation, comproportionation and oxidation by atmospheric oxygen. The influence of complexation. The diagrammatic presentation of potential data: Latimer, Frost and Pourbaix diagrams. 4. Introduction to coordination chemistry Definitions, constitution and geometry. Representative ligands and nomenclature. Isomerism and chirality.Part B- The chemistry of the elements and their compounds 1. General aspects The nature and types of the elements. The chemistry of the elements in relation to its position in the periodic table. 2. Systematic description Atomic, physical and chemical properties, occurrence, preparation and uses of the elements. Hydrogen: physical and chemical properties of dihydrogen and simple hydrides. G1,2: structure, physical and chemical properties of representative compounds. Solubility and hydration. Solutions in liquid ammonia. Contrasting light and heavy elements: anomalous behaviour of lithium and berilium. G13: structure, physical and chemical properties of representative compounds. Contrasting light and heavy elements: differences in the chemistry of boron relatively to the other elements. G14: structure, physical and chemical properties of representative compounds. Contrasting light and heavy elements: differences in the chemistry of carbon and silicon relatively to the other elements. G15: structure, physical and chemical properties of representative compounds. Contrasting light and heavy elements: differences in the chemistry of nitrogen and phosphorous relatively to the other elements. G16: structure, physical and chemical properties of representative compounds. Contrasting light and heavy elements: differences in the chemistry of oxygen and sulfur relatively to the other elements. G17: structure, physical and chemical properties of representative compounds. G18: structure, physical and chemical properties of Xenon compounds. Examples of coordination compounds. Other representative compounds. d-Metal elements: trends in chemical properties (oxidation states, structures and noble character). Structure, physical and chemical properties of representative compounds.Part C- d-Metal complexes 1. Chemical bonding and electronic spectra Crystal-field theory and the consequences of the splitting of the ligand field: magnetic, thermodynamic and structural effects. Ligand field bonding. Electronic spectra: ligand-field transitions, ptheory: & sigma; and spectrochemical series, charge transfer bands, selection rules and intensities. 2. Reactions of complexes Ligand substitution reactions: thermodynamic considerations, rates and mechanisms. Ligand substitution in square-planar and octahedral complexes. Redox reactions: the inner and outer-sphere mechanisms. Photochemical reactions. 3. d-Metal organometallic compounds Foundations of structure and bonding. Stable electron configurations. Electron counting: ionic and covalent models. Nomenclature. Survey of organometallic compounds according to the type of ligands.