People's Democratic Republic of Algeria
Ministry of High Education and Scientific Research

Harmonization

A Master's training offer

Academic

The institution	College/The Institute	Department
University of Jijel	**Faculty of Exact Sciences and Computer science**	**Mathematics**

Translated from french to english by
Dr : Mourad Chelgham
Responsible of Fondamental and Discrete Mathematics speciality

The field: Mathematics and Computer science
The branch: Mathematics
Specialization: Fondamental and Discret Mathematics

Academic year: 2016-2017

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First - Master's Program identity card

(All fields must be completed)

1- Location of training

Faculty: Faculty of Exact Sciences and Computer Science

Department: Mathematics

Qualification Decision Reference : No. 1294 of 09/08/2016

2- Training Partners

- Other university institutions:

- Businesses and other socio-economic partners:

- International partners:

***=** Present the conventions in the formation annex**.**

3 - Context and objectives of the training

A- Admission requirements (University majors qualifying for admission to the Master's program must be mentioned.)

✓ Bachelor's degree (LMD) after studying the file

✓ Postgraduate Diploma (Classical system) after the file has been studied by the program team

B- Training objectives

(Targeted skills, educational knowledge acquired after completing the program - maximum 20 lines)

The development of Mathematics represents one of the key indicators of scientific and technological progress, and it demonstrates the need for mathematical tools in many higher education disciplines. It is clear that Algerian universities will need highly qualified professionals in the field of Mathematics teaching and research in the future..

This Master's program aims to provide students with the following::

- Solid academic qualifications that qualify them to begin scientific research in preparation for the doctoral stage.
- Theoretical knowledge and mastery of techniques that enable them to solve mathematical problems using algebraic tools and topological methods.
- In-depth knowledge of algebra and its effective applications in emerging fields such as::
    - Error correction codes
    - Formal calculus

C - Targeted professional files and skills
(In the field of professional integration - maximum 20 lines):

- This program aims to graduate PhD researchers in fundamental Mathematics, especially in the fields of topology and algebra and their applications (number theory, braid groups, coding theory).).

D - Employment opportunities at the regional and national levels for graduates

At the regional level:

- Employment in the field of higher education and scientific research, due to the shortage of Mathematics professors, especially at Jijel University..

At the national level:

- Scientific research centers.
- National Education Institutions (Ministry of Education).

E - Bridges to other specialties
The student may change his academic track after the approval of the educational program team..

F - Training monitoring indicators
The educational team follows up on the progress of teaching through::

- Holding periodic educational committees
- Preparing quarterly evaluation reports

G - Supervisory capacity
(The number of students that can be accommodated in the program is determined)Maximum of **16 students**

4 -Available human resources

A- Faculty members affiliated with the institution and contributing to the specialization

First name - last name	Graduate Diploma + Specialization	Postgraduate Diploma + Specialization	Rank	Type of intervention
Nour Sadat Twafek	D.E.S (Analysis)	HDR, Mathematics	Pr,	Lectures, TD, Supervision
Karada Mohammed	D.E.S (Algebra)	HDR, Mathematics	Pr	Lectures, TD , Supervision
Bouchair AbdeRahman	D.E.S (Algebra)	HDR, Mathematics	Pr	Lectures, TD, Supervision
Ahmia Moussa	Engineer (Research for my operations)	HDR, Mathematics	Pr	Lectures, TD, Supervision
Mounira Kemiha	D.E.S (Algebra and Number Theory)	Magister, Algebra and Number Theory	MA-A-	Lectures, TD, Supervision
Chelgham Mourad	Bachelor of Education (Mathematics)	HDR, Mathematics	MC-A-	Lectures, TD, Supervision
Belhanache Farida	Bachelor of Education (Mathematics)	HDR, Mathematics	MC-A-	Lectures, TD, Supervision
Boussayoud Ali	D.E.S (Mathematics)	HDR, Mathematics	Pr	Lectures, TD, Supervision
Boulouh Mounira	D.E.S (Mathematics)	Doctorat Sciences	MC-B-	TD, Supervision

B- External supervisors:
Parent institution

Name and surname	Graduate Diploma + Specialization	Postgraduate Diploma + Specialization	Rank	Type of intervention	

Parent institution

Name and surname	Graduate Diploma + Specialization	Postgraduate Diploma + Specialization	Rank	Type of intervention	

Parent institution

Name and surname	Graduate Diploma + Specialization	Postgraduate Diploma + Specialization	Rank	Type of intervention	

Parent institution

Name and surname	Graduate Diploma + Specialization	Postgraduate Diploma + Specialization	Rank	Type of intervention	

***= Lectures, A.M., A.T., Internship supervision, Memo supervision, Other (to be specified)**

5 -Available private material means

A- Educational laboratories and equipment:
(Model of existing educational equipment for the practical work of the intended program - one model for each laboratory)

Laboratory name: Computer science Laboratory 1.

N°	Device name	number	Observations
1	Computer	15	

B - Internship and vocational training sites

Waiting location	Number of students	Waiting period

C - Research laboratories supporting the Master's program:
Mathematics and Mathematics Applications Laboratory (LMAM)

Laboratory Manager: Mohammed Karada
Laboratory Accreditation No.: 145 dated 04/14/2012
Date: March 6, 2016 **Opinion of the head of the laboratory:** Favorable opinion

Laboratory Manager:
Laboratory accreditation number:
date: **Laboratory Director's recommendation:**

D- Scientific research supporting the master's degree:

Research project title	Project code	Project start date	Project end date
On certain classes of differential equations and non-linear difference equations	B01720120004	01/01/2013	12/31/2015
Open group topologies on function spaces	B01120120017	01/01/2013	12/31/2015

E - Personal workspaces and information and communication technology:

Second - The semester organization card for teaching

(Please provide the four season cards)

First semester

Teaching Unit	VHS	Weekly hourly volume				Coeff	Credits	Assessment method	
	15 semaines	C	TD	TP	Personal work			Continuous	Exam
Fondamental units									
UEF1 (mandatory)							18		
Algebraic Topology (1)	60 h	1 h 30	1 h 30		1 h	2	4	X	X
Commutative Algebra (1)	82 h 30	3 h	1 h 30		1 h	3	5	X	X
UEF2(compulsory(									
Arithmetic (1)	45 h	1 h 30	1 h 30			2	4	X	X
Introduction to Difference Equations	45 h	1 h 30	1 h 30			2	5	X	X
Curriculum units									
UEM1(compulsory)							9		
Analytical function theory	45 h	1 h 30	1 h 30			2	6	X	X
Scientific English	37 h 30	1 h 30			1 h	1	3		X
Discovery units									
UED1(compulsory)							3		
Linear programming	45 h	1 h 30	1 h 30			2	3	X	X
Total	**360 h**	**12 h**	**9 h**			**14**	**30**		

Second semester

Teaching Unit	VHS	Weekly hourly volume				Coeff	Credits	Assessment method	
	(15 weeks)	Lecture	TD	TP	Personal work			Continuous	Exam
Fondamental units									
UEF1(compulsory)	**120 h**	**3 h**	**3 h**				18		
Algebraic topology2	60 h	1 h 30	1 h 30		1 h	2	4	X	X
Commutative algebra 2	60 h	3 h	1 h 30		1 h	2	5	X	X
UEF2(compulsory)	**105 h**	**3 h**	**3 h**						
Arithmetic 2	60 h	1 h 30	1 h 30		1 h	2	5	X	X
Number Theory 1	45 h	1 h 30	1 h 30			2	4	X	X
Methodology units									
UEM1(compulsory)	97 h 30						9		
Symmetric Functions and Maple	75 h	1 h 30	1 h 30	2 h		3	6	X	X
Scientific English	22 h 30	1 h 30				1	3		X
Discovery units									
UED1(compulsory)	82 h 30					3			
Code Theory 1	82 h 30	3 h	1 h 30		1 h	3	3	X	X
The total	**405 h**	**12 h**	**9 h**	**2 h**		**15**	**30**		

Third semester

Teaching Unit	VHS	Weekly hourly volume				Coeff	Credits	Assessment method	
	15 semaines	C	TD	TP	Personal work			Continuous	Examen
Fondamental units									
UEF1(compulsory)							18		
Braid group theory	60 h	1 h 30	1 h 30		1 h	2	6	X	X
Commutative Algebra 3	60 h	1 h 30	1 h 30			2	6	X	X
UEF2 (compulsory)									
Number Theory 2	45 h	1 h 30	1h30			2	6	X	X
Methodology units									
UEM1 (compulsory)							9		
Space topology functions	75 h	1 h 30	1 h 30		2 h	2	6	X	X
Write in Latex	52 h 30	1 h 30		2 h		2	3	X	X
Discovery units									
UED1(compulsory)							2		
Codes Theory 2	45 h	1 h 30	1 h 30			2	2	X	X
Interjection Units									
UET1(compulsory)							1		
Labor legislation and professional ethics	22 h 30	1 h 30				1	1		
The total	**360 h**	**10 h 30**	**7h 30 h**	**2 h**		**13**	**30**		

Fourth semester

The field: Mathematics-Computer science
The branch: Mathematics
Specialization: Fondamental Mathematics

Memorandum and discussion

	Hourly volume	**Coeff**	**Credits**
Personal Work			
Internship in a company			
Seminaries			
Manuscrit	300 h	12	30
Total of the fourth semester	300 h	12	30

5-**Comprehensive summary of the formation**:(Point toTotal number of lecture h, TD, for 4 semesters of teaching, for different types of teaching modules)

Fondamental units → **Hourly volume ↓**	**UEF**	**UEM**	**UED**	**UET**	**Manuscit**	**Total**
Lectures	270 h	135 h	90 h	22 h 30		517 h 30
TD	247 h 30	67 h 30	75 h	----	----	390 h
TP	----	60 h	----	----	----	60 h
Personal work	105 h	45 h	15 h	----	----	165 h
Manuscit	----	----	----	----	300 h	300 h
Total	622 h 30	307 h 30	180 h	22 h 30	300	1432 h 30
Credits	54	27	8	1	30	120
% For credits to all UE	45%	22.5%	6.66%	0.83%	25%	100%

Third : Detailed program according to the tool

(One detailed sheet for each material)

Detailed program according to theTool for the first semester

Master's title: Fondamental Mathematics
Semester: The first
Educational unit title: UEF1
Article title: Algebraic topology(1)
Credits: 4
Coefficient: 2
Teaching objectives (Description of the skills the student is expected to acquire after passing this course – maximum 3 lines)
This course aims to introduce the basic concepts of elementary algebraic topology, such as fundamental groups and covering theory..
Prerequisites : (A brief description of the knowledge required to be able to follow this course – maximum of two lines)
Basic concepts in algebra and general topology.
Content of the article (The detailed content of the program must be mentioned in the personal attendance and self-work.)

Chapter 1: Creating of spaces

- Reminder (Topological spaces, separation axioms, connected spaces).
- Compact topology and application of compactness.
- Cellular spaces.
- Topological group actions.

Chapter 2: Homotopy and the fondamental Group

- Application and path homotopty.
- Fondamental group.
- Examples: The Fondamental group of circles and spheres.

Evaluation method: Final exam (factor 2) + self-work score (factor 1)
Referrences (Books, files, websites, etc.)

1- G. Bredon, Geometry and topology, Springer-Verlag GTM 139, 1993.
2- C. Godbillon, Elements of topological algébriques, Hermann 1971.
3- A. Hatcher, Algebraic topology, Cambridge University Press 2004.
4- W. Fulton, Algebraic topology: A first course, Springer-Verlag GTM 153, 1995.
5- E. Spanier, Algebraic topology, Tata McGraw-Hill, 1981.

Master's title: Fondamental Mathematics
Semester: the first
Educational unit title: UEF1
Article title: Commutative algebra (1)
Credits: 5
Coefficient: 3
Teaching objectives (Description of the skills the student is expected to acquire after passing this course – maximum 3 lines)
Classification of finite groups, Sylow's theorems..
Prerequisites : (A brief description of the knowledge required to be able to follow this course – maximum of two lines)
Basic concepts of algebraic structures..
Content of the article (The detailed content of the program must be mentioned in the personal attendance and self-work.)

Chapter 1: Reviews

- Quotient groups
- Cyclic groups.
- Action of a group on a set

Chapter 2: Semi-direct product

- Inner and outer semi-direct product
- Semi-direct product structures

Chapter 3: Classification of finite groups

- Sylow's theorems and applications
- Classification of finite groups of small orders
- Study of some groups with relatively large ranks
- Group representations

Chapter 4: Introduction to Ring Theory

- Ring
- Partial Ring
- Ideals
- Quotient rings

Evaluation method: Final exam (factor 2) + self-work score (factor 1)

Referrences (Books, files, websites, etc.)
1. Lang, Algebra, Addison-Wesley.
2. Samuel & Zariski, Commutative algebra, Springer.
3. Chambert-loir Antoine, Algèbre commutative,
http://perso.univ-rennes1.fr/antoine.chambert-loir/publications/teach/algcom.pdg

4. Goblot Rémi, Algèbre commutative, Masson.

Master's title: Fondamental Mathematics
Semester: the first
Educational unit title: UEF2
Article title: Arithmetic (1)
Credits: 4
Coefficient: 2
Teaching objectives (Description of the skills the student is expected to acquire after passing this course – maximum 3 lines)
Introducing basic conceptsinArithmetic such as: numbers anda lotBorders Bernoulli, numbers anda lotBorders Euler
Prerequisites : (A brief description of the knowledge required to be able to follow this course – maximum of two lines)
Basic concepts such as: the ring of rational integers andDependenciesThe birthAnd.
Content of the article (The detailed content of the program must be mentioned in the personal attendance and self-work.)

Chapter 1: Reminders and definitions

- Groups
- Rings.
- Fields

Chapter 2: Arithmetic of congruences

- Greatest common divisor, Euclid's algorithm, and prime numbers
- Prime number calculation, Chinese theory
- Euler's theorem, rotating groups

Chapter3: Bernoulli numbers and polynomials

- Bernoulli numbers
- Bernoulli polynomials

Chapter4: Euler numbers and polynomials

- Euler's numbers
- Euler polynomials

Evaluation method: Final exam (factor 2) + self-work score (factor 1)

Referrences (Books, files, websites, etc.)
1- JP Serre, Cours d'arithmétique, presse university de France, 1970.
2- André Joyal: Arithmétique.http://megamath.shos.fr
3- André Joyal: The names of Bernoulli. http://megamath.shos.fr
4- Pierre Wassef, Course of Arithmétique, Pierre et Marie Curie University.
5- JH Conway, KR Guy. "The Book of Numbers" Springer-Verlag. New York, Berlin.
6- P. Damphousse. "L'arithmétique ou l'art de compter" Edition quatre à quatre, France.
7/ H. Davenport. "The Higher Arithmetic". Cambridge University Press

Master's title: Fondamental Mathematics
Semester: The first
Educational unit title: UEF2
Article title: Introduction to difference equations (1)
Credits: 5
Coefficient: 2
Teaching objectives (Description of the skills the student is expected to acquire after passing this course – maximum 3 lines)
The main objective of this course is to enable students to master the basic results and techniques for studying real phenomena modeled by non-linear difference equations.
Prerequisites : (A brief description of the knowledge required to be able to follow this course – maximum of two lines)
Basic concepts about difference equations
Content of the article (The detailed content of the program must be mentioned in the personal attendance and self-work.)

Chapter 1: Linear difference equations

- Definitions
- Solutions space.
- Solutions of difference equations with constant coefficients.

Chapter2: Non-linear difference equations

- Definitions
- Periodicity and stability.
- Non-linear difference equations that lead to linear difference equation.

Chapter3: Systems of difference equations

- Definitions
- Reducing a difference equation to a system.
- Some solution techniques.

Evaluation method: Final exam (factor 2) + self-work score (factor 1)

Referrences (Books, files, websites, etc.)

1) E. Camouzis, G. Ladas, Dynamics of third order rational difference equations with open problems and conjectures, Advances in discrete Mathematics and applications, volume 5, Chapman & Hall/CRC, 2008.
2) E. A. Grove, G. Ladas, Periodicities in nonlinear difference equations, Advances in discrete Mathematics and applications, volume 4, Chapman & Hall/CRC, 2005.
3) V. L. Kocic, G. Ladas, Global Periodicities behavior of nonlinear difference equations of higher order with applications, Mathematics and its applications, Kluwer Academic Publishers, 1993.
4) S. Elaydi, An Introduction to Difference Equations, Third Edition, Springer, 2005.

Master's title: Fondamental Mathematics
Semester: The first
Educational unit title: UEM1
Article title: Introduction to the analytic functions theory
Credits: 6
Laboratories: 2
Educational objectives
This course aims to prepare the student who wishes to specialize in the theory of functions of a complex variable, especially entire functions and meromorphic functions, which will later be essential in solving functional equations.
Prerequisites: Real analysis, basic concepts of complex analysis.

Content of the article (Detailed program content must be included in personal attendance and self-work)

Chapter 1: Functions with a complex variable

- Analytic functions at a point and in a domain
- Real and imaginary parts of an analytic function
- Elementary functions

Chapter 2: Taylor series decomposition

- Decomposition of an analytic function into a Taylor series
- Liouville's theorem
- Differentiability of analytic and harmonic functions
- Zeros of analytic functions
- Moreira and Weierstrass's theorems, unity theorem

Chapter 3: Analytical extension

- The problem of analytical extension
- Indirect analytical extension
- Constructing an analytical function from its points

Evaluation method: Final exam (factor 2) + self-work score (factor 1)

Referrences (Books, files, websites, etc.)

1. H.Cartan, Theorie element of analytical functions, Hermann 1995
2. W.Rudin, Analyze analysis and analysis, Dunod 1998.
3. Y. Caumel, Cours d'Analysis fonctionnelle et coupéléxe, Cepaudues 2003. 1996.
4. J.F. Pabion, Elements analysis complex, 1997.
5. W.K.Hayma, Meromorphic Functions, Oxford Mathematics Monographs1964.2002.

Master's title: Fondamental Mathematics
Semester: the first
Educational unit title: UEM1
Article title: Scientific English
Credits: 3
Laboratories: 1

Educational objectives (Description of the skills the student should acquire after passing this subject - maximum 3 lines)

Prerequisites : (Brief description of the knowledge required to pursue this education - maximum two lines)

Content of the article (The detailed content of the program must be mentioned in the personal attendance and self-work):

Evaluation method: Continuous monitoring, exam, etc. (The relative weight is left to the discretion of the teaching team)

note: *The required sections (learning objectives, prior knowledge, course content) were left blank as in the original text for the teaching team to fill in as needed.*

Master's title: Fondamental Mathematics
Semester: the first
Educational unit title: UED1
Article title: Linear programming
Credits: 3
Coefficient: 2

Educational objectives This course aims to teach students the basic concepts of linear programming. The techniques for solving linear problems and the performance of optimization algorithms depend on the nature of the objective function and constraint functions. Linear programming addresses the case where the objective function and constraints are linear..

Prerequisites : Linear algebra, mathematical analysis.

Content of the article

Chapter One: Generalities about linear programmation

1.1- Concrete examples
1.2- Modeling
1.3- Graphical solution of a two-variable problem

Chapter Two: The Simplex Algorithm

2.1- Principle of the method
2.2- Initialization
2.3- Study of special cases

Chapter Three: Duality

3.1- Simplex dual algorithm
3.2- General duality theorems, post-optimization
3.3- Sensitivity analysis

Chapter Four: The transportation problem

4.1- Definition and examples
4.2- Algorithm for solving the transportation problem
4.3- The transshipment problem

Evaluation method: Continuous assessment and examination

Referrences (Books, files, websites, etc.)

1- B. Lemaire, C. Picouleau, Operational research method: Methods and procedures d'application, DUNOD, 5th edition, Paris, 1992.
2-G. Baillargeon, Program font application, SMG Canada editions 1996.
3- H. Bonnel, License of Mathematics L3, course of programming language, Paris, 2002.

Detailed program according to theTool for the second semester

Master's title: Fondamental Mathematics
Semester: the second
Educational unit title: UEF1
Article title: Algebraic Topology (2)
Credits: 4
Coefficient: 2

Educational objectives This unit aims to introduce the basic concepts of elementary algebraic topology, such as covering theory and homology groups..

Prerequisites : Basic concepts in general topology and algebra.

Content of the article

Chapter One: Coating theory

- Definition of coating
- Local homeomorphisms and coatings
- Surveying paths and homotopies

Chapter Two: Homological algebra

- Chains complexes
- Homology groups of a chains complexe
- Short and long exact sequences

Chapter Three: The singular homology theory

- Singular homology of a topological space
- Examples

Evaluation method: Continuous assessment and examination

Referrences (Books, files, websites, etc.)

1- G. Bredon, Geometry and topology, Springer-Verlag GTM 139, 1993.
2- C. Godbillon, Elements of topological algébriques, Hermann 1971.
3- A. Hatcher, Algebraic topology, Cambridge University Press 2004.
4- W. Fulton, Algebraic topology: A first course, Springer-Verlag GTM 153, 1995.
5 - E. Spanier, Algebraic topology, Tata McGraw-Hill, 1981.

Master's title: Fondamental Mathematics
Semester: the second
Educational unit title: UEF1
Article title: Commutative algebra(2)
Credits: 5
Coefficient: 2

Educational objectives:
Principal rings, factorial rings, modules, exact sequences.

Prerequisites: Basic concepts of algebraic structures.

Content of the article:

Chapter 1: Ring Theory
- Principal rings, factorial rings.
- Euclidean rings.

Chapter 2: Modules Theory
- Modules, sub-modules
- Quotient modules.

Chapter 3: Exact sequences of modules

Evaluation method: Continuous assessment and examination

Referrences (Books, files, websites, etc.)

1. Lang, Algebra, Addison-Wesley.
2. Samuel & Zariski, Commutative algebra, Springer.
3. Chambert-loir Antoine, Algèbre commutative,
http://perso.univ-rennes1.fr/antoine.chambert-loir/publications/teach/algcom.pdg
4. Goblot Rémi, Algèbre commutative, Masson

Master's title: Fondamental Mathematics
Semester: the second
Educational unit title: UEF2
Article title: Arithmetic (2)
Credits: 5
Coefficient: 2

Educational objectives: Introducing the student to basic number theory concepts such as Diophantine equations and analytic number theory.

Prerequisites: Basic concepts such as integer loops and generating functions.

Content of the article:

Chapter 1: Finite structures
- Review on $\mathbb{Z}/m\mathbb{Z}$
- Legendre and Jacobi Codes
- Gauss sum

Chapter 2: Algorithms, primality and factorization
- Basic algorithms
- Encryption, system RSA
- The primality test
- factorization

Chapter3: Algebra and diophantine equations
- Sum of squares
- Fermat's equationand and Pell-Fermat equation
- Algebraic integer rings

Chapter4: Analytic number theory
- Dirichlet series
- Dirichlet's theorem
- Prime numbers theorem and Riemann hypothesis

Evaluation method: Continuous assessment and examination
Referrences (Books, files, websites, etc.)

1- JP Serre, Cours d'arithmétique, presse university de France, 1970.
2- André Joyal: Arithmétique.http://megamath.shos.fr
3- André Joyal: The names of Bernoulli. http://megamath.shos.fr
4- Pierre Wassef, Course of Arithmétique, Pierre et Marie Curie University.
5- JH Conway, KR Guy. "The Book of Numbers" Springer-Verlag. New York, Berlin.
6- P. Damphousse. "The arithmetic or the art of the computer" Edition quatre a quatre, France

Master's title: Fondamental Mathematics
Semester: the second
Educational unit title: UEF2
Article title: Number Theory (1)
Credits: 4
Coefficient: 2

Educational objectives: This course aims to introduce the basic concepts of elliptic curves such as::
Weierstrass shapes, discriminant, singular points, Mordell-Weil theorem.

Prerequisites: Basic concepts of curves in the affine plane.

Article content:

Chapter One: Projective plane curves

- Definitions
- k-rational points
- Smooth curves, (bi)-rational applications between curves.

Chapter Two: Elliptic Curves

- Definitions
- Weirstrass forms,
- Discriminant and invariants
- Single point description.

Chapter Three: Group Structure

- Group law
- Explicit formulas of the group law
- Mordell-Weil theory
- characterization of torsion points

Evaluation method: Continuous assessment and examination
Referrences (Books, files, websites, etc.)

1/ J. Cassels, Lectures On Elliptic Curves, Cambridge Univ. Press, 1991.
2/ J. Cremona, Algorithms For Modular Elliptic Curves, Cambridge Univ. Press, Second Edition 1997.
3/ D. Husemoller, Elliptic Curves, Graduate Texts In Math. 111, Springer-Verlag, New York, 1987.
4/ J. Silverman, The Arithmetic Of Elliptic Curves, Graduate Texts In Math. 106, Springer-Verlag,

New York, 1986.

Master's title: Fondamental Mathematics
Semester: the second
Educational unit title: UEM1
Article title: Symmetric functions and the Maple program
Credits: 6
Coefficient: 2

Educational objectives:
This unit aims to introduce students to the concepts of symmetric functions and prepare them to work using Maple..

Prerequisites: Algebra 1, Linear Algebra, Mathematical Analysis.
Content of the article:
Chapter One: Initial Concepts
1.1- Formal series
1.2- Regressive relations
1.3- Generating functions

Chapter Two: Complete Symmetric Functions
2.1- Second-degree algebraic equations

2.2- Some properties related to symmetric functions

Chapter Three: Some Applications of symmetric functions
3.1- Definitions and Symbols
3.2- Basic Formula
3.3- Applications

Chapter Four: Maple Program
4.1- Using Maple in Linear Algebra
4.2- Graphing Using Maple
4.3- Linear Programming Using Maple

note:*The mathematical terminology has been kept as is.Like "Maple" from Maple, explaining it in context.*
Evaluation method: Continuous assessment and examination
Referrences (Books, files, websites, etc.)

1- A. Lascoux, Symmetric functions and combinatorial operators on polynomials, CBMS/AMS, Lecture Notes, 2003.
2- D. Foata and G. Han, Principles of Combinatoire Classique, University of Louis Pasteur, Strasbourg Department of Mathematics, 2008.
3- L.Manivel, Courses Specialties, Functions Symmetriques, Polynomes of Schuet and Lieux of Dégcnérexence, N3, Société Mathematics de France, 1998.

Master's title: Fondamental Mathematics
Semester: the second
Educational unit title: UED1
Article title: Codes Theory (1)
Credits: 3
Coefficient: 3

Educational objectives: This unit aims to introduce the basic concepts in symbol theory such as: block symbols, Hamming distance…

Prerequisites: Consent Calculation and Polynomials.

Article content:

Chapter One: Algebraic Concepts and Generalities on codes
1.1- Introduction and historical overview
1.2- Basic algebraic concepts
1.3- Block-correcting codes and systematic codes
1.4- Hamming distance and minimum distance of a code
1.5- Correction capacity and error detection capacity of a code
1.6- Equivalent codes, Singleton bound and MDS codes

Chapter Two: Linear codes, encoding and decoding
2.1- Introduction
2.2- Definition of linear code
2.3- Generating matrix and its properties
2.4- Orthogonal code and control matrix
2.5- Systematic linear coding, Hamming code
2.6- Decoding of linear codes
2.6.1 Decoding by standard table.
2.6.2 Decoding by syndrome

Chapter Three: Encryption and linear codes
3.1- Introduction
3.2- Secret key cryptography
3.2.1- Basic principles and definitions
3.2.2- Examples (Caesar Cipher, Vigenère, Substitution)
3.3- Private key cryptography
3.3.1- Overview and definitions
3.3.2- RSA encryption system
3.4- Applications of linear codes in cryptography
3.4.1- MacEllis encryption system
3.4.2- Security of MacEllis encryption system

Evaluation method: Continuous assessment and examination

Referrences(books, files, websites, etc.)

1- Badrikian, Codes correct principes and examples, Ellipses.
2- O.Papini, J.Wolfmann, Algèbre discrete et codes correcteurs, Springer.

Detailed program according to theTool for the third semester

Master's title: Fondamental Mathematics
Semester: the third
Educational unit title: UEF1
Article title: Braid group theory
Credits: 6
Coefficient: 2

Educational objectives : This course aims to provide an introduction to the theory of braid groups, where some of their representations will be defined through covering theory and homology theory.

Prerequisites: Basic concepts in algebraic topology, homotopy, coverings and homology.
Article content: Braid group theory

Chapter One: Braid Groups

- Review (symmetric groups, free groups, group representations)
- Groups defined by generators and relations
- Diffeotopy groups (self-homomorphism)
- Configurations space.

Chapter Two: Representations of Braid Groups

- Burau 's representation
- Magnus's representation

Evaluation method: Continuous assessment and examination
Referrences (Books, files, websites, etc.)

1/ J. S. Birman, Braids, links and mapping class groups, Annals of Mathematics. Studies 82, Princeton University Press, 1974.
2/ C. Kassel and V. Turaev, Braid groups, GTM 247, Springer-verlag (2008).
3/ D. Rolfsen, Knots and links, AMS Chelsea Publishing, (2003)

Master's Program: Fondamental Mathematics
Semester: the third
Educational unit: UEF1
The material: Commutative Algebra (3)
Credits: 6
Coefficient: 2

Course objectives : After passing this course, the student will be able to:

- Understand the basic chapters in commutative algebra necessary to pursue his academic formation
- Mastering the concepts of field extensions and Galois groups

Prerequisites: Group structures

- Ring theory
- Vector spaces

Content of the article:

Chapter One: Fields expansion

- Algebraic expansions
- **N**atural and separate extensions

Chapter Two: Galois Theory

- Galois groups
- Practical applications

Evaluation method: Continuous assessment and examination
Referrences(books, files, websites, etc.)

1. S. Lang, Algebra, Addison-Wesley.
2. Samuel & Zariski, Commutative algebra, 2 volumes, Springer.

Master's title: Fondamental Mathematics
Semester: the third
Educational unit: UEF2
The material: Number Theory (2)
Credits: 6
Coefficient: 2

Educational objectives: After success, the student will be able to::

- Knowledge of algorithms for finding the Weierstrass formula necessary for studying curves used recently in cryptography such as Edwards and Huff curves
- To gain a comprehensive understanding of the basic findings of the Mahler scale, which is currently an important research focus.

Prerequisites: Basic Concepts of Elliptic Curves

Article content: Number theory(2)
Chapter One: Algorithms for finding Weierstrass formulas for curves (of type 1) defined by polynomials in two variables:

- The case of quadrilateral curves and double-degree polynomials (2,2)
- Applications on Jacobi, Huff and other curves

Chapter Two: Mahler's measure of polynomials in one and two variables:

- Mahler's logarithmic measure
- Mahler's multiple measure
- Mahler’s measure of higher order
- Mahler's q-measure.

Evaluation method: Continuous assessment and examination
Referrences (books, files, websites, etc.)

1). G. Everest and T. Ward, Heights of Polynomials and Entropy in Algebraic Dynamics, Springer-Verlag, London-New York-Tokyo (1999).
2). J. Cassels, Lectures on Elliptic Curves, Cambridge Univ. Press, 1991.
3). J. Cremona, Algorithms for modular elliptic curves, Cambridge Univ. Press, Second Edition 1997.
4). D. Husemoller, Elliptic curves, Graduate Texts In Math. 111, Springer-Verlag, New York, 1987.
5). J. Silverman, The arithmetic of elliptic curves, Graduate Texts In Math.106, Springer-Verlag, New York, 1986.

Master's title: Fondamental Mathematics
Semester: the third
Educational unit: UEM1
The material: Topologies of function spaces
Credits: 6
Coefficient: 2

Educational objectives: This course aims to enable the student to::

- Gain knowledge about topologies defined on function spaces.
- Understanding topological structures on hyperspaces
- Establishing the necessary foundations for pursuing the topological and algebraic study of these spaces

Prerequisites: Basic concepts in general topology

Content of the article:

Chapter 1: Basic Topological Spaces

- Compact space
- Measurable space
- Countability properties
- Uniform space

Chapter 2: Convergence Topologies

- Simple convergence topology
- Uniform convergence topology

Chapter 3: Open Compact Topology

Chapter 4: Classical Topologies on Hyperspaces

- Vietoris topology
- Fell topology
- Convergence topology

Evaluation method: Continuous assessment and examination
Referrences(books, files, websites, etc.)

1/ R. Engelking, General topology, Heldermann Verlag, Berlin, (1989).
2 / A. V. Arkhangel'skii, Topological function spaces, Kluwer Academic Publishers, (1992).
3/ G. Beer, Topologies on closed and closed convex sets, Kluwer Academic Publishers, (1993).

Master's title: Fondamental Mathematics
Semester: the third
Educational unit: UEM1
The material: LaTeX writing
Credits: 3
Coefficient: 2

Educational objectives: This course aims to teach students the system ofLaTeX, a scientific text editing program that features:

- Ease of use and user-friendly interface
- High level of abstraction compared to other text editors
- High efficiency in producing scientific documents

Prerequisites: There are no prerequisites.

Content of the article:

Chapter One: Getting started

- Processing mechanisms and the concept of commands
- Class of a document and text structuring
- Characters

Chapter Two: Presentation elements

- Environments and enumerators
- Mathematical mode, Special Symbols
- Mathematical opperators

Chapter Three: Moving Elements and References

- Footnotes, figures, and tables
- References

Evaluation method: exam

Referrences (Books, files, websites, etc.)

1 - V. Granet and JP Regourd, Objectif Latex. Masson 1995.

Master's title: Fondamental Mathematics
Semester: the third
Educational unit: UED1
The material: Coding theory (2)
Credits: 2
Coefficient: 2

Educational objectives: After successfully completing this course, the student will be able to:

- Understand the basic foundations and tools of coding theory
- Understanding the problems of encoding and decoding
- Knowledge of the sports tools and techniques used in this field
- Understand the role of coding theory in protecting information from errors.
- Application of error correction codes in the field of cryptography

Prerequisites: Arithmetic in the integer ring$\mathbb{Z}$ and the ring of polynomials on the field K, group structures, rings, and finite fields

Article content: Coding theory(2)

Chapter One: Reminder about linear codes
1. Encoding and decoding linear codes
2. Some practical examples

Chapter Two: Cyclic codes
1. General concepts of cyclic codes
2. Systematic cyclic codes and coding
3. Some methods for decoding cyclic codes
(Polynomial syndrome, Meggitt, and error trapping)

Chapter Three: Decoding of BCH and RS codes
1. BCH codes and Reed-Solomon codes
2. Algebraic decoding of BCH codes
3. Algebraic decoding of RS codes

Chapter Four: Encryption and Rotating Codes
1 Introduction
2 Cryptography Concepts
3 Applications of Cyclic Codes in Cryptography
(MacEllis Cipher System, Niederreiter Cipher System)

Evaluation method: Continuous assessment and examination
Referrences (Books, files, websites, etc.)

1. J.Badrikian, Codes correct principes and examples, Ellipses.
2. O.Papini, J.Wolfmann, Algèbre discrete et codes correcteurs, Springer.
CRM-Monograph series, Vol.11, Amer.Math.Soc., Providence, RI, 2000.

Master's title: Fondamental Mathematics
Semester: Third semester
Educational unit: UET1
The material: Labor legislation and professional ethics
Credits: 1
Coefficient: 1

The objective of the article: Educating students about the dangers of corruption and motivating them to contribute to combating it..

Content of the article:

Chapter 1: The concept of corruption

- Definition of corruption
- Religion and corruption

Chapter 2: Types of corruption

- Financial corruption, administrative corruption, moral corruption, political corruption...etc.

Chapter 3: Manifestations of administrative and financial corruption:

- Nepotism, favoritism and mediation, extortion and fraud, looting of public funds and illegal expenditures
- Slowness in completing transactions (project implementation, etc.)
- Administrative, functional, or organizational deviations between the employee and the official
- Violations committed by the employee while performing his duties during the year
- Not respecting working h, wasting time reading newspapers, receiving visitors, refusing to perform work, and not taking responsibility

Chapter 4: Causes of administrative and financial corruption:

4.1 Causes of corruption from the researchers' point of view
4.2 General causes of corruption

Chapter 5: Effects of administrative and financial corruption (continued):

- The impact of financial and administrative corruption on economic development
- The impact of administrative and financial corruption on the political system and stability

Chapter 6: Combating corruption by local and international organizations:

- Transparency International,United Nations Convention against Administrative Corruption
- The World Bank's program to assist developing countries in combating administrative corruption
- International Monetary Fund
- Algeria's efforts to combat corruption (Law 06-01 on Combating Corruption,The role of the judicial police in combating corruption)

Chapter 7: Methods of addressing and means of combating the phenomenon of corruption:
(Religious aspect, educational aspect, political aspect, economic aspect, legislative aspect, judicial aspect, administrative aspect, human aspect)

Chapter 8: Examples of some countries' experiences in combating corruption: Indian experience,Singapore experience,American experience,Hong Kong Experience,Malaysia's experience,Turkish experience

Evaluation method: exam

Referrences (Books, files, websites, etc.)

1-MusaSafi Imam. (1041 AH / 1891 AD).**strategy Reform Administrative And re-organization in range thought and theories**) T1)RiyadhDar Al-Ulum for Printing and Publishing.
http://www.islameiat.com/doc/article.php?sid=276&mode=&order=0
2 -sea, Yusef .**Corruption Administrative And its treatment from perspective Islamic**
http://www.scc-online.net/thaqafa/th_1.htm
3 -Hamoudi, Hamam**term Corruption in The Qur'an The generous** .
http://209.61.210.137/uofislam/behoth/behoth_quran/16/a1.htm
4 -Al-Faqih, Mustafa.**Corruption Administrative and financial between Policies and procedures**
http://www.cipe-egypt.org/articles/art0900.htm
5 -MahmoudMahyoub Khader**.from Landmarks the school Al-Omariya in Combating**

Corruption .
http://www.hetta.com/current/mahyoob23.htm
6 -Buzaz, Saad**.campaign against Corruption**
http://www.saadbazzaz.com/index.asp?fname=articles%5C7540.htm&code=display
7 -TahaKhaled Issa**.Pursuit Corruption Administrative**
http://www.azzaman.com/azzaman/articles/2004/03/03-29/802.htm
8 -The swordKhalifa Abdullah.**when We see mechanism Correct To fight Corruption**
http://www.alwatan.com.sa/daily/2002-10-19/resders.htm

Fourth: Agreements or conventions

Please specify by ticking (✓)

☐Yes
☑no

(If yes, please attach a copy of the agreements and/or memoranda of understanding with the training paper file)

Standard Letter of Intent
(In the case of a joint master's degree with a university institution Other)
(On official letterhead bearing the letterhead of the relevant university institution)

Topic: Approval to partner in the Master's program entitled:

Hereby, the University announces / The University Center (name of institution) announces its partnership in sponsoring the above-mentioned master's program for the duration of its accreditation..

To this end, the university (or the university center) will assist this project by:

- Providing advice and opinions on preparing and updating educational programs
- Participation in seminars and scientific meetings organized for this purpose
- Contribute to the formation of discussion committees
- Working on exchanging human and material resources between the two institutions

Signature of the legally authorized person.

Position:

The date

Standard Letter of Intent

(In the case of a master's program in cooperation with an institution from the beneficiary sector)
(On official letterhead bearing the institution's letterhead)

Topic: Approval of the project to launch a master's program entitled:

Presented in:

Through this letter, our organization announces its desire to support this training program as a potential user of the product.

To this end, we confirm our approval of this project and our role will include the following::

- Providing our opinions and consultations in preparing and updating educational curricula
- Participation in seminars and workshops organized for this purpose
- Contribute to the formation of thesis discussion committees
- Facilitating the reception of trainees, whether to prepare graduation theses or for directed projects

All necessary material and human resources will be provided to carry out the tasks assigned to us to achieve these goals.

Mr./Mrs..... has been appointed as the external coordinator for this project..

Signature of the legally authorized person :

Function:

Date :

Official stamp or company seal