



AUTONOMOUS UNIVERSITY OF AGUASCALIENTES

MASTER OF SCIENCE WITH OPTIONS IN COMPUTING, APPLIED MATHEMATICS PROGRAM¹

I. PROGRAM IDENTIFICATION

Responsible academic center:	Basic Science Center
Responsible academic center:	Computer Science Statistics Maths and Physics
Modality:	On-campus
Program engagement:	Exclusive time
Level :	Master's Degree
Program orientation:	Oriented to training for scientific research.
Type of academic program:	Institutional
Duration:	2 years (4 academic semesters)
Academic credits:	160
Approval date by the HCU ² :	November 2018
Actualization date:	August 2021

II. QUALITY CERTIFICATIONS

National:	National Postgraduate System (SNP)
Level:	In Development
International:	Ibero-American Postgraduate University Association (AUIP)

III. OBJECTIVES OF THE PROGRAM

Objective:

Form human resources with academic quality, with the skills and attitudes to apply and generate knowledge, as well as carry out technological development to contribute to the solution of problems related to Computing or Applied Mathematics in the academic, scientific and/or productive sector.

The above making use of theoretical and experimental results achieved in a systematic way, with the support of the scientific method, where methods of applied mathematics and computer science

Date of actualization: December 2022

¹ (Web Version)

² Honorable University Council

are involved, such as analytical, synthetic, inductive, and deductive reasoning, and encouraging the student to carry out research activities in a specific area and to apply, in an integral and creative way, the fundamentals of computing and applied mathematics.

IV. LINES OF RESEARCH

Computing-Software Engineering:

The purposes of the LGAC in Software Engineering Technology: research on metrics, process maturity, methodologies, etc. that allow the development of a quality software industry, as well as formal and orderly work in the production, testing and creation of virtual learning environments over the Internet.

In the area of Technology Learning Objects: Metadata standards. Analysis and discussion of the different international standards defined for learning objects, as well as their adaptation to the needs and realities of the Latin American context.

In the case of the Learning Objects Repository: Generate databases capable of storing and exploiting various types of learning objects. In addition, the development methodologies of learning objects and collaborative learning environments are contemplated. This line studies the interactions of the different types of users, technologies and resources in the design, construction, operation, and improvement of different collaborative learning environments. Tools that allow the achievement of the objectives of the previous lines are analyzed and built.

Computing-Artificial Intelligence:

Using artificial intelligence techniques, statistical, heuristic, and probabilistic methods, as well as discrete mathematics, the artificial intelligence pipeline covers topics of pattern recognition, computational learning, and computer vision.

Applied Mathematics:

This line studies various integration theories and their applications. Especially those applications that lead to the theory of probability and stochastic processes. Theoretical properties of various numerical methods are studied. In addition, computational simulations of the theoretically studied numerical methods are performed.

V. APPLICANT AND GRADUATE PROFILES

APPLICANT	GRADUATE
<p><i>Knowledge:</i></p> <ol style="list-style-type: none"> 1. Basic knowledge of the area (knowledge test). 2. In Information Technology (interview). 3. Minimal notions of the scientific method (interview). 	<p><i>Knowledge in:</i></p> <ol style="list-style-type: none"> 1. The area of your specialty: Computing or Applied Mathematics. 2. Simulation and optimization techniques with the support of specialized software, as well as theories related to algorithms. 3. Theories of mathematical and numerical optimization, with emphasis on the analysis of restricted optimization problems and partial differential equations. 4. The theoretical bases and experimental methods, developing a broad mathematical knowledge of natural phenomena. 5. The scientific method. 6. The methodologies and tools for technological development.

<p><i>Skills</i></p> <ol style="list-style-type: none"> 1. Apply logic and/or mathematical techniques for the analysis and solution of problems (admission exam). 2. Use appropriately the Information Technologies (interview). 3. Interpret and manage abstract symbols to have skills of theoretical formality and/or programming (interview). 4. Mastery of a second language other than Spanish (TOEFL), at least 450 TOEFL points or according to the Institution's requirements. 	<p><i>Skills for:</i></p> <ol style="list-style-type: none"> 1. Generate frontier knowledge, based on analysis to balance the ability to solve technological problems and the development of basic research. 2. Apply and generate knowledge of computer science or applied mathematics. 3. Identify needs and understand social and/or disciplinary problems by carrying out problem-solving projects from the field of computer science or applied mathematics. 4. Apply the appropriate models, methodologies, and tools to generate scientific and technological products that contribute to efficiently solving real-life problems. 5. Interact with research groups (considering gender diversity) in different areas of knowledge, being able to identify and solve problems that require optimal mathematical and/or computational solutions. 6. Apply the most modern theory, methodologies, and techniques of mathematical/numerical optimization and computation, focusing on the following substantive activities: addressing industrial/scientific/technological problems and professional practice, conducting scientific research, and participating in teaching at university and postgraduate level. 7. Apply specialized techniques in software development and use of scientific analysis tools and learn to write scientific articles. 8. Ability to join scientific research projects and/or technological projects that require computer science or applied mathematics. 9. Communicate orally and in writing the results of research in different academic forums both in Spanish and English
<p><i>Attitudes</i></p> <ol style="list-style-type: none"> 1. To work individually and in a team (interview). 2. Adaptation to different situations (interview). 3. To face new challenges with a critical attitude (interview, knowledge test). 	<p><i>Attitudes on:</i></p> <ol style="list-style-type: none"> 1. Independent work and forming or participating in work teams, always with a spirit of constructive criticism. 2. Learn independently to create a study habit that allows them to assimilate knowledge and develop their skills. 3. Understand the needs of the environment with a social sense. 4. Develop professionally in the academic and business sectors, and in public and private institutions.
<p><i>Values</i></p> <ol style="list-style-type: none"> 1. Social and academic responsibility (interview, exam). 2. Discipline (interview, exam). 3. Punctuality (interview, exam). 	<p><i>Values</i></p> <ol style="list-style-type: none"> 1. Be responsible, honest and with academic and scientific rigor, for the application and generation of knowledge, as well as for the technological development that is presented for the benefit of society. 2. Ethics to recognize and respect the academic and scientific work of other people and to know the scope of their work. 3. Discipline, which allows you to fulfill your duty and goals in a timely manner. 4. Social responsibility.

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| | <ol style="list-style-type: none">5. Humanism.6. Quality.7. Innovation.8. Autonomy.9. Pluralism. |
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VI. ADMISSION AND SELECTION REQUIREMENTS

ADMISSION

National applicants

1. Those established by the institution in the current General Teaching Regulations.
2. Present and accredit the admission exam applied at the institutional level.
3. Present and accredit the exam of Computer Science or Applied Mathematics, which will allow diagnosing the basic knowledge of their discipline. This exam will be prepared and applied by the admission committee proposed by the Academic Council to the Dean of the Center.
4. Have a personal interview with the admission committee, previously a diagnosis of postgraduate skills will be applied.
5. Submit a letter of commitment to dedicate full time to postgraduate studies.
6. Submit a letter of intent and reasons: academic, personal, labor, and professional, to request admission to the master, which will allow the identification of personal interests and compare them with what was said in the interview.
7. Deliver the Curriculum Vitae, to evaluate the coherence between their previous studies, activities, and experience, with those of the postgraduate course.
8. Demonstrate proficiency in a second language, other than Spanish, equivalent in English to at least 400 TOEFL points. And at the end of the first year of the master, you must prove the equivalent of 450 TOEFL points or according to the requirements of the institution.
9. Have a minimum average of 8.0 in their previous studies.

Internacional applicants or national applicants living abroad

1. What is established by the institution in the General Teaching Regulations in force in article 40, clause VI.
2. Present and accredit the exam of Computer Science or Applied Mathematics, obtained in the degree, which will allow diagnosing the basic knowledge of their discipline. This exam will be prepared and applied by the admission committee proposed by the Academic Council to the Dean of the Center. The modality will be established by the Admission Committee.
3. Interview with the admission committee (the modality will be established by the admission committee), to evaluate aspects of the applicant's profile, among which are qualitative ones such as the person's attitude, interest in postgraduate studies, the commitment of time, their responsibility, tolerance, among other aspects.
4. Submit a letter of commitment to dedicate full time to postgraduate studies.
5. Submit a letter of intent and reasons: academic, personal, labor, and professional to request admission to the master's degree, which will allow the identification of personal interests and compare them with what was said in the interview.
6. Submit the Curriculum vitae to assess the coherence between their previous studies, activities and experience, with those of the postgraduate course.
7. Demonstrate command of English, if required, according to the General Teaching Regulations (450 TOEFL and 500 points accredited during the first year of studies). In the case of English-speaking foreigners, they must take the DELE level B-2 exam; however, standardized certificates with international validity equivalent to the language may be accepted.

7. Have a bachelor's degree related to the master's degree. This must be accredited by presenting an apostilled and certified professional title, validated by the Department of School Control.
8. Have a minimum average of 8.0 in a bachelor's degree or its equivalent.
9. Submit a letter of commitment in which you state your willingness to dedicate full time throughout the program.

Evaluation and selection process

The admission committee will review that all the admission requirements are fulfilled, as well as compliance with the desirable profile, in such a way as to ensure a good selection of applicants and that, in turn, there is interest in contributing to the quality of the program. This committee, through the Academic Council, will propose the best applicants to the Dean.

VII. CURRICULAR ORGANIZATION AND STRUCTURE OF THE PROGRAM

PROGRAM ORGANIZATION

Formation ax	DESCRIPTION OF FORMATION AX
Basic	They are those subjects of common core that the students of the two areas of study must take, providing the bases and the seal of formation.
Discipline	The subjects in this one will deepen the basic knowledge of the terminal area and postgraduate specialty. In this, there are selected topics, which are subjects that complement the training of students based on emerging issues of Computer Science or Applied Mathematics, as the case may be.
Integral	Here the bases will be provided to strengthen research training, and obtain the scientific attitude of the student. In these spaces, students will develop their thesis, whether it is a scientific approach or technological development with the advice of a tutoring committee. Each semester the progress of your project will be presented, to be fed back with the participation of students and teachers of the NAB and to be evaluated by the tutoring committee. In this area are included the research seminars.
Optative and Complementary activities	They are emerging credits that will guide the student to complete their training according to the thesis project or technological development, as well as contribute to the objective and graduation profile of the program. These credits may be covered through courses (The implementation of elective courses will adhere to current UAA policies), they must be related to the LGAC and the selected terminal area. The credits must be covered in any semester.

Program organization

Formation ax	# subjects	% of subjects	Credits	% of credits
Basic	3	30%	30	18.75%
Discipline	3	30%	30	18.75%
Integral	4	40%	59	36.88%
Optative	0	0%	16	10%
Complementary activities	0	0%	15	9.38%
Subtotal	10	100%	150	93.75%
Grade test			10	6.25%
Total	10	100%	160	100%

Curricular Structure

#	Subjects	HT	HP	Cr	Center	Department	Formati on ax	Academi c area
PRIMER SEMESTRE								
1	Numerical Methods	3	4	10	CCB	Maths and physics	Basic	Applied mathematics
2	Computational Theory	3	4	10	CCB	Computer Science	Basic	Computing
3	Discrete Mathematics	3	4	10	CCB	Interdepartamental	Basic	Applied mathematics
4	Selected Topics I Computing: Software Engineering and Artificial Intelligence Applied Mathematics: Real Analysis	3	4	10	CCB	Interdepartamental	Discipline	Computing Applied mathematics
5	Investigation methodology	2	2	6	CCB	Interdepartamental	Integral	Computing
Subtotal		14	18	46				
SEGUNDO SEMESTRE								
6	Selected topics II Computing: Vision and new technological paradigms Applied Mathematics: Optimization Theory I	3	4	10	CCB	Interdepartamental	Discipline	Computing Applied mathematics
7	Selected Topics III Computing: Component- Based Software Development and Bio- Inspired Heuristic Techniques Applied Mathematics: Functional Analysis I	3	4	10	CCB	Interdepartamental	Discipline	Computing Applied mathematics
8	Research Seminar I	0	13	13	CCB	Interdepartamental	Integral	
Subtotal		6	21	33				
TERCER SEMESTRE								
9	Research Seminar II	0	20	20	CCB	Interdepartamental	Integral	
Subtotal		0	20	20				
CUARTO SEMESTRE								
10	Research Seminar III	0	20	20	CCB	Interdepartamental	Integral	
Subtotal		0	20	20				
Subtotal (all semesters):		20	79	119				
Optatives*				16				
Complementary activities**				15				
Grade test				10				
TOTAL		20	79	160				

Curricular Map

Formati on ax	1st Semester	2nd Semester	3rd Semester	4th Semester
Basic 30 Credits	Numerical methods HT: 3 HP: 4 Credits: 10			
	Computational Theory HT: 3 HP: 4 Credits: 10			
	Matemáticas discretas HT: 3 HP: 4 Créditos: 10			
Discipline 30 Credits	*Selected Topics I HT: 3 HP: 4 Credits: 10	Selected Topics II HT: 3 HP: 4 Credits: 10		
		Selected Topics III HT: 3 HP: 4 Credits: 10		
Integral 59 Credits	Research methodology (topic selection and information search) HT: 2 HP: 2 Credits: 6	Research seminar I (thesis progress 50%) HT: 0 HP: 13 Credits: 13	Research Seminar II (thesis progress 80%) HT: 0 HP: 20 Credits: 20	Research Seminar III (thesis progress 100%) HT: 0 HP: 20 Credits: 20
Optative 16 Credits	Courses related to the thesis, which may be at the UAA, preferably at a national or international institution. The Tutoring Committee is the one who recommends and endorses them with the approval of the Academic Council.			
Complementary Activities 15 Credits	Presentations, memories, articles, stays related to the thesis. The Tutoring Committee is the one who recommends and endorses them and with the approval of the Academic Council.			
HT: Theoretical Hours per week, HP: Practical Hours per week				

VIII. PERMANENCE REQUIREMENTS

The student must meet the following requirements to continue with their master's studies:

- Maintain a minimum general average of 8.0 (eight) and accredit all subjects. Present the activity plan with Vo. Bo to the Academic Council, where the activities, courses, to be developed during the semester to which you enroll are indicated.
- Deliver to the Academic Council a report of activities endorsed by the tutor at the end of each semester, which must present the progress in student training, ensuring the graduation profile, the achievement of the objective and the progress in the development of the thesis.
- Present the thesis progress as established in the study plan.

IX. REQUIREMENTS FOR OBTAINING THE DEGREE

1. Accredit all the subjects and academic activities indicated in the study plan and obtain a minimum average of 8.0 (eight).
2. Take a degree exam and pass it in a period of no more than 2.5 years, which are considered from the moment you enter the master's degree.
3. Prepare and present an individual thesis according to the following modalities and according to the Manual for the preparation of reception work in postgraduate programs: thesis or practical work approved by the University Executive Commission:
 1. Traditional thesis
 2. Thesis with the modality of scientific article, in which the student must have an article published because of the thesis, in a journal indexed in JCR of ISI-THOMPSON, in this case the first author or author must be the or the student and as author or author of correspondence (or person in charge) to the tutor or integral tutor of the Basic Academic Nucleus of the master's degree.

To obtain the Master, the student will have to comply with the provisions of the General Teaching Regulations in force. Once all the requirements and processes to obtain the corresponding degree have been covered, the UAA will grant you a degree that will contain one of the following denominations:

MASTER (A) IN SCIENCE WITH OPTION TO COMPUTING

Either

MASTER (A) OF SCIENCE WITH OPTION TO APPLIED MATHEMATICS

X. NÚCLEO ACADÉMICO BÁSICO

Grado	Nombre	Inst. del último grado	Cuerpo académico	S.N.I.
Computación-Ingeniería de software				
Dr.	Álvarez Rodríguez, Francisco J	UT1/FRANCIA	Objetos de Aprendizaje e ingeniería de software	I
Dr.	Bazán Trujillo, Ivonne	CINVESTAV	Investigación Tecnológica Aplicada	I
Dr.	Muñoz Arteaga, Jaime	UMEP	Objetos de Aprendizaje e ingeniería de software	I
Dr.	Ponce Gallegos, Julio César	UAA	Sistemas inteligentes	
Computación-Inteligencia artificial				
Dr.	Guerrero Díaz de León, José Antonio	CIMAT	Análisis matemático y simulación	I
Dr.	Muñoz Zavala, Ángel Eduardo	CIMAT	No pertenece a cuerpo académico	
Dr.	Salinas Gutiérrez, Rogelio	UNAM	No pertenece a cuerpo académico	C
Dr.	Sánchez Cruz, Hermilio	CIMAT	Sistemas inteligentes	I
Matemáticas Aplicadas				
Dr.	Alfaro Gómez, Mariana		No pertenece a cuerpo académico	I
Dr.	Macías Díaz, Jorge Eduardo	TULANE/EUA	Análisis matemático y simulación	III
Dr.	Ramírez Aranda, Manuel	CIMAT		
Dr.	Villa Morales, José	CIMAT		II

XI. FLEXIBILITY OF THE PROGRAM

The flexibility of the curriculum is based on its two terminal areas that are Computing or Applied Mathematics, with three LGAC:

Artificial Intelligence, Software Engineering and Applied Mathematics.

The student will have a thesis tutor who will be appointed from the second semester to ensure personalized attention and guide them to organize, plan and develop their protocol, in addition to giving them the opportunity to develop their skills and generate their own needs. to face the problems of his LGAC that will be developed in the research seminars. The student, together with her tutor, will be able to select the topics to complement her training in the chosen line. The tutor may also recommend mobility and research stays at the national level and preferably internationally for curricular courses and research activities that contribute to the quality of the research carried out by the student.

The optional credits can be courses that can be taken at the UAA (although it is preferable that it be in another national or international institution), which must be related to the postgraduate LGAC, so that the student advances in their thesis, with the previous recommendation of the tutoring committee and Vo. Bo. of the Academic Council, these credits must be covered in any semester, for this, the student, in coordination with his or her tutor, must prepare an annual activity plan where the activities to be carried out throughout the year are displayed, which allows progress in the thesis and in their training according to its objective and the graduate profile.



UNIVERSIDAD AUTÓNOMA
DE AGUASCALIENTES

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Dean of the Center for Basic Sciences

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General Director of Research and Postgraduate

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Head of the Department of Mathematics and Physics

M. en C. Luis Alejandro Escobar López

Head of the Statistics Department

Dr. Hermilo Sánchez Cruz

Technical Secretary and Coordinator for the redesign of the Master of Science with options for Computing, Applied Mathematics

Dr. Francisco Javier Álvarez Rodríguez

Member of the Committee for the Redesign of the Master of Science with options for Computing and Applied Mathematics.

Dr. Jorge Eduardo Macías Díaz

Member of the Committee for the Redesign of the Master of Science with options for Computing and Applied Mathematics.

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Full-time Professor-Researcher at the Computing Research Center (CIC-IPN)
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