Institute of Mathematics and Computer Sciences

Course: Bachelor's Degree in Computer Science

Basic Curriculum Information

Start Date: 01/01/2025

Duration

Ideal	10 semesters
Minimum	8 semesters
Maximum	15 semesters

Workload (Hours)	Lecture	Practical	Subtotal	
Mandatory Courses	2205	1920	4125	
Free Electives	0	0	0	
Elective Courses	450	0	450	
Total workload from coursework	2655	1920	4575	(Internship: 600) (AAC: 90) (AEX Apolo and/or electives: 242)

Overall total workload required in extension courses: 491 (10.01%)

Overall Total (*Total workload in subjects from the curriculum + AAC + AEX Apolo and/or electives): 4907

* Internship and extension activity hours included in mandatory courses are already factored into the Total workload.

Specific Information

Approval of the Transfer of Modality by the University Council in a session on 07/17/1979. Recognized by MEC Ordinance No. 138, of 02/11/1981, DOE 02/13/1981. Recognition renewed for 5 years by CEE/GP Ordinance No. 457/2019, of 10/29/2019, DOE 10/30/2019.

To enroll in the courses related to Supervised Internship (SCC0291 and SCC0292), Graduation Project (SCC0293 and SCC0294), or Exchange Project (SCC0289 and SCC0290), the student must have completed at least 100 lecture credits in mandatory and elective courses of the program.

Elective courses aim to provide students with a broader understanding and deeper knowledge in one or more areas of computing. Students may choose to focus on specific fields within their studies.

A maximum of 10 elective lecture credits, provided they do not have similar content to mandatory courses, may be counted towards the elective course credit requirements.

The special study certificates currently recommended at ICMC reflect the areas of excellence in computing from the Departments of Computer Science and Computer Systems. These special studies aim to guide a more coherent choice of elective courses, and the selection of elective courses to be offered is mainly determined by students in their fourth year.

The currently available special study certificates are in the following areas:

Web Development
SCC0260 Human-Computer Interaction
SCC0261 Multimedia
SCC0280 Accessibility in Computational Systems
SCC0282 Information Retrieval
SCC0283 Introduction to the Semantic Web
SCC0225 Mobile Application Development Laboratory

SCC0303 - Introduction to Data Compression
-> Minimum of 4 courses required

Data Engineering
SCC0243 Architecture of Database Management Systems
SCC0244 Mining from Large Databases
SCC0245 Analytical Data Processing
SCC0246 Content-Based Data Retrieval
SCC0251 Image Processing
SCC0252 Computational Visualization
->Minimum of 4 courses required

Software Engineering
SSC0721 or SSC0959 Software Testing and Inspection
SSC0725 Software Architecture
SSC0726 Software Reuse
SSC0128 Project Management or SEP0172 Practice and Project Management
SSC0723 Collaborative Systems: Foundations and Applications
SCC0260 Human-Computer Interaction
SCC0209 IT Entrepreneurship
-> Minimum of 4 courses required

Artificial Intelligence
SCC0282 Information Retrieval
SCC0284 Recommender Systems
SCC0286 Mining Complex Networks
SCC0287 Mining Unstructured Data
SCC0633 Natural Language Processing

SCC0233 Machine Learning Applications and Data Mining
SCC0270 Neural Networks and Deep Learning
SCC0276 Machine Learning
SCC0370 Introduction to Bio-Inspired Computing
-> Minimum of 4 courses required

Robotics
SCC0251 Image Processing
SCC0273 Intelligent Mobile Robots
SSC0712 Mobile Robot Programming
SSC0714 Autonomous Mobile Robots
SSC0713 Evolutionary Systems and Robotics Applications
SSC0715 Intelligent Sensors
-> Minimum of 4 courses required

Advanced and High-Performance Computing Systems
SSC0158 Cloud Computing and Service-Oriented Architectures
SSC0159 Advanced Topics in High-Performance Computing
SSC0160 Computational Systems Modeling and Simulation
SSC0950 System Software Development
SSC0951 Optimized Code Development
SSC0952 Internet of Things
SSC0953 Open Source Systems
SSC0954 High-Performance and Distributed Computing Infrastructure
-> Minimum of 4 courses required

Embedded Systems
SSC0740 Embedded Systems
SSC0720 Software Engineering for Embedded Systems
SSC0741 Embedded Systems Design and Implementation I
SSC0721 Software Testing and Inspection
SSC0746 Fault-Tolerant Computing Systems
SSC0745 Real-Time Computing Systems
-> Minimum of 4 courses required

Advanced Programming Techniques
SCC0210 Advanced Algorithms Lab I
SCC0211 Advanced Algorithms Lab II
SCC0220 Introduction to Computer Science II Lab
SSC0951 Optimized Code Development
-> Minimum of 4 courses required

Data Science Emphasis for courses at ICMC

The courses are organized within two groups:

Group 1 includes:
SCC0276 Machine Learning
SCC0270 Neural Networks and Deep Learning
SCC0244 Mining Large Databases
SCC0251 Image Processing
SCC0252 Computational Visualization
SCC0275 Introduction to Data Science

Group 2 includes:
SME0806 Computational Statistics
SME0822 Multivariate Analysis and Unsupervised Learning
SME0878 Statistical Data Mining
SME0823 Regression Models and Supervised Learning II
SME0808 Time Series and Dynamic Learning
SME0130 Complex Networks

To obtain the certificate, students must complete 6 courses, selecting 3 from Group 1 and 3 from Group 2.

In addition to the credits from mandatory and elective courses, students must complete:

- at least 90 hours (3 practical credits) of Complementary Academic Activities (AACs), which will be recorded on their transcript.
- Students must also fulfill extension activities corresponding to 10% of the total curriculum workload, in compliance with the National Education Plan (PNE), as regulated by CNE/CES Resolution No. 7/2018 and CEE Deliberation 216/2023.

Curriculum

Legend: CH = Total Course Load; CE = Internship Course Load; CP = Course Load for Practical Activities as Curricular Components; ATPA = Course Load for Theoretical-Practical Deepening Activities; EXT = Course Load for Extension Activities

Mandatory Courses

1º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0200	Professional Information and Mentoring on Computer Science	2	0	30				
SCC0221	Introduction to Computer Science I	4	1	90				10
SCC0222	Introduction to Computer Science: Laboratory Practice I	2	2	90				
SMA0300	Analytic Geometry	4	0	60				
SMA0353	Calculus I	4	0	60				
SSC0104	Computing History, Evolution and Applications	2	1	60				30
SSC0109	Introduction to Digital Logic: Laboratory Practice	2	1	60				
SSC0117	Introduction to Digital Logic	2	1	60				
SSC0180	Electronics for Computer Sciences	2	2	90				10
	Subtotal:	24	8	600				50

2º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
7600105	Basic Physics I	4	0	60				
SMA0353 - Calculus I				Weak Requirement				

SCC0201	Introduction to Computer Science II		4	2	120			5
SCC0221 - Introduction to Computer Science I					Weak Requirement			
SCC0202	Algorithms and Data Structures I		4	2	120			
SCC0201 - Introduction to Computer Science II					Set Indication			
SMA0180	Discrete Mathematics I		4	0	60			
SMA0354	Calculus II		4	0	60			
SMA0353 - Calculus I					Weak Requirement			
SSC0108	Digital Systems: Laboratory Practice		2	1	60			15
SSC0118 - Digital Systems					Set Indication			
SSC0118	Digital Systems		2	1	60			
SSC0117 - Introduction to Digital Logic					Weak Requirement			
		Subtotal:	24	6	540			20

3º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
7600109	General Physics Laboratory I	2	0	30				
7600105 - Basic Physics I				Weak Requirement				
SCC0215	File Organization	3	2	105				
SCC0202 - Algorithms and Data Structures II				Weak Requirement				
SCC0201 - Introduction to Computer Science II				Weak Requirement				
SCC0216	Computational Modelling in Graphs	2	1	60				
SCC0202 - Algorithms and Data Structures I				Weak Requirement				
SMA0355	Calculus III	4	0	60				
SMA0354 - Calculus II				Weak Requirement				
SSC0103	Object-Oriented Programming	2	1	60				
SCC0202 - Algorithms and Data Structures I				Weak Requirement				
SSC0902	Organization and Architecture of Computers	4	1	90				15
SSC0118 - Digital Systems				Weak Requirement				
SSC0960	Functional Programming	2	1	60				
SCC0202 - Algorithms and Data Structures I				Weak Requirement				
	Subtotal:	19	6	465				15

4º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0218	Advanced Algorithms and Applications	2	2	90				5
SCC0216 - Computational Modeling in Graphs				Weak Requirement				
SME0123	Statistics	4	0	60				
SMA0354 - Calculus II				Weak Requirement				
SME0142	Linear Algebra and Applications	4	1	90				
SSC0124	Object-Oriented Analysis and Design	2	1	60				15
SSC0103 - Object-Oriented Programming				Weak Requirement				
SSC0140	Operating Systems I	4	2	120				30
SCC0202 - Algorithms and Data Structures I				Weak Requirement				
SSC0902 - Computer Organization and Architecture				Weak Requirement				
	Subtotal:	16	6	420				50

5º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0219	Introduction to Web Development	4	1	90				10
SCC0240	Databases	4	2	120				
SCC0215 - File Organization				Weak Requirement				
SME0104	Numerical Analysis	4	0	60				
SMA0353 - Calculus I				Weak Requirement				
SME0142 - Linear Algebra and Applications				Weak Requirement				
SME0121	Stochastic Processes	4	0	60				
SME0123 - Statistics				Weak Requirement				
SSC0130	Software Engineering	4	1	90				15
SSC0124 - Object-Oriented Analysis and Design				Weak Requirement				
SSC0142	Computer Networks	4	2	120				30
SSC0140 - Operating Systems I				Weak Requirement				
	Subtotal:	24	6	540				55

6º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0205	Theory of Computation and Formal Languages	4	2	120				10
SCC0201 - Introduction to Computer Science II				Weak Requirement				
SCC0207	Computers and Society I	2	0	30				
SCC0230	Artificial Intelligence	4	1	90				10
SCC0201 - Introduction to Computer Science II				Weak Requirement				
SME0110	Mathematical Programming	4	2	120				
SME0104 - Numerical Analysis				Weak Requirement				
SSC0903	High-Performance Computing	4	1	90				
SSC0902 - Computer Organization and Architecture				Weak Requirement				
SSC0140 - Operating Systems I				Weak Requirement				
	Subtotal:	18	6	450				20

7º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0217	Programming Languages and Compilers	4	2	120				

	SCC0205 - Theory of Computation and Formal Languages				Weak Requirement				
SCC0250	Computer Graphics		4	1	90				
	SSC0103 - Object-Oriented Programming				Weak Requirement				
SSC0120	Information Systems		2	1	60				
SSC0900	Security Engineering		2	1	60				15
	SSC0142 - Computer Networks				Weak Requirement				
SSC0904	Distributed Computing Systems		2	1	60				
	SSC0140 - Operating Systems I				Weak Requirement				
	SSC0142 - Computer Networks				Weak Requirement				
		Subtotal:	14	6	390				15

9º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0291	Supervised Internship I		4	10	360	300			
		Subtotal:	4	10	360	300			

10º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0292	Supervised Internship II		4	10	360	300			
	SCC0291 - Supervised Internship I				Requirement				
		Subtotal:	4	10	360	300			

Elective Courses

2º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0220	Laboratory of Introduction to Computer Science II		4	0	60				
	SCC0201 - Introduction to Computer Science II				Set Indication				

3º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0303	Introduction to Data Compression		2	1	60				
	SCC0202 - Algorithms and Data Structures I				Requirement				
SSC0119	Practice in Computer Organization		2	1	60				
	SSC0112 - Digital Computer Organization I				Set Indication				
or									
	SSC0902 - Computer Organization and Architecture				Set Indication				

4º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0213	Research Methodology in Computing		2	2	90				10
SCC0227	Seminars in Computing I		1	0	15				
SCC0295	Academic Extension Activities I		1	2	75				75

5º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0210	Laboratory of Advanced Algorithms I		3	2	105				10
	SCC0202 - Introduction to Computer Science II				Weak Requirement				
	SCC0201 - Algorithms and Data Structures I				Weak Requirement				
SCC0228	Computing Seminars II		1	0	15				
	SCC0227 - Computing Seminars I				Weak Requirement				
SCC0296	Academic Extension Activities II		1	2	75				75
SSC0953	Open Source Systems		2	2	90				

6º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0211	Laboratory of Advanced Algorithms II		3	2	105				10
	SCC0210 - Laboratory of Advanced Algorithms I				Weak Requirement				
SCC0229	Computing Seminars III		1	0	15				
	SCC0228 - Computing Seminars II				Weak Requirement				
SCC0247	NoSQL Databases and Distributed Processing Frameworks		4	2	120				
	SCC0240 - Databases				Weak Requirement				
SSC0770	Introduction to Game Development		4	2	120				
	SSC0103 - Object-Oriented Programming				Weak Requirement				
SSC0954	Infrastructure for High-Performance Computing and Distributed Systems		2	2	90				15
	SSC0142 - Computer Networks				Weak Requirement				

7º Ideal Period			Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0209	Entrepreneurship in Informatics		4	1	90				10
SCC0241	Databases Laboratory		4	2	120				
	SCC0240 - Databases				Weak Requirement				
SCC0243	Architecture of Database Management Systems		4	2	120				
	SCC0240 - Databases				Weak Requirement				
SCC0245	Analytical Data Processing		3	2	105				30
	SCC0240 - Databases				Weak Requirement				
SCC0251	Image Processing		4	1	90				10
	SCC0202 - Algorithms and Data Structures I				Weak Requirement				
	SCC0201 - Introduction to Computer Science II				Weak Requirement				

SCC0260	Human-Computer Interaction and User Experience	4	1	90			10
	SSC0103 - Object-Oriented Programming			Weak Requirement			
SCC0261	Multimedia	2	0	30			
	SCC0201 - Introduction to Computer Science II			Weak Requirement			
SCC0270	Neural Networks and Deep Learning	4	1	90			10
	SCC0230 - Artificial Intelligence			Weak Requirement			
SCC0276	Machine Learning	4	1	90			10
	SCC0230 - Artificial Intelligence			Weak Requirement			
SCC0282	Information Retrieval	2	1	60			10
	SCC0202 - Algorithms and Data Structures I			Weak Requirement			
SCC0284	Recommender Systems	4	1	90			10
	SCC0202 - Algorithms and Data Structures I			Weak Requirement			
SCC0370	Introduction to Bio-Inspired Computing	2	1	60			
	SCC0215 - File Organization			Weak Requirement			
	SCC0216 - Computational Modeling in Graphs			Weak Requirement			
SCC0633	Natural Language Processing	4	1	90			10
	SCC0230 - Artificial Intelligence			Weak Requirement			
SCC0910	Advanced Topics in Computer Science I	3	2	105			
SME0130	Complex Networks	4	2	120			
	SMA0353 - Calculus I			Weak Requirement			
	SCC0216 - Computational Modeling in Graphs			Weak Requirement			
SME0806	Computational Statistics	4	2	120			
	SME0123 - Statistics			Weak Requirement			
SSC0141	Operating Systems Practice	4	2	120			
	SSC0140 – Operating Systems I			Weak Requirement			
SSC0147	Special Topics in Computing Systems I	3	0	45			
SSC0154	Advanced Seminars in Distributed Systems and Concurrent Programming I	3	0	45			
	SSC0140 - Operating Systems I			Weak Requirement			
SSC0158	Cloud Computing and Service-Oriented Architecture	2	1	60			30
	SCC0202 - Algorithms and Data Structures I			Weak Requirement			
	SSC0140 - Operating Systems I			Weak Requirement			
	SSC0142 - Computer Networks			Weak Requirement			
SSC0160	Modeling and Simulation of Computer Systems	3	2	105			
	SCC0202 - Algorithms and Data Structures I			Weak Requirement			
	SSC0140 - Operating Systems I			Weak Requirement			
SSC0712	Mobile Robots Programming	2	3	120			10
SSC0714	Autonomous Mobile Robots	2	2	90			
SSC0723	Collaborative Systems: Fundamentals and Applications	2	0	30			
	SCC0201 - Introduction to Computer Science II			Weak Requirement			
SSC0725	Software Architecture	2	2	90			
	SSC0124 - Object-Oriented Analysis and Design			Weak Requirement			
SSC0740	Embedded Systems	3	2	105			
	SSC0902 - Computer Organization and Architecture			Weak Requirement			
SSC0950	System Software Design and Development	2	2	90			
	SSC0140 - Operating Systems I			Weak Requirement			
SSC0951	Development of optimized code	2	2	90			
	SSC0902 - Computer Organization and Architecture			Weak Requirement			
	SCC0201 - Introduction to Computer Science II			Weak Requirement			
SSC0959	Software Testing and Inspection	2	1	60			
	SSC0130 - Software Engineering			Weak Requirement			

8º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0225	Mobile Application Development Lab	4	1	90				
	SSC0103 - Object-Oriented Programming			Weak Requirement				
SCC0231	Introduction to Intelligent Systems	3	1	75				
	SCC0230 - Artificial Intelligence			Weak Requirement				
SCC0233	Applications of Machine Learning and Data Mining	2	2	90				
	SCC0230 - Artificial Intelligence			Weak Requirement				
SCC0244	Data Mining in Large Databases	3	0	45				
	SCC0240 - Databases			Weak Requirement				
	SCC0230 - Artificial Intelligence			Weak Requirement				
SCC0252	Computational Visualization	3	1	75				
	SSC0103 - Object-Oriented Programming			Requirement				
SCC0254	Introduction to Computational Geometry: algorithms and applications	4	2	120				
SCC0271	Introduction to Bioinformatics	2	1	60				
	SCC0215 - File Organization			Weak Requirement				
	SCC0216 - Computational Modeling in Graphs			Weak Requirement				
SCC0273	Intelligent Mobile Robots	2	1	60				
	SCC0201 - Introduction to Computer Science II			Weak Requirement				
SCC0275	Introduction to Data Science	4	1	90	0			10
SCC0277	Data Science Competitions	4	1	90				
	SCC0230 - Artificial Intelligence			Weak Requirement				
SCC0280	Accessibility in Computer Systems	2	1	60				15
	SSC0130 - Software Engineering			Weak Requirement				
SCC0283	Introduction to Semantic Web	4	2	120				
	SCC0216 - Computational Modelling in Graphs			Weak Requirement				
	SMA0180 - Discrete Mathematics I			Requirement				
SCC0287	Unstructured Data Mining	4	1	90				10
	SCC0230 - Artificial Intelligence			Weak Requirement				

SCC0911	Advanced Topics in Computer Science II	3	2	105				
SME0808	Time Series Analysis and Dynamical Learning	4	0	60				
SME0123 - Statistics				Requirement				
SME0822	Multivariate Analysis and Unsupervised Learning	4	0	60				
SME0123 - Statistics				Requirement				
SME0823	Regression Models and Supervised Learning II	4	1	90				
SME0123 - Statistics				Requirement				
SSC0123	Special Topics in Software Engineering	3	0	45				
SSC0130 - Software Engineering				Weak Requirement				
SSC0128	Project Management	3	1	75				15
SSC0152	Network Management and Administration	3	2	105				30
SSC0142 - Computer Networks				Weak Requirement				
SSC0159	Advanced topics on High Performance Computing	3	0	45				
SSC0143 - Concurrent Programming				Weak Requirement				
SSC0643	Computer Systems Performance Evaluation	3	1	75				
SSC0114 - Computer Architecture				Weak Requirement				
or								
SSC0902 - Organization and Architecture of Computers				Weak Requirement				
SSC0713	Evolutionary systems applied to robotics	2	2	90				10
SSC0715	Intelligent Sensors	2	3	120				
SSC0720	Software Engineering for Embedded Systems	3	1	75				
SSC0130 - Software Engineering				Weak Requirement				
SSC0724	Advanced Learning Technologies	3	0	45				
SCC0201 - Introduction to Computer Science II				Weak Requirement				
SSC0726	Software Reuse	2	1	60				
SSC0130 - Software Engineering				Weak Requirement				
SSC0741	Design and Implementation of Embedded Systems I	3	3	135				
SSC0740 - Embedded Systems				Weak Requirement				
SSC0744	Distributed Computation	3	3	135				
SSC0903 - High-Performance Computing				Weak Requirement				
SSC0904 - Distributed Computing Systems				Weak Requirement				
SSC0745	Real-time Computer Systems	3	0	45				
SSC0140 - Operating Systems I				Weak Requirement				
SSC0748	Mobile Networks	3	2	105				
SSC0142 - Computer Networks				Weak Requirement				
SSC0901	Laboratory on Security Engineering	2	1	60				15
SSC0900 - Security Engineering				Weak Requirement				
SSC0952	Internet of Things	2	2	90				30
SSC0958	Cryptocurrencies and Blockchain	4	2	120				

9º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0289	Supervised Exchange Project I	4	10	360	300			
SCC0293	Undergraduate Project I	4	10	360	300			
SCC0300	Entrepreneurs Project I	4	10	360	300			
SME0878	Statistical Data Mining	4	2	120				60
SME0123 - Statistics				Requirement				
SME0822 - Multivariate Analysis and Unsupervised Learning				Requirement				

10º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SCC0290	Supervised Exchange Project II	4	10	360	300			
SCC0289 - Supervised Exchange Project I				Requirement				
SCC0294	Undergraduate Project I	4	10	360	300			
SCC0293 - Undergraduate Project I				Requirement				
SCC0302	Entrepreneurs Project II	4	10	360	300			

Optional Elective Courses

2º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
5500002	Seminars on organizational management	1	1	45				
SMA0392	Calculus I (semi-presencial)	4	0	60				
SMA0353 - Calculus I				Weak Requirement				
SMA0394	Analytic Geometry (semi-presencial)	4	0	60				
SMA0300 - Analytic Geometry				Weak Requirement				

3º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SMA0390	Calculus II (semi-presencial)	4	0	60				
SMA0354 - Calculus II				Weak Requirement				

4º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SMA0393	Calculus III (semi-presencial)	4	0	60				
SMA0355 - Calculus III				Weak Requirement				

5º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
SMA0391	Calculus IV (semi-presencial)	4	0	60				

8º Ideal Period		Cred. Lect.	Cred. Pract.	CH	CE	CP	ATPA	EXT
IAU0126	Social Sciences and Humanities	2	0	30				