

## CURRICULA

### I. SYNTHETIC DESCRIPTION OF THE PROGRAM

Denumirea programului de studii: **COMPUTER SCIENCE**

Domeniul fundamental: COMPUTER SCIENCE

Domeniul de licență: COMPUTER SCIENCE IN ENGLISH

Titlul absolventului: Degree in Computer Science

Durata studiilor: 3 ani, 6 semestre, 180 de credite

Forma de învățământ: full-time studies

Finalizarea studiilor: bachelor exam, 10 credits ECTS

Calificări/opportunități<sup>1</sup>: Analist/251201, Programator de sistem informatic/251204, Inginer de sistem în informatică/251203

Corespondența ESCO-08: 2511/ Systems Analyst, 2512/ Software developers

Acces în ciclul de masterat: yes

Available starting with the academic year: 2022/2023

#### **Mission:**

Training education specialist's degree in Computer Science, specializing in Computer Science: the study programme prepares programmers, analysts - programmers, system software engineers, computer network administrators, data base administrators, IT consultants and – provided crossing a pedagogical module training organized by the Department of Teacher Training – teachers Informatics specialization in primary and secondary education.

#### **Objectives:**

- Acquiring theoretical knowledge needed for the implementation of software systems and the management of computer networks;
- Practical skills training necessary to achieve software systems and network infrastructure installation and management;
- Developing communication and collaborations skills that are specific in elaboration of projects for IT & C solutions and services.

### II. COMPETENCES PROFILE OF GRADUATE

The graduates of the study program proposed for the **Computer Science** specialization, acquire the following professional competences:

#### **A. General competences:**

- written and oral professional communication capacity, including a foreign language of international use;
- learning ability and self-improvement, responsiveness to the field news;
- scientific approachability of specialized field – ability to analyze, synthesize and interpret specialized information;
- ability to work in a team; ability to work with specialists in other fields;
- ability to continue their undergraduate studies with university masters and then PhD

#### **B. Specific competences in:**

- the analysis and design of computer systems: the analysis and design of computer systems: conception, design, development, testing, implementation and maintenance of computer systems and programs, preparing technical documentation
- projects management for IT&C solutions, ensuring the functionality, monitoring and development of implemented IT&C solutions, personnel training for use implemented IT&C technologies, coordinating teams of specialists
- designing, installing and managing network infrastructure, ensuring the functionality of the network computers and connectivity and communication equipments, the administration of servers, interconnection of networks and access to the global Internet network, the design and implementation of network security strategy;
- development of projects for IT&C solutions and services, design/redesign of IT&C solutions for the most complex components of the system, coordination of projects and IT&C teams, performance monitoring of implemented IT&C solutions, personnel training for using IT&C technologies;
- training in information technology in primary and secondary education.

<sup>1</sup> Ocupații posibile conform COR

**Professional competences:**

1. *Programming in high-level languages*
2. *Development and maintenance of computer applications*
3. *The use of computer tools in an interdisciplinary context*
4. *The use of the theoretical basis of computer science and of formal models*
5. *Design and management of databases*
6. *Design and management of computer networks*

**Transversal competences:**

**CT1** The application of rules for organized and efficient work, of responsible attitudes towards the scientific and didactic domain, for the creative realization of one's own potential following the principles and norms of professional ethics.

**CT2** The efficient fulfillment of activities in an interdisciplinary group and the development of skill such as empathic interpersonal communication, establishing relations and collaboration with various groups.

**CT3** The use of efficient methods and techniques for learning, scientific inquiry and development of the capacities of using knowledge, of adapting to a dynamic society and of communicate on in English.

**III. REQUIREMENTS FOR GETTING THE BACHELOR DEGREE**

Number of ECTS credits for compulsory courses: 150 (83,33%)

Number/percent of ECTS credits for elective courses: 30 (16,67%)

Number of ECTS credits for assessment exam of fundamental and speciality knowledge: 5

Number of ECTS credits for Bachelor's Paper defence and presentation: 5

**IV. THE STRUCTURE OF THE ACADEMIC YEARS (per number of weeks)**

Academic years	Didactic activities		Examination sessions			Practice	Holidays		
	Winter semester	Summer semester	Winter	Summer	Not passing exam		Winter	Between Semesters+Spring	Summer
I	14	14	3	3	2	-	2	1+1	11
II	14	14	3	3	2	3	2	1+1	8
III	14	14*	3	3+1	-	-	2	1+1	-
<b>TOTAL</b>	<b>42</b>	<b>42</b>	<b>9</b>	<b>9+1</b>	<b>4</b>	<b>3</b>	<b>6</b>	<b>6</b>	<b>19</b>

\* 12 weeks didactic activity + 2 weeks finalizing of the bachelor's thesis

**V. NUMBER OF HOURS PER WEEKS (COMPULSORY AND COMPULSORY ELECTIVE COURSES)**

Academic years	Winter Semester					Summer Semester				
	C	S	L	P	TOTAL	C	S	L	P	TOTAL
I	10	9	4	0	23	10	6	8	0	24
II	12	3	10	0	25	12	1	10	0	23
III	10	4	10	0	24	8	2	8	4	22
<b>TOTAL</b>	<b>32</b>		<b>40</b>		<b>72</b>	<b>30</b>		<b>39</b>		<b>69</b>

**VI. CONDIȚII DE PROMOVARE**

According to the *Regulation on the professional activity of students* for both Cycle I - bachelor and Cycle II - master, approved by the UAB Senate on 27.11.2019, for access to the higher year, students must accumulate a minimum of 20 ECTS credits, related to the compulsory and elective courses in the curriculum.

RECTOR  
PROF. UNIV. DR. VALER DANIEL BREAZ

DECAN  
CONF. UNIV. DR. CORINA ROTAR

DIRECTOR DE DEPARTAMENT  
LECT. UNIV. DR. MIHAELA ALDEA

## VII. ELECTIVE COURSES

No.	Courses <sup>2</sup> from the elective package	Year	Semester	No. of ECTS credits	Credits weight
1	CSE206, CSE207	II	1	6	3,33%
2	CSE304, CSE305	III	1	6	3,33%
3	CSE306, CSE307, CSE308	III	1	6	3,33%
4	CSE313, CSE314	III	2	6	3,33%
5	CSE315, CSE316	III	2	6	3,33%
<b>Total</b>				<b>30</b>	<b>16,65%</b>

<sup>2</sup>The course are identified with codes

## VIII. BACHELOR'S DEGREE EXAMINATION

Drawing up the bachelor's thesis: semester 5 and 6

Bachelor's thesis refinement: 2 weeks in semester 6

Bachelor's thesis defence: June – July, September, February

Bachelor's degree examination: 10 credits

- Number of ECTS credits for assessment exam of fundamental and speciality knowledge: 5
- Number of ECTS credits for Bachelor's Paper defence and presentation: 5

The curriculum includes a package of optional courses related to the pedagogical module that are presented in the annex.

# IX. THE STRUCTURE OF THE EDUCATION PLAN

Year I

Academic year 2022-2023

No.	Courses code	Courses	Type of courses	Number of weeks	Număr de ore de activități de învățare										Types of assessment	Number of ECTS credits	
					Collective activities						Individual/ Independent activities						Total number of hour per semester
					Didactic Activity				Total per week	Total pe semestru	Thematical Training discipline	Practical Training discipline	Total per semester				
					Course	Seminar	Lab	Practical training									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
<b>WINTER SEMESTER</b>																	
Compulsory courses																	
1	CSE 101	Computer system architecture	F	14	2	0	2	0	4	56	57	37	94	150	E	6	
2	CSE 102	Mathematical and computational logics	F	14	2	1	0	0	3	42	45	13	58	100	E	4	
3	CSE 103	Programming basics	F	14	2	1	2	0	5	70	54	51	105	175	E	7	
4	CSE 104	Linear algebra and analytical and differential geometry	C	14	2	2	0	0	4	56	42	27	69	125	C	5	
5	CSE 105	Mathematical analysis	C	14	2	2	0	0	4	56	57	37	94	150	E	6	
6	CSE 106	Sport and physical education 1	C	14	0	1	0	0	1	14	7	54	61	75	C	3*	
Total compulsory courses				<b>14</b>	<b>10</b>	<b>7</b>	<b>4</b>	<b>0</b>	<b>21</b>	<b>294</b>	<b>262</b>	<b>219</b>	<b>481</b>	<b>775</b>	<b>4E+2C</b>	<b>28</b>	
Complementary courses																	
7	CSE 107.1	English language 1	C	14	0	2	0	0	2	28	0	22	22	50	C	2	
	CSE 107.2	French language 1															
	CSE 107.3	German language 1															
Total compulsory courses				<b>14</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>28</b>	<b>0</b>	<b>22</b>	<b>22</b>	<b>50</b>	<b>1C</b>	<b>2</b>	
<b>TOTAL SEMESTER 1</b>				<b>14</b>	<b>10</b>	<b>9</b>	<b>4</b>	<b>0</b>	<b>23</b>	<b>322</b>	<b>262</b>	<b>241</b>	<b>503</b>	<b>825</b>	<b>4E+3C</b>	<b>30</b>	
Facultative courses																	
8	CSE 108	<i>Embedded systems architecture</i>	F	14	2	-	-	-	2	28	-	-	-	-	C	2	
<b>SUMMER SEMESTER</b>																	
Compulsory courses																	
9	CSE 109	Data structures	F	14	2	2	2	0	6	84	40	51	91	175	E	7	
10	CSE 110	Operating systems	F	14	2	0	2	0	4	56	57	37	94	150	E	6	
11	CSE 111	Graph algorithms	F	14	2	0	2	0	4	56	57	37	94	150	E	6	
12	CSE 112	Probabilistic and mathematical statistics	F	14	2	1	0	0	3	42	64	19	83	125	E	5	
13	CSE 113	Graphical interface design	S	14	2	0	2	0	4	56	27	17	44	100	C	4	
14	CSE 114	Sport and physical education 2	C	14	0	1	0	0	1	14	7	54	61	75	C	3*	
Total compulsory courses				<b>14</b>	<b>10</b>	<b>4</b>	<b>8</b>	<b>0</b>	<b>22</b>	<b>308</b>	<b>253</b>	<b>214</b>	<b>467</b>	<b>775</b>	<b>4E+2C</b>	<b>28</b>	
Discipline Optionale Obligatorii																	
15	CSE 115.1	English language 1	C	14	0	2	0	0	2	28	2	20	22	50	C	2	
	CSE 115.2	French language 1															
	CSE 115.3	German language 1															
Total discipline OPTIONALE obligatorii				<b>14</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>28</b>	<b>2</b>	<b>20</b>	<b>22</b>	<b>50</b>	<b>1C</b>	<b>2</b>	
<b>TOTAL SEMESTER 2</b>				<b>14</b>	<b>10</b>	<b>6</b>	<b>8</b>	<b>0</b>	<b>24</b>	<b>336</b>	<b>255</b>	<b>234</b>	<b>489</b>	<b>825</b>	<b>4E+3C</b>	<b>30</b>	
Discipline facultative																	
7	CSE 116	<i>Computational geometry</i>	F	14	2	1	1	-	4	56	-	-	-	-	-	4	
Compulsory study programme				<b>28</b>	<b>20</b>	<b>15</b>	<b>12</b>	<b>0</b>	<b>47</b>	<b>658</b>	<b>517</b>	<b>475</b>	<b>992</b>	<b>1650</b>	<b>8E+6C</b>	<b>60</b>	

The abbreviation used in the table: E – final exam; C – colloquium examination; A/R – accepted/rejected

\*In the total number of credits per semester is not included the sport and physical education

RECTOR

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DECAN

CONF. UNIV. DR. CORINA ROTAR

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No.	Courses code	Courses	Type of courses	Number of weeks	Number of hours of learning activities										Types of assessment	Number of ECTS credits
					Collective activities					Individual/Independent activities				Total number of hour per semester		
					Didactic Activity				Total per week	Total pe semester	Thematical Training discipline	Practical Training discipline	Total per semester			
					Course	Seminar	Lab	Practical training								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<b>WINTER SEMESTER</b>																
<b>Compulsory courses</b>																
1	CSE 201	Databases	F	14	2	0	2	0	4	56	42	27	69	125	E	5
2	CSE 202	Fundamental algorithms	F	14	2	0	2	0	4	56	42	27	69	125	E	5
3	CSE 203	Computer networks	F	14	2	0	2	0	4	56	42	27	69	125	E	5
4	CSE 204	Object oriented programming	S	14	2	1	2	0	5	70	28	27	55	125	E	5
5	CSE 205	Differential and partial derivates equations	C	14	2	2	0	0	4	56	27	17	44	100	C	4
<b>Total compulsory courses</b>				<b>14</b>	<b>10</b>	<b>3</b>	<b>8</b>	<b>0</b>	<b>21</b>	<b>294</b>	<b>181</b>	<b>125</b>	<b>306</b>	<b>600</b>	<b>4E+1C</b>	<b>24</b>
<b>Complementary courses</b>																
6	CSE 206	Mathematical software	F	14	2	0	2	0	2	28	12	110	122	150	C	6
	CSE 207	Complex analysis														
<b>Total compulsory and optional courses</b>				<b>14</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>28</b>	<b>12</b>	<b>110</b>	<b>122</b>	<b>150</b>	<b>1C</b>	<b>6</b>
<b>TOTAL SEMESTER 3</b>				<b>14</b>	<b>12</b>	<b>3</b>	<b>10</b>	<b>0</b>	<b>23</b>	<b>308</b>	<b>325</b>	<b>131</b>	<b>428</b>	<b>750</b>	<b>4E+ 2C</b>	<b>30</b>
<b>Facultative courses</b>																
7	CSE 208	<i>Project</i>	F	14	2	1	1	-	4	56	-	-	-	-	V	4
<b>SUMMER SEMESTER</b>																
<b>Compulsory courses</b>																
8	CSE 209	Formal language sand automata	F	14	2	0	2	0	4	56	27	17	44	100	E	4
9	CSE 210	Numerical calculus	S	14	2	0	2	0	4	56	27	17	44	100	E	4
10	CSE 211	WEB applications development	S	14	2	0	2	0	4	56	42	27	69	125	E	5
11	CSE 212	Database management systems	S	14	2	0	2	0	4	56	42	27	69	125	E	5
12	CSE 213	Advanced programming techniques	S	14	2	0	2	0	4	56	27	17	44	100	C	4
13	CSE 214	Optimization techniques	S	14	2	1	0	0	3	42	26	7	33	75	C	3
14	CSE 215	<b>Speciality internship*</b>	S	14	0	0	0	8	8	112	1	12	13	125	C	5
<b>Total compulsory courses</b>				<b>14</b>	<b>12</b>	<b>1</b>	<b>10</b>	<b>8</b>	<b>23</b>	<b>434</b>	<b>192</b>	<b>124</b>	<b>316</b>	<b>750</b>	<b>4E+3C</b>	<b>30</b>
<b>TOTAL SEMESTER 4</b>				<b>14</b>	<b>12</b>	<b>1</b>	<b>10</b>	<b>8</b>	<b>23</b>	<b>434</b>	<b>192</b>	<b>124</b>	<b>316</b>	<b>750</b>	<b>4E+3C</b>	<b>30</b>
<b>Facultative courses</b>																
16	CSE 217	<i>Embedded systems programming</i>	F	14	2	1	1	-	4	56	-	-	-	-	V	4
<b>Compulsory study programme - total</b>				<b>28</b>	<b>24</b>	<b>4</b>	<b>20</b>	<b>8</b>	<b>46</b>	<b>742</b>	<b>517</b>	<b>255</b>	<b>744</b>	<b>1500</b>	<b>8E+5C</b>	<b>60</b>

\*Speciality internships cumulative, three weeks at the end of summer semester weeks (112 hours) or during the academic year

No.	Courses code	Courses	Type of courses	Number of weeks	Număr de ore de activități de învățare										Types of assessment	Number of ECTS credits		
					Collective activities					Individual/ Independent activities								
					Didactic Activity				Total pe săptămână	Total pe semestru	Thematical Training discipline			Practical Training discipline			Total per semester	
					Course	Seminar	Lab	Practical training			Thematical Training discipline	Practical Training discipline	Total per semester					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
<b>WINTER SEMESTER</b>																		
<b>Compulsory courses</b>																		
1	CSE 301	Artificial intelligence	F	14	2	0	2	0	4	56	57	37	94	150	E	6		
2	CSE 302	Computer graphics	S	14	2	0	2	0	4	56	57	37	94	150	E	6		
3	CSE 303	Development of mobile application	S	14	2	0	2	0	4	56	57	37	94	150	E	6		
<b>Total compulsory courses</b>				<b>14</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>12</b>	<b>168</b>	<b>172</b>	<b>110</b>	<b>282</b>	<b>450</b>	<b>3E</b>	<b>18</b>		
<b>Complementary courses</b>																		
4	CSE 304	Machine learning	S	14	2	2	2	0	6	84	29	37	66	150	C	6		
	CSE 305	Evolutionary computing																
5	CSE 306	Programming environments and tools	S	14	2	2	2	0	6	84	29	37	66	150	C	6		
	CSE 307	Multimedia techniques and technologies																
	CSE 308	Ethics and academic integrity																
<b>Total compulsory and optional courses</b>				<b>14</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>12</b>	<b>168</b>	<b>58</b>	<b>74</b>	<b>132</b>	<b>300</b>	<b>2C</b>	<b>12</b>		
<b>TOTAL SEMESTER 5</b>				<b>14</b>	<b>10</b>	<b>4</b>	<b>10</b>	<b>0</b>	<b>24</b>	<b>336</b>	<b>230</b>	<b>184</b>	<b>414</b>	<b>750</b>	<b>3E+2C</b>	<b>30</b>		
<b>Facultative courses</b>																		
6	CSE 309	Intelligent robots	C	14	2	1	1	-	4	56	-	-	-	-	V	4		
<b>SUMMER SEMESTER</b>																		
<b>Compulsory courses</b>																		
7	CSE 310	Modeling and simulation	S	12	2	0	2	0	4	48	62	40	102	150	E	6		
8	CSE 311	Software engineering	S	12	2	1	2	0	5	60	46	44	90	150	E	6		
9	CSE 312	Practice for the development of the bachelor's thesis	S	12	0	0	0	4	4	48	11	91	102	150	C	6		
<b>Total compulsory courses</b>				<b>12</b>	<b>4</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>13</b>	<b>156</b>	<b>119</b>	<b>175</b>	<b>294</b>	<b>450</b>	<b>2E+1C</b>	<b>18</b>		
<b>Complementary courses</b>																		
10	CSE 313	Computational intelligence	S	12	2	1	2	0	5	60	46	44	90	150	C	6		
	CSE 314	Optimization metaheuristics																
11	CSE 315	Information systems security	F	12	2	0	2	0	4	48	62	40	102	150	C	6		
	CSE 316	Automata, computing and complexity																
<b>Total compulsory and optional courses</b>				<b>12</b>	<b>4</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>9</b>	<b>108</b>	<b>108</b>	<b>84</b>	<b>192</b>	<b>300</b>	<b>2C</b>	<b>12</b>		
<b>TOTAL SEMESTER 6</b>				<b>12</b>	<b>8</b>	<b>2</b>	<b>8</b>	<b>4</b>	<b>22</b>	<b>264</b>	<b>227</b>	<b>259</b>	<b>486</b>	<b>750</b>	<b>2E+3C</b>	<b>30</b>		
<b>Facultative courses</b>																		
12	CSE 317	IT projects management	F	14	2	1	1	-	4	56	-	-	-	-	V	4		
<b>Compulsory study programme - total</b>				<b>26</b>	<b>18</b>	<b>6</b>	<b>18</b>	<b>4</b>	<b>46</b>	<b>600</b>	<b>457</b>	<b>443</b>	<b>900</b>	<b>1500</b>	<b>5E+5C</b>	<b>60</b>		

\* Independent activities take place cumulatively in the last 2 weeks of the semester

**X. The structure of the number of hours for didactic activities according to the type of course imposed with a view to ensuring the training**

<b>Courses</b>	Year I Winter semester	Year I Summer semester	Year II Winter semester	Year II Summer semester	Year III Winter semester	Year III Summer semester	Total without speciality internship	Percentage	Total with internship speciality (112 hours - second year, Summer semester)	Percentage with internship (112 hours)
Compulsory courses	294	308	294	322	168	156	1542	81.07	1654	82.13
Optional compulsory courses	28	28	28	0	168	108	360	18.93	360	17.87
<b>Total compulsory and optional compulsory courses</b>	<b>322</b>	<b>336</b>	<b>322</b>	<b>322</b>	<b>336</b>	<b>264</b>	<b>1902</b>	<b>100</b>	<b>2014</b>	<b>100.00</b>
Other facultative course	28	56	56	56	56	56	196	10.30	196	9.73
<b>Total facultative course</b>	<b>350</b>	<b>392</b>	<b>378</b>	<b>322</b>	<b>392</b>	<b>264</b>	<b>2098</b>	<b>-</b>	<b>2210</b>	<b>100,00%</b>

**XI. Number of hours for the complete bachelor cycle, without facultative courses**

Study year	Semester	Number of weeks	Number of hours/weeks	Number of hours Speciality internship	Total hours (without internship)	Total hours (with internship)
I	1	14	23	-	322	322
I	2	14	24	-	336	336
II	1	14	23	-	322	322
II	2	14	23	112	322	434
III	1	14	24	-	336	336
III	2	12	22	-	264	264
<b>Total</b>				<b>112</b>	<b>1902</b>	<b>2014</b>

**XII. ARACIS's specific standards**

### 1. General structure

Courses	Year I, Winter semester	Year I, Summer semester	Year II, Winter semester	Year II, Summer semester	Year III, Winter semester	Year III, Summer semester	Total without internship	Total with internship	Courses percentage	
									Percentage without internship	Percentage with internship
Fundamental courses	168	238	196	56	56	48	762	762	40.06%	37.84%
Specialization courses	-	56	70	266	280	216	888	1000	46.69%	49.65%
Complementary courses**	154	42	56	0	-	-	252	252	13.25%	12.51%
<b>TOTAL</b>							<b>1902</b>	<b>2014</b>	<b>100,00%</b>	<b>100,00%</b>

### 2. Report course hours/applicative hours, per total compulsory and optional compulsory courses

Activities	Year I Winter semester	Year I Summer semester	Year II Winter semester	Year II Summer semester	Year III Winter semester	Year III Summer semester	Total without internship	Total with internship (112 hours)
Courses	140	140	168	168	140	96	852	852
Seminars, labs, practice	182	196	182	154	196	168	1078	1190
The report between applicative hours and course hours is 1,12 (this report is calculated without the speciality internship hours and those related to the development of the bachelor's thesis)							79.03	71.59

### 3. Number of courses

Courses	Fundamental compulsory	Speciality compulsory	Complementary compulsory	Total
Total number of complementary courses	14	16	7	38
	12 compulsory	13 compulsory		(21 exams, 16 colloquium)
	2 optional compulsory	3 optional compulsory		

### 4. The share of courses in other areas of science, in all complementary and optional compulsory courses

Courses	Total number of hours	Percentage
Other fields of science	84	33%
Total number of complementary courses	252	100%

### 5. The share of credits in the compulsory courses decided by student

Courses	Credits	Percentage
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Compulsory	146	81%
Optional compulsory	34	19%
<b>Total</b>	<b>180</b>	<b>100%</b>

**6.The share of hours in the compulsory courses decided by student**

<b>Courses</b>	<b>Hours</b>	<b>Percentage</b>
Compulsory	1654	82.13%
Optional compulsory	360	17.87% <b>(17-30%)</b>
<b>Total</b>	<b>2014</b>	<b>100,00%</b>