# COURSE SYLLABUS

*Academic year 2024-2025*

## 1. Programme Information

| | |
|---|---|
| 1.1. Higher education institution | **Lucian Blaga University of Sibiu** |
| 1.2. Faculty | Faculty of Engineering |
| 1.3. Department | Department of Computer Science and Electrical and Electronics Engineering |
| 1.4. Field of study | Computer Science and Information Technology |
| 1.5. Level of study[1] | Master |
| 1.6. Programme of study/qualification | EMBEDDED SYSTEMS |

## 2. Course Information

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|---|---|---|---|
| 2.1. Name of course | Adaptive Systems Theory | Code | ES.103.RO |
| 2.2. Course coordinator | Assist. Prof. Mihai NEGHINĂ, PhD | | |
| 2.3. Seminar/laboratory coordinator | Assist. Prof. Mihai NEGHINA, PhD | | |

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|---|---|---|---|---|---|
| 2.4. Year of study[2] | 1 | 2.5. Semester[3] | 1 | 2.6. Evaluation form[4] | E |
| 2.7. Course type[5] | O | 2.8. The formative category of the course[6] | | | R |

## 3. Estimated Total Time

| 3.1. Course Extension within the Curriculum – Number of Hours per Week | | | | | |
|---|---|---|---|---|---|
| 3.1.a. Lecture | 3.1.b. Seminar | 3.1.c. Laboratory | 3.1.d. Project | 3.1.e. Other | Total |
| 1 | 0 | 2 | 0 | 0 | **3** |
| 3.2. Course Extension within the Curriculum – Total Number of Hours within the Curriculum | | | | | |
| 3.2.a. Lecture | 3.2.b. Seminar | 3.2.c. Laboratory | 3.2.d. Project | 3.2.e. Other | Total[7] |
| 14 | 0 | 28 | 0 | 0 | **42** |

| **Time Distribution for Individual Study[8]** | **Hours** |
|---|---|
| Learning by using course materials, references and personal notes | 15 |
| Additional learning by using library facilities, electronic databases and on-site information | 13 |
| Preparing seminars / laboratories, homework, portfolios and essays | 42 |
| Tutorial activities[9] | 10 |
| Exams[10] | 3 |
| **3.3. Total Individual Study Hours[11] *($NOSI_{sem}$)*** | **83** |
| **3.4. Total Hours in the Curriculum *($NOAD_{sem}$)*** | **42** |
| **3.5. Total Hours per Semester[12] *($NOAD_{sem}$ + $NOSI_{sem}$)*** | **125** |
| **3.6. No. of Hours / ECTS** | **25** |
| **3.7. Number of credits[13]** | **5** |

**4. Prerequisites (if needed)**

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|---|---|
| 4.1. Courses that must be successfully completed first (from the curriculum)[14] | Mathematics, Signals and Systems, Information Technology |
| 4.2. Competencies | Matlab and C programming |

**5. Conditions** (where applicable)

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|---|---|
| 5.1. For course/lectures[15] | Whiteboard, projector, computers.<br>Active participation, reading support material, individual study, additional documentation, preparing labs and homework. To achieve all course objectives, students are expected to work at a greater level of intensity. |
| 5.2. For practical activities (lab/sem/pr/app) [16] | Room equipped with computers installed with the necessary tools to support laboratory work. Develop and support the planned work |

**6. Specific competencies acquired**[17]

| | | Number of credits assigned to the discipline[18] | 5 | Credits distribution by competencies[19] |
|---|---|---|---|---|
| **6.1. Professional competencies** | PC8 | model hardware | | 2 |
| | PC13 | perform data analysis | | 2 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| **6.2. Transversal competencies** | TC2 | show initiative | | 1 |
| | | | | |
| | | | | |

**7. Course objectives** (resulted from developed competencies)

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|---|---|
| 7.1. Main course objective | Advanced DSP curse has two main objectives:<br>• Presentation of theoretical aspects and basic principles of Adaptive Systems, underlying the analysis and synthesis using input- output or input- state-output formalism automatic control systems.<br>• To study and understand techniques to make the algorithms to run faster, enabling their use in real time processing. |
| 7.2. Specific course objectives | • Knowledge and understanding of relevant principles in control theory.<br>• Use of Matlab/Simulink for system simulation, analysis and control<br>• Improvement on the performances of specific systems through optimization |

**8. Content**

| **8.1 Lectures**[20] | | **Teaching methods**[21] | **Hours** |
|---|---|---|---|
| Lecture 1 | Introduction | | 2 |
| Lecture 2 | Complex Adaptive Systems (pattern, feedback, agents). Properties. | | 2 |
| Lecture 3 | LTI systems and linearization | | 2 |
| Lecture 4 | Control applications: system identification, self-tuning control, model-reference adaptive control | | 2 |
| Lecture 5 | Controller Design Methods. | | 2 |
| Lecture 6 | System compensation. Stabilization of unstable system. | | 2 |
| Lecture 7 | Example application | | 2 |

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|---|---|
| **Total lecture hours:** | **14** |

**8.2 Practical activities**

| **8.2.b. Laboratory** | | **Teaching methods**[22] | **Hours** |
|---|---|---|---|
| Laboratory 1 | Matlab / Simulink introduction | | 2 |
| Laboratory 2 | System properties | | 2 |
| Laboratory 3 | System direct modelling from differential equations | | 2 |
| Laboratory 4 | State space modelling | | 2 |
| Laboratory 5 | Transfer function modelling | | 2 |
| Laboratory 6 | Linearization | | 2 |
| Laboratory 7 | System identification | | 2 |
| Laboratory 8 | Controllers and tuning | | 2 |
| Laboratory 9 | Self-tuning control | | 2 |
| Laboratory 10 | Controller design methods | | 2 |
| Laboratory 11 | System compensation | | 2 |
| Laboratory 12 | System stability | | 2 |
| Laboratory 13 | Stabilization of unstable systems | | 2 |
| Laboratory 14 | Evaluation | | 2 |
| | | **Total laboratory hours:** | 28 |

**9. Bibliography**

| | |
|---|---|
| 9.1. Recommended Bibliography | Mihai NEGHINA Modelarea si controlul sistemelor. Ed. Univ. "Lucian Blaga" Sibiu, ISBN 978-606-12-1530-0 / 2018 |
| | Ogata,K. : "System Dynamics", Prentice Hall,Saddle River,NewJersey,1998. |
| | Dorf R. C., Bishop R. H., Modern Control Systems, Prentice Hall, Saddle River,New Jersry, 2008. |
| | |
| 9.2. Additional Bibliography | |
| | Pagini Internet din domeniu |
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**10. Conjunction of the discipline's content with the expectations of the epistemic community, professional associations and significant employers of the specific study program**[23]

Periodic discussions with representatives of companies, both in formal and informal contexts.

**11. Evaluation**

| Activity Type | 11.1 Evaluation Criteria | 11.2 Evaluation Methods | 11.3 Percentage in the Final Grade | Obs.[24] |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 11.4a Exam / Colloquy | • Theoretical and practical knowledge acquired (quantity, correctness, accuracy) | Tests during the semester[25]: | % | 60% | |
| | | Homework: | % | | |
| | | Other activities[26]: | % | | |
| | | Final evaluation: | 60% | | |
| 11.4c Laboratory | • Knowledge of the equipment, how to use specific tools; evaluation of tools, processing and interpretation of results | • Written questionnaire<br>• Oral response | | 40% | nRFE |
| 11.5 Minimum performance standard[27]<br>At least 50% of weighted sum (according to percentages) | | | | | |

***The Course Syllabus will encompass components adapted to persons with special educational needs (SEN – people with disabilities and people with high potential), depending on their type and degree, at the level of all curricular elements (skills, objectives, contents, teaching methods, alternative assessment), in order to ensure fair opportunities in the academic training of all students, paying close attention to individual learning needs.***

Filling Date: 12.09.2024

Department Acceptance Date: 16.09.2024

| | Academic Rank, Title, First Name, Last Name | Signature |
|---|---|---|
| **Course Teacher** | Assist. Prof. Mihai NEGHINĂ, PhD | |
| **Study Program Coordinator** | Prof. Arpad GELLERT, PhD | |
| **Head of Department** | Assoc. Prof. Radu George CREȚULESCU, PhD | |
| **Dean** | Prof. Maria VINȚAN, PhD | |

[1] *Bachelor / Master*
[2] *1-4 for bachelor, 1-2 for master*
[3] *1-8 for bachelor, 1-3 for master*
[4] *Exam, colloquium or VP A/R - from the curriculum*
[5] *Course type: R = Compulsory course; E = Elective course; O = Optional course*
[6] *Formative category: S = Specialty; F = Fundamental; C = Complementary; I = Fully assisted; P = Partially assisted; N = Unassisted*
[7] *Equal to 14 weeks x number of hours from point 3.1 (similar to 3.2.a.b.c.)*
[8] *The following lines refer to individual study; the total is completed at point 3.37.*
[9] *Between 7 and 14 hours*
[10] *Between 2 and 6 hours*
[11] *The sum of the values from the previous lines, which refer to individual study.*
[12] *The sum (3.5.) between the number of hours of direct teaching activity (NOAD) and the number of hours of individual study (NOSI) must be equal to the number of credits assigned to the discipline (point 3.7) x no. hours per credit (3.6.)*
[13] *The credit number is computed according to the following formula, being rounded to whole neighbouring values (either by subtraction or addition*

$$No.credits = \frac{NOCpSpD \times C_C + NOApSpD \times C_A}{TOCpSdP \times C_C + TOApSdP \times C_A} \times 30\ credits$$

Where:

- NOCpSpD = Number of lecture hours / week / discipline for which the credits are calculated
- NOApSpD = Number of application hours (sem./lab./pro.) / week / discipline for which the credits are calculated
- TOCpSdP = Total number of course hours / week in the Curriculum
- TOApSdP = Total number of application hours (sem./lab./pro.) / week in the Curriculum
- $C_C$/$C_A$ = Course coefficients / applications calculated according to the table

| **Coefficients** | **Course** | **Applications (S/L/P)** |
|---|---|---|
| Bachelor | 2 | 1 |
| Master | 2,5 | 1,5 |
| Bachelor - foreign language | 2,5 | 1,25 |

[14] *The courses that should have been previously completed or equivalent will be mentioned*
[15] *Board, video projector, flipchart, specific teaching materials, online platforms, etc.*
[16] *Computing technology, software packages, experimental stands, online platforms, etc.*
[17] *Competences from the Grids related to the description of the study program, adapted to the specifics of the discipline*
[18] *From the curriculum*
[19] *The credits allocated to the course are distributed across professional and transversal competences according to the specifics of the discipline*
[20] *Chapter and paragraph titles*
[21] *Exposition, lecture, board presentation of the studied topic, use of video projector, discussions with students (for each chapter, if applicable)*
[22] *Practical demonstration, exercise, experiment*
[23] *The relationship with other disciplines, the usefulness of the discipline on the labour market*
[24] *CPE – Conditions Exam Participation; nCPE – Does Not Condition Exam Participation; CEF - Conditions Final Evaluation; N/A – not applicable*
[25] *The number of tests and the weeks in which they will be taken will be specified*
[26] *Scientific circles, professional competitions, etc.*
[27] *The minimum performance standard in the competence grid of the study program is customized to the specifics of the discipline, if applicable*