



DISCIPLINE ACADEMIC SHEET
ACADEMIC YEAR 2025 – 2026

1. PROGRAMME DATA

1.1. Higher Education Institution	UNIVERSITY OF CRAIOVA
1.2. Faculty	Automation, Computers and Electronics
1.3. Department	Computers and Information Technology
1.4. Field of Study	Computers and Information Technology
1.5. Study level	L(License / Undergraduate)
1.6. Organizational form	IF
1.7. Study Program (name/code) /Qualification	Computers / L2060101010

2. DISCIPLINE DATA

2.1 Discipline Name	System Theory						
2.2 Course Activities Holder	Prof. dr. eng. Danciu Daniela						
2.3. Practical Activities Holder	Prof. dr. eng. Danciu Daniela						
2.4. Study Year	2	2.5. Semester	1	2.6. Evaluation type	E	2.7. Discipline regime	DS DOB

3. ESTIMATED TOTAL TIME (hours per semester of teaching activities)

3.1 Number of hours per week	4	in which: 3.2 course	2	3.3. seminar	2
3.4 Total hours of curriculum	56	in which: 3.5 course	28	3.6. seminar	28
3.7 Time distribution - hours/week					hours
Study after manual, course support, bibliography and notes					22
Additional documentation in library, on specialized electronic platforms and field					4
Training seminars / labs, homework, portfolios and essays					12
Tutoring					2
Examinations					2
Other activities: consultations, student meetings					2
Total hours per individual activities					44
3.8. Total hours per semester					100
3.9. Number of credits					4

4. PRECONDITIONS (where appropriate)

4.1 of curriculum	Students must have specialized knowledge acquired in the following subjects: Mathematical Analysis; Linear Algebra, Analytical and Differential Geometry; Special Chapters in Mathematics; Physics I - General Physics; Physics II - Elements of Mechanics; Electrotechnics.
4.2 of competence	Not necessary.

5. CONDITIONS (where appropriate)⁹

5.1. of the course	The course is taught by using a video projector. For explanations and answers to students' questions are used: the board from the classroom endowment, various presentations, recorded experiments.
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	Course support and up-to-date documentation are provided in electronic format. The teaching process has the following structure: 70% theoretical presentation, based on the course support 30% interactive activity (dialogue with students)
5.2. of seminar	The seminar activity is carried out by using the board from the classroom endowment. Seminar support in electronic format is provided.

6. COURSE OBJECTIVES – expected learning outcomes that are supported by completing and passing the course

Knowledge	Student/Graduate describes, identifies, and summarizes basic concepts and methods related to systems in general and digital systems, as well as their application to specific problems. The course introduces fundamental systemic concepts (input-output theory and state-based theory) and describes specific characteristics useful in system analysis and control synthesis.
Skills (Abilities)	The student/graduate uses specific methods for measuring electrical quantities and identifies digital and analog electronic devices. The student/graduate analyzes systems using the theories studied and designs, implements, diagnoses, and troubleshoots digital systems. The student/graduate uses specific theories and tools (applications, models, protocols, etc.) for the analysis, simulation, design, and implementation of computer networks.
Responsibility and autonomy	Student/Graduate carries out processes in computer and information technology project management, taking on various roles within the team and providing clear and concise verbal and written descriptions of the results.

7. CONTENT

<i>7.1. Course</i>	The method of implementation	Teaching methods	Allocated time (hours)
1. Fundamental concepts in System theory 1.1. Introduction to signals and systems. 1.2. Representation of systems by block diagrams. 1.3. Control systems: the role of feedback in natural and technological systems.	Synchronous Online (week 1)	Course teaching: this activity uses a video projector; for explanations and answers to students' questions are used: the board from the classroom endowment, various presentations, filmed experiments.	2
2. Time-domain modeling of and time invariant analog linear systems 2.1. Equations of physical-technical systems. 2.2. Time-domain mathematical models of linear systems. Input-output model. State-space mathematical model. 2.3. Basic system properties of linear and time invariant systems. 2.4. Structural properties. Minimal state-space realizations	Synchronous Online (weeks 2 + 3)	Course support and up-to-date documentation are provided in electronic format.	4
3. Complex-domain modeling of linear and time invariant analog systems 3.1. Transfer function (matrix) for SISO (MIMO) systems. 3.2. Elementary transfer functions. 3.3. Operational characteristics of the zeros and poles polynomials.	Synchronous Online (weeks 4 + 5)	The teaching process has the following structure: 70% theoretical presentation, based on the course support	4

3.4. Deduction the transfer function (matrix) for LTI systems. Example. 3.5. State-space realizations of transfer functions. 3.6. Elementary connections of linear systems. Deduction of the transfer function (matrix) by the method of elementary transformations for the reduction of block diagrams.		30% interactive activity (dialogue with students)	
4. Qualitative analysis of linear and time invariant systems 4.1. Signals description and classification 4.2. Systems response to external signals. The components of systems' response. 4.3. System response to standard input signals. Impulse response. Step response. System response for typical transfer functions. 4.4. Stability of linear systems. Internal stability. Bounded input-bounded output stability. Algebraic stability criteria. 4.5. Roots locus of the characteristic polynomial for systems with negative feedback. Rules for roots locus drawing. 4.6. Quality indices of the step response for system's transient regime and the effect of the dominant poles.	Face-to-face		8
5. Frequency-domain analysis of linear and time invariant systems 5.1. Frequency-domain representations of linear systems. Frequency-domain response of a SLIT. 5.2. Bode diagrams. 5.3. Nyquist diagram. Nyquist criterion for closed-loop stability. Examples. 5.4. Stability margins.	Face-to-face		4
6. Introduction to linear control systems 6.1. Typical transfer blocks. 6.2. General structure of a control system. 6.3. Examples of technological control systems based on negative feedback connection. 6.4. Types of control systems (open and closed loop control).	Face-to-face		2
7. Precision and conventional control of linear systems 7.1. Systems stabilization by dynamic compensation. 7.2. Control precision with respect to both the reference and disturbance signals 7.3. Conventional control laws and PID controllers 7.4. LEAD-LAG and LAG-LEAD controllers	Face-to-face		4

Bibliography:
1. E. W. Kamen, <i>Introduction to signals and systems</i> , Macmillan, New York, 1990
2. J. R. Leigh, <i>Control Theory</i> , IEE Control Series, 64, 2nd edition, The IEEE, 2004
3. J. R. Leigh, <i>Applied Control Theory</i> , IEE Control Series, 18, 2nd edition, Peregrinus, 1987
4. E. Ceangă, O. Păstrăvanu, <i>Modele matematice</i> , In: (I. Dumitrache ed.), <i>Automatica</i> , Vol. 1, Cap. 4, Editura Academiei Române, București, 2009

5. M. Voicu, Proprietăți structurale, In: (I. Dumitrache ed.), <i>Automatica</i> , Vol. 1, Cap. 5, Editura Academiei Române, București, 2009
6. C. Oară, D. Popescu, Analiza sistemelor liniare, In: (I. Dumitrache ed.), <i>Automatica</i> , Vol. 1, Cap. 7, Editura Academiei Române, București, 2009
7. V. Ionescu, <i>Teoria sistemelor</i> , Vol.1, Editura Didactică și Pedagogică, București, 1985
8. V. Răsvan, <i>Teoria stabilității</i> (Cap. 2), Editura Științifică și Enciclopedică, București, 1987
9. M. Voicu, <i>Introducere în automatică</i> , Editura Polirom, Iași, 2002
10. D. Danciu, System theory, course notes, 2026 (minimal bibliography)

7.2. Seminar	The method of implementation	Teaching methods	Allocated time (hours)
1. Laplace transform. Applications to differential equations solving.	Synchronous Online (week 1)	The board and a video projector provided in the seminar room are used. The seminar starts with a theoretical breviary, presenting the methods / algorithms used in the current seminar session. It continues with applied exercises and ends with discussions and conclusions. Seminar support in electronic format is provided.	2
2. State-space mathematical model for LTI systems.	Synchronous Online (week 2)		2
3. Transfer function (matrix) for SISO (MIMO) systems.	Synchronous Online (week 3)		2
4. Structural properties of linear systems: controllability and observability.	Face-to-face		2
5. Minimal realizations. Conversions between the two mathematical models.	Face-to-face		2
6. Connections of linear systems. Block diagram reduction.	Face-to-face		2
7. Systems response to standard input signals	Face-to-face		2
8. Stability of linear systems. Algebraic stability criteria.	Face-to-face		2
9. Nyquist criterion for the closed-loop stability analysis.	Face-to-face		2
10. Bode frequency characteristics and Bode criterion.	Face-to-face		2
11. Roots locus for feedback systems.	Face-to-face		2
12. Systems stabilization by dynamic compensation.	Face-to-face		2
13. Precision of a control system	Face-to-face		2
14. Recapitulation.	Face-to-face		2

Bibliography:
1. E. W. Kamen, <i>Introduction to signals and systems</i> , Macmillan, New York, 1990.
2. J. R. Leigh, <i>Control Theory</i> , IEE Control Series, 64, 2nd edition, The IEEE, 2004
3. J. R. Leigh, <i>Applied Control Theory</i> , IEE Control Series, 18, 2nd edition, Peregrinus, 1987
4. E. Ceangă, O. Păstrăvanu, Modele matematice, In: (I. Dumitrache ed.), <i>Automatica</i> , Vol. 1, Cap. 4, Editura Academiei Române, București, 2009
5. M. Voicu, Proprietăți structurale, In: (I. Dumitrache ed.), <i>Automatica</i> , Vol. 1, Cap. 5, Editura Academiei Române, București, 2009
6. C. Oară, D. Popescu, Analiza sistemelor liniare, In: (I. Dumitrache ed.), <i>Automatica</i> , Vol. 1, Cap. 7, Editura Academiei Române, București, 2009
7. V. Ionescu, <i>Teoria sistemelor</i> , Vol.1, Editura Didactică și Pedagogică, București, 1985
8. V. Răsvan, <i>Teoria stabilității</i> (Cap. 2), Editura Științifică și Enciclopedică, București, 1987
9. M. Voicu, <i>Introducere în automatică</i> , Editura Polirom, Iași, 2002
10. D. Danciu, System theory, Course and seminar notes, 2026 (minimal bibliography)

8. Correlating the content of the discipline with the expectations of representatives from the epistemic community, professional associations and representative employers in the field related to the program

The content of the course was discussed with the course holders from other national universities, where this discipline is taught: - Faculty of Automation and Computers, National University of Science and Technology Politehnica Bucharest - Faculty of Automation and Computers, "Gh. Asachi" of Iași - Faculty of Automation and Computers, "Politehnica" University of Timișoara

- Informal discussions during meetings at academic and scientific events held in European Union countries
- Partners from the economic sector: HELLA Craiova, CS Romania

9. EVALUATION

Activity Type	9.1 Evaluation criteria	9.2 Evaluation methods	9.3 Final mark weight
9.4 Course	- Understanding the theoretical foundations reflected in the answer to test questions. - Ability to make connections between the notions taught by solving simple application problems.	Written exam: evaluation through both theoretical and applicative-type subjects, grouped by degrees of difficulty.	80 %
9.5 Seminar	Ability to apply assimilated methods and procedures to solve specific problems. - Interpretation of results. - The degree of involvement in the seminar activity.	Seminar: Evaluation throughout the semester by homework	20%
9.6 Minimum standard of performance (the minimum knowledge necessary to promote discipline and how to check the knowledge acquiring)			
▪ The knowledge necessary to promote discipline is a minimum of 50% of the expected learning outcomes. This corresponds to a minimum of 50% of the marks for the seminar homework and the final exam. ▪ The final mark is calculated by rounding off the final score to an integer. The minimum mark is 5.			

Date of Completion	Signature of the Course Activities Holder,	Signature of the Practical Activities Holder,
23.08.2025	Prof.dr.ing. Daniela DANCIU	Prof.dr.ing. Daniela DANCIU

Date of Approval in the Department	Signature of the Department Director,
25.08.2025	Ș.I.dr.ing. Nicolae ENESCU

Date of Approval in the Faculty	Signature of the Dean,
	Prof.dr.ing. Dorin ȘENDRESCU