SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babeş–Bolyai Universitaty of Cluj–Napoca
1.2 Faculty	Chemistry and Chemical Engineering
1.3 Department	Chemical Engineering
1.4 Field of study	Chemical Engineering
1.5 Study cycle	Master
1.6 Study programme / Qualification	Advanced Chemical Process Engineering

2. Information regarding the discipline

2.1 Name of the discipline	**Acquisition and treatment of experimental data – CME7313**						
2.2 Course coordinator	Assoc. Prof. dr. Sorin-Aurel Dorneanu						
2.3 Seminar coordinator	Assoc. Prof. dr. Sorin-Aurel Dorneanu						
2.4. Year of study	I	2.5 Semester	1	2.6. Type of evaluation	C	2.7 Type of discipline	Compulsory

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					40
Additional documentation (in libraries, on electronic platforms, field documentation)					30
Preparation for seminars/labs, homework, papers, portfolios and essays					30
Tutorship					4
Evaluations					4
Other activities:					-

3.7 Total individual study hours	108
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	• Not the case
4.2. competencies	• Not the case

5. Conditions (if necessary)

5.1. for the course	• Students should switch off the mobile phones during courses and seminars. • Students should read before the course support available on internet. • If possible, the student will come with personal mobile computers having installed the corresponding software applications.
5.2. for the seminar /lab activities	• Students should switch off the mobile phones during courses and seminars.

	• Before each seminar, the student will download from internet an should read the corresponding seminar supports. • If possible, the student will come with personal mobile computers having installed the corresponding software applications. • The access in the lab with food and drinks is forbidden.

6. Specific competencies acquired

Professional competencies	• Defining the language and identification of advanced concepts for mathematical modelling and programming for the process engineering applications • Understanding and explaining the operation of the chemical process engineering equipment and installations using complex dynamic mathematical models and statistical data processing • Developing dynamic mathematical models with lumped and distributed parameters and their implementation in simulators used for the process performance assessment in order to identify operation and control solutions for economic benefits, improved energetic efficiency and safety while reducing the negative impact on the environment • Utilisation of the mathematical models for technological design and their implementation in automatic control systems in order to obtain the optimal solutions for economic benefits, improved energetic efficiency and safety while reducing the negative impact on the environment • Utilisation of the advanced analysis and synthesis concepts of process, equipments and units for the process engineering. • Creative utilisation of the professional knowledge, of the analysis and synthesis methods and concepts in the new chemical process development. • Integrate utilisation of the chemical process analysis and synthesis for the development of the process and innovative products development. • Creative utilisation of the analysis and synthesis for the elaboration of innovative products an technologies. • Utilisation of the professional knowledge in order to establish the research strategy and the programme for experiments and simulations, explanation and treatment of data.
Transversal competencies	• Execution of the professional duties in accordance with the fixed needs and dead-lines, respecting the professional ethics and moral, following a pre-fixed work plan. • Solving the required duties in accordance with the fixed general objectives by the integration in the work group. • Planning, monitoring and assuming professional duties of underline group. Proving the coordination capabilities, analytical thinking, adaptability and flexibility, collaboration with team members. • Auto-evaluation of professional performances and establish the needs of continuous learning, documentation in the work fields in correlation with the labor market

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• To get familiar with the facilities and the advantages offered by the automatic acquisition and treatment of experimental and process data
7.2 Specific objective of the discipline	• Acquisition of knowledge concerning the main modalities of interconnection between the experimental/industrial equipments and computers. • Acquisition of knowledge concerning the equipments dedicated to data acquisition and chemical experiments/processes control. • Initiation in the using of dedicated software applications for the acquisition and treatment of experimental and process data. • Acquisition of the basic theoretical knowledge for the analysis and synthesis of the industrial processes.

8. Content

8.1 Course	Teaching methods	Remarks
8.1.1. **Recapitulation of some basic elements concerning the numerical systems.** (Decimal and binary systems. Decimal and binary arithmetic with integer and rational numbers. Development and classification of digital circuits. Combinational logical circuits. Applications.	Lecture giving, explanation, conversation	
8.1.2. **Complex digital circuits.** Sequential digital structures. Applications of the sequential digital circuits in the data acquisition.	Lecture giving, explanation, conversation	
8.1.3. **Basic elements concerning the elements of a computer.** Central unit. Basic components and constructive models. Connectors, interfaces, busses.	Lecture giving, explanation, conversation, description, exemplification	
8.1.4. **Standard interfaces between peripheral equipments and computer. The problems concerning the transmission at distance of the digital an analogical signals.** Communication interfaces, dedicated connectors for I/O equipments, standard connectors. I/O operations. Attenuation and disturbing of the digital and analogical signals. Stages for the treatment and translation of the igital and analogical signals.	Lecture giving, explanation, conversation, exemplification	
8.1.5. **Basic circuits for the acquisition and generation of the electrical signals.** A/D and D/A converters of the electrical signals – models and characteristics.	Lecture giving, explanation, conversation, description, exemplification	
8.1.6. **Specific hardware for the acquisition and generation of the electrical signals**. Data acquisition boards and equipments for signal conditioning – models, structure and characteristics.	Lecture giving, explanation, conversation, description, exemplification, questioning	
8.1.7. **LabView elements for graphic presentation of data and their writing/reading on/from HDD.** Filtration, integration, derivation, concatenation, linear and non-linear regression, indicators, diagrams, data conversion, saving and reading data, path.	Explanation, conversation, description, debate, exemplification, questioning	
8.1.8. **LabView routines for the acquisition of the analogical and digital signals.** Analogical/digital inputs/outputs, sampling rate, synchronisation, unique value, values chain, wave, continuous acquisition, simple and complex routines.	Lecture giving, explanation, conversation, description, exemplification, questioning	
8.1.9. **LabView practical applications for the acquisition and generation of the analogical and digital signals. I. Static signals.** Input/output channels, 7 segments display, digital port, decimal/binary switch, data saving.	Lecture giving, explanation, conversation, description, questioning, debate, exemplification.	
8.1.10. **LabView practical applications for the acquisition and generation of the analogical and digital signals. II. Dynamic signals.** Differential input channels, RC circuit, optical coupler, exponential function linearization, linear regression, capacitance measurement.	Lecture giving, explanation, conversation, description, debate, exemplification.	
8.1.11. **Software applications for the communication with equipments containing integrated A/D and D/A conversion systems and micro-controllers**. Micro-controller, RS232, RS485 and USB serial interfaces, source code, syntactic.	Lecture giving, explanation, conversation, description, debate, exemplification.	
8.1.12. **The using of the MS-Excel software application**	Lecture giving,	

for the import, treatment, displaying and interpretation of the acquired data. import, calculus, generation of graphical representations, linear and nonlinear regressions, statistical analysis, data and graphics export.	explanation, conversation, description, debate, exemplification.	
8.1.13. **The using of the ORIGIN software application for the import, treatment, displaying and interpretation of the acquired data. I. The data import and displaying**. Import, generation of graphical representations, graphs parameters.	Lecture giving, explanation, conversation, description, debate, exemplification.	
8.1.14. **The using of the ORIGIN software application for the import, treatment, displaying and interpretation of the acquired data. II. Treatment and analysis of data**. Linear and non-linear regressions, statistical analysis, data and graphics export.	Lecture giving, explanation, conversation, description, debate, exemplification.	
Bibliography 1. Course support in electronic format 2. Daniel Page, A Practical Introduction to Computer Architecture, Springer-Verlag, London, 2009 3. Data Acquisition and Signal Conditioning Course Manual, National Instruments Corporation, Austin, Texax, SUA, 2003 4. LabVIEW Fundamentals, National Instruments Corporation, Austin, Texax, SUA, 2005 5. Microsoft, Microsoft Excel Help 6. OriginLab, Origin Documentation		
8.2 Seminar / laboratory	Teaching methods	Remarks
8.2.1. **Introduction in LabView and Electronics Workbench. Types od variables and their conversion. Numerical and logical applications concerning the design and use of the combinational and sequential logical circuits.**	Explanation, conversation, description, questioning	The seminary hours were distributed in 7 sessions of 2 hours, one session every 2 weeks.
8.2.2. **The components of a data acquisition system. Identification and use of the computer components, of the communication interfaces with the peripheral equipments and of the conditioning devices for analogical and digital signals.**	Explanation, conversation, description, questioning, exemplification.	
8.2.3. **Transfer and primary treatment of data using LabView**. Arrays, dimension, structure, indexing, cluster, construction, fundamental mathematic operations, analysis, filtering.	Explanation, conversation, description, questioning, exemplification.	
8.2.4. **Advanced treatment and displaying of data using LabView.** Filtering, integration, derivation, concatenation, linear and non-linear regressions, indicators, graphs, diagrams.	Explanation, conversation, description, questioning.	
8.2.5. **LabView applications for acquisition, generation, saving, export and import of data and for equipments control**. Analogical/digital inputs/outputs, sampling rate, synchronisation, unique value, values chain, wave, continuous acquisition, serial port, transfer rate, RS232, USB, parallel port, communication protocol, control codification.	Experiment, Explanation, conversation, description, questioning	
8.2.6. **Import, treatment, displaying and interpretation of the acquired data using MS-Excel**. Import, calculus, graphical representation, statistical analysis, linear and non-linear regressions, data and graphics export.	Explanation, conversation, description, questioning, exercise.	
8.2.7. **Import, treatment, displaying and interpretation of the acquired data using ORIGIN**. Import, calculus, graphical representation, statistical analysis, linear and	Explanation, conversation, description, questioning, exercise.	

non-linear regressions, data and graphics export.		

Bibliography

1. Course and seminary supports in electronic format
2. M. Cornea-Haşegan, Proiectarea sistemelor cu microprocesor Z80, Ed. Dacia, Cluj, 1988.
3. M. Popa: Microprocesoare si microcontrolere, Editura Politehnica Timişoara, 1997.
4. Transaction in Measurement and Control - Volume. 2 - Data Acquisition, Putman Publishing Company and OMEGA Press LLC, Stamford, Connecticut, USA, 1998.
5. Smith S.W., The Scientist and Engineer's Guide to Digital Signal, CTP, San Diego, 1999.
6. S. Sumathi, P. Surekha, LabVIEW based Advanced Instrumentation Systems, Springer, New York, 2007.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- By instructing the theoretical and practical concepts of Acquisition and treatment of experimental data course, the students will get the knowledge in accordance with the competencies requested by possible employment sectors settled by RNCIS.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	The correctness of answers and the argumentation of wrong answers – acquiring and correct understanding of the concepts included in the course.	Written examination (colloquium) at the end of the semester. The test, of grille type, include also numerical applications. Access to examination is conditioned by the participation at the seminaries (at least 80 % from the total number of hours). Examination fraud: the student is expelled from the exam according the ECTS regulations	80 %
	Correct solving of the numerical applications.		
10.5 Seminar/lab activities	The correctness of numerical and software applications - acquiring and correct understanding of the concepts included in the seminaries.	The software and numerical applications corresponding to the seminar content must be transmitted by mail to the examiner before the colloquium.	20%
	Laboratory/seminar activity		

10.6 Minimum performance standards

- Grade 5 both in laboratory / seminar works and exams
- Knowledge about the modalities of process/experimental data acquisition, the computer hardware and software components, the main equipments for process/experimental data acquisition and the main software application for process/experimental data acquisition.

Date: 30.03.2015

Signature of course coordinator: .....

Signature of seminar coordinator: .....

Date of approval: .....

Signature of the head of department: .....