UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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No._____of _____ **USAMV** form **0701040319**

SUBJECT OUTLINE

1. General data

1.1. Higher Education Institution	University of Agricultural Sciences and Veterinary Medicine from Cluj-Napoca
1.2. Faculty	Food Science and Technology
1.3. Departament	Food Engineering
1.4.Domain of study	Food Engineering
1.5.level of study[1)]	Bachelor
1.6.Specialization/ Program of study	Technology of Agricultural Products Processing
1.7. Form of teaching	Full Time

2. Information on the discipline

2.1. Name of the discipline	Control process and measuring devices							
2.2. Course coordinator				Assoc. professor MUNTEAN MIRCEA-VALENTIN				
2.3. Seminar / laboratory/project coordinator				Assoc. professor MUNTEAN MIRCEA-VALENTIN				
2.4. Year of study	IV	2.5. Semester	**VII**	2.6. Type of Evaluation	Sumate	2.7. Course regime	Content[2]	DS
							Level of complulsorine ss[3]	DF ac

3. Total estimated time (teaching hours per semester)

3.1. Hours per week – full time programme	3	of which care: 3.2. lecture	1	3.3. seminar/ laboratory/ project	2
3.4. Total number of hours in the curriculum	42	Of which: 3.5.lecture	14	1. 3.6.seminar/laborator y	28
Distribution of the time allotted					hours
3.4.1. Study based on book, textbook, bibliography and notes					15
3.4.2. Additional documentation in the library, specialized electronic platforms and field					5
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					8
3.4.4.Tutorials					3
3.4.5.Examination					2
3.4.6. Other activities					
3.7. Total hours of individual study	33				
3.8. Total hours per semester	75				
3.9. Number of credits [4]	4				

4. Prerequisites (is applicable)

4.1. curriculum-related	Special mathematics, Physical science, Physical and colloidal chemistry, Technical drawing, Unit operation in food industry, Air conditioning and refrigeration equipment, Electrical engineering and applied electronics
4.2. skills-related	The student should have knowledge of Technical drawing, Equipments in food industry, Unit operation in food industry, Air conditioning and refrigeration equipment, Electrical engineering and applied electronics

5. Conditions (if applicable)

5.1. for the lecture	It follows a direct response of the information presented in question and answer from both students and teachers. Academic discipline enforce the time start and end of the course. We do not allow any other activities during the lecture, mobile phones are closed .
5.2. for the seminar / laboratory / project	Practical work is compulsory to wear dressing gown, consulting advisor practical work, each student will develop an individual activity with laboratory materials made available and described in practice. Academic discipline is required for the duration of works.

6. Specific competences acquired

Proffesional competences	C.2.1. Description and use of basic concepts, theories and methods in the field of process control and measuring device for operation of agri-food chain facilities. C2.2.Explanation and interpretation of basic engineering concepts, methods and models in equipment exploitation issues in the agri-food industry. C.2.3.Application of basic principles and methods within unitary operations for solving engineering and technological problems. C 2.5. Elaboration of projects related to the process control and measuring device in food industry operations.
Transversal competences	CT1 Apply the strategies of perseverance, rigor, efficiency and responsibility at work, punctuality and taking responsibility for the results of personal activity, creativity, common sense, analytical and critical thinking, problem solving, etc., based on the principles of norms and values of the code of professional ethics in the food field. CT2 Application of interrelation techniques within a team; amplifying and refining the empathic capacities of interpersonal communication and of assuming specific attributions in carrying out the group activity in order to treat / resolve individual / group conflicts, as well as the optimal time management; CT 3 Efficient use of various ways and techniques of learning - training for the acquisition of information from bibliographic and electronic databases both in Romanian and in an international language, as well as assessing the need and usefulness of extrinsic and intrinsic motivations of education continue; Elaboration of an individual project based on a technical study through the efficient use of relevant and current documentation resources (internet, databases, courses, etc.).

7. Course objectives (based on the list of competences acquired)

7.1. Overall lecture objective	To know the device and equipment on wich the transformation of raw material into a finished product takes place. To know the installations specific to the sub-branches of the food industry. To understand the functioning of the apparatus that analyzes the phenomena of heat transfer and mass energy that occur during specific operations sub-sectors of the food and appliances respectively installations achieve them.
7.2. Specific objective	To know the functioning of the equipment and installations from the sub-branches specific to the specialization, to develop their skills to resort to notions and theoretical principles in approaching the practical problems encountered in the operations and devices related to the branches of the food industry. To know and use the latest devices, methods and measurement systems that are used in heat transfer processes that occur in the processing of agricultural products in specific installations; To know the important factors with the help of which some new technical and technological projects are elaborated, monitored and implemented; To analyze and evaluate the characteristics, performances and limits of some technological processes and equipments in the field of the agri-food industry; To elaborate a process project specific to the food industry, using basic concepts, theories and methods in the field; To solve concrete food science problems based on a given algorithm.

8. Content

8.1. LECTURE	Methods of teaching	Observations
Number of hours – 14		
Object of control process and measuring device. Generalities. Legal measurement units. Composed units. Constant measurement error. Systematic errors. Random errors. Gross errors. The expression of errors. Methods	Lectures	1 lecture = 2 hours

and means of measurement. Characteristics of measuring instruments. Technical characteristics, metrological and working AMCs, feature nominal working point, the curve of error fidelity, quality, precision, sensitivity, justice, value startup, temperature coefficient, precision, variation, sensitivity, overload capacity; consumption; reliability. Structure and metrology of the means of measuring indices of measuring Parts: transducer, transmission and processing; assemblies output, scale degrees, marks the division, the division, the limits of measurement, area measurement.		
Instruments and apparatus for electric measuring. Classification of electric measuring apparatus and instruments; constructive elements, functioning electrical measuring instruments, tools magneto-electric, electrodynamic instruments, induction tools, digital devices, devices of voltage and electric current: ammeters, voltmeter , multi-meters, ammeters extension measurement.	Lectures	1 lecture = 2 hours
Instruments and apparatus for temperature measuring. Classification, which operate on the principle of dilatation thermometers bodies: bimetal and Mano-metric, thermometers mercury thermometers Thermistor, thermometers thermos-resistive metal, semiconductor thermos-resistive thermometers, thermocouples.	Lectures	1 lecture = 2 hours
Instruments and apparatus for pressure measuring. Pressure manometers with elastic elements. Pressure transducers deformable with elastic element, tensometric pressure transducers, piezoelectric pressure transducers, liquid manometers and differential pressure manometer.	Lectures	1 lecture = 2 hours
Instruments and apparatus for measuring flow. Flowmeters strangulation devices, diaphragm flow meters, Venturi flowmeters, Pitot-Prandtl flowmeters tube, rotameters, rotameters turbine (radial and axial) no perturbative induction flowmeters.	Lectures	1 lecture = 2 hours
Instruments and apparatus for measuring the level of liquids and granular materials and powders. Indirect measurement of the level. Level meters with floater, level meters with detector, digital Leve meters, direct measurement of level, incremental level meters, resistive and capacitive level meters.		
Instruments and apparatus for measuring solids, granular and powdery humidity. Resistive, capacitive devices; UHF frequencies apparatus; gas transducers for measuring humidity, Resistive, capacitive hygrometers, psychrometric hygrometers.	Lectures	1 lecture = 2 hours
Instruments and apparatus for measuring mass. Weighing mechanical balances - analytical, technical, composed, level scale, decimal dial; Scales.	Lectures	1 lecture = 2 hours
Instruments and apparatus for measuring the volume; Laboratory glass and plastic. Special measures.		
Instruments and apparatus for measuring the density of liquids. Dens meters, pycnometers, refractometers, Mohr-Westphal balance**.**		
Instruments and apparatus for measuring pH. pH-meters. Measurement of pH. Factors influencing directly measuring pH.		

8.2. PRACTICAL WORK **Number of hours – 28**		
Introduction. Laboratory safety rules**.**	Analysis MSDS and PCC.	1 lecture = 2 hours
Technical calculation errors, charts and measures of size intervening processes studied in laboratory	Using the Technical calculation applications in the study of measurements of	1 lecture = 2 hours

	the processes occurring in lab.	
Electrical measurements of fundamental measurements with handheld digital and the panel multimeter. Multimeter measurements**.**	Carrying out the measurements on experimental laboratory facility with multimeters;	1 lecture = 2 hours
Measurement of pressure. Location of pressure measuring instruments and equipment installations.	Carrying out the measurements on experimental laboratory facility with manometers;	1 lecture = 2 hours
Measurement of temperature. Location of temperature measuring instruments and equipment installations.	Carrying out the measurements on experimental laboratory facility with thermometers;	1 lecture = 2 hours
Flow measurement using flowmeters. Rotameters with turbine (radial and axial). Analysis of the devices link them in series.	Carrying out the determination with the laboratory pilot plant with rotameter turbine radial and axial.	1 lecture = 2 hours
Mass measurement using analytical and numerical balance.	Performing the determination on the laboratory scales. Analysis of their accuracy.	1 lecture = 2 hours
Measurement of the volumes.	Carrying out the determination on cylinders, graduated glasses, pipettes, laboratory glass and plastic burettes. Analysis of their accuracy.	1 lecture = 2 hours
Measuring salinity. Salinity analyzers.	Making the determination the saline samples from laboratory.	1 lecture = 2 hours
Measuring moisture. Moisture meters.	Carrying out the determination in different points of the premises, storage spaces, ventilation openings and evacuation of noxious substances from laboratories.	1 lecture = 2 hours
Application of measurement methods and equipment studied on practical examples of measuring all parameters within pilot stations	Carrying out determinations on pilot installations	3 lectures = 6 hours
Verifying knowledge	Colloquium on the possibility of placing the devices studied on some examples of plants in food industry	1 lecture = 2 hours

Compulsory bibliography:

1. *Muntean M., Aparate de Masura si Control si Sisteme de Masurare in Industria Alimentara, Ed Risoprint 2010*

Facultative bibliography:

2. *Banu, C. şi col., Manualul Inginerului de Industria Alimentară, vol. I si II, Edit. Tehnică, Bucureşti., 1999*
3. *Chiriac, F., şi alţii, Procese de transfer de căldură şi masă în instalaţii industriale, Editura Tehnică, Buc., 1981;*
4. *Cojocaru, C. si colab. – Manualul inginerului din industria alimentara, Ed. Tehnica, Bucuresti, 1998;*
5. *Dănescu, A., Nicolescu, T., Termotehnică şi instalaţii termice în agricultură, Edit. Didactică şi Pedagogică, Bucureşti, 1967*
6. *Drăghici, N. N., Conducte pentru transportul fluidelor, Editura Tehnică, Buc., 1971;*
7. *Florea, O., Jinescu, g., Procedee intensive în operaţiile unitare de transfer, Editura Tehnică, Bucureşti, 1975;*
8. *Gheorghiu, N., şi col., Utilizarea energiei electrice în industrie şi agricultură, Edit. Tehnică, Bucureşti., 1974;*

9.	*Geankoplis, C.J., Transport processes and unit operations, Prentice-Hall International, Inc., New Jersey, 1993;*
10.	*Janssen, W., Verwarmigstechnieck, V 8801, CST EDE, 1991*
11.	*Moore, C.A., Automation in the Food Industry,Edit. Blackie&Co, Glasgow and London, 1997*
12.	*Muntean Mircea, Gherman Vasile – Fenomene de transfer – Note de curs si lucrari practice, Ed. AcademicPress 2010 ;*
13.	*Popescu, S., Ghinea, T., Automatizarea maşinilor şi instalaţiilor folosite în agricultură, Edit. Scrisul Românesc, Craiova, 1986*
14.	*Rasenescu,A., Fenomene de transfer, Editura Universităţii din Galaţi, 1979;*
15.	*Stefănescu, D., Marinescu, M., Transferul de căldură în tehnică - culegere de probleme pentru ingineri, Editura Tehnică, Bucureşti, 1983;*, Bucureşti, 1983;

9. Corroborating the course content with the expectations of the epistemic community representatives, of the professional associations and of the relevant stakeholders in the corresponding field

In order to identify ways of modernization and continuous improvement of teaching and course content with the current issues and practical problems teachers attend the annual meeting of the Romanian Association of Food Industry Engineers where issues are discussed current and future technologies in Romania and Europe.

10. Assessment

Type of activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Percentage of the final grade
10.4. Lecture	Knowledge of the main methods and apparatus for determining the measurements that characterize technological processes in food	Oral Exam	70%
10.5. Practical Work	Knowing how to determine, processing and interpretation of measurements of the processes simulated in the food industry	Laboratory colloquium	20%
Attendance lecture			10%
10.6. Minimum performance standards			
Mastery of scientific information transmitted through lectures and practical work at an acceptable level. Obtaining the pass mark in test evaluation is the condition of graduation. The final grade must be equal to or greater than 5.			

[1] Level of study- to be chosen one of the following - Bachelor/Post graduate/Doctoral.

[2] Course regime (content) – for bachelor level it will be chosen one of the following - **DF** (fundamental subject), **DD** (subject in the domain), **DS** (specific subject), **DC** (complementary subject).

[3] Course regime (compulsory level) - to be chosen one of the following - **DI** (compulsory subject), **DO** (optional subject), **DFac** (facultative subject)

[4] One ECTS is equivalent with 25-30 de hours of study (didactical and individual study).

[5] Disciplines: AK- Advanced knowledge, CT- Complementary Training, S- Synthesis

Filled in on
06.09.2021

Course coordinator
Assoc. Professor Mircea-Valentin Muntean

Laboratory work/seminar coordinator
Assoc. Professor Mircea-Valentin Muntean

Subject coordinator
Assoc. Professor Mircea-Valentin Muntean

Approved by the
Department on
22.09.2021

Head of the Department
Prof. dr. Sevastita Muste

Approved by the Faculty
Council on
28.09.2021.

Dean
Prof. dr. Elena Mudura