UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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**Nr._____din _____** **Formular USAMV-CN-0307010108**

# FIŞA DISCIPLINEI

## 1. Date despre program

| | |
|---|---|
| 1.1. Instituţia de învăţământ superior | Universitatea de Ştiinţe Agricole şi Medicină Veterinară din Cluj-Napoca |
| 1.2. Facultatea | Zootehnie şi Biotehnologii |
| 1.3. Departamentul | Ştiinţe Fundamentale |
| 1.4. Domeniul de studii | Biotehnologii |
| 1.5. Ciclul de studii[1)] | Master |
| 1.6. Specializarea/Programul de studii | Biotehnologii aplicate |
| 1.7. Forma de învăţământ | IF |

## 2. Date despre disciplină

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1. Denumirea disciplinei | **Tehnici moleculare de autentificare a alimentelor şi detecţia OMG** | | | | | | | |
| 2.2. Titularul activităţilor de curs | | | | Şef lucr. dr. ing. Cristian Ovidiu Coroian | | | | |
| 2.3. Titularul activităţilor de seminar/laborator/proiect | | | | Şef lucr. dr. ing. Cristian Ovidiu Coroian | | | | |
| 2.4. Anul de studiu | 1 | 2.5. Semestrul | 1 | 2.6. Tipul de evaluare | Continuă | 2.7. Regimul disciplinei | Continut[2] | DS |
| | | | | | | | Obligativitate[3] | DI |

## 3. Timpul total estimat (ore pe semestru al activităţilor didactice)

| | | | | | |
|---|---|---|---|---|---|
| 3.1. Număr de ore pe săptămână – forma cu frecvenţă | 3 | din care: 3.2. curs | 1 | 3.3. seminar/laborator/proiect | 2 |
| 3.4. Total ore din planul de invatamant | 42 | din care: 3.5. curs | 14 | 3.6.seminar/laborator | 28 |
| Distribuţia fondului de timp | | | | | ore |
| 3.4.1. Studiul după manual, suport de curs, bibliografie şi notiţe | | | | | 48 |
| 3.4.2. Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate şi pe teren | | | | | 37 |
| 3.4.3. Pregătire seminarii/laboratoare/proiecte, teme, referate, portofolii şi eseuri | | | | | 30 |
| 3.4.4. Tutoriala | | | | | 8 |
| 3.4.5. Examinări | | | | | 10 |
| 3.4.6. Alte activităţi | | | | | 0 |
| 3.7. Total ore studiu individual | 133 | | | | |
| 3.8. Total ore pe semestru | 175 | | | | |
| 3.9. Numărul de credite[4] | 7 | | | | |

## 4. Precondiţii (acolo unde este cazul)

| | |
|---|---|
| 4.1. de curriculum | Genetică, chimia alimentului, inginerie genetică, microbiologie alimentară |
| 4.2. de competenţe | Competente cognitive: cunoasterea si utilizarea adecvata a notiunilor specifice biochimiei, microbiologie alimentară;inginerie genetică<br>Competenţe acţionale: de documentare; lucrul în echipa |

## 5. Condiţii (acolo unde este cazul)

| | |
|---|---|
| 5.1. de desfăşurare a cursului | Cursul este prezentat prin comunicare interactivă, bazată pe instrumente TIC.<br>Studenţii au obligaţia de a respecta orarul destinat cursului.<br>În cazul activităţii didactice desfăşurate on-line, metodele de predare vor fi adaptate adaptate la expunerea prin intermediul platformelor specifice. |
| 5.2. de desfăşurare a seminarului/ laboratorului/ proiectului | La lucrarile practice, este obligatorie respectarea normelor de protecţie a muncii în laborator. Fiecare student va purta echipament de protecţie şi va respecta recomandările de lucru şi de manipulare a reactivilor, pe perioada desfăşurării activităţilor individuale sau de grup, prevăzute în protocoale. Studenţii pot adresa întrebări referitoare la ipoteza de lucru, rezultatele aşteptate şi interpretarea lor. Studenţii participă activ la desfăşurarea activităţilor de lucru. Prezenţa la lucrările practice este obligatorie, conform regulamentului, şi condiţionează participarea la |

| | |
|---|---|
| | colocviu. Promovarea colocviului condiţioneaza participarea la examen.<br>În cazul activităţii didactice desfăşurate on-line, metodele de predare vor fi adaptate adaptate la expunerea prin intermediul platformelor specifice. |

**6. Competenţe specifice acumulate**

| | |
|---|---|
| Competenţe profesionale | Descrierea şi utilizarea conceptelor, teoriilor şi metodelor de bază folosite în controlul calităţii şi expertiza produselor alimentare, referitoare la chimia compuşilor care determină calitatea şi trasabilitatea produselor alimentare, la transformările pe care aceştia le suferă în cursul prelucrării, transportului şi depozitării, la aparatura şi metodele de determinare şi analiză a acestor compuşi şi la legislaţia din domeniu.<br>Cunoaşterea conceptului de „aliment modificat genetic”<br>Cunoaşterea avantajelor şi dezavantajelor induse de obţinerea şi utilizarea alimentelor modificate genetic<br>Cunoaşterea principalelor metode de depistare a alimentelor modificate genetic<br>Manifestarea unei atitutdini responsabile faţă de alimentele modificate genetic<br>Cunoaşterea principalelor alimente modificate genetic existente pe piaţa românească şi internaţională<br>Cunoaşterea legislatiei referitoare la alimentele modificate genetic si a modului de etichetare a acestora |
| Competenţe transversale | Să îşi dezvolte capacitatea de integrarea intr-o echipa de cercetare prin participarea la activitatile de cercetare desfaşurate în cadrul lucrarilor practice;<br>Să îşi dezvolte abilităţi de comunicare cu alţi colegi pentru conceperea/dezvoltarea unor experimente stiintifice referitoare la tematica abordată;<br>Să îşi dezvolte preocupări privind perfecţionarea metodelor de lucru. |

**7. Obiectivele disciplinei** (reieşind din grila competenţelor specifice acumulate)

| | |
|---|---|
| 7.1. Obiectivul general al disciplinei | Disciplina urmareste asimilarea de către studenţi a noţiunilor ce cuprind: noţiuna de aliment modificat genetic, utilitatea lui, influenţa alimentelor modificate genetic asupra plantelor, animalelor, omului, mediului, siguranţa alimentelor modificate genetic, riscul acestor alimente, legislaţia românească şi europeană în domeniu. Din punct de vedere practic studentii se for familiariza cu notiuni de educatie in domeniul nutritiei, cu înţelegerea utilităţii modificărilor genetice, determinarea valorii nutritive a acestor alimente, verificarea siguranţei în consum a alimentelor modificate genetic |
| 7.2. Obiectivele specifice | Dobândirea cunoştinţelor teoretice şi tehnice privind genomica şi biotehnologiile aplicate pentru implementarea şi interpretarea corectă a instrumentelor moleculare pentru selecţia asistată de markeri şi testele de diagnostic utilizate pentru identificarea genetică a speciilor, soiurilor de plante, raselelor şi indivizilor de animale, inclusiv trasabilitatea genetică alimentelor derivate din acestea. |

**8. Conţinuturi**

| **8.1. CURS**<br>**Număr de ore - 28** | Metode de predare | Observaţii |
|---|---|---|
| **Metode moleculare de autentificare a alimentelor** | | |
| Genomica aplicată selecţiei asistate de markeri (MAS) pentru reproducerea speciilor de culturi. Identificarea speciilor prin profilarea ADN-ului cu markeri derivaţi din PCR (SSR, SNP), şi cpDNA şi codul de bare mtDNA; | Prelegere | 1 prelegere |
| Determinarea diversităţii genetice, statisticile de similitudine şi identitate, diferenţierea genetică şi fluxul de gene, parametrii de distanţă genetică, estimările de homozigozitate şi heterozigozitate utile pentru caracterizarea genetică şi identificarea soiurilor de plante (hibrizi, linii pure şi clone) şi rase şi rase de animale ; | Prelegere | 1 prelegere |
| Implementarea testelor de diagnostic molecular pentru trasabilitatea genetică a produselor agroalimentare prin amprentarea ADN, genotiparea SSR şi haplotiparea SNP. | Prelegere | 1 prelegere |
| Tehnici moleculare de autentificarea a alimentelor de origine animală bazate pe analiza variabilităţii proteomului: electroforezele in gel de poliacrilamida (IEF, PAGE, 2D-PAGE), Western blot, ELISA, MALDI-TOF MS; | Prelegere | 1 prelegere |

| | | |
|---|---|---|
| Tehnici moleculare de autentificarea a alimentelor de origine animală bazate pe analiza variabilităţii genomului/trancriptomului | Prelegere | 1 prelegere |
| Organisme modificate genetic (OMG). Introducere. Definitii. Istoric al alimentelor modificate genetic<br>Metode de modificare genetica. Tehnologia ADNului recombinat. Tehnologia ADN-ului liber. Tipuri de aplicatii ale modificarilor genetice la obtinerea produselor de origine vegetala si animala.<br>Argumente pro si contra utilizarii modificarilor genetice. Beneficiile utilizarii modificarilor genetice : asupra plantelor de cultura, asupra cantitatii si calitatii alimentelor, asupra industriei alimentare si biotehnologii, | Prelegere | 3 prelegeri |
| Atitudini privind obtinerea si consumarea alimentelor modificate genetic: impactul asupra mediului, raspnadirea organismelor modificate genetic prin intermediul polenului, alergenitatea, rezistenta la actiunea virusurilor, transferul rezistentei la antibiotice, aparitia noilor toxine naturale. | Prelegere | 2 prelegeri |
| Impactul alimentelor modificate genetic asupra organismelor vii: impactul asupra sistemului imunitar, digestiv, respirator, metabolismului | Prelegere | 1 prelegere |
| Prevederi legislative la nivel national, european si international privind alimentele modificate genetic. Etichetarea alimentelor modificate genetic | Prelegere | 1 prelegere |
| Organisme Europene si mondiale implicate in studierea si monitorizarea alimentelor modificate genetic. Implicarea EFSA in privinta alimentelor modificate genetic | Prelegere | 1 prelegere |
| Alimente modificate genetic versus alimente organice.<br>Harta alimentelor modificate genetic in lune, Europa, Romania | Prelegere | 1 prelegere |

| **8.2. LUCRĂRI PRACTICE**<br>**Număr de ore - 28** | Metode de predare | Observaţii |
|---|---|---|
| Purificarea acizilor nucleici (ADN, ARN) si/sau a proteinelor recoltate din diverse surse biologice (sange, par, tesut, produse alimentare, furaje etc.) si evaluarea calitatii lor; | Demonstraţie practică | 1 lucrare de laborator |
| Evaluarea autenticitatii declarate (specia de provenienta) a carnii/unor produse din carne (ex. rumegatoare, suine, cabaline, pasari) pe baza unor markeri ADN (autozomali sau mitocondriali) analizati prin tehnicile PCR/Real-Time PCR/RFLP; | Demonstraţie practică | 2 lucrări de laborator |
| Certificarea in produse din carne de porc a rasei de provenienta pe baza unor markeri ADN analizati prin tehnica PCR/RFLP; | Demonstraţie practică | 1 lucrare de laborator |
| Evaluarea autenticitatii declarate (specia de provenienta) a laptelui/branzeturilor pe baza unor markeri ADN (autozomali) analizati prin tehnicile PCR/Real-Time PCR/RFLP. Certificarea rasei/originii geografice a unor branzeturi | Demonstraţie practică | 2 lucrări de laborator |
| Prelevarea probelor pentru analiza prezentei organismelor modificate genetic. Tehnici de testare a alimentelor suspicionate ca contin organisme modificate genetic: ELISA, PCR | Demonstraţie practică | 1 lucrare de laborator |
| Evaluarea cunostintelor generale ale studentilor in legatura cu organismele modificate genetic si a alimentelor modificate genetic. | Demonstraţie practică | 1 lucrare de laborator |
| Companii cu obiect de activitate: producerea organismelor modificate genetic (Montsanto). Alimente modificate genetic versus alimente organice | Demonstraţie practică | 1 lucrare de laborator |
| Tehnici de evidentiere a alimentelor modificate genetic: ELISA si PCR | Demonstraţie practică | 2 lucrări de laborator |
| Studiu de caz: etichetarea alimentelor modificate genetic. Monitorizarea existentei inscriptiilor pe etichetele unor produse alimentare cu privire la includerea unor produse vegetale/animale modificate<br>genetic in compozitia alimentului respectiv. Raportarea la legislatia nationala, europeana si internationala cu privire la etichetare | Demonstraţie practică | 2 lucrări de laborator |
| Dezbatere: alimente modificate genetic. Studentii vor prezenta opinii pro si contra din punctul de vedere al companiilor biotehnologice, fermierilor, consumatorilor, comerciantilor | Demonstraţie practică | 1 lucrare de laborator |
| *Bibliografie Obligatorie: Notite de curs si de laborator,* | | |
| *Bibliografie Facultativă:*<br>Gianni Barcaccia e Mario Falcinelli, Genetica e genomica. Vol. III Genomica e biotecnologie genetiche.. --: Liguori Editore, Napoli., 2006. Cerca nel catalogo<br>Martino Cassandro, Marcello Mele e Erminio Trevisi, Sicurezza e tracciabilità nei sistemi di produzione del latte.. --: | | |

ARACNE editrice S.r.l. Roma., 2010

**9. Coroborarea conţinuturilor disciplinei cu aşteptările reprezentanţilor comunităţilor epistemice, asociaţilor profesionale şi angajatori reprezentativi din domeniul aferent programului**

Atat cursul cat si partea de lucrari practice au fost concepute in asa fel incat sa imbine armonios aspectele teoretice si practice privind autentificarea alimentelor prin tehnici moleculare, raportate la celei mai noi descoperiri si unele cerinte legislative din domeniu. Autentificarea alimentelor, in scopul depistarii posibilelor adaosuri de materii prime de la specii nedeclarate pe eticheta sau a excesului unor materii prime mai ieftine folosite inlocuitor (de exemplu, adoas de soia in produse din carne/lapte), este o necesitate, deoarece falsificarea lor reprezinta la ora actuala o reala problema care intereseaza atat consumatorii cat si procesatorii onesti sau autoritatile de control. De aceea in cadrul cursului si a lucrarilor practice sunt integrate armonios metodologiile de lucru utilizate in cadrul laboratorului nostru si rezultatele obtinute in acest domeniu, care pot constitui reale solutii pentru limitarea acestui fenomen.

**10. Evaluare**

| Tip activitate | 10.1. Criterii de evaluare | 10.2. Metode de evaluare | 10.3. Pondere din nota finală |
|---|---|---|---|
| **10.4. Curs** | | Examen scris sau oral | 60% |
| **10.5. Seminar/Laborator** | | Colocviu final si/sau verificari periodice si/sau intocmire referate | 40% |
| **10.6. Standard minim de performanţă** | | | |
| Participarea la examenul teoretic final este conditionata de prezenta in cadrul tututor lucrarilor practice si de obtinere minim a notei 5 la colocviu. In cadrul lucrarilor practice se asteapta implicarea studentilor care va conta la nota finala. Nota finala de promovare a examenului teoretic trebuie sa fie minim 5. | | | |

[1] Ciclul de studii – se alege una din variantele Licenta/Master/Doctorat
[2] Regimul disciplinei (continut) – pentru nivelul de licenta se alege una din variantele – **DF** (disciplina fundamentala), **DD** (disciplina din domeniu), **DS** (disciplina de specialitate ), **DC** (disciplina complementara).
[3] Regimul disciplinei (obligativitate)- se alege una din variantele – **DI** (disciplina obligatorie) **DO** (disciplina optionala) **DFac** (disciplina facultativa).
[4] Un credit este echivalent cu 25-30 de ore de studiu (activitati didactice si studiu individual).

| **Data completării** | **Titular curs** | **Titular lucrari laborator/seminarii** |
|---|---|---|
| **23.09.2021** | **Şef lucr. dr. ing. Cristian Ovidiu Coroian** | **Şef lucr. dr. ing. Cristian Ovidiu Coroian** |

**Data avizării în departament** **30.09.2021**

**Director de departament**
**Sef lucr.dr. Camelia Răducu**

**Nr._____din _____** **Formular USAMV 0311010103**

**DISCIPLINE SHEET**

**1. Data about the program**

| | |
|---|---|
| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine from Cluj- |
| 1.2. Faculty | Animal Sciences and Biotechnology |
| 1.3. Department | Fundamental Sciences |
| 1.4. Field of study | Biotechnology |
| 1.5.Study cycle[1)] | Master |
| 1.6. Specialization / Study program | Applied Biotechnology |
| 1.7. Form of education | Daily frequency |

**2. Date despre disciplină**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1. Name of the discipline | **GENOMICS** | | | | | | | |
| 2.2. The titular of the course activities | | | | Dr. Adriana Carolina Aurori | | | | |
| 2.3. Titular of seminar / laboratory / activities Project | | | | Dr. Adriana Carolina Aurori | | | | |
| 2.4. Year of the study | I | 2.5. Semester | **I** | 2.6. Type of evaluation | Summative | 2.7. Discipline regime | Content[2] | DD |
| | | | | | | | Compulsoriness[3] | DI |

**3. Estimated total time** (hours per semester of teaching activities)

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Number of hours per week - frequency form** | 4 | of which: 3.2. course | 2 | 3.3. seminar / laboratory / project | 2 |
| **3.4. Total hours in the curriculum** | 56 | of which: 3.5.course | 28 | 3.6. seminar / laboratory | 28 |
| **Distribution of time fund** | | | | | hour |
| **3.4.1. Study of textbook, course support, bibliography and notes** | | | | | 40 |
| **3.4.2. Additional documentation in the library, on specialized electronic platforms and in the field** | | | | | 30 |
| **3.4.3. Preparation of seminars / laboratories / projects, topics, papers, portfolios and essays** | | | | | 20 |
| **3.4.4.Tutorial** | | | | | 9 |
| **3.4.5.Exames** | | | | | 20 |
| **3.4.6. Other activities** | | | | | |
| **3.7. Total individual study hours** | 119 | | | | |
| **3.8. Total hours per semester** | 175 | | | | |
| **3.9. Number of credits[4]** | 7 | | | | |

**4. Preconditions** (where applicable)

| | |
|---|---|
| 4.1. of curriculum | Genetics, Genetic Engineering, English |
| 4.2. of skills | Knows the structure and functions of genetic material; Explains and can formulate integrated reasoning about cellular structures that play a genetic role and their functions. |

**5. Conditions** (where applicable)

| | |
|---|---|
| 5.1. for conducting the course | Based on previous knowledge of Genetics and Genetic Engineering, new information on the organization and functioning of genomic information is introduced; the new branch of Molecular Genetics - Genomics is presented. The course is presented through interactive communication, based on ICT tools. Students have the obligation to respect the schedule of the course. |
| 5.2. for conducting the seminar / laboratory / project | Attendance at the practical works is mandatory and conditions the participation in the exam. Academic discipline is required throughout the practical works. |

**6. Competenţe specifice acumulate**

| | |
|---|---|
| professional competences | • Using the theoretical and practical foundations of genomics in order to apply them in related fields of interest<br>• Expertise in the study and work with genetic databases, with applications in biotechnologies and other related areas<br>• Ability to design and conduct research in the molecular field under conditions of qualified assistance. |
| Transversal competences | ✓ Objective self-assessment of the need for continuous vocational training in order to constantly adapt and respond to new economic needs and requirements<br>✓ Elaboration and management of research projects in the field of molecular genetics with applicability in agriculture, animal husbandry, veterinary and human medicine. |

**7. Discipline objectives** (based on the grid of specific skills acquired)

| | |
|---|---|
| 7.1. The general objective of the discipline | Development of knowledge in the field of molecular genetics and genomics for acquiring specialized professional skills |
| 7.2. Specific objectives | ✓ Application of current approaches of genomics in biotechnologies<br>✓ Ability to manage information from genetic databases for development of practical applications, including in basic research<br>✓ Critical analysis of genomic information to reconfigure the problem in fundamental, population and quantitative genetics<br>✓ Applications of genomic information in the genomic selection of populations of animals, metagenomic studies, studies of genetic variability in microorganisms, viruses, plants and animals, as well as in studies of developmental genetics, etc.<br>✓ Acquiring the necessary practical skills in the molecular genetics / genomics laboratory<br>✓ Developing the ability to act independently and creatively in solving problems that use genomic data |

**8. Content**

| **8.1.COURSE** | **Methods** | **Observations** |
|---|---|---|
| **Number of hours – 28** | | |
| **From Classical Genetics to Modern Genetics -** Introduction to the Current Field of Study of Molecular Genetics and Genomics. | Lecture | 0,5 lecture |
| **Basic Resources in Molecular Genetics:** Genetic Databases, Molecular Genetic Maps, and Model Organisms (Prokaryotic and Eukaryotic Model) | Lecture | 1,5 lecture |
| **Cellular structures with a genetic role** | Lecture | 1 lecture |
| **The genome in cell organization**<br>**Organization of DNA sequences in the eukaryotic and prokaryotic genome** | Lecture | 1 lecture |
| **The functions of genetic material**<br>The new concept of gene and the functions of genetic material in the post-genomic era | Lecture | 2 lectures |
| **Gene mutations** | | 1 lecture |
| **Structural genomics:**<br>**De novo deciphering a genome and deciphering a genome from a reference genome** | Lecture | 3 lectures |
| **1. Hierarchical Shotgun Sequencing**<br>Converting the genome into clones and clones into a genome<br>Preparation of physical maps - saturation of maps in markers<br>Types of markers: RFLP, STR, VNTR, STS and mapping methods Basic techniques for study and research in Genomics (PCR, Hybridization and NextGen Sequencing)<br>Genomic libraries - Calculation of the required number of colonies for the preparation of the genomic library. Molecular cloning in BAC and YAC vectors. Subcloning into plasmid vectors, λ phages and other categories of vectors. Dideoxy sequencing in clone-to-clone strategy. Genomic sequence assembly. | Lecture | 1 lecture |

| | | |
|---|---|---|
| **2. The whole genome shotgun sequencing method** (Whole Genome Shotgun Sequencing) with NGS technology. Genome assembly and completion | Lecture | 1 lecture |
| **Functional genomics:** annotation of genomic sequences<br>Identifying unique sequences: building cDNA libraries<br>Mapping EST markers (Expressed Sequence Tag)<br>Computerized and experimental analysis of gene functions. Annotation of variations in the genome: SNPs and haplotypes. Transcriptome and proteome: definition, study methods and practical applications | Lecture | 1 lecture |
| **Comparative genomics:** practical applications of comparative genomics in fundamental and applied research | Lecture | 1 lecture |
| **Genomic Engineering -** Introduction to the field of study of genomic editors. | Lecture | 1 lecture |
| **8.2.PRACTICals**<br>**Number of hours - 28** | | |
| Presentation of the framework of the molecular genetics laboratory.<br>Introduction to the efficient use of informatics in molecular genetics. | Practical | 1Laboratory |
| DNA analysis.<br>Familiarization with PCR amplification methods and Souther blotting and microarray hybridization | Practical | 1Laboratory |
| Familiarization with the Sanger sequencing method and the new generation sequencing methods (NGS) 454 Roche, Illumina, Ion Torent, PacBio, Oxford Nanopore. Key elements in Next Gen sequencing: the format of their quality sequences; NGS sequence quality assessment indices | Practical | 1Laboratory |
| Access and use of genomic databases (GenBank / EMBL-EBI / DDBJ) and of model organisms. | Practical | 1Laboratory |
| Search tools available on NCBI (PubMed) | Practical | 1Laboratory |
| Using genetic databases and saving molecular information - (Gene, GenBank, RefSeq; Orthologs) | Practical | 1Laboratory |
| Using Genomic Resources with the Genome Data Viewer (Ensembl) | Practical | 1Laboratory |
| Use of genomic databases to identify variations at the molecular level (OMIM and OMIA). Methods for identifying genomic and transcriptomic polymorphisms in silico. | Practical | 1Laboratory |
| Computerized analysis of experimental sequences for annotation. Sequence alignment methods and analysis of similarity between nucleotide and amino acid sequences using the BLAST Program; variants of the BLAST program (Blastn and Megablast) and other specialized tools. Reading and interpreting the results | Practical | 1Laboratory |
| Using the BLAST instrument on NCBI for protein sequence analysis | Practical | 1Laboratory |
| Using the BLAST tool to identify bacterial communities (Mole-Blast)<br>De novo study of a genomic sequence - amplification strategies and the use of the Primer blast tool | Practical | 1Laboratory |
| Verification of knowledges | Colloquy | 1Session |

***Mandatory Bibliography:***


1. Cosier Viorica, 2019, De la Genetica moleculara la Genomica, Ed. Risoprint Cluj-Napoca
2. Coşier Viorica, Note de curs
3. Coşier Viorica, 2008, Inginerie genetică, Ed. Risporint Cluj-Napoca
4. Peter J. Russel, 2009, *i*Genetics – A Molecular Aproach, Ed. Pearson International
5. Shendure, Jay, and Hanlee Ji. "Next-generation DNA sequencing." Nature biotechnology 26.10 (2008): 1135.
6. Trapnell, Cole, and Steven L. Salzberg. "How to map billions of short reads onto genomes." *Nature biotechnology* 27.5 (2009): 455-457.
7. Schatz, Michael C., Arthur L. Delcher, and Steven L. Salzberg. "Assembly of large genomes using second-generation sequencing." *research* 20.9 (2010): 1165-1173.
8. Garber, Manuel, et al. "Computational methods for transcriptome annotation and quantification using RNA-seq." *Nature methods* 8.6 (2011):
9. Duran, Chris, et al. "Molecular genetic markers: discovery, applications, data storage and visualisation." *Current Bioinformatics* 4.1 (2009): 1
   Varshney, Rajeev K., et al. "Next-generation sequencing technologies and their implications for crop genetics and breeding." Trends in biotetech. 27.9 (2009): 522-530.

***Optional Bibliography:***

10. Brown, T.A., 2002, Genomes, John Wiley /Sons Inc., New York
11. Griffiths, J.F., Miller J.H., Suzuki, D.T., Lewontin, C.R.,Gelbart, W.M., 1993, An Introduction in Genetic Analysis., Fifth Edition. W.H.Freeman and Company, New York.
12. Hartwell, L. H., Hood, L., Goldberg, L.M., Ann Reynolds, Silver, Lee M., Veres, R., 2006, Genetics – From Genes to Genomes, McGraw Hill Comp.
13. Watson, D.J., Gilman, M., Witkowski, J., Zoller, M., 1992, Recombinant DNA, Second Edition, W.H. Freeman and Company, New York.
14. Watson, J.D., Baker,T.A, Bell, S.P, Gann, A., Levine, M., Losick, R., Molecular Biology of the Gene, 5th Edition, 2003, Pearson –Benjamin Cummings
15. Rampal, J.B.- 2007, Microarrays – Application and Data Analysis, in Methods in Molecular Biology, Human Press, NJ
16. Albala, J.S., Humphery-Smith. I., 2003, Protein Arrays, Biochip and Proteomics-The next Phase of Genomic Discovery, Marcel Dekker Inc. , NY-Basel
17. Pierce B., 2008, Genetics- A conceptual Approach,Hardcover
18. Smith G., 2005, The Genomics Age, Amacom USA.


**9. Corroborating the contents of the discipline with the expectations of the representatives of the epistemic communities, professional associations and representative employers in the field related to the program**

The course is updated annually with new discoveries in the field and is corroborated with practical applications in the field of genomics.

**10. Evaluation**

| Activity type | 10.1. Evaluation criteria | 10.2. Evaluation methods | 10.3. % from the final mark |
|---|---|---|---|
| **10.4. Course** | Knowledge of new approaches in molecular genetics based on genomic data and practical applications developed to solve the problem in different fields<br>Critical approach to the subjects during the examination to solve the problem, specific to the field of genomics | Written exam | 50% |
| **10.5. Seminar/Laboratory** | Knowledge and application of the way of working with genetic databases (NCBI) | Practical colloquium | 50% |
| **10.6. Minimum performance standard** | | | |
| The student is familiar with specialized terminology and new discoveries in the field of genomics and uses scientific information transmitted through lectures and practical work at an acceptable level, for its integration into practical applications; critically analyzes the information and establishes logical links for its application in related fields, including in the research activity. | | | |

[1]The study cycle - one of the variants is chosen - License / Master / Doctorate

2 Discipline regime (content) - for the license level one of the variants is chosen - DF (fundamental discipline), DD

(discipline in the field), DS (specialized discipline), DC (complementary discipline).
3 Discipline regime (compulsory) - choose one of the variants - DI (mandatoryry discipline) DO (optional discipline) DFac (optional discipline).
4 One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

| Date | Titular course | Titular laboratory/seminary |
|---|---|---|
| September 2021 | Dr. Adriana Aurori | Dr. Adriana Aurori |

Date of approval in department.....
.....

Department director
Assoc. Prof. Dr Constantinescu Radu

**Nr._____din _____** **Form code USAMV 0311010104**

## COURSE DESCRIPTION

**1. General data**

| | |
|---|---|
| 1.1. Higher Education Institution | University of Agricultural Sciences and Veterinary Medicine |
| 1.2. Facultaty | Animal Sciences and Biotechnologies |
| 1.3. Departament | II Technological sciences |
| 1.4.Domain of study | Biotechnologies |
| 1.5.level of study[1)] | Masters |
| 1.6.Specialization/ Program of study | Applied Biotechnologies |
| 1.7. Form of teaching | IF |

**2. Characteristics of the course**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1. Name of the course | Nutritional genomics | | | | | | | |
| 2.2. Course leader | | | | Lecturer dr. Cristian-Ovidiu Coroian | | | | |
| 2.3. Coordinator of the laboratory/seminars activity | | | | Lecturer dr. Cristian-Ovidiu Coroian | | | | |
| 2.4. Year of study | I M | 2.5. Semester | I | 2.6. Type of Evaluation | Summative | 2.7. Course regime | Content[2] | DS |
| | | | | | | | Level of complulsory[3] | DI |

**3. Total estimated time** (hours/semester for the teaching activities)

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Number of hours/week– frequency form** | 2 | of which care: 3.2. course | 1 | 3.3. laboratory | 1 |
| **3.4.Total hours in the teaching curricula** | 28 | of which: 3.5.course | 14 | 3.6. laboratory | 14 |
| **Distribution of time** | | | | | hours |
| **3.4.1.Study based on hand book, notes, bibliography** | | | | | 26 |
| **3.4.2. Extra documentation in the library, on specific electronic platforms and on field** | | | | | 18 |
| **3.4.3. Prepare the seminars / laboratories / projects, theme, essays,reports, portofolio** | | | | | 18 |
| **3.4.4.Tutorial** | | | | | 4 |
| **3.4.5.Examination** | | | | | 6 |
| **3.4.6. Other activities** | | | | | |
| **3.7. Total hours of individual study** | 72 | | | | |
| **3.8. Total hours on semester** | 100 | | | | |
| **3.9. Number of ECTS [4]** | 4 | | | | |

**4. Pre-conditions** (where is the case)

| | |
|---|---|
| 4.1. of curriculum | Biotechnologies in animal nutrition, Animal genetics, Genetic engineering. |
| 4.2. of competences | The MA Student must have knowledge regarding the adequate use of the specific terminology used in nutritional genomics and establishing the influence of diet and individual nutrients on genetic programing of cells and tissues. |

**5. Conditions** (where is the case)

| | |
|---|---|
| 5.1. of course development | The lecture is interactive; the MA students can address questions regarding the content of the presentation. Also, the teacher asks questions regarding the topics presented in the lecture. The academically discipline entails that the beginning and finishing times of the lecture are kept.<br>No other activities are tolerated throughout the lecture; the mobile phones are kept shut down.<br>In the case of online courses, the teaching methods are adapted. |
| 5.2. of laboratory development | In seminars, each student will acquire knowledge regarding the nutritional profile of the food and will carry out an individual activity that will comprise of identification, characterization and use of some nutrigenomics products. Also, the MA student will identify genes of interest for nutritional genomics: obesity genes, cancer responsible genes and the involvement of nutrigenomics in prevention of |

| | |
|---|---|
| | diabetes.Academically discipline is required throughout the seminars duration.<br>In the case of practical work carried out online, the teaching methods are adapted. |

**6. Specific competences gained**

| | |
|---|---|
| Proffesional competences | Development of efficient methods of using nutrigenomics products.<br>Implementing laboratory techniques (DNA tests, "genetic chip" technology) in order to establish the effects of nutrients or food additives on gene expression in the human body.<br>Developing more efficient methods for the treatment of some nutritional diseases using nutrigenomics. |
| Transversal competences | Implementing new management methods, based on nutrient-gene interaction, in the prevention and treatment of complex chronically maladies.<br>Implementing and using functional genomics in evaluating the risks and benefits of the micro and macro-nutrients.<br>Evaluation of the benefits of nutritional genomics on the health status in humans. |

**7. Suject Objectives** (as a result of the specific competences gained)

| | |
|---|---|
| 7.1. Subject general objective | Introducing the MA student in the field of nutritional genomics and acquiring the specific terminology.<br>Knowledge regarding the diet-based gene-environment interaction; gene-nutrient interaction, nutrients as modulators of the gene expression, genetic variability and nutritional requirements; nutrigenomics products, etc. |
| 7.2.Specific objective | Knowledge of the way nutrition influences homeostasis and development of strategies for disease prevention and treatment.<br>Understanding the nutrigenomics techniques that allow quantifying the effects of a single key nutrient on the genes expression profiles for thousands of genes.<br>Understanding the implication of using organic Selenium (Sel-Plex) in nutritional genomics. |

**8. Content**

| **8.1.COURSE**<br>**Number of hours – 14** | Methods of teaching | Observations |
|---|---|---|
| Defining nutritional genomics and introducing the specific terminology (metabolomics, nutrigenomics, genomics). Acquiring the specific terminology of nutrigenomics. | Lecture | 1 lecture |
| Progress in formulation of optimal feeding regimes. Defining the optimal diet; lipids and specific fatty acids in diet; carbohydrates; proteins; calcium and dairy products, vitamin and mineral supplements. Impact of optimal diet on health status. | Lecture | 2 lectures |
| Interaction between genes and nutritional environment. Measuring genetic and environmental factors: diet-based gene-environment interactions; gene-microorganism interactions. | Lecture | 1 lecture |
| Gene-nutrient interaction in type I and II diabetes. | Lecture | 1 lecture |
| Uses of the animal model. Detecting the gene interactions; polyphenols in green tea and cancer prevention; Maternal nutrition. | Lecture | 2 lectures |
| Nutrients and gene expression. Direct and indirect regulation of gene expression through nutrients; Nutrients as ancestral modulators of gene expression. | Lecture | 1 lecture |
| Nutritional genomics in safe and efficient assessment of food components. Nutrition and genomics convergence. Using functional genomics in assessment of risks and | Lecture | 2 lecture |

| | | |
|---|---|---|
| benefits of micro and macro-nutrients. Nutrient-nutrient interaction. | | |
| Genetic variability and nutritional requirements. Nutrients and disease prevention. Genetic variability of human populations and diet. | Lecture | 2 lectures |
| Ethical aspects in nutritional genomics. Benefits of nutritional genomics on human health; nutrigenomics products (probiotics, prebiotics, phytochemicals); Access to nutrigenomics. | Lecture | 2 lectures |

| | | |
|---|---|---|
| **8.2.PRACTICAL WORK**<br>**Number of hours – 14**<br>Determining the nutritional profile of food expressed using the nutritional density index, caloric density index, glycemic index, antioxidant score, alkalizing or acidifying biochemical profile. | Carrying out chemical analysis | 2 seminars |
| Identification, characterization and use of nutrigenomics products: probiotics, prebiotics, phytochemicals (tannins, carotenoids, flavonoids, phytoestrogens, glucosinolates). | The study of nutrigenomics products | 2 seminars |
| Knowledge of the effects of organic selenium (Sel-Plex) in nutritional genomics. Determining the ARN levels using fluorescent makers in order to record the nutritional effects of Sel-Plex. | Carrying out chemical analysis | 2 seminars |
| Use of the PCR technique to identify genes of interest for nutritional genomics like the genes for obesity or the genes that lead different types of cancer. Identification of the gene controlling the sensitivity to insulin (GNB3), of the gene responsible for hunger sensation (NPY) an the gene stimulating the formation of the adipose deposits (Beta 3). | Carrying out laboratory techniques | 3 seminars |
| Using computer to analyze the DNA sequences and identifying genes of metabolic interest (gene for obesity). | Carrying out computer techniques | 2 seminars |
| Preventive diagnosis of some specific diseases (type I and II diabetes, early obesity) and highlighting the genes responsible for this diseases. | Carrying out laboratory techniques | 2 seminars |
| Knowledge regarding the differentiated nutrition, according to a person's blood type. | Nutrition study group according to a person's blood type | 1 seminar |

*Compulsory bibliography:*


1. Simopoilos, J.M. Ordovas- Nutrigenetics and nutrigenomics, Ed. World Review of Nutrition and Dietetics, 2004.
2. Kaput Jim, Raymond L. Rodriguez- Nutritional genomics, Ed. Wiley- Interscience, 2006.
3. Surai P. – Selenium in nutrition and health, Ed. Nottingam University Press, 2006.
4. Coşier Viorica – Inginerie genetică, Ed. Risoprint Cluj- Napoca, 2008.
5. Note de curs


*Facultative bibliography:*


1. Mencinicopschi G., Nutrigenomica, Ed. Planta Romanica Bucureşti, nr. 13, pg. 18, 2006.
2. Ong E. R. T. J. – Nutritional genomics. BMJ 324, 1438 – 42, 2002.
3. Nutriția și gena Performanță Profitabilitate- Turneul de conferințe pentru Europa , Orientul Mijlociu și Africa de Nord, Alltech 2007
4. www.medicinalive.com


**9. Corroboration of the subject content with teh expectations of the epistemic communities` representatives,of the proffesional associations and representatives employers in the domain**

In order to modernize and improve the topics of the lecture and seminar, the teaching staff participate to international symposiums held at the National Institute for Research and Development in Biology and Animal Nutrition Balotești, were present themes are debated regarding the contribution of nutrigenomic products to the quality improvement of the

| |
|---|
| human life. |

**10. Evaluation**

| Type of activity | 10.1. Evaluation criteria | 10.2. Evaluation methods | 10.3. Percent of the final grade |
|---|---|---|---|
| **10.4. Course** | Progress made in elaborating optimal food regimes.<br>Knowledge regarding the gene-environment and gene-nutrient interactions in the prevention of some maladies<br>Knowledge regarding the influence of nutrients on gene expression.<br>Genetic variability and nutritional requirements.<br>Benefits of nutritional genomics on health status. | oral exam | 70% |
| **10.5. Laboratory** | Knowledge regarding the nutritional profile of food<br>Knowledge and use of nutrigenomic products: probiotics, prebiotics, phytochemicals, organic minerals and their implications in nutrigenomics.<br>Knowledge regarding the implication of some genes in the epidemiology of certain maladies. | A colloquy is taking place, with regard to the evaluation criteria presented. | 30% |
| **10.6.Minimal standard of performance**<br>Learning the data presented during the lectures and seminars at an acceptable level. A graduation requisite is a passing grade at the lectures and seminars. | | | |

Date of completition
21.09.2021

Course coordinator
Lecturer dr. Cristian-Ovidiu Coroian

Leader of the laboratory
Lecturer dr. Cristian-Ovidiu Coroian

Date of Department`s aproval.....

Department manager
Prof.dr. Camelia Maria Răducu

UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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**No._____from _____** **USAMV form 0311010105**

# SUBJECT OUTLINE

## 1. Information on the programme

| | |
|---|---|
| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca |
| 1.2. Faculty | Animal Husbandry and Biotechnologies |
| 1.3. Department | Department 2 – Technological Sciences – Animal Husbandry |
| 1.4. Field of study | Biotechnologies |
| 1.5. Cycle of study[1] | Master |
| 1.6. Specialization / Study programme | Applied Biotechnologies |
| 1.7. Form of education | Full time |

## 2. Information on the discipline

| | |
|---|---|
| 2.1. Name of the discipline | Ethics and Academic Integrity |
| 2.2. Course coordinator | Lecturer Mihai Șuteu, PhD |
| 2.3. Seminar / laboratory / project coordinator | Lecturer Mihai Șuteu, PhD |

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Hours per week – full time programme** | 2 | Out of which: 3.2. lecture | 1 | 3.3. seminar/ laboratory/ project | 1 |
| **3.4. Total number of hours in the curriculum** | 28 | Out of which: 3.5. lecture | 14 | 3.6. seminar/laboratory | 14 |
| **Distribution of the time allotted** | | | | | hours |
| **3.4.1. Study based on book, textbook, bibliography and notes** | | | | | 15 |
| **3.4.2. Additional documenting in the library, specialized electronic platforms and field** | | | | | 15 |
| **3.4.3. Preparing seminars / laboratories / projects, subjects, reports, portfolios and essays** | | | | | 10 |
| **3.4.4. Tutorials** | | | | | 3 |
| **3.4.5. Examinations** | | | | | 2 |
| **3.4.6. Other activities** | | | | | - |
| **3.7. Total hours of individual study** | 30 | | | | |
| **3.8. Total hours per semester** | 75 | | | | |
| **3.9. Number of credits[4]** | 3 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.4. Year of study | I | 2.5. Semester | I | 2.6. Type of evaluation | Periodical | 2.7. Discipline status | Content[2] | AP |
| | | | | | | | Compulsoriness[3] | OD |

**3. Total estimated time** (teaching hours per semester)

**4. Prerequisites** (is applicable)

| | |
|---|---|
| 4.1. curriculum-related | Not applicable |
| 4.2. skills-related | Not applicable |

.

**5. Conditions** (if applicable)

| | |
|---|---|
| 5.1. for the lecture | This academic discipline requires compliance with the start and end of the session duration. The course is interactive, students can ask questions regarding the content. We do not allow any other activities during the lecture, mobile phones will be powered off. |
| 5.2. for the seminar/ laboratory/ project | Seminars take place both in the laboratory, where the students are introduced to the course topics, as well as in the university library |

**6. Specific competences acquired**

| | |
|---|---|
| Professional competences | Students will gain competences specific to academic ethics and academic integrity. This course will enable students to develop academic papers (papers, scientific reports, theses and dissertations) according to the latest standards in the field. The course will allow students to search electronic databases to identify the latest news in the field, to manage bibliographic references and to use them in accordance with national and international laws on plagiarism. The overall objective is to train students to use these competences in their professional and moral development. |
| Transversal competences | We aim to develop competences related to the main of view in academic ethics and to form abilities to recognise and solve problems with ethical implications (moral dilemmas). The principles (e.g. scientific publications ethics) and the techniques (e.g. knowledge of the functionalities of the Review tab of the Microsoft Word text editor, or reference management software) have a wide applicability, the skills being useful to the students in the writing of non-scientific documents (e.g.: CV, letter of intent etc.). The students will gain knowledge and abilities required to understand, respect, and implement ethical codes and professional integrity, such as (but not limited to) the laws and regulations regarding plagiarism. |

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

| | |
|---|---|
| 7.1. Overall course objective | This course is intended to familiarize the student with to academic ethics and academic integrity. The course is compulsory for students of the first year. |
| 7.2. Specific objectives | To understand the complexity of ethics as a broad domain.<br>To grasp basic ethical aspects related to the field of Biotechnologies.<br>To know the types of academic / scientific documents.<br>To know the main databases that host the main flow of scientific literature and the various ways to search them.<br>To know how to handle bibliographic references.<br>To know the correct way of citing references in the text, and of drawing up of the bibliographic list.<br>To know the rules of academic writing.<br>To know the laws and regulations regarding plagiarism.<br>To know the university's Code of Ethics. |

**8. Content**

| **8.1.LECTURE**<br>**Number of hours – 14 hours** | Teaching methods | Notes<br>1 lecture = 1 hour |
|---|---|---|
| **Introduction. Presentation of the curricula, of the objectives and ways of working.** | Lecture | 1 lecture |
| **Introduction to Ethics as a philosophical concept** | Lecture | 1 lecture |
| **What is Ethics? What is Integrity? Interdisciplinary and integrative approaches.** | Lecture | 1 lecture |
| **Ethical implications of biotechnologies** | Lecture | 4 lecture |
| **Publication ethics** | Lecture | 4 lectures |
| **Notions related to bioethics** | Lecture | 1 lecture |
| **The university's Code of Ethics** | Lecture | 1 lecture |
| **Final evaluation** | | |

| **8.2. PRACTICAL WORK**<br>**Number of hours – 14 hours** | Theoretical presentation of practical work | 1 lab work = 1 hour |
|---|---|---|
| **Visit the university library** | Study Visit | 1 session |
| **Publication ethics – introduction** | Presentation and discussions | 1 session |

| | | |
|---|---|---|
| **Searches in international databases (PubMed, Web of Science, Scopus, Science Direct)** | Presentation and exercise | 2 sessions |
| **Citation in the text and drawing up the bibliographic list** | Presentation and exercises | 2 sessions |
| **Reference management** | Presentation and exercise | 1 session |
| **Functions of the Microsoft Word text editor indispensable for editing academic materials** | Presentation and exercises | 2 sessions |
| **Review of a scientific text** | Exercises | 2 sessions |
| **USAMV Guide for Writing Works** | Presentation and discussions | 1 session |
| **Avoiding plagiarism** | Presentation | 1 session |
| **Knowledge Review** | - | 1 hour |

*Compulsory bibliography:*

!Course notes
Ardelean M., 2007, Metodologia elaborării tezelor de doctorat. Ed. AcademicPres, Cluj-Napoca.
Beauchamp T. L., D. DeGrazia, 2019, Principles of animal research ethics. Oxford University Press.
Blum S. D., 2009, Academic integrity and student plagiarism: A question of education, not ethics. The Chronicle of Higher Education, 55(24), A35.
Chiriac V., 2005, Etica și eficiența profesională, Ed. Bic All, București.
Cighi V., 2008, Elemente de tehnică experimentală, Ed. Risoprint, Cluj-Napoca.
Corlett J. A., 2009, Moral integrity and academic research. Journal of Academic Ethics, 7(1), 45-49.
Keeney P., 2017, Academic Ethics. Routledge.
Macfarlane B., Zhang J., Pun, A., 2014, Academic integrity: a review of the literature. Studies in Higher Education, 39(2), 339-358.
***Codul de etică și deontologie profesională USAMV (disponibil la: https://www.usamvcluj.ro/index.php/codul-de-etica)
***Ghid de redactare Proiecte de Diplomă / Lucrare de Licență, 2013, USAMV Cluj-Napoca
(disponibil la: http://www.usamvcluj.ro/images/ghid_de_redactare_lucari_licenta.pdf)
***Legea 8/1996 a drepturilor de autor și drepturilor conexe.
***Szász A. Z., 2011, Plagiatul: forme și tehnici de evitare (disponibil la: http://www.apubb.ro/wp-content/uploads/2011/03/ReguliPlagiat.pdf).

*Optional bibliography:*

Joubert P. H., Rogers S. M., 2015, Strategic Scientific and Medical Writing - the Road to Success. Ed. Springer-Verlag, Berlin.

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

The corroboration of the content was made following consultations with Medical Writing companies.

**10. Assessment**

| Type of activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Percentage of the final grade |
|---|---|---|---|
| **10.4. Lecture** | Attendance at the lecture.<br>Correct and comprehensive responses to periodic verification tests.<br>The mandatory approach and proper treatment of all subjects on the examination sheet. | Written exam | 70% |
| **10.5. Seminary / Laboratory** | Solving the academic writing exercise in the final colloquy correctly and as completely as possible. | Practical exam | 30% |
| **10.6. Minimum performance standards** | | | |
| Acquiring the information provided at the lecture and practical sessions at a level that allows passing the designated forms of verification. | | | |

[1] Cycle of studies- choose of the three options: Bachelor/Master/Ph.D.

[2] Discipline status (content) - for the undergraduate level, choose one of the options: **FD** (fundamental discipline), **BD** (basic discipline), **CS** (specific disciplines-clinical sciences), **AP** (specific disciplines-animal production), **FH** (specific disciplines-food hygiene), **UO** (disciplines based on the university's options).

[3] Discipline status (compulsoriness) - choose one of the options – **CD** (compulsory discipline) **OD** (optional discipline) **ED** (elective discipline).

[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

| | | |
|---|---|---|
| Filled in on | Course coordinator<br>**Lecturer Mihai Șuteu, PhD** | Laboratory work/seminar coordinator<br>**Lecturer Mihai Șuteu, PhD** |
| 24/09/2021 | | |

Subject coordinator
**Lecturer Mihai Șuteu, PhD**

Approved by the Department on 24/09/2021

Head of the Department
**Prof. Camelia Răducu, PhD**

Approved by the Faculty Council on 30/09/2021

Dean

**.....**

UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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www.usamvcluj.ro

**No._____of _____** **USAMV form 0311010107**

## SUBJECT OUTLINE

**1. Information on the programme**

| | |
|---|---|
| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca |
| 1.2. Faculty | Animal Sciences And Biotechnologies |
| 1.3. Department | Fundamental Sciences |
| 1.4. Field of study | Biotechnology |
| 1.5.Education level | Master |
| 1.6.Specialization/ Study programme | Applied Biotechnology |
| 1.7. Form of education | Full Time |

**2. Information on the discipline**

| | |
|---|---|
| 2.1. Name of the discipline | **MARKER ASSISTED SELECTION IN ANIMAL POPULATIONS** |
| 2.2. Course coordinator | Dr. Ing. Rusu Alexandru-Vasile |
| 2.3. Seminar/ laboratory/ project coordinator | Dr. Ing. Rusu Alexandru-Vasile |

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Hours per week – full time programme** | 4 | out of which: 3.2. lecture | 2 | 3.3. seminar/ laboratory/ project | 2 |
| **3.4.Total number of hours in the curriculum** | 56 | Out of which: 3.5.lecture | 28 | 3.6.seminar/laboratory | 28 |
| **Distribution of the time allotted** | | | | | hours |
| **3.4.1. Study based on handbook, textbook, bibliography and notes** | | | | | 50 |
| **3.4.2. Additional documentation in the library, specialized electronic platforms and field** | | | | | 40 |
| **3.4.3. Preparing seminars/ laboratories/ projects, themes, reports, portfolios and essays** | | | | | 30 |
| **3.4.4.Tutorials** | | | | | 4 |
| **3.4.5.Examinations** | | | | | 20 |
| **3.4.6. Other activities** | | | | | |
| **3.7. Total hours of individual study** | 144 | | | | |
| **3.8. Total hours per semester** | 200 | | | | |
| **3.9. Number of credits**[4] | 8 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.4. Year of study | I | 2.5. Semester | **II** | 2.6. Type of evaluation | Continuous | 2.7. Discipline status | Content[2] | DS |
| | | | | | | | Compulsoriness[3] | DI |

**3. Total estimated time** (teaching hours per semester)

**4. Prerequisites** (is applicable)

| | |
|---|---|
| 4.1. curriculum-related | Genetics, Genomics, Biostatistics |
| 4.2. skills-related | Prior knowledge in Population Genetics, Quantitaive Genetics and Genomics |

**5. Conditions** (if applicable)

| | |
|---|---|
| 5.1. for the lecture | The course is presented through interactive communication, based on ICT tools. Students have the obligation to respect the lecture schedule. New notions on marker-assisted selection are introduced, making references to previous knowledge in population genetics, quantitaive genetics and molecular-genomic genetics. |

| | |
|---|---|
| 5.2. for the seminar/ laboratory/ project | The compliance with the starting time of the lecture and with the academic discipline is mandatory throughout the entire duration of the course. Work safety norms in laboratory and the work recommendations within each protocol must be followed. |

**6. Specific competences acquired**

| | |
|---|---|
| Professional competences | • Expertise in the methodology and technologies of molecular markers used in animal biotechnologies<br>• Expertise in the use of molecular information with applications in selection and animal breeding<br>• Ability to design and conduct research in molecular-assisted selection under qualified assistance conditions. |
| Transversal competences | ✓ Objective self-assessment of the need for professional training in order to adapt to the new economic needs and requirements<br>✓ Use of molecular information towards the application in other related professional areas<br>✓ Development of critical thinking, of the need for continuous improvement, for the creative solving of problems involving molecular information |

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

| | |
|---|---|
| 7.1. Overall course objective | Developing, understanding and promoting the concept of marker assisted selection in animal breeding |
| 7.2. Specific objectives | ✓ Ability to critically select informations from molecular genetic field and to use it in marker assisted selection, in animal populations.<br>✓ Scientific argumentation ability of MAS advantages compared to conventional methods of selection and breeding.<br>✓ Development of practical skills for the appropriate deduction and application of relevant molecular techniques and technologies in the selection and animal breeding<br>✓ Correct interpretation of experimental data and their application in molecular markers assisted selection<br>✓ Expertise in the use of software for the statistical processing and interpretation of molecular data within population and quantitative genetics<br>✓ Application of molecular data to reconfigure approaches in animal selection, based on genomic data |

**8. Content**

| **8.1.LECTURE**<br>Number of hours –28 | Teaching methods | |
|---|---|---|
| Brief history of the emergence of molecular marker technology | Lecture | 2 Lectures |
| Qualitative character versus quantitative character<br>Molecular variability and genetic markers in selection<br>Markers on chromosomes and ways of transmission in offspring<br>Types of genetic markers and types of molecular marker assisted selections<br>DNA polymorphisms and genotyping techniques of molecular markers | Lecture | 3 Lectures |
| **Quantitative Trait Loci (QTL) and their mapping**<br>QTL mapping through linkage analysis and association analysis<br>Mapping specific methods. Mass segregation analysis | Lecture | 4 Lectures |

| | | |
|---|---|---|
| and candidate gene approach.<br>Molecular markers associated with attributes of economic interest<br>Molecular markers associated with disease resistance<br>**Marker assisted selection in animal populations**<br>**Evaluation of genetic variability in the dynamics of animal populations by using molecular markers**<br>Hardy-Weinberg principle. Valorisation of molecular data.<br>Reproduction and mating systems<br>Processes that modify the genetic structure of populations (migration, mutation, selection, drift and inbreeding). Assessment of genetic variability by using molecular markers.<br>New forms of selection - Genomic selection | Lecture | 5 Lectures |

| | | |
|---|---|---|
| **8.2. PRACTICAL WORK**<br>**Number of hours – 29**<br>**Scientific method of study in MAS:**<br>• Levels of biological diversity<br>• Relationships between phenotype and genotype<br>• Assessment of genetic variation | Presentations with ICT tools; discussion, problematization, | 2 lab. work |
| Development hypothesis and experimental design.<br>Setting up samples, sampling, conducting of experiments.<br>Calculation of allele frequencies and genotypes with molecular marker data, in different cases of allelism and gene interactions<br>Software tools for molecular based data analysis of the genetic structure of population and analysis of the association with attributes of interest.<br>Assessment of genetic variability using biallelic and codominant molecular markers (Case study with PCR - RFLP molecular markers)<br>Determination of the genetic structure of populations for loci of interest in case of simple and multiple allelism<br>Association of polymorphisms with attributes of economic interest<br>Inclusion of molecular information in the selection<br>Statistical processing of experimental data.<br>Data interpretation.<br>Knowledge verification | Practical demonstration | 4 lab. work<br>7 lab. work<br>1 session |

*Compulsory bibliography:*

1.Coşier Viorica, Note de curs
2. Kent E. Holsinger, 2012, Lecture Notes in Population Genetics, University of Connecticut
3. Dekkers, C.M.. Commercial application of marker- and gene-assisted selection in livestock: Strategies and lessons. J Anim Sci, 82:E313-E328 (2004)
4. Dekkers J.C.M. and Van Der Werf, J.H.J. Marker-assisted selection – Current status and future perspectives in crops, livestock, forestry and fish. Chapter 10. Guimaraies EP (ISBN 978-92-5-105717-9) (2007).
5. Meuwissen T.H.E.. Genomic selection: The future of Marker Assisted Selection and Animal Breeding. Workshop "Marker assisted selection: A fast track to increase genetic gain in plant and animal breeding?" Turin, Italy, 17-18 October (2003).
6. Goddard M.E., Hayes B.J., Meuwissen T.H.. Genomic selection in livestock populations. Genet Res (Camb), 92(5- 6): 413-21 (2010).

7. Peter J. Russel, 2009, iGenetics – A Molecular Aproach, Ed. Pearson International

*Optional bibliography:*

1. Meuwissen T.H.E., Goddard M.E.. The use of markers haplotypes in animal breeding schemes. Gen Sel Evol. 28, 161-176 (1996).
2. Juane J., A. Sonnino. Marker assisted selection as a tool for genetic improvement of crops, livestock, forestry and fish in developing countries: An overview of the issues. Marker Assisted Selection. Current status and further perspectives in crops, livestock, forestry and fish. FAO of the United Nations, Rome, (2007).
3. Williams J.L.. The use of marker assisted selection in animal breeding and biotechnology. Rev Sci Techn Off Int Epiz. 24(1):379-388 (2005).
5. Rampal, J.B.- 2007, Microarrays – Application and Data Analysis, in Methods in Molecular Biology, Human Press, NJ
6. COSIER VIORICA, Creşterea rezistenţei la scrapie în populaţiile de ovine din România prin selecţia asistată la nivel molecular, 2007, Vol I, Ed. Risoprint Cluj-NapocaISBN specific: 978-973-571-579-7
7. COSIER VIORICA, 2008, Creşterea rezistenţei la scrapie în populaţiile de ovine din România prin selecţia asistată la nivel molecular, vol II, Ed. Risoprint Cluj-Napoca, ISBN: 978-973-751-578-0; ISBN specific: 978-973-751-815-6.
8. Goddard M.E., Hayes B.J.. Genomic selection, J Anim Breed Genet, 124(6), 323-30 (2007).
9. Hayes B.J., Bowman P.J., Goddard M.E.. Linkage disequilibrium and accuracy of predicting breeding values from marker haplotypes: 269-272 in Procc Assoc Adv mt Anim Breed Genet., Queenstown, New Zeeland, (2001).

**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**

The course is updated annually and in conjunction with practical applications in the field of marker-assisted selection.

**10. Assessment**

| Type of activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Percentage of the final grade |
|---|---|---|---|
| **10.4. Lecture** | Understanding the processes that take place at the molecular level and the current techniques and technologies in the field of molecular genetics and genomics with applicability in MAS | Exam | 50% |
| **10.5. Seminar/Laboratory** | Criteria regarding the elaboration of the essay and its defend | Essay from the studied thematic | 50% |
| **10.6. Minimum performance standards** | | | |
| The student knows the specialized terminology and is familiar with the thematic content of the discipline; formulates scientifically reasoned reasoning, at an acceptable level; | | | |

[1] Education levels- choose of the three options: Bachelor/ * Master/Ph.D.
[2] Discipline status (content)- for the undergraduate level, choose one of the options:- **FD** (fundamental discipline), **BD** (basic discipline), **CS** (specific disciplines-clinical sciences), **AP** (specific disciplines-animal production), **FH** (specific disciplines-food hygiene), **UO** (disciplines based on the university's options).
[3/] Discipline status (compulsoriness)- choose one of the options – **CD** ( compulsory discipline) **OD** (optional discipline) **ED** ( elective discipline).
[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).
[5 / *] Disciplines: AK- Advanced knowledge, CT- Complementary Training, S- Synthesis

Filled in on September, 2021

Course coordinator
Dr. Ing. Rusu Alexandru-Vasile

Laboratory work/seminar coordinator
Dr. Ing. Rusu Alexandru-Vasile

Subject coordinator
Prof. Dr. Coşier Viorica

Approved by the
Department on
.....

Head of the Department
Conf dr Constantinescu Radu

Approved by the Faculty
Council on
.....

Dean
Prof.dr. Daniel Severus Dezmirean

# SUBJECT OUTLINE

## 1. Information on the programme

| | |
|---|---|
| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca |
| 1.2. Faculty | Animal Sciences and Biotechnologies |
| 1.3. Department | Fundamental Sciences and Biotechnologies |
| 1.4. Field of study | Biotechnologies |
| 1.5. Cycle of study[1] | Master |
| 1.6. Specialization/ Study programme | Applied biotechnologies |
| 1.7. Form of education | Full time |

## 2. Information on the discipline

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1. Name of the discipline | Embryo biotechnology | | | | | | | |
| 2.2. Course coordinator | | | | Lecturer Ileana Miclea, PhD | | | | |
| 2.3. Seminar/ laboratory/ project coordinator | | | | Lecturer Ileana Miclea, PhD | | | | |
| 2.4. Year of study | I | 2.5. Semester | II | 22.6. Type of evaluation | continuous | 2.7. Discipline status | Content[2] | DS |
| | | | | | | | Compulsoriness[3] | DI |

## 3. Total estimated time (teaching hours per semester)

| | | | | | |
|---|---|---|---|---|---|
| 3.1. Hours per week – full time programme | 4 | 3.2. course | 2 | 3.3. laboratory | 2 |
| 3.4. Total hours of the curriculum | 56 | 3.5. course | 28 | 3.6. laboratory | 28 |
| Distribution of the time allotted | | | | | hours |
| 3.4.1. Study based on book, textbook, bibliography and notes | | | | | 50 |
| 3.4.2. Additional documentation in the library, specialized electronic platforms and field | | | | | 50 |
| 3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays | | | | | 20 |
| 3.4.4. Tutorials | | | | | 10 |
| 3.4.5. Examinations | | | | | 14 |
| 3.4.6. Other activities | | | | | - |
| 3.7. Total hours of individual study | 144 | | | | |
| 3.8. Total hours per semester | 200 | | | | |
| 3.9. Number of credits [4] | 8 | | | | |

## 4. Prerequisites (is applicable)

| | |
|---|---|
| 4.1. curriculum-related | Animal reproduction, Animal improvement, Animal genetics, Biochemistry, Biotechnology for embryo transfer and IVF, Modern languages |
| 4.2. skills-related | English language |

## 5. Conditions (if applicable)

| | |
|---|---|
| 5.1. for the lecture | The course takes place on-line on the Google Meet platform and is interactive, based on oral presentation and Power Point presentation. Students can address questions about the content of the lecture and have the obligation to keep their cameras open throughout the course. |
| 5.2. for the seminar/ laboratory | The seminar takes place on-line on the Google Meet platform and is based on oral presentation and Power Point presentation. Students can address questions about the content of the lecture and have the obligation to keep their cameras open throughout the seminar.<br>If the pandemic situation permits the presence of students in the laboratory during the practical each student will understand and be able to employ the methods and techniques. Each student will develop an individual activity with laboratory materials. Academic discipline is imposed throughout the development of practical work. |

**6. Specific competences acquired**

| | |
|---|---|
| Professional competences | In vitro manipulation of gametes and embryos to produce offspring in farm animals in unconventional ways. |
| Transversal competence | Involvement in scientific activities, such as the elaboration of scientific papers and specialized studies; participation in scientific projects, compatible with the requirements of integrating into European higher education. |

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

| | |
|---|---|
| 7.1. Overall course objective | Acquisition of knowledge related to preimplantation embryos. This is particularly related to preparations for the manipulation of gametes intended for in vitro fertilisation and associated techniques but also for embryo micromanipulation and cryopreservation of genes in animals. |
| 7.2. Specific objectives | Training the ability to critically interpret and synthetize data, to formulate hypothesis or conclusions but also to take decisions in the various situations encountered in assisted reproduction. |

**8. Content**

| **8.1. LECTURE** | Teaching methods | Notes |
|---|---|---|
| **Number of hours –28** | | 1 lecture = 2 hours |
| Use of primordial germ cells and oocytes in assisted reproduction. Molecular mechanisms involved in oocyte growth and maturation. In vitro culture of primordial germ cells. In vitro culture of immature oocytes. | | 3 lectures |
| Sperm analysis and preparation for use in assisted reproduction. Molecular mechanisms involved in sperm capacitation. New methods to assess function and acrosome integrity. | Lectures, exposure with the use of audio-video (video and Power-Point presentation), explanation, problem solving, brain-storming | 2 lectures |
| Oocyte – sperm cell interactions. Sperm cell activation. Oocyte activation. Formation of pronuclei and syngamy. | | 1 lecture |
| Assisted in vitro fertilization techniques. Intracytoplasmic sperm injection. Analysis, preparation, selection and manipulation of sperm cells. Preparation and manipulation of oocytes. Partial digestion of the zona pellucida. | | 2 lectures |
| In vitro manipulation of preimplantation embryos. Isolation, culture and manipulation of embryo stem cells. Culture conditions for embryo stem cells. Co-culture techniques for embryo stem cells. Microinjection of embryo stem cells into blastocyst. Alternate methods for the production of animal chimeras. Transfer of nuclei from somatic cells. Analysis of polar bodies for genetic diagnosis. Assisted hatching. | | 4 lectures |
| Long term preservation of animal germplasm. Long term preservation of gametes/embryos. New techniques to cryopreserve oocytes/embryos. Methods to cryopreserve oocytes and embryos in different species. | | 3 lectures |

| **8.2. PRACTICAL WORK** | | 1 lab work (2 hours / work) |
|---|---|---|
| **Number of hours – 28** | | |
| Oocyte maturation on a somatic cell monolayer (fibroblasts) | | 1 laboratory work |
| Assessment of oocyte maturation using fluorescent coloration | | 1 laboratory work |
| Sperm cell capacitation methods: Percoll vs. swim-up | | 1 laboratory work |
| Assessment of sperm cell capacitation using CTC | Explanation, | 1 laboratory work |
| Fixation, alignment and equilibration of micropipettes | demonstration, | 1 laboratory work |

| | | |
|---|---|---|
| Preparation and selection of high quality sperm cells for injection<br>Sperm cell injection into oocytes<br>Partial digestion of zona pellucida using acidic solutions<br>Assessment of in vitro developed embryos based on energy usage<br>Blastomere extraction and in vitro culture<br>Analysis and injection of blastomeres into the embryo<br>Cryopreservation of swine sperm cells.<br>New techniques for oocyte cryopreservation: minimum drop size technique and open pulled straw<br>Modern techniques for the cryopreservation of embryos: one step technique | individual and team work. Laboratory activities in laboratory, specific laboratory techniques. | 1 laboratory work<br>1 laboratory work<br>1 laboratory work<br>1 laboratory work<br>1 laboratory work<br>1 laboratory work<br>1 laboratory work<br>1 laboratory work<br><br>1 laboratory work |
| ***Compulsory bibliography***<br>1. Course material<br>2. Elder K. and B. Dale, 2000, In vitro fertilization. Second edition, Cambridge University Press, U.K.<br>3. Fleming S.D. and R.S. King, 2003, Micromanipulation in Assisted Conception-A Users' Manual and Troubleshooting Guide. Cambridge University Press, United Kingdom<br>4. Gardner D.K., M. Lane, A.J. Watson, 2006, A Laboratory Guide to the Mammalian Embryo. Oxford University Press, United Kingdom | | |
| ***Optional bibliography:***<br>1. Gordon I., 1994, Laboratory production of cattle embryos, CAB International, UK<br>2. Marshak D.R., D. Gottlieb, R.L. Gardner, 2001, Stem cell biology. Cold Spring Laboratory Press<br>3. Schatten Heide, 2004, Germ Cell Protocols - Volume 1: Sperm and Oocyte Analysis. Humana Press, Methods in Molecular Biology, vol. 253<br>4. Schatten Heide, 2004, Germ Cell Protocols - Volume 2: Molecular Embryo Analysis, Live Imaging, Transgenesis, and Cloning. Humana Press, Methods in Molecular Biology, vol. 254 | | |

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

| |
|---|
| The content is according to current worldwide research trends |

**10. Assessment**

| Type of activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Percentage of the final grade |
|---|---|---|---|
| **10.4. Lecture** | Attendance | Interaction during the course | 5% |
| | Knowledge of the subject presented during the course | Final oral exam | 60% |
| **10.5. Laboratory** | Work technique | Continuous observation | 5% |
| | Practical examination | Essay on a subject in the field | 30% |
| **10.6. Minimum performance standards** | | | |
| | | | |

[1] Cycle of studies- choose of the three options: Bachelor/Master/Ph.D.

[2] Discipline status (content) - for the license level one of the variants - **DF** (fundamental discipline), **FD** (discipline in the field), **DS** (specialized discipline), **DC** (complementary discipline).

[3] Discipline status (compulsory) - choose one of the variants - **DC** (compulsory discipline) **DO** (optional discipline) **DFac** (facultative discipline).

[4] One credit is equivalent to 25 hours of study (didactic and individual study).

Filled in on
24.09.2021

Course coordinator
Lecturer Ileana Miclea, PhD

Laboratory work coordinator
Lecturer Ileana Miclea, PhD

Date of approval in the department
……

Department Director
Associate professor Radu Constantinescu, PhD

UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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www.usamvcluj.ro

**No._____of _____** **USAMV form CN-0311010108**

# SUBJECT OUTLINE

## 1. Information on the programme

| | |
|---|---|
| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca |
| 1.2. Faculty | Animal Science and Biotechnologies |
| 1.3. Department | II - Technological sciences |
| 1.4. Field of study | |
| 1.5.Education level | Master |
| 1.6.Specialization/ Study programme | Applied Biotechnologies |
| 1.7. Form of education | Full time |

## 2. Information on the discipline

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1. Name of the discipline | Molecular techniques for food authentication and GMO detection | | | | | | | |
| 2.2. Course coordinator | | | | Associate professor Dr. Cristian Ovidiu Coroian | | | | |
| 2.3. Seminar/ laboratory/ project coordinator | | | | Associate professor Dr. Cristian Ovidiu Coroian | | | | |
| 2.4. Year of study | 1 | 2.5. Semester | **II** | 2.6. Type of evaluation | continuous | 2.7. Discipline status | Content[2] | FD |
| | | | | | | | Compulsoriness[3] | CD |

## 3. Total estimated time (teaching hours per semester)

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Hours per week – full time programme** | 3 | out of which: 3.2. lecture | 1 | 3.3. seminar/ laboratory/ project | 2 |
| **3.4.Total number of hours in the curriculum** | 42 | Out of which: 3.5.lecture | 14 | 3.6.seminar/laboratory | 28 |
| **Distribution of the time allotted** | | | | | hours |
| **3.4.1. Study based on book, textbook, bibliography and notes** | | | | | 48 |
| **3.4.2. Additional documentation in the library, specialized electronic platforms and field** | | | | | 37 |
| **3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays** | | | | | 30 |
| **3.4.4.Tutorials** | | | | | 8 |
| **3.4.5.Examinations** | | | | | 10 |
| **3.4.6. Other activities** | | | | | 0 |
| **3.7. Total hours of individual study** | 133 | | | | |
| **3.8. Total hours per semester** | 175 | | | | |
| **3.9. Number of credits[4]** | 7 | | | | |

## 4. Prerequisites (is applicable)

| | |
|---|---|
| 4.1. curriculum-related | Genetics, food chemistry, genetic engineering, food microbiology |
| 4.2. skills-related | Cognitive skills: knowledge and proper use of specific notions biochemistry, food microbiology, genetic engineering Action skills: documentation; team work |

## 5. Conditions (if applicable)

| | |
|---|---|
| 5.1. for the lecture | The course is presented through interactive communication, based on ICT tools. Students are required to adhere to the course schedule. In the case of online teaching, the teaching methods will be adapted to the exposure through specific platforms. |

| | |
|---|---|
| 5.2. for the seminar/ laboratory/ project | In practical work, it is mandatory to comply with the rules of labor protection in the laboratory. Each student will wear protective equipment and will follow the work and reagent handling recommendations during the individual or group activities provided in the protocols. Students can ask questions about the working hypothesis, the expected results and their interpretation. Students actively participate in the work activities. Attendance at the practical works is mandatory, according to the regulations, and conditions the participation in the colloquium. Passing the colloquium conditions participation in the exam. In the case of online teaching, the teaching methods will be adapted to the exposure through specific platforms. |

**6. Specific competences acquired**

| | |
|---|---|
| Professional competences | Description and use of basic concepts, theories and methods used in food quality control and expertise, related to the chemistry of compounds that determine the quality and traceability of food products, the transformations they undergo during processing, transport and storage, equipment and methods determination and analysis of these compounds and the relevant legislation. Knowledge of the concept of "genetically modified food" Knowledge of the advantages and disadvantages of obtaining and using genetically modified foods Knowledge of the main methods of detecting genetically modified foods Demonstrating a responsible attitude towards genetically modified foods Knowledge of the main genetically modified foods existing on the Romanian and international market Knowledge of the legislation on genetically modified foods and how to label them. |
| Transversal competences | To develop the capacity to integrate in a research team by participating in the research activities carried out within the practical works; To develop communication skills with other colleagues for the conception / development of scientific experiments related to the approached topic; To develop concerns regarding the improvement of working methods. |

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

| | |
|---|---|
| 7.1. Overall course objective | The discipline aims at assimilating by students the notions that include: the notion of genetically modified food, its usefulness, the influence of genetically modified foods on plants, animals, humans, environment, safety of genetically modified foods, risk of these foods, Romanian and European legislation. From a practical point of view, students will become familiar with notions of education in the field of nutrition, with an understanding of the usefulness of genetic modification, determining the nutritional value of these foods, checking the safety of consumption of genetically modified foods. |
| 7.2. Specific objectives | Gain theoretical and technical knowledge of applied genomics and biotechnology for the correct implementation and interpretation of molecular tools for marker-assisted selection and diagnostic tests used for genetic identification of species, plant varieties, breeds and individuals, including genetic traceability of food derived from these. |

**8. Content**

| **8.1. LECTURE**<br>**Number of hours – 14** | Teaching methods<br>Lecture | Notes<br>1 lecture = 1 hours |
|---|---|---|
| Genomics applied to marker-assisted selection (MAS) for the reproduction of crop species. Species identification by DNA profiling with markers derived from PCR (SSR, SNP), and cpDNA and mtDNA barcode; | Lecture | 1 |
| Determination of genetic diversity, similarity and identity statistics, genetic differentiation and gene flow, genetic distance parameters, homozygosity and Lecture heterozygosity estimates useful for genetic characterization and identification of plant varieties (hybrids, purebreds and clones) and animal breeds and breeds | Lecture | 1 |
| 1Implementation of molecular diagnostic tests for genetic traceability of agri-food products by DNA | Lecture | 1 |

| | | |
|---|---|---|
| imprinting, SSR genotyping and SNP haplotyping | | |
| Molecular techniques for authentication of food of animal origin based on the analysis of proteome variability: polyacrylamide gel electrophoresis (IEF, PAGE, 2D-PAGE), Western blot, ELISA, MALDI-TOF MS | Lecture | 1 |
| Molecular techniques for the authentication of food of animal origin based on the analysis of genome / transcriptome variability | Lecture | 1 |
| Genetically modified organisms (GMOs). Introduction. Definitions. History of genetically modified foods Methods of genetic modification. Recombinant DNA technology. Free DNA technology. Types of applications of genetic modification to obtain products of plant and animal origin. Arguments for and against the use of genetic modification. The benefits of using genetic modification: on crop plants, on the quantity and quality of food, on the food industry and biotechnology, | Lecture | 3 |
| Attitudes towards obtaining and consuming genetically modified foods: impact on the environment, the spread of genetically modified organisms through pollen, allergenicity, resistance to the action of viruses, transfer of antibiotic resistance, the emergence of new natural toxins. | Lecture | 2 |
| The impact of genetically modified foods on living organisms: the impact on the immune system, digestive tract, respiratory system, metabolism | Lecture | 1 |
| National, European and international legislation on genetically modified food. Labeling of genetically modified foods | Lecture | 1 |
| European and global bodies involved in the study and monitoring of genetically modified foods. EFSA's involvement in genetically modified food | Lecture | 1 |
| Genetically modified foods versus organic foods. Map of genetically modified foods in the moon, Europe, Romania | Lecture | 1 |

| | | |
|---|---|---|
| **8.2. PRACTICAL WORK**<br>**Number of hours – 28** | Theoretical presentation of practical works | 1 lab work (2 hours / work) |
| Purification of nucleic acids (DNA, RNA) and / or proteins harvested from various biological sources (blood, hair, tissue, food, feed, etc.) and evaluation of their quality | Practical work | 1 |
| Assessment of the declared authenticity (species of origin) of meat / meat products (eg ruminants, pigs, horses, birds) based on DNA markers (autosomal or mitochondrial) analyzed by PCR / Real-Time PCR / RFLP techniques | Practical work | 2 |
| Certification in pork products of the breed of origin based on DNA markers analyzed by PCR / RFLP technique | Practical work | 1 |
| Assessment of the declared authenticity (species of origin) of milk / cheese based on DNA markers (autosomal) analyzed by PCR / Real-Time PCR / RFLP techniques. Certification of the breed / geographical | Practical work | 2 |

| | | |
|---|---|---|
| origin of some cheeses | | |
| Sampling for the analysis of the presence of genetically modified organisms. Techniques for testing foods suspected of containing genetically modified organisms: ELISA, PCR | Practical work | 1 |
| Assessment of students' general knowledge about genetically modified organisms and genetically modified foods | Practical work | 1 |
| Companies with activity: production of genetically modified organisms (Montsanto). Genetically modified foods versus organic foods | Practical work | 1 |
| Genetically modified food highlighting techniques: ELISA and PCR | Practical work | 2 |
| Case study: labeling of genetically modified foods. Monitoring the existence of inscriptions on food labels regarding the inclusion of modified plant / animal products genetically in the composition of that food. Reporting on national, European and international labeling legislation | Practical work | 2 |
| Debate: genetically modified foods. Students will present pros and cons from the point of view of biotechnology companies, farmers, consumers, traders | Practical work | 1 |
| *Compulsory bibliography: Course and laboratory notices* | | |
| *Optional bibliography:* Gianni Barcaccia e Mario Falcinelli, Genetica e genomica. Vol. III Genomica e biotecnologie genetiche. Liguori Editore, Napoli., 2006. Cerca nel catalogo<br>Martino Cassandro, Marcello Mele e Erminio Trevisi, Sicurezza e tracciabilità nei sistemi di produzione del latte. ARACNE editrice S.r.l. Roma., 2010 | | |

**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**

Both the course and the part of the practical works have been designed in such a way as to harmoniously combine the theoretical and practical aspects of food authentication through molecular techniques, related to the latest discovery and some legislative requirements in the field. Food authentication, in order to detect possible additions of raw materials from undeclared species on the label or the excess of cheaper raw materials used as a substitute (for example, soybean additives in meat / milk products), is a necessity because their counterfeiting is at present a real problem that concerns both consumers and honest processors or control authorities. That is why the working methodologies used in our laboratory and the results obtained in this field are harmoniously integrated in the course and in the practical works, which can be real solutions for limiting this phenomenon.

**10. Assessment**

| Type of activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Percentage of the final grade |
|---|---|---|---|
| **10.4. Lecture** | | Written or oral exam | 60% |
| **10.5. Seminar/Laboratory** | | Final colloquium and / or periodic verifications and / or preparation of reports | 40% |
| **10.6. Minimum performance standards** | | | |
| Participation in the final theoretical exam is conditioned by the presence in all practical works and obtaining a minimum grade of 5 in the colloquium. The involvement of the students is expected in the practical works, which will count in the final grade. The final grade for passing the theoretical exam must be at least 5. | | | |

[1] Education levels- choose of the three options: Bachelor/ * Master/Ph.D.

[2] Discipline status (content)- for the undergraduate level, choose one of the options:- **FD** (fundamental discipline), **BD**

(basic discipline), **CS** (specific disciplines-clinical sciences), **AP** (specific disciplines-animal production), **FH** (specific disciplines-food hygiene), **UO** (disciplines based on the university's options).

[3/] Discipline status (compulsoriness)- choose one of the options – **CD** ( compulsory discipline) **OD** (optional discipline) **ED** ( elective discipline).

[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

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

| | | |
|---|---|---|
| Filled in on<br>September 2021 | Course coordinator<br>Associate professor Dr. Cristian Ovidiu Coroian | Laboratory work/seminar coordinator<br>Associate professor Dr. Cristian Ovidiu Coroian |

Subject coordinator
.....

Approved by the Department on
.....

Head of the Department
Prof. Dr. Răducu Camelia

Approved by the Faculty Council on
.....

Dean
Prof. Dr. Dezmirean Daniel Severus

**No._____of _____** **USAMV form 0311010109**

**SUBJECT OUTLINE**

**1. Information on the programme**

| | |
|---|---|
| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca |
| 1.2. Faculty | Animal Science and Biotechnology |
| 1.3. Department | I-Fundamental Sciences-Biotechnology |
| 1.4. Field of study | Biotechnology |
| 1.5. Education level[1)] | Master |
| 1.6. Specialization/ Study programme | Applied biotechnology |
| 1.7. Form of education | Full time |

**2. Information on the discipline**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1. Name of the discipline | Bioinformatics and biostatistics | | | | | | | |
| 2.2. Course coordinator | | | | Lecturer. Dr. Bogdan A. Vlaic | | | | |
| 2.3. Seminar/ laboratory/ project coordinator | | | | Lecturer. Dr. Bogdan A. Vlaic | | | | |
| 2.4. Year of study | I | 2.5. Semester | **II** | 2.6. Type of evaluation | Sumative | 2.7. Discipline status | Content[2] | DF |
| | | | | | | | Compulsoriness[3] | DI |

**3. Total estimated time** (teaching hours per semester)

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Hours per week – full time programme** | 4 | out of which: 3.2. lecture | 2 | 3.3. seminar/ laboratory/ project | 3 |
| **3.4.Total number of hours in the curriculum** | 56 | Out of which: 3.5.lecture | 28 | 3.6. seminar/laboratory | 42 |
| **Distribution of the time allotted** | | | | | hours |
| **3.4.1. Study based on book, textbook, bibliography and notes** | | | | | 25 |
| **3.4.2. Additional documentation in the library, specialized electronic platforms and field** | | | | | 40 |
| **3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays** | | | | | 25 |
| **3.4.4.Tutorials** | | | | | 20 |
| **3.4.5.Examinations** | | | | | 19 |
| **3.4.6. Other activities** | | | | | |
| **3.7. Total hours of individual study** | 119 | | | | |
| **3.8. Total hours per semester** | 175 | | | | |
| **3.9. Number of credits[4]** | 7 | | | | |

**4. Prerequisites** (is applicable)

| | |
|---|---|
| 4.1. curriculum-related | Cellular Biology, Molecular Biochemistry, Molecular Genetics, Computer Science and Computer Use |
| 4.2. skills-related | Knowledge of the theoretical foundations of Molecular Biology, Molecular Genetics and Informatics for understanding the scientific basis the concepts of bioinformatics |

**5. Conditions** (if applicable)

| | |
|---|---|
| 5.1. for the lecture | The course is interactive; students can ask questions regarding the content of lecture. Academic discipline requires compliance with the start and end of the course. |
| 5.2. for the seminar/ laboratory/ project | Each student carries out an individual activity on the computer, which consists of solving specific problems of bioinformatics and drawing up projects on a specific topic, by accessing databases on the Internet.Academic discipline is imposed throughout the course of practical works. |

**6. Specific competences acquired**

| | |
|---|---|
| Professional competences | • Use of the theoretical foundations of bioinformatics with reference to genetic resources and applied biotechnologies.<br>• Adequate use of knowledge and development of skills for identifying and solving theoretical and practical problems through the use of specific bioinformatics programs |
| Transversal competences | - Developing and following a work schedule<br>- Applying effective communication techniques in activities that require team work<br>- Fulfill their duties with professionalism and rigor<br>- Use of information and communication techniques |

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

| | |
|---|---|
| 7.1. Overall course objective | Understanding the conceptual scientific bases of bioinformatics and their use in genetic resources<br>Understanding the implications of bioinformatics in the field of in-depth knowledge of biological phenomena. |
| 7.2. Specific objectives | Knowledge and use of bioinformatics programs for genetic analysis.<br>Development of scientific and practical skills for knowledge and access to online databases.<br>Knowledge and use of bioinformatic methods in analyzing nucleic acids and proteins.<br>Use of similarity analyzes and sequence alignments.<br>Studying the phylogeny of species by bioinformatic means |

**8. Content**

| **8.1.LECTURE**<br>**Number of hours – 14** | Teaching methods | Notes |
|---|---|---|
| Fundamentals of bioinformatics. Introduction to bioinformatics<br>Definition of bioinformatics<br>Brief history of bioinformatics<br>Applications of bioinformatics in genomics, transcriptomics, proteomics and phylogeny | Lecture | 1 lecture |
| Databases<br>Databases of biological interest<br>Database classification | Lecture | 1 lecture |
| The concept of the assembly of nucleotide and amino acid sequences. Sequence alignment and similarity analysis<br>Similarity and sequence homology<br>Sequence alignment. Global alignment and local alignment<br>Global alignment<br>Local alignment<br>Pair alignment and multiple alignment<br>Search the databases using Smith-Waterman heuristic algorithms -BLAST and FASTA.<br>The BLAST algorithm<br>FASTA algorithm | Lecture | 2 lectures |

| | | |
|---|---|---|
| Parameters vs. statistical indices<br>Types of variables. Truncated data<br>Theoretical (ideal) distributions for adjusting the experimental ones (empirical)<br>Statistical distributions. Properties and parameters of normal distribution | Lecture | 1 lecture |
| Elements of general statistics. General presentation. The population. Sample.<br>Frequency distribution. Class interval. Relative frequency. Absolute frequency. Frequency diagram. Frequency polygon. The cumulative frequency. Data types. | Lecture | 1 lecture |
| Introduction to variant analysis<br>- F distribution F<br>one-way ANOVA for independent samples, the nonparametric Kruskal -Wallis test<br>one-way ANOVA for correlated samples, Friedman nonparametric test<br>-two-way ANOVA | Lecture | 1 lectures |

| | | |
|---|---|---|
| **8.2. SEMINARS**<br>**Number of hours – 42** | | |
| Searching, accessing and storing specialized information based on www. (Based services) | | 1 practical work |
| Classification and access to databases for publications. Searching and selecting information from bibliographic databases | Practical work | 1 practical works |
| Familiarize and access the databases for nucleic acids. Structure of information in nucleic acid databases. Search and analysis of DNA or RNA fragments of interest. Organizing information in banks for nucleic acids. | | 1 practical work |
| NCBI and EMBL-EBI databases<br>Classification of sequence analysis tools<br>Classifying the types of alignment analyzes, performing and analyzing the data obtained through alignment and similarity analyzes. Gene cards. | | 1 practical works |
| Protein databases<br>Presentation of the main protein databases. Protein banks of NCBI and EMBL-EBI | | 2 practical works |
| Search and analyze data from protein banks<br>PDB-RCSB protein bank. Presentation. Tools. Protein search and analysis. Other databases for PIR, PRFDB proteins<br>Tools for protein identification and characterization. | | 2 practical works |
| Databases and programs of interest for molecular genetics analysis.<br>KEGG Pathways. Ribosomal databases-RDB.<br>Programs used to characterize and analyze DNA fragments with applicability in different molecular analyzes | | 2 practical work<br>2 practical works |
| Windows operating system: basics | | 1 practical work |
| Microsoft Excel: calculations, function library | | 1 practical work |

| | | |
|---|---|---|
| Microsoft Excel: making graphs | | 1 practical work |
| Microsoft Excel: calculations dedicated to the statistical domain | | 2 practical work |
| R software: use, function library | | 2 practical work |
| R software: graphic design | | 2 practical work |
| Software and software packages for statistical applications: GraphPad Prism, Biostat, Statistics, Origin | | 2 practical work |

*Compulsory bibliography:*


1. Course notices
2. Bioinformatics for Beginners 1st Edition, **2014,**Supratim Choudhuri, **ISBN:** ISBN 9780124104716, Academic Pr
3. Mount DW. (2001) Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor, New York: Cold Spring Harbor Laboratory Press.
4. http://www.ebi.ac.uk/
5. http://www.ncbi.nim.nih.gov/
6. http://www.nig.ac.jp/home.html
7. http://www.srs.ebi.ac.uk/
8. http://www.rcsb.org/pdb/
9. Rice JA (1995) Mathematical statistics and data analysis, 2nd edn. , Duxbury Press, Belmont CA, 603 p.
10. Sokal RR, Rohlf FJ (1987) Introduction to Biostatistics, WH Freeman & Co., New York, 363 p.
11. Bogdan Vlaic, 2015, Bioinformatică ,Manual didactic, Editura AcademicPres Cluj-Napoca, ISBN 978-973-744-419-6, Manual didactic, 140 pag.


*Supplementary bibliography:*


1.Bioinformatics For Dummies, 2nd Edition, Jean-Michel Claverie, Cedric Notredame, 2006, ISBN: 978-0-470-08985-9
2. Bioinformatics and Functional Genomics, 3rd Edition, Jonathan Pevsner, 2015, ISBN: 978-1-118-58178-0, Wiley-Blackwell


**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 continuously improve teaching techniques and course content with the current issues and practical problems, teachers participate in meetings of the Romanian Society of Bioinformatics and annual symposiums organized by the faculties of the USAMV consortium,

**10. Assessment**

| Type of activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Percentage of the final grade |
|---|---|---|---|
| **10.4. Lecture** | Assimilation of notions and deepening of specialized knowledge, ability to synthesize | Written examination | 70% |
| **10.5. Seminar/Laboratory** | Thematic report on a given theme | Power point presentation | 30 % |
| **10.6. Minimum performance standards** | | | |
| Acquiring scientific information transmitted through lectures and practical work at an acceptable level. Getting the pass mark in continuous assessment is a graduation requirement. | | | |

[1] Education levels- choose of the three options: Bachelor/ * Master/Ph.D.

[2] Discipline status (content)- for the undergraduate level, choose one of the options:- **FD** (fundamental discipline), **BD** (basic discipline), **CS** (specific disciplines-clinical sciences), **AP** (specific disciplines-animal production), **FH** (specific disciplines-food hygiene), **UO** (disciplines based on the university's options).

[3/] Discipline status (compulsoriness)- choose one of the options – **CD** ( compulsory discipline) **OD** (optional discipline) **ED** ( elective discipline).

[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

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

| | | |
|---|---|---|
| Filled in on<br>24.09.2021 | Course coordinator<br>Lecturer. Dr. Bogdan A. Vlaic | Laboratory work/seminar coordinator<br>Lecturer. Dr. Bogdan A. Vlaic |

Approved by the department on

Head of the Department
Lecturer. Dr. Constantinescu Radu

UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
Calea Mănăştur 3-5, 400372, Cluj-Napoca
Tel: 0264-596.384, Fax: 0264-593.792
www.usamvcluj.ro

**No._____of _____** **USAMV form 0312010106**

## SUBJECT OUTLINE

**1. Information on the programme**

| | |
|---|---|
| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca |
| 1.2. Faculty | Animal Science and Biotechnologies |
| 1.3. Department | Fundamental sciences |
| 1.4. Field of study | Animal Science |
| 1.5.Education level | Master |
| 1.6.Specialization/ Study programme | Ethology and human-animal interaction |
| 1.7. Form of education | Full time |

**2. Information on the discipline**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1. Name of the discipline | **Animal health and diseases** | | | | | | | |
| 2.2. Course coordinator | | | | **Lecturer Ladoşi Ioan PhD** | | | | |
| 2.3. Seminar/ laboratory/ project coordinator | | | | **Assoc.prof. Criste Adriana PhD** | | | | |
| 2.4. Year of study | 1 | 2.5. Semester | **2** | 2.6. Type of evaluation | continous | 2.7. Discipline status | Content[2] | FD |
| | | | | | | | Compulsoriness[3] | CD |

**3. Total estimated time** (teaching hours per semester)

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Hours per week – full time programme** | 3 | out of which: 3.2. lecture | 1 | 3.3. seminar/ laboratory/ project | 2 |
| **3.4.Total number of hours in the curriculum** | 42 | Out of which: 3.5.lecture | 14 | 3.6.seminar/laboratory | 28 |
| **Distribution of the time allotted** | | | | | hours |
| **3.4.1. Study based on book, textbook, bibliography and notes** | | | | | 20 |
| **3.4.2. Additional documentation in the library, specialized electronic platforms and field** | | | | | 22 |
| **3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays** | | | | | 20 |
| **3.4.4.Tutorials** | | | | | 10 |
| **3.4.5.Examinations** | | | | | 1 |
| **3.4.6. Other activities** | | | | | 10 |
| **3.7. Total hours of individual study** | 83 | | | | |
| **3.8. Total hours per semester** | **125** | | | | |
| **3.9. Number of credits[4]** | **5** | | | | |

**4. Prerequisites** (is applicable)

| | |
|---|---|
| 4.1. curriculum-related | General biology |
| 4.2. skills-related | Microsoft Office, Literature database search |

**5. Conditions** (if applicable)

| | |
|---|---|
| 5.1. for the lecture | The course is interactive, students can ask questions regarding the content of lecture. Academic discipline requires compliance with the start and end of the course. |
| 5.2. for the seminar/ laboratory/ | During practical works, each student will develop an individual activity with |

| | |
|---|---|
| project | laboratory materials (made available in the book that describes the laboratory work). Academic discipline is imposed throughout the course of practical works. |

**6. Specific competences acquired**

| | |
|---|---|
| Professional competences | Students will understand the basis and principles animal health, how to manage animal first aid, and how to recognise some common illnesses in animals and will have the basis for further learning on the application in the field. |
| Transversal competences | Development of information and documentation skills, group activity and use of computer tools for searching and processing analytical data.<br>Competences in reflecting on various problems, topics or methodologies, and on exercising cognitive flexibility |

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

| | |
|---|---|
| 7.1. Overall course objective | Provide basic knowledge in the field of animal health and diseases. Familiarization with key concepts and models for managing animal health and diseases |
| 7.2. Specific objectives | • Acquiring knowledge related to optimum health as essential for the wellbeing and longevity of all animals.<br>• Understanding the normal behaviour of the animal, information on the history of the animal health, a physical health check, observing the species and specialized testing to identify the cause of the illness<br>• Understanding the impact of surveillance and monitoring on farm/companion animal disease<br>• Understanding the strategies to improve animal health and welfare |

**8. Content**

| **8.1.LECTURE**<br>**Number of hours 14** | Teaching methods | 1 lecture = 2 hours |
|---|---|---|
| Preventing disease and injury | | 1 lecture |
| Understanding & inspecting health issues | | 1 lecture |
| Animal first aid | lecture, heuristic conversation, explanation | 1 lecture |
| Some common illnesses in animals | | 2 lectures |
| Treatment of disease | | 1 lecture |
| Strategies to improve animal health and welfare in the future and the role of different Stakeholders | | 1 lecture |

| **8.2. PRACTICAL WORK**<br>**Number of hours 28** | | 1 lab work (2 hours / work) |
|---|---|---|
| European comision Animal Health strategy. State and quality of the current animal health system | | 1 practical work |
| Recommendations for strengthening the animal health framework | Theoretical presentation of practical works | 1 practical work |
| Exercise: gaps in the animal health framework | | 1 practical work |
| Health Checks And Observations | | 1 practical work |
| Keeping Animals Healthy | | 1 practical work |
| Case study: Impact of surveillance and monitoring on farm/companion animal disease | | 1 practical work |
| Impact of disease on farm/companion animal welfare | | 1 practical work |
| Animal diseases and their vectors | | 2 practical work |

| | | |
|---|---|---|
| Multiple species diseases<br>Animal disease: Cattle, Sheep and goat diseases<br>Animal disease: Equine, Swine, Poultry diseases<br>Animal disease: Companion-animal diseases<br>Final evaluation | | 1 practical work<br>1 practical work<br>1 practical work<br>1 practical work |
| *Compulsory bibliography:* Animal Health 2nd edition, ISBN: 978-0-9954356-1-2 Distance Learning And Online Courses E-Books By John Mason And ACS Staff | | |
| *Optional bibliography:* Jibachha's Textbook ofAnimal Health Vol.-I | | |

**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**

| |
|---|
| A strong collaboration with NGOs involved in animal protection. |

**10. Assessment**

| Type of activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Percentage of the final grade |
|---|---|---|---|
| **10.4. Lecture** | Level of knowledge | Evaluation | 50% |
| **10.5. Seminar/Laboratory** | Quality of presentation | Practical exam | 50% |
| **10.6. Minimum performance standards 5 (five)** | | | |
| Learning scientific information and specialized language from the course and practical work at a medium level. Obtaining the final average for passing the checks on the way is a condition of passability. | | | |

[1] Education levels- choose of the three options: Bachelor/ * Master/Ph.D.
[2] Discipline status (content)- for the undergraduate level, choose one of the options:- **FD** (fundamental discipline), **BD** (basic discipline), **CS** (specific disciplines-clinical sciences), **AP** (specific disciplines-animal production), **FH** (specific disciplines-food hygiene), **UO** (disciplines based on the university's options).
[3/] Discipline status (compulsoriness)- choose one of the options – **CD** ( compulsory discipline) **OD** (optional discipline) **ED** ( elective discipline).
[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).
[5 / *] Disciplines: AK- Advanced knowledge, CT- Complementary Training, S- Synthesis

Filled in on
24.09.2021

Course coordinator
**Lecturer Ladoși Ioan PhD**

*Laboratory work/seminar coordinator*
**Assoc prof. Criste Adriana PhD**

Subject coordinator
.....

Approved by the Department on
30.09.2021

Head of the Department
**Assoc. prof. Constantinescu Radu PhD**

Dean
**Prof. Dezmirean S.Daniel PhD**