COURSE DETAILS

"LARGE ANIMAL"

DEGREE PROGRAMME: PRECISION LIVESTOCK FARMING

ACADEMIC YEAR 2025/26

GENERAL INFORMATION – TEACHER REFERENCES

TEACHER: GIANLUCA NEGLIA; MATTEO SANTINELLO
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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE: AUTOMATED FARM MANAGEMENT
MODULE: LARGE ANIMAL
SSD OF THE MODULE: AGRI-09/C – ANIMAL SCIENCE (EX AGR/19 – ANIMAL SCIENCE D.M. 855/2015)
TEACHING LANGUAGE: ENGLISH
CHANNEL: //
YEAR OF THE DEGREE PROGRAMME: II
SEMESTER: I
CFU: 10

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "REGOLAMENTO")

None.

PREREQUISITES (IF APPLICABLE)

Knowledge of the main breeding techniques and procedures used in livestock.

LEARNING GOALS

The course aims at providing students with advanced notions related to precision livestock farming. At the end of the course, the student will have advanced knowledge on: the fundamentals of animal behavior and its relationships with physiological and pathological processes; monitoring, through Precision Livestock Farming technologies, physiological responses related to welfare, as well as productive and reproductive performance of animals. In particular, the student will have the ability to: critically interpret data obtained from real-time monitoring systems, which will allow to make decisions in operational contexts that will ensure the effective management of farms, improving animal welfare and health and, consequently, productive and reproductive performance.

Moreover, the course aims to provide students with advanced knowledge and a critical understanding of the latest innovations, technologies, and sustainable practices in poultry and fish production. Specifically, it seeks to develop the ability to independently and comprehensively analyze and evaluate scientific and technological advancements related to genetic selection, nutritional strategies, animal welfare standards, environmental sustainability, and digital applications. These competencies are intended to prepare professionals capable of making informed contributions within the poultry and aquaculture sectors, supporting innovation and the ecological transition of production systems.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

The course aims to provide students with the knowledge and methodological tools necessary to analyze the main issues related to livestock husbandry, which will allow to understand the causal connections between animal farming and environmental, economic and social sustainability, as well as the main relationships that exist with the welfare and quality of production. In particular, students must develop and understand the basic principles of precision livestock farming (PLF), such as:

- the basics of PLF;
- how to apply a PLF system on a farm;
- principles of commercialization of PLF technologies;
- Key performance indicators (KPI).
- Knowledge and understanding of the main technologies applied to breeding and their potential use.
- Knowledge and understanding of the main indicators of animal welfare and production.

PLF has been defined as "intelligent management and care of (individual) animals on farms through automated and continuous monitoring/control of production/reproduction, health and welfare, thus enabling rapid corrections when deviations from the norm are monitored". Initially, students will learn about the behaviour, physiology and main signs in animals, so that they can understand the monitoring principles applied by LPF tools. Students will indeed learn about new techniques to measure animal bioresponses (including the use of cameras, microphones, wearable technology, internal sensors, biosensors, etc.) and integrated sensor systems to monitor new or established key production indicators. Students will learn how to critically interpret the data obtained from the real-time monitoring system so that as professionals they can make informed decisions that ensure effective and efficient management of farms by optimizing animal health and welfare and consequently farm productivity.

Applying knowledge and understanding

The course delivers skills and methodological and operational tools necessary to draw the consequences of a set of information collected by sensors and other precision technologies and to concretely apply the knowledge to carry out the management of the agro-zootechnical company. Must be able to use the information collected to solve problems concerning

animal breeding, with particular attention to differential diagnosis, also through the development and analysis of spreadsheets and specific programs for the management of the agricultural company

COURSE CONTENT/SYLLABUS GIANLUCA NEGLIA

FRONTAL LESSONS	HOURS
Vocalization tools: technologies for assessing animal vocalizations; significance; association with bevavior and pathologies; utilization for health assessment (es. cough monitoring).	**2**
New technologies for milk characteristics assessment: milk amount; main components (fat, protein, lactose); other components (urea, BHB, progesterone); milk color; milk flow.	**4**
New technologies for milk quality and mammary gland health: milk electrical conductivity; somatic cell count and differential cell count; mastitis detection.	**4**
Automated milking management: milking parlors; milking routine; milking robot (characteristics, types, functioning).	**4**
Automated calf management: puberty; calf feeding; automatic feeding for calves; robotics applied to calf feeding.	**4**
Automated environmental control: weather information systems; control of microenvironment in the farm; technologies for environment control in livestock and their use in farm management.	**4**
Automated control of welfare: pedometers; activometers (auricular, collars, other localizations); respiratory and cardiac sensors; lameness detection; rumination detection.	**4**
Automated control of reproduction: estrus detection (heatwatch; pedometers; activometers; thermography; progesterone; metabolomic approach); synchronization protocols.	**2**
Automated control of animals in extensive systems: virtual fencing; GPS technologies.	**2**
TOTAL	**30**

PRACTICAL TEACHING	HOURS
Software for farm management: data organization, analysis and interpretation; monitoring environment, welfare, health and reproduction through software	**10**
Management of milking: milking robot and milking parlours	**10**
TOTAL	**20**

COURSE CONTENT/SYLLABUS MATTEO SANTINELLO

FRONTAL LESSONS	HOURS

Basic principles of Precision Livestock Farming (PLF): reasons for PLF application; development of a PLF system in the farm; commercialization principles of PLF technologies.	**4**
Key performance indicators: characteristics, development and utilization; advantages and disadvantages of KPI.	**2**
Big data management and analysis: data collection in the farm, organization, significance and application for livestock management; basic principles of machine learning and artificial intelligence.	**2**
Genetic improvement in dairy and beef cattle and dairy buffalo: from traditional genetic techniques to genomic application for farm management.	**2**
Main technologies applied to large animals and their potential use: technologies classification; PLF for automated management; applications in cattle (dairy and beef), buffalo, sheep, goat and swine.	**3**
Animal Identification: importance of animal identification; standard and new identification systems; radio frequency identificatrion (RFID) systems; TAG and reader technologies; animal biometrics.	**3**
The rumen: monitoring rumen activity through technologies; sub-acute rumen acidosis; ketosis; advanced tools.	**3**
Image analysis applications and processing in livestock: body condition score (BCS) evaluation; morphology; lameness detection	**4**
Utilization of thermography in livestock: environmental control; mammary gland health; body condition score (BCS) evaluation; pathologies diagnosis.	**3**
Mid-infrared Spectroscopy (MIRS) and Near-infrared Spectroscopy (NIRS) technologies: definition; application and utilization for product quality; development of prediction models.	**4**
TOTAL	**30**

PRACTICAL TEACHING	HOURS
Management of calves through automatic system	**8**
Practical application of image analysis techniques	**6**
Laboratory analysis for milk and feed quality	**6**
TOTAL	**20**

READINGS/BIBLIOGRAPHY

- ✓ *Lecture notes provided during the course*.
- ✓ *Suggested scientific articles*.
- ✓ Ilan Halachmi. 2015. Precision livestock farming applications. Wageningen Academic Publisher. (Available in our library, Collocation: 636.01 PRE).
- ✓ Claudia Kamphuis, Wilma Steeneveld. 2016. Precision dairy farming. Wageningen Academic Publisher. (Available in our library,

TEACHING METHODS

Teachers will use:

- ✓ *Frontal lessons for 60% of total hours;*
- ✓ *Practical activities (which include technical visits to livestock farms and other facilities where PLF technologies are applied, practical exercises on PC for the use of management software, practical activities at the Improsta farm) for 40% of total hours.*

The teacher will use a student-centered method; tutorials; Practical lessons, learning by doing method. The lessons will be supported by multimedia teaching material available to students on the teacher's website, after registering for the course.

EXAMINATION/EVALUATION CRITERIA

*For **integrated courses**, this field should encompass all modules, with indication of the relative weight of each module on the final mark. For integrated courses, this field should be coordinated by the reference teacher for the course.*

a) Exam type:

Exam type	
written and oral	
only written	
only oral	X
project discussion	
other	

b) Evaluation pattern:

The oral exam consists of at least 4 questions (two for each module). The final mark will be weighted on CFU of each module and therefore will be made up of: Module '' Large animal'' 10 CFU 62,5%; Module '' Poultry and Fish'' 6 CFU 37,5%.
*For the evaluation, the "**Regulation for Guidelines_for_exams_management**" approved by the Didactic Coordination Committee of the Master Degree in Precision Livestock Farming will be considered.*