GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Basic Avian Sciences: Embryology, Physiology, Immunology, Breeding & Genetics (G000842)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0 **Study time 120 h**

Course offerings in academic year 2024-2025

A (Year)	English	Gent

Lecturers in academic year 2024-2025

Antonissen, Gunther	DI02	lecturer-in-charge
Cornillie, Pieter	DI03	co-lecturer
De Gussem, Maarten	DI05	co-lecturer
De Spiegelaere, Ward	DI03	co-lecturer
Devriendt, Bert	DI04	co-lecturer
Ducatelle, Richard	DI05	co-lecturer
Janssens, Geert	DI07	co-lecturer
Van Den Broeck, Wim	DI03	co-lecturer
Van Immerseel, Filip	DI05	co-lecturer
Van Meirhaeghe, Hilde	DI04	co-lecturer

Offered in the following programmes in 2024-2025	crdts	offering
Postgraduate in Poultry Health Sciences(main subject Asia)	4	A
Postgraduate in Poultry Health Sciences(main subject Europe)	4	A
Postgraduate in Poultry Health Sciences(main subject Latin America)	4	A

Teaching languages

English

Keywords

embryology, anatomy, physiology, immunology, breeding and genetics

Position of the course

The goal of this course is to provide knowledge and deeper insights in the basic principles of avian sciences related to the normal structures, functioning and development of the healthy bird in relation to poultry farming.
First, in the section embryology the different developmental steps that occur to attain the normal anatomical and histological configuration of a neonatal chick are discussed. In addition to the normal embryonic development, also the occurrence and origin of congenital malformations and anatomical variations are discussed. Subsequently, this knowledge will be more practically elaborated in the section incubation biology and hatchery management.
Next the normal anatomy relevant to poultry health assessment in practice is investigated. Subsequently, the cellular morphology and the microscopic structure of the four basic tissues: epithelial tissue, connective tissue, muscle tissue and nervous tissue are discussed. Besides, also the physiological processes and the development and maintenance of the innate and adaptive immune mechanisms will be discussed. An important link will be made between normal anatomy, physiology and immunology and poultry farming.
Finally, the students get familiar with the basic principles of genetics, genetic variation and the molecular processes involved. This knowledge will subsequently be more practically elaborated in the section breeding management.

Contents

Embryology & Incubation management: The content of this section focusses

on the egg development; daily embryonic development; embryonic communication; the effect of environmental factors on embryo development and embryonic mortality. In relation to incubation management, cleanliness, disinfection, storage and transport of the hatching eggs; hatchery design; incubation process; identification of problems during incubation; factors affecting hatchability; hatching; chick transport and in ovo administrations will be discussed.
Avian anatomy: This section will discuss the avian anatomy relevant for poultry farming and clinical cases; focusing on locomotor system and biomechanics; digestive system; respiratory system; urinary system; reproductive system; cardiovascular system; nervous system; immune system and lymphoid organs; endocrine glands; integument; and anatomy of the senses. In the cell biology and histology sessions an overview of microscopic techniques and staining methods; cellular morphology; cell cycle; mitosis and meiosis will be given. Followed by a general introduction on the microscopic structure of epithelial tissue; connective tissue; muscle tissue and nervous tissue.
Physiology: The content of this section focusses on the basics of physiological processes of major importance in poultry farming and its relation to poultry management; such as gastrointestinal physiology; carbohydrate metabolism; adipose tissue and lipid metabolism; protein metabolism; food intake regulation; respiration; cardiovascular system; blood; bone physiology; skeletal muscle physiology; photoperiodism; thermoregulation; endocrinology; chemical senses in birds, and molting.
Immunology: In this section basic principles of the innate and adaptive immune mechanisms in birds are explained, including an introduction to the avian lymphoid system; development of the avian immune system; avian B and T-cells; immunoglobulins; innate immune response; cytokines and chemokines; antigen presenting cells; mucosal immunology; intestinal barrier, and tumors of the avian immune system.
Breeding and genetics: The content of this section focusses on structure of DNA and the avian genome; DNA replication, recombination and repair; information flow from DNA to RNA and proteins; principles of quantitative genetics: variation, heritability and breeding value estimation; breeding objectives and selection strategies for poultry production, and also problems associated with poultry breeding and selection.

Initial competences

General knowledge of life sciences at academic level.

Final competences

1 Be able to define the different phases of embryonic development in poultry species.
2 Know the essentials of egg incubation biology and hatchery management.
3 Exemplify the critical aspects in egg storage, incubation and hatching affecting chick quality
4 Describe the anatomical organisation and function of anatomical structures, organs and systems.
5 Correctly situate a given anatomical structure on a figure, picture or anatomical specimen of poultry species.
6 Know the essentials of cell structure and functions, cell cycle, and cell death.
7 Know the essentials of the organisation of cells in different tissues.
8 Be able to describe the basics of physiological processes of major importance in poultry and to use this knowledge to comprehend the aetiology of pathophysiological processes.

9 Being able to name and understand the function of the most important tissues of the avian immune system.
10 Know the essentials of cellular and humoral compenents of the avian innate and adaptive immune system.
11 Have basic insight in how extracellular signals, e.g. cytokines and antigen recognition, can lead to activation of immune cells
12 Know the essentials of genetic principles and be able to apply this knowledge in relation to poultry breeding.

13 Being able to exemplify problems associatied with poultry breeding and

selection.

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, Practical, Independent work

Extra information on the teaching methods

The course consists of instructor-led and facilitated e-learning (53.5h), expert webinars (4.5h), (e-)practical exercises (12h).
Practical exercises of the postgraduate Poultry Health Sciences are offered in enterprises in situ though, within periods of one week twice per academic year (first and second year of the programme) resp. once per academic year (third year of the programme). For the European program the practical courses will be organised in Belgium (Merelbeke, Izegem and Poeke); for the Asian program they will be organised alternately in Thailand (Bangkok)/the Philippines (Manilla); for Latin American program they will be organised in Brasil (Sao Paolo).

Study material

None

References

Avian Embryology, 2nd edition, by Marianne Bronner-Fraser (Ed.)
Avian Anatomy: Textbook and Colour Atlas, 2nd edition, by Horst E. Koenig, Rüdiger Korbel, and Hans-Georg Liebich (Eds.)
Sturkie's Avian Physiology, 6th edition, by Colin G. Scanes (Ed.)
Avian Immunology, 2nd edition, by Bernd Kaspers and Karel A. Schat (Eds.)
Hatchery Signals, A practical guide for improving hatching results (Roodbont publisher)

Course content-related study coaching

E-mentoring by the lecturers will provided support and feedback at class and individual level through online tools; possibility to discuss some problems with the lecturer-in-charge during the practical courses.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Skills test, Participation

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

A: Periodic evaluation: There is a part of the written examination with open questions with an oral defence, and a part of the written examination with multiple choice questions. The theory and practical examples discussed in the e-lessons, expert webinar, and practical sessions form the content of this examination.
Periodic evaluation in the first-term examination period will be organised onsite in the period May 1st - June 30th. For the postgraduate Poultry Health Sciences module Europe first-term examination will be organized in Merelbeke (Belgium), for the module Asia in Bangkok (Thailand), for the module Latin America (Sao Paolo).
Periodic evaluation in the second-term examination period will be organized in the period August 1st - September 15th in Merelbeke (Belgium) for all modules.
B: Permanent evaluation: Presence and active participation during practical sessions, and participation in asynchronous online discussions.

Calculation of the examination mark

Periodical examination: 90%
Permanent evaluation: 10%
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examinator.