EM-SANF courses in year 1

Aarhus University

The subjects at Aarhus University focus on Animal Nutrition & Environment and are described below.

**Introduction Animal Production (5 ECTS)**
Subject code: to be announced
Main lecturers: Tine Rousing, Peter Lund, Jakob Sehested, Helle Nygaard Lærke, Sanna Steenfeldt, Michel de Rancourt (EI Purpan) and Djamel Ali Haimoud (EI Purpan)
Activities: lectures, theoretical practical sessions, excursions.

**Brief content:**
The subject will introduce the student to nutrition, production and welfare of farm animals. This includes anatomic characteristics, feedstuffs, nutrient digestion and evaluation, as well as an introduction to the 'herd' as an production systems where management, animal health, animal welfare and animal production inter-relate. In the beginning of the subject there will be one 2-day-excursion. Topics for lectures and belonging theoretical sessions:
- Farm animal characteristics and feedstuffs
- Animal production systems
- Digestion in monogastrics and ruminants
- Evaluation of feedstuffs and diets
- Animal health, ethology and on-farm welfare assessment

**Quantitative Animal Nutrition and Physiology (10 ECTS)**
Subject code: to be announced
Main lecturers: Peter Lund, Jan Værum Nørgaard, Kristen Sejrsen, Mogens Vestergaard, Sanna Steenfeldt, Jakob Sehested, Helle Nygaard Lærke
Activities: lectures, theoretical exercises, individual project assignments, presentations, practical laboratory exercises and excursion.

**Brief content:**
The aim of this advanced subject is to give the students a sufficient background to be able to describe and quantify digestion of individual nutrients both in the gastrointestinal tract and intermediary in domestic animals. This will take place on the basis of a solid knowledge of nutrient composition of feedstuffs and domestic animal anatomy and physiology. The obtained knowledge will enable the students to evaluate the need for nutrients and energy for domestic animals for given responses (growth, lactation, egg-laying, fur development, reproduction).

**Nutrient Cycling and Environmental Effects (10 ECTS)**
Subject code: 25548
Main lecturers: Hanne L. Kristensen, Jørgen E. Olesen, John E. Hermansen, Brian Kronvang
Activities: lectures, project-based work, experimental and theoretical exercises including field- and laboratory work and computer modelling.

**Brief content:**
The focus will be on the biological and physical/chemical processes and transport of importance for the loss of nutrients from agro-ecosystems and their effect on the surrounding natural ecosystems. The subject will take its starting point in environmental problems and their solution concerning the use of nutrients in agricultural production. The subject will include the function and cycling of nutrients:
- In plants, animals, micro-organisms, soil, water and atmosphere.
- At the level of organisms, ecosystems and landscape.
• In agro-ecosystems, terrestrial and freshwater (semi-) natural ecosystems.
• In and between the farm, the agricultural soil and the natural ecosystems.
This will include management tools for use in agricultural and horticultural production to increase the nutrient use efficiency such as fodder and fertiliser practice, waste management and design of crop rotations as well as restoration of natural ecosystems. The subject will focus on nitrogen, phosphorus and include other selected nutrients.

**Project in Sustainable Animal Feeding (5 ECTS)**

**Subject code:** to be announced

**Main lecturers:** Hanne L. Kristensen, Peter Lund, Tine Rousing, Hanne Damgaard Poulsen, Sanna Steenfeldt, John E. Hermansen, Brian Kronvang, Jakob Sehested, Fabien Alleman (EI Purpan), Jean François Gabarrou (EI Purpan) and Michel de Rancourt (EI Purpan)

**Activities:** lectures, independent project work under supervision, presentations.

**Brief content:**
The subject is co-organized between the partner universities EI Purpan and AU. By the use of video-link there is a joint introduction to the subject and the SWOT method, and a short series of joint lectures on environmental and economic sustainability of animal feeding. Individually or in groups the students identify and analyse a relevant scientific problem regarding the environmental and/or economic issues in animal science. Each project is allocated a main-supervisor from AU, and a co-supervisor from EI Purpan. The students will be trained to identify, analyse and present a relevant scientific problem by the use of original literature and by the use of knowledge and methods acquired during the subjects of the course. The students are to present their project orally, to be opponents on another project and to deliver a project report. An assessment is made based on a written project work (10 to 12 pages per student).
Ecole d'ingénieurs de Purpan

The subjects at Ecole d'Ingénieurs de Purpan focus on Feed market & Economics and are described below.

**Levelling and introduction session in animal chains (4 ECTS)**

Subject code: 41 SPA 03  
Main lecturers: Michel de Rancourt, Maud Roucan, Jean Francois Gabarrou, Djamila Lekhal, Fabien Alleman  
Activities: lectures, exercises and individual work.

**Brief content:**
- Leveling courses and exercises in:
  - European history, institutions and CAP
  - Livestock farms productions and feeding systems
  - Farm accountancy and management basis
- Main issues for the European animal productions and chains
- Intercultural conference and exercises
- Individual coaching during the semester

**International agricultural policies (4 ECTS)**

Subject code: 41 ECM 02  
Main lecturers: Evert Van der Sluis (South Dakota University), Fabian Alleman (Purpan), lecturers from European Commission, COPA COGECA and FEFAC & FEFANA in Brussels  
Activities: lectures, study tours and individual work.

**Brief content:**
- European common agricultural policy
- European regulations and procedures for animal productions and animal feed sector
- WTO and US Farm Bill, influence on markets and animal productions
- Study Tour in Brussels (European Commission, COPA COGECA & FEFAC)

**Livestock production systems in Europe (4 ECTS)**

Subject code: 41 SPA 01  
Main lecturers: Cortes (ESA), Michel de Rancourt (PURPAN), lecturers from Autonomous University of Barcelone (SP) and Aarhus University (DK)  
Activities: lectures, visits & study tours and individual & group work.

**Brief content:**
- METHOD: Diagnosis method for technique and economic farm performances, reference databases in Europe
- ANIMAL PRODUCTION SYSTEMS for dairy & meat ruminants, poultry and pigs
- FEEDING and FORAGE SYSTEMS compared in Europe
- STUDY TOUR & VISITS in: Spanish Catalonia, French South West, French West

**Livestock farm managements in Europe (4 ECTS)**

Subject code: 41 SPA 03  
Main lecturers: Dumont (PURPAN), Roucan (PURPAN), Ben Arfa (ESA), Ghali (ESA)  
Activities: lectures and individual work.

**Brief content:**
- FARM MANAGEMENT: Farm accountancy analysis and different accountancy systems in Europe
- FARM MODELLING with simulation for different policies
Animal market chains and feed industry in Europe (4 ECTS)

Subject code: 41 ECM 03
Main lecturers: Bouroullec (PURPAN), de Rancourt (PURPAN), Feher (GÖDÖLLŐ Univ.), René (IFREMER), Van Ferneij (IFIP), Jachnik (MAISON DU LAIT), Mariette (ex. SOCOPA), Habert (Consultant)
Activities: lectures, visits and individual work.

Brief content:
- Concept and method for the market chains
- Future international market types
- FEED INDUSTRY markets in Europe
- DAIRY products chains in Europe
- BEEF MEAT chains in Europe
- PORK MEAT chains in Europe
- POULTRY MEAT chains in Europe
- LAMB MEAT chains in Europe
- FISH chains in the world

Future of livestock production in Europe (4 ECTS)

Subject code: 41 ECM 04
Main lecturers: Lensink (ISA), IRSEA Ltd., Giotto (Univ. Toulouse), Vellinga (Univ. Wageningen), Guglielmi (ISARA)
Activities: lectures, visits and individual work.

Brief content:
LIVESTOCK SUSTAINABILITY: methods (IDEA), example for the main species, case study
ANIMAL WELFARE: European regulations, assessment and certification methods, animal feeding and welfare
ENVIRONMENT: Livestock farms and environmental impacts, Life Cycle Analysis for animal products
CONSUMPTION ISSUES: consumer behaviour in Europe, quality signs and sanitary issues for animal products

Tutored work in sustainable animal feeding (6 ECTS)

Subject code: 41 ECM 06
Main lecturers: Tutors from FESIA Schools and Aarhus University (DK)
Activities: lectures, group and individual work.

Brief content:
- Course on project management and SWOT methods
- Course on bibliographic research method and referencing
- Tutored workshop with bibliographical study and critical analysis, thanks to interviews of professional, concerning an animal nutrition and feeding topic having a multidisciplinary and international dimension
University of Debrecen

The subjects at the University of Debrecen focus on Feed & Food Evaluation and are described below.

Energy and Protein Evaluation (8 ECTS)
Subject code: MTMAE042
Main lecturers: László Babinszky and James Pettigrew (scholar)
Activities: lectures, read scientific papers and to discuss the development and data interpretation of experiments on selected topics in tutorials, write a literature review on different relevant topics based on 4-5 papers and give presentations on literature of energy and/or amino acid metabolism.

Brief content:
The subject overviews the principles of feed analysis and the role of energy yielding nutrients. Students get acquainted with different methods to determine the energy utilization of livestock and the energy evaluation systems in different species. The subject introduces in vitro and in vivo methods for determination the protein quality of the feed, feedstuffs and food. Determination of protein quality in terms of digestibility and bioavailability of the amino acids are also discussed. Furthermore the use of knowledge on bioavailability of amino acids and the ideal protein concept as well as the importance of appropriate amino acid/energy (DE or ME) ratio in pigs and poultry nutrition will be detailed.

Feed Formulation and Compound Feed Production (6 ECTS)
Subject code: MTMAE045
Main lecturers: Levente Czeglédi and Thomas van der Poel (WU)
Activities: lectures, read scientific papers and to discuss the development and data interpretation of experiments on selected topics in tutorials, write a literature review on different relevant topics based on 4-5 papers and give a presentation, solve diet formulation problems, feed mixing practice in the model feed production plant of the department and visiting feed manufacturing plants.

Brief content:
Different animal requirement tables will be discussed (NRC, CVB, Danish feed evaluation system) for monogastric and ruminant species. The methods of diet formulations will be studied and practiced. The course introduces the current state of the art technologies used in compound feed production and its effect on the performance of farm animals.

Nutrition and Product Quality (6 ECTS)
Subject code: MTMAE046
Main lecturers: Dr. Csaba Szabo
Activities: lectures, read scientific papers and discuss the development and data interpretation of experiments on selected topics in tutorials, give presentations on selected scientific research studying the impact of nutrient supply on quality of animal products, make proposal for a simple experiment.

Brief content:
Traceability of the production system of “from farm to fork chain” is essential in the interest of safe and good quality food. The subject introduces the critical points of the food production chain, in particular how the diet composition and the nutrient content of the feed influence the quality and safety of animal products (meat, milk, egg). The subject gives an overview of the risk factors occurring in the food production chain and particular in animal feeding, as well as the various systems to handle these risk factors, that are concerned with food safety.
Restricted optional courses at UD:

**Environmental Impact of Animal Nutrition (5 ECTS)**
Subject code: MTMAE043  
Main lecturers: Hanne Kristensen (AU)  
Activities: lectures, read scientific papers and discuss the development and data interpretation of experiments on selected topics in tutorials, give presentations on experiments studying the impact of nutrient supply on efficiency and waste of animal production.

**Brief content:**  
One of the big challenges of the 21st century is the sustainable development. In order to ensure the sustainability reduction of the environmental pollution is imperative. The subject introduces the environmental issues of animal nutrition, aims to show the impact of animal feeding on the pollution of animal production. The students are going to study nutritional regimes that are useful tools for reducing N, P and CH4 excretion of livestock, without reducing the production quality.

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**Feed Conservation (5 ECTS)**
Subject code: MTMAE044  
Main lecturers: Peter Bárány  
Activities: lectures, write a literature review on different relevant topics based on 4-5 papers, to evaluate (visual appraisal, pH determination, determining dry matter) forage samples (haylage, corn silage, high moisture grain, and dry hay).

**Brief content:**  
The subject provides knowledge about production, conservation (silage, haylage, hay, different way of cereal conservation), describe the relations between cultivation, harvesting, conservation of forage and the quality of feed and milk, describe how conserved forage is evaluated in some different feed evaluation systems. The focus is on forage for dairy cow and beef production.

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**Precision Livestock Nutrition (5 ECTS)**
Subject code: MTMAE047  
Main lecturers: László Babinszky  
Activities: lectures and seminars, farm visiting, making a report on the experience of farm visits and case study on a livestock farm’s feeding system.

**Brief content:**  
By applying precision nutrition, the farm animals (i.e. primarily cattle, sheep, pig, poultry) are fed so that their nutrient requirements are met with the maximum possible precision, ensuring thereby the most efficient and safest production of animal products, the best product quality (meat, milk, eggs, a.s.o.) and at the same time the lowest level of environmental pollution. The concept is based on information technology and extensive international databases; hence the term “information intensive nutrition” can also be used. Upon the completion of this subject the students gain comprehensive knowledge about the relationship between animal nutrition and information technology; about the complex issues of meeting nutrient requirements, product quality and environmental pollution by animal species.
Wageningen University

The subjects at the Wageningen University focus on Modelling Nutrient Metabolism and are described below.

**Animal Nutrition and Physiology (6 ECTS)**
Subject code: ANU-30806
Main lecturers: Walter Gerrits and Wilbert Pellikaan
Activities: lectures and practicals (including the conduct and reporting of three experiments).

*Brief content:*
The subject consists of two parts: Lectures digestive physiology and intermediary metabolism and Pricals Nutritional Physiology. Digestive physiology and intermediary metabolism will be presented as lectures covering general principles of anatomy and function of the digestive tract in various species, metabolism of carbohydrates, fats, fatty acids, proteins and amino acids. The practicals nutritional physiology will consist of three modules. (1) Practical Rumen Fermentation. This practical focuses on measurement of rumen fermentation and passage processes. (2) Practical Energy Metabolism. This practical focuses on measurement of carbohydrate and fat metabolism in young pigs using indirect calorimetry. Students will collect data from 10 piglets, housed in two climate controlled respiration chambers, to calculate heat production, protein and fat deposition rates. (3) Practical Nutrient Analyses. During these practicals, students will get experience in laboratory measurement of dry matter, ash, nitrogen, crude fat, starch and cell wall analyses. The results of the 3 experiments will be integrated and interpreted by using mathematical modelling.

**Nutrient Dynamics (6 ECTS)**
Subject code: ANU-30306
Main lecturers: Jan Dijkstra, Walter Gerrits and Ermias Kebreab (scholar)
Activities: read scientific papers and to discuss the development and data interpretation of experiments on selected topics in tutorials, utilise extant mechanistic models of digestion and metabolism in farm and companion animals and interpret simulation results, develop mechanistic models based on hypotheses and data from literature and report and discuss simulation results.

*Brief content:*
In this subject, knowledge of digestion and metabolism of nutrients in farm and companion animals will be extended and quantified. Students will read and discuss scientific papers on five various topics, such as microbial metabolism, growth in ruminants and nutrient based feed evaluation systems. Quantitative understanding of these topics will be obtained by application of mathematical models and developing new models. These models are mechanistic, i.e., based on understanding of the underlying processes involved. The behaviour of the whole system under study is analysed in terms of its components and their interactions. Simulation results will be presented in short reports and discussed.

**Quality of Animal Products (6 ECTS)**
Subject code: YAS-32806
Main lecturers: Wilbert Pellikaan, René Kwakkel, Johan Verreth and Hans van Trijp
Activities: active participation during lectures, working out of own reports, participation to excursions (compulsory) and working-out of specific case studies/presentation.

*Brief content:*
The composition, structure and quality of foods from animal origin such as milk, meat, fish and eggs; is discussed. The effects of nutrition, genetics and the environment on physical and (bio)chemical product changes, nutritional value, hygienic/microbiological quality, sensoric quality is assessed in this course. Moreover, quality control and assurance of animal products in production chains in evaluated; every aspect of product quality is discussed at the animal, farm and industrial level.
**Feed technology (6 ECTS)**

Subject code: ANU-30806
Main lecturers: Thomas van der Poel, Johan Schrama and Peter Ferket (scholar)
Activities: lectures/discussion, participation in practicals, ingredient technology, linear programming of diets, feed manufacturing and challenge problems via the web.

**Brief content:**
In this course, all aspects of feed processing are studied and discussed, such as (1) feed legislation, feed safety and quality; (2) feed ingredients and processing; (3) feed additives; and (4) feed manufacturing technology.