From Mendel to the genomic revolution: Genetics in daily life
July 9th – 22nd, 2017
Kavala, Greece

Course Description

Just over 150 years ago an Augustinian monk was setting the basis for what is now known as Genetics and Inheritance. Since then many brilliant innovations have boosted this scientific field leading to astonishing breakthroughs. Today, outcomes of Genetics research feature in and affect many aspects of our daily lives. The course will take us on a trip from the early days to modern developments. This is an Introductory University-level course aiming to (i) provide a basic knowledge of Genetics theory and the rules of inheritance; (ii) offer meaningful insights at molecular, genomic, individual and population level; (ii) explore modern applications in agronomy, agrifood, biomedicine, justice, policy making etc.

Course Syllabus

Week 1: Genetics and inheritance (G. Banos)

1. Definitions
   a. Genes, chromosomes, genotypes, genome
   b. Nucleic acid
   c. From genes to proteins (duplication, transcription, translation)
2. Mendelian Genetics
   a. Modes of inheritance
   b. Dominance-Epistatic interactions
   c. Sex and inheritance
   d. Linkage
3. Population Genetics
   a. Genotypic and gene frequencies
   b. Hardy-Weinberg equilibrium
4. Quantitative Genetics (complex traits)
   a. Additive genetic effects
   b. Phenotype-genotype association
   c. Relevant statistics
   d. Genetic relationships among individuals
   e. Genetic parameters

Week 2: Practical applications (D. Chatziplis)

5. Sequencing
6. Genome mapping
7. Molecular applications
   a. Traceability (food)
   b. Breed/variety identification (animals and plants)

        c. Parental tests and verification
        d. Forensic identification
        e. Gene editing
        f. Genetic engineering

8. Genetic characterisation
        a. Assessment of genetic merit – genetic evaluation
        b. Genotypic identification and development of appropriate treatment
        c. DNA arrays

9. Genetic resource management (animals, plants)
        a. Managing inbreeding and biodiversity

10. Breeding for improvement (animals, plants)
        a. Breeding for disease resistance
        b. Optimal mating strategies
        c. Carrier detection

Suggested background reading (to be purchased by the students prior to their arrival):
- iGenetics: A Mendelian Approach by Peter J. Russell
- iGenetics: A Molecular Approach by Peter J. Russell
- More suggested readings will be produced closer to the course dates.

Course material, examples and applications will pertain to humans, animals (companion and livestock) and plants.

Students will need to bring a hand-calculator with them.

Student assessment will be based on an exam at the end of week one (35%), an exam at the end of week two (35%) and a final essay (30%) due to be completed within two weeks from the end of the course. The essay (min. 2,000 words) will discuss an application of Genetics that is of interest to the student. A title and a one-paragraph proposed description must be presented to the instructors before the end of the course for approval. The essay will consist of an Introduction, objectives, discussion (including practical examples) and conclusions. The final grading scale will be as follows:

A+	96-100
A	90-95
A-	86-89
B+	80-85
B	75-79
B-	70-74
C+	65-69
C	60-64
C-	55-59
D	50-54
Fail	>50