BIO1.4: GENETICS

I. Course description:

1. **Credit points**: 3 ECTS

2. **Time commitment:**

Items	Lecture	Tutorial	Practical	**Total**
No. of hours	20	10	0	**30**

3. **Prerequisites:** Basic cell biology, basic biochemistry, mathematics (probability)

4. **Recommended background knowledge:** N/A

5. **Subject description:**

This course is an introduction to genetics for students in the fields of biotechnology and pharmacy.

6. **Objectives & Outcome:**

After this course, students will acquire basic knowledge in the following fields:

- DNA structure and function
- mechanisms of RNA and protein synthesis
- gene inheritance
- genetic differences between individuals
- genetic differences between species
- biotechnology applications
- introduction to epigenetics

In addition, students will be able to solve simple problems regarding the genetic code, protein synthesis and gene inheritance.

7. **Assessment/ Evaluation**

Component	Attendance	Exercises	Assignments	Reports	Midterm	Final
Percentage %	5	15	0	0	0	80

8. **Prescribed Textbook(s): N/A**

II. Course content & schedule:

1. Introduction to the genetic revolution: from Mendel to genome sequencing, a historical perspective
2. DNA

[1] DNA structure, chromatin structure

[2] Chromosomes and karyotype

[3] Definition of the gene and the genome

[4] DNA replication in prokaryotes and eukaryotes

3. From genes to proteins:

    [1] the genetic code

    [2] RNA synthesis (transcription)

    [3] protein synthesis (translation)

    [4] control of gene expression

4. Genetic variations:

    [1] Metagenomics: gene and genome structure in bacteria, plants and animals, genetic differences and similarities between species

    [2] Genetic variations, mutations and polymorphisms

    [3] Somatic gene variations and cancer

5. Inheritance (part I):

    [1] Reproduction of cells and organisms, meiosis

    [2] Mendel laws

6. Inheritance (part II): particular cases

    [1] Sex chromosomes

    [2] Linkage (Morgan law)

    [3] Mitochondrial inheritance

7. Introduction to population genetics: Hardy-Weinberg law
8. Epigenetics

    [1] DNA methylation

    [2] chromatin regulation

9. An introduction to gene technologies:

    [1] DNA sequencing

    [2] bioinformatics: sequence comparison using BLAST, databases

    [3] Polymerase Chain Reaction

    [4] artificial genes and protein production

    [5] transgenesis in animals and plants

10. Conclusion and discussion

III. Reference Literature:

[1]. Biology. Campbell & Reece. 8th Ed. Pearson

[2]. Introduction to genetic analysis. Griffiths et al. 9th Ed. Freeman.