COURSE SYLLABUS STEM Ed Abroad Program

Course Title: Principles of Genetics

Course Semester: Fall

University and Country: Adam Mickiewicz University; Poznan, Poland

Number of ECTS: 8 (lecture)

Course Designations for Transfer Credit: GEN311 (NCSU)

Content: Principles of Genetics is a one-semester course on experiment and theory behind modern genetics.
Pre-requisites: General Biology with a grade of C- or better.

Aims: 01-X-GENET GENET is an upper-level survey course in the field of modern genetics. The course will cover a broad range of topics, including Mendelian inheritance, linkage, mapping, DNA and chromosome structure, and function, as well as gene expression and regulation. Besides, selected aspects of population and quantitative genetics will be discussed (including factors determining the population variation and heritability of quantitative traits). We will study basic genetics principles in prokaryotic and eukaryotic organisms on the level of individuals, and populations.

Course learning outcomes (EU) in terms of knowledge, skills and social competences and their reference to study program learning outcomes (EK):

Course learning outcome symbol (EU)	On successful completion of this course, a student will be able to:	Reference to study programme learning outcomes (EK)
EU_01	Define the basic principles of genetics gained in classroom lectures, textbook readings, and homework exercises	
EU_02	Explain the scientific process and how genetic principles have emerged from many scientists' work by the integration of observational and experimental evidence with logical analysis.	
EU_03	Use critical-thinking skills and problem-solving skills gained in this study of genetics.	
EU_04	Analyse the crucial role that genetics plays in different areas of biology and integrate a strong foundation in genetics with subsequent coursework in biology.	
EU_05	Apply knowledge of genetics to problem solving in areas such as agriculture, medicine and society.	

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2. Learning content with reference to course learning outcomes (EU)

Course learning content:	Course learning outcome symbol (EU)
Model Organisms, Mitosis and Meiosis, Transmission Genetics, Chi-square analysis	EU_01; EU_02
Sex Determination, Sex Linkage, Pedigree Analysis, Genetic Testing, Extensions to Mendelian Inheritance, Sex Limited Traits, Sex Influenced Traits, Cytoplasmic Inheritance and Maternal Effect, Epistasis	EU_2; EU_04
Linkage and Chromosome Mapping (including Two and Three point Mapping and Reverse Mapping), Variations in Chromosome Number and Structure: Chromosome Aberrations, Aneuploidy and Polyploidy,	EU3; EU_04
Bacterial Genetics and Gene Transfer and Mapping in Bacteria; Prokaryotic Gene Regulation, Eukaryotic Gene Regulation, Epigenetics, Genetics of the Immune System, Developmental Genetics	EU_04; EU_05
DNA as the Genetic Material, Important Genetics Experiments/Researchers DNA Structure, Chromosome Structure, Transposable Elements	EU_01; EU_05
Replication, Transcription, RNA Types and RNA Processing, The Genetic Code and Translation, Problems involving Transcription and Translation,	EU_01; EU_05
Biochemical Pathways, Mutation, Mutagens and Repair Mechanisms, Quantitative Genetics and Cancer Genetics,	EU_01; EU_02; EU_04
Evolutionary Genetics and Phylogeny, Population Genetics, Biotechnology	EU_02; EU_05

Recommended Books: *Genetics: A conceptual Approach*, 6th ed., by Benjamin Pierce, 2017 (ISBN: 978-1-319-05096-2)
Lecture Slides: Lecture slides will be posted online prior to class.

Instructors:

Dr hab. Konrad Celinski
Dr hab. Ewa Chudzinska, Prof. UAM
Dr hab. Iwona Melosik, Prof UAM
Dr hab. Ireneusz Odrzykoski, Prof. UAM
Dr hab. Miroslawa Siatecka, Prof UAM.
Dr hab. Aleksandra Wojnicka-Poltorak, Prof. UAM
with consultation by Dr. Betty Gardner(NC State University).

Grading System and Percentage Contribution

Homework	25%
Exam (5 @15% each)	75%
Total	100%

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AMU Grading system and scale

The grading system used at Adam Mickiewicz University, whose name is abbreviated as AMU or UAM, is as follows:

Exams and homework assignments grading scale

5 100%-92%
4+ 91%-83%
4 82%-74%
3+ 73%-65%
3 64%-56%
2 55% and less

This translates into the following ECTS (European internationally recognized system) grading scale:

ECTS Grade	AMU grade	Definition
A	5.0	EXCELLENT – outstanding performance with only minor errors
B+	4+ / 4.5	VERY GOOD – above the average standard but with some errors
B	4.0	GOOD – generally sound work with a number of notable errors
C+	3+ / 3.5	SATISFACTORY – fair but with significant shortcomings
C	3.0	SUFFICIENT – performance meets the minimum criteria
F	2.0	FAIL – considerable further work is required

Hours: 3 Lecture hours and 1 Tutorial hour per week.

Course Lecture Topics:

1. Introduction to the Course, Model Organisms, Mitosis and Meiosis, Transmission Genetics, Chi-square analysis ;
2. Sex Determination, Sex Linkage, Pedigree Analysis, Genetic Testing, Extensions to Mendelian Inheritance, Sex Limited Traits, Sex Influenced Traits, Cytoplasmic Inheritance and Maternal Effect ;
3. Extensions to Mendelian Inheritance, Epistasis, (including biochemical pathways for epistasis and chi-square tests for epistasis);
4. Linkage and Chromosome Mapping (including Two and Three point Mapping and Reverse Mapping) ;
5. Variations in Chromosome Number and Structure: Chromosome Aberrations, Aneuploidy and Polyploidy;
6. DNA as the Genetic Material, Important Genetics Experiments/Researchers ;
7. DNA Structure, Chromosome Structure, Transposable Elements ;
8. Replication, Transcription, RNA Types and RNA Processing ;
9. The Genetic Code and Translation, Problems involving Transcription and Translation, Bacterial Genetics and Gene Transfer and Mapping in Bacteria ; Prokaryotic Gene Regulation ; Genetics of the Immune System ;
10. Biochemical Pathways ; Mutation, Mutagens and Repair Mechanisms, Eukaryotic Gene Regulation, Biotechnology ;
11. Biotechnology;

12. Population Genetics: Frequency Calculations, Hardy-Weinberg Equilibrium and Violations of Hardy-Weinberg Equilibrium ;
13. Evolutionary Genetics and Phylogeny ; Quantitative Genetics ;
14. Eukaryotic Gene Regulation, Epigenetics ;
15. Developmental Genetics, Cancer Genetics.

Course Schedule (dates will be applied at the beginning of the semester):

Note: W refers to week #, L refers to lecture #, HW refers to homework

W# L#	Topic	Assignment(s) Due	Pierce Chapters
W1 L1	Introduction, Model Organisms, Mitosis and Meiosis	Required Reading: Pierce p. A1 – A13	1, 2, A1 – A13
W1 L2	Transmission Genetics		3
W1 L3	Chi-Square Analysis		3
W1 L4	Tutorial Session #1		

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Date	Topic	Assignment(s) Due	Pierce Chapters
W2 L1	Sex Determination and Sex Linkage	HW #1	4
W2 L2	Pedigree Analysis		6
W2 L3	Genetic Testing and Extensions to Mendelian Inheritance		5, 6
W2 L4	Tutorial Session #2		
W3 L1	Sex Limited and Sex Influenced Traits, Cytoplasmic Inheritance and Maternal Effect	HW #2	5, 11
W3 L2	Epistasis		5
W3 L3	Tutorial Session #3		
W3 L4	Catch Up Day and Review for Exam #1	HW #3	
W4 L1	**Exam #1**	**Exam #1**	
W4 L2	Linkage and Chromosome Mapping 1: Two and Three point Mapping		
W4 L3	Linkage and Chromosome Mapping 2: Reverse Mapping		7
W4 L4	Tutorial Session #4		
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W5 L1	Bacterial Genetics and Gene Transfer and Mapping in Bacteria	HW #4	9
W5 L2	Population Genetics: Frequency Calculations and Hardy-Weinberg Equilibrium		25
W5 L3	Tutorial Session #5		
W5 L4	Population Genetics: Violations of Hardy-Weinberg Equilibrium		25
W6 L1	Variations in Chromosome Structure: Chromosome Aberrations	HW #5	8
W6 L2	Variation in Chromosome Number: Aneuploidy and Polyploidy		8
W6 L3	Tutorial Session #6		
W6 L4	Catch Up Day and Review for Exam #2	HW #6	
W7 L1	**Exam #2**	**Exam #2**	
W7 L2	DNA as the Genetic Material, Important Genetics Experiments/Researchers		10, 11
W7 L3	DNA Structure and Analysis		10, 11
W7 L4	Chromosome Structure, Transposable Elements		11, 18

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Date	Topic	Assignment(s) Due	Pierce Chapters
W8 L1	Tutorial Session #7		
W8 L2	Replication	HW #7	12
W8 L3	Transcription		13
W8 L4	Tutorial Session #8		
W9 L1	Types of RNA and RNA Processing	HW #8	14
W9 L2	The Genetic Code and Translation		15
W9 L3	Tutorial Session #9		
W9 L4	Catch Up and Review for Exam #3	HW #9	
W10 L1	**Exam 3**	**Exam #3**	
W10 L2	Biochemical Pathways		18
W10 L3	Mutation, Mutagens and Repair Mechanisms		18
W10 L4	Tutorial Session #10		
W11 L1	Prokaryotic Gene Regulation	HW #10	16
W11 L2	Tutorial Session #11		
W11 L3	Eukaryotic Gene Regulation		17
W11 L4	Epigenetics		21
W12 L1	Genetics of the Immune System	HW #11	22
W12 L2	Developmental Genetics		22
W12 L3	Tutorial Session #12		
W12 L4	Catch Up Day and Review for Exam #4	HW #12	
W13 L1	**Exam #4**	**Exam #4**	
W13 L2	Evolutionary Genetics and Phylogeny		26
W13 L3	Tutorial Session #13		
W13 L4	Quantitative Genetics	HW #13	24
W14 L1	Quantitative Genetics		24
W14 L2	Cancer Genetics		23
W14 L3	Tutorial Session #13		
W14 L4	Biotechnology Part 1	HW #14	19, 20
W15 L1	Biotechnology Part 2 and Genomics		19, 20
W15 L2	Tutorial Session #15		
W15 L3	Catch Up Day and Review for Exam #5	HW #15	
W15 L4	STUDY DAY - Walk in Meetings with Instructor		
W16	**Exam #5**	**Exam #5**	