UNIVERSITI TEKNOLOGI MARA

BMS412: GENERAL GENETICS

Course Name (English)	GENERAL GENETICS APPROVED
Course Code	BMS412
MQF Credit	3
Course Description	This course will address on Mendelian genetics, chromosomal inheritance, modified Mendelian ratios, chromosome mapping, linkage, gene and chromosomal mutations, recombination, Students will define the vocabulary in genetics and explain the rules of inheritance. Students will apply critical thinking skills in analyzing genetic data and determining mode of inheritance and construct the genetic diagram. The designated lecture session is used to discuss results of genetic crosses leading to its relation to the existing laws. Lecture sessions employ a mixture of lectures and active learning (self and peer discussions). The outcomes shall be assessed through a variety of tools which include the traditional paper examination, tests, quizzes, assignments and laboratory reports.
Transferable Skills	students are able to explain rules and mode of inheritance and apply critical thinking skills in analyzing genetic data.
Teaching Methodologies	Lectures, Practical Classes
CLO	CLO1 Describe the chromosomal theory of inheritance and basic population genetics CLO2 Explain the core concepts of Mendelian inheritance and apply them to predict the outcomes of crosses CLO3 Compare results of genetic crosses with predicted ratios and evaluate significance of deviations using simple statistical analysis CLO4 Perform experiments to collect and analyse genetic data, and present the results in an oral presentation.
Pre-Requisite Courses	No course recommendations

Topics
1. Basic Concepts of Genetics 1.1) 1.1 Historical Concepts of Genetics 1.2) 1.2 The Search of Genetic Material (Griffith's Experiment, Avery's Experiment, Hershey – Chase Experiment and Fraenkel – Conrat Experiment) 1.3) 1.3 Discovery of the Double Helix Structure – Erwin Chargaff, Maurice Wilkins, Rosalind Franklin, Watson and Crick. 1.4) 1.4 The Genetic Code - The Wobble Hypothesis 1.5) 1.5 Fields of Genetics – Classical, Molecular and Population Genetics 1.6) 1.6 The Genetics Research – Cytogenetics
2. Investigative Approach to Genetics 2.1) n/a
3. Genetics and Society 3.1) Genetics and Society – Eugenics and Euphenics, Genetic Advances in Medicine and Agriculture, GMO's, Gene Therapy, Gene Testing, Ethics in Genetics (Human Genome Project). 3.2) Lab 1: Cytogenetics: Karyotyping Techniques
4. Mendelian Genetics 4.1) 2.1 Homologous Chromosomes in Diploid: Metacentric, Submetacentric, Acrocentric and Telocentric 4.2) 2.2 Terms Used in Genetics 4.3) 2.3 Mendelian Genetics 4.4) 2.2.1 Law of Segregation 4.5) Lab 2: Monohybrid Cross 4.6) 4.7) 2.2.2 Law of Independent Assortment

4.8)
4.9) Lab 3: Dihybrid Cross
4.10)
4.11) 2.4 Application of Mendelian Principles: Punnett Square, Forked Line Method, Chi Square Test.
4.12)
4.13) Lab 4: Probability
4.14)
4.15) Lab 5: Chi-Square Analysis

5. Extension of Mendelian Inheritance
5.1) 2.5 Extension of Mendelian Inheritance
5.2) 2.5.1 Incomplete Dominance
5.3) 2.5.2 Codominance
5.4) 2.5.3 Multiple Alleles
5.5) 2.5.4 Gene Interaction and Modified Mendelian Ratios (Epistasis)
5.6) 2.5.5 Lethal Genes
5.7) 2.5.6 Pleiotropy
5.8) 2.5.7 Expressivity vs Penetrance
5.9) 2.5.8 Nature vs Nurture

6. Sex Determination and Sex Linkage
6.1) 2.6 Sex Determination and Sex Linkage
6.2) 2.6.1 Sex Chromosomes
6.3) 2.6.2 Sex Determination in Human Beings, Drosophila and Other Animals.
6.4) 2.6.3 Sex-Linked Genes
6.5) 2.6.4 Dosage Compensation of X-Linked Genes: The Lyon Hypothesis
6.6)
6.7) Lab 6: Inactivation of X-Linked Genes in Female Mammals
6.8)
6.9) 2.6.5 Hyperactivation of X-Linked Genes in Male Drosophila
6.10) 2.6.6 Temperature Variation and Sex Determination in Reptiles.
6.11) 2.6.7 Sex Limited and Sex Influenced Traits.

7. Human Pedigree
7.1) 2.7 Human Pedigrees

8. Variation in Chromosome Number and Structure
8.1) n/a

9. Linkage, Crossing Over and Genetic Mapping
9.1) Lab 7: Linkage and Crossing Over

10. Population genetics
10.1) n/a

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	related to topics covered	10%	CLO2 , CLO4
Practical	based on the lab data and how the results are presented in a written form	10%	CLO4
Presentation	data collected and analysed from experiments and results presented in an oral presentation.	5%	CLO4
Test	test 3: problem solving questions	5%	CLO3
Test	test 1: problem solving questions.	10%	CLO1 , CLO2
Test	test 2	10%	CLO2 , CLO3

Reading List

Recommended Text

- **Robert J. Brooker 2005, *Genetics*, 2nd Ed., McGraw-Hill [ISBN: 0072835125]**
- **Daniel L. Hartl,Elizabeth W. Jones 2002, *Essential Genetics*, Jones & Bartlett Learning [ISBN: 0763718521]**
- **William S. Klug,Michael R. Cummings,Charlotte Spencer 2007, *Essentials of Genetics*, Prentice Hall [ISBN: 0132241277]**

Reference Book Resources

- **Robert H. Tamarin 1999, *Principles of genetics*, 7th Edition. Ed., 1,2,3, McGraw-Hill Science, Engineering & Mathematics [ISBN: 0-697-35462-8]**
- **D. Peter Snustad,Michael J. Simmons 2008, *Principles of Genetics*, 3rd Ed., Wiley [ISBN: 0470388250]**
- **William S. Klug,Michael R. Cummings,Charlotte A.. Spencer, *Concepts of Genetics* [ISBN: 1292026340]**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources