# Unit Outline (Higher Education)

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| **Institute / School:** | Institute of Innovation, Science & Sustainability |
| **Unit Title:** | Mammalian Genetics |
| **Unit ID:** | SCMOL2010 |
| **Credit Points:** | 15.00 |
| **Prerequisite(s):** | (SCBIO1001 or SCBIO1010 or SCBIO1020) |
| **Co-requisite(s):** | Nil |
| **Exclusion(s):** | Nil |
| **ASCED:** | 010909 |

**Description of the Unit:**

Mammalian Genetics provides an in-depth study of the principles underlying inheritance in mammals, with a particular focus on applications of genetics in human and animal health. This unit builds on foundational knowledge of DNA structure, gene expression, cellular reproduction and patterns of inheritance covered in core first year units. The topics covered include molecular genetics and the regulation of gene expression, encompassing whole genome approaches that provide new insights into the genetic basis of disease. The relationship between genetic mutation, phenotypic variation and disease will be considered in individual crosses, families and populations, identifying patterns of inheritance and applying probability to predict breeding outcomes or estimate disease risk. Clinical applications of genetics will be further explored through animal and human examples and case studies, where students will learn about current technologies used to quantify gene expression and diagnose or treat genetic disorders, as well as considering the ethical issues associated with the use of these new gene-based technologies. The unit also develops digital literacy skills in bioinformatics, including accessing and interpreting information from large molecular databases, and the use of specialised software to analyse biological sequences and datasets.

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| **Grade Scheme:** | Graded (HD, D, C, P, MF, F, XF) |

**Work Experience:**

No work experience

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| **Placement Component:** | No |
| **Supplementary Assessment:** | Yes |

Where supplementary assessment is available a student must have failed overall in the Unit but gained a final

mark of 45 per cent or above, has completed all major assessment tasks (including all sub-components where a task has multiple parts) as specified in the Unit Description and is not eligible for any other form of supplementary assessment.

**Course Level:**

| Level of Unit in Course | AQF Level of Course | | | | | |
|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10 |
| Introductory | | | | | | |
| Intermediate | | | ✔ | | | |
| Advanced | | | | | | |

**Learning Outcomes:**

**Knowledge:**

**K1.** Demonstrate an understanding of the basic principles of cellular reproduction, chromosome replication and Mendelian inheritance.

**K2.** Describe basic gene structure and function and the factors that regulate gene expression

**K3.** Identify the genetic mutations and abnormalities that can result in disease conditions

**K4.** Describe the current applications of gene-based technology and discuss the ethical implications of gene manipulation.

**Skills:**

**S1.** Analyse pedigree charts to identify patterns of inheritance and apply principles of probability to predict outcomes of a cross, or compare allele freqencies in populations

**S2.** Collect, compare and interpret genomic data from large molecular databases (bioinformatics)

**S3.** Research genetic issues and effectively communicate this research through the preparation of clear, concise written reports and oral presentations

**Application of knowledge and skills:**

**A1.** Utilise bioinformatics skills to research the molecular basis and inheritance of genetic disorders and evolutionary relationships.

**A2.** Apply knowledge of bioinformatics and molecular techniques to design theoretical strategies for selective animal breeding, genetic testing or therapies for genetic disorders

**Unit Content:**

Review of cellular reproduction and information flow in biology

Comparative organisation of mammalian genes, chromosomes and genomes

Gene structure and regulation of expression: the role of regulatory RNAs and epigenetics in control of gene expression.

Relationships between genome, transcriptome and proteome and techniques for their analysis

Bioinformatics: obtaining and understanding information from large biological databases

Different types of genetic mutation and their relationship to disease

Patterns of genetic inheritance - monogenic, polygenic and multifactorial traits, sex determination and analysis of pedigree charts

Probability in genetics, estimating disease risk and studying allele frequencies in populations

Clinical applications of current DNA technologies in diagnosis and treatment of disease

Bioethics: handling and storage of genetic information, implications of genetic modification of animals and gene therapies

**FEDTASKS**

Federation University Federation recognises that students require key transferable employability skills to prepare them for their future workplace and society. FEDTASKS (**T**ransferable **A**ttributes **S**kills and **K**nowledge) provide a targeted focus on five key transferable Attributes, Skills, and Knowledge that are be embedded within curriculum, developed gradually towards successful measures and interlinked with cross-discipline and Co-operative Learning opportunities. *One or more FEDTASK, transferable Attributes, Skills or Knowledge must be evident in the specified learning outcomes and assessment for each FedUni Unit, and all must be directly assessed in each Course.*

| **FEDTASK attribute and descriptor** | | **Development and acquisition of FEDTASKS in the Unit** | |
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| | | **Learning Outcomes (KSA)** | **Assessment task (AT#)** |
| FEDTASK 1 Interpersonal | Students will demonstrate the ability to effectively communicate, inter-act and work with others both individually and in groups. Students will be required to display skills in-person and/or online in:<br>• Using effective verbal and non-verbal communication<br>• Listening for meaning and influencing via active listening<br>• Showing empathy for others<br>• Negotiating and demonstrating conflict resolution skills<br>• Working respectfully in cross-cultural and diverse teams. | Not applicable | Not applicable |
| FEDTASK 2 Leadership | Students will demonstrate the ability to apply professional skills and behaviours in leading others. Students will be required to display skills in:<br>• Creating a collegial environment<br>• Showing self -awareness and the ability to self-reflect<br>• Inspiring and convincing others<br>• Making informed decisions<br>• Displaying initiative | Not applicable | Not applicable |
| FEDTASK 3 Critical Thinking and Creativity | Students will demonstrate an ability to work in complexity and ambiguity using the imagination to create new ideas. Students will be required to display skills in:<br>• Reflecting critically<br>• Evaluating ideas, concepts and information<br>• Considering alternative perspectives to refine ideas<br>• Challenging conventional thinking to clarify concepts<br>• Forming creative solutions in problem solving. | Not applicable | Not applicable |

| FEDTASK attribute and descriptor | | Development and acquisition of FEDTASKS in the Unit | |
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| | | Learning Outcomes (KSA) | Assessment task (AT#) |
| FEDTASK 4 Digital Literacy | Students will demonstrate the ability to work fluently across a range of tools, platforms and applications to achieve a range of tasks. Students will be required to display skills in:<br>• Finding, evaluating, managing, curating, organising and sharing digital information<br>• Collating, managing, accessing and using digital data securely<br>• Receiving and responding to messages in a range of digital media<br>• Contributing actively to digital teams and working groups<br>• Participating in and benefiting from digital learning opportunities. | Not applicable | Not applicable |
| FEDTASK 5 Sustainable and Ethical Mindset | Students will demonstrate the ability to consider and assess the consequences and impact of ideas and actions in enacting ethical and sustainable decisions. Students will be required to display skills in:<br>• Making informed judgments that consider the impact of devising solutions in global economic environmental and societal contexts<br>• Committing to social responsibility as a professional and a citizen<br>• Evaluating ethical, socially responsible and/or sustainable challenges and generating and articulating responses<br>• Embracing lifelong, life-wide and life-deep learning to be open to diverse others<br>• Implementing required actions to foster sustainability in their professional and personal life. | Not applicable | Not applicable |

**Learning Task and Assessment:**

| Learning Outcomes Assessed | Assessment Tasks | Assessment Type | Weighting |
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| K1, K2, K3, S1, A2 | AT1: Theory quizzes | Multiple choice quizzes, short answer questions and problems requiring revision of conente and application of knowledge | 0-20% |
| K2, K3, K4, S2, A1 | AT2: Tutorial Activities | Questions and problem solving tasks requiring research and use of bioinformatics tools and databases | 10-30% |
| K3, K4, S2, S3, A2 | AT3: Research and Communication Task | Presentation and/or written report on gene or genetic disorder of interest | 20-50% |
| K1, K2, K3, K4, S1, A2 | AT4: End of Semester Test | Test demonstrating and applying knowledge of unit content | 20-50% |

**Adopted Reference Style:**

APA ()

Refer to the library website for more information

Fed Cite - referencing tool