

Course Title: **Biomedical Thermofluids Modelling**

Course Code: **ENME806**

Descriptor Start Date: **01/01/2025**

POINTS: **15.00**

LEVEL: **8**

PREREQUISITE/S: **ENME713, ENGE800**

COREQUISITE/S: **None**

RESTRICTION/S: **None**

## LEARNING HOURS

Hours may include lectures, tutorials, online forums, laboratories. Refer to your timetable and course information in Canvas for detailed information.

**Total learning hours: 150**

## PRESCRIPTOR

Develop an understanding of how to apply mechanical engineering to solve biomedical engineering problems. The process is presented as a problem solving, decision making, analysis and optimising activity. Analyse and model thermo-fluid systems from human physiology using appropriate engineering tools and approaches. Applications to disease diagnosis and medical device design are considered.

## LEARNING OUTCOMES

1. Express the concepts and methods of energy and mass transport as related to human physiology (a,b).
2. Demonstrate critical thinking in interpreting human physiology into relevant engineering systems using various engineering techniques (a,b,d,i,j).
3. Derive systems of equations to analyse & solve bio-heat transfer and bio-fluid mechanics problems (a,b,c,d,e).
4. Design and critically evaluate simulations of thermofluids models of human physiology using computer-based tools (a,b,c,d,e,i,j).
5. Explain the relationship between engineering analysis, healthcare and medical device design (a,c,d,f,h,i,j).

**Disclaimer: Course descriptors may be amended between teaching periods/semesters**

## CONTENT

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- Basic human physiology.
- Use of engineering modelling to solve clinical problems.
- Use of engineering modelling in medical device design.
- Heat transfer. Governing equations and boundary conditions with examples of conductive and convective heat transfer within biological systems.
- Mass transfer kinetics and governing equations. Modes of mass transfer, governing equation and boundary conditions with examples of mass diffusion and convection within biological systems.
- Fluid mass and energy conservation and governing equations, with examples from circulatory physiology.
- Fluid-structure interactions in physiological systems.
- Modelling techniques used to apply governing equations within human physiology.
- Computer-based simulation of models of human physiology

### Key to Graduate Capabilities Profile

- Engineering knowledge
- Problem analysis
- Design/development of solutions
- Investigation
- Modern tool usage
- The engineer and society
- Environment and sustainability
- Ethics
- Individual and team work
- Communication
- Project management and finance
- Lifelong learning

## LEARNING & TEACHING STRATEGIES

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Lectures, tutorials, case studies, computer simulation, laboratory.

## ASSESSMENT PLAN

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Assessment Event	Weighting %	Learning Outcomes
Project Part 1	60.00	1-4
Project Part 2	40.00	1-2, 4-5

<b>Grade Map</b>	<b>MAP1</b>
	A+ A A- Pass with Distinction
	B+ B B- Pass with Merit
	C+ C C- Pass
	D Fail

### Overall requirement/s to pass the course:

To pass the course, students must satisfy the stated learning outcomes and achieve a minimum overall grade of C-.

## LEARNING RESOURCES

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No prescribed texts

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**Principal Programme:** AK3751, Bachelor of Engineering (Honours)

**Related Programme/s:** AK1296  
AK1325  
AK3566  
ICE1  
INEXCH1  
SABRD1