

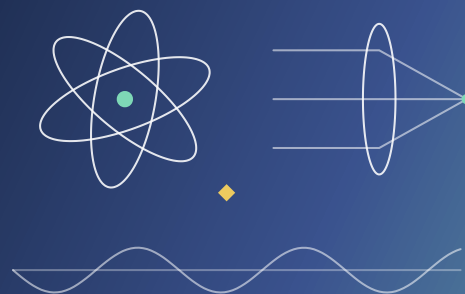
Module code

SPP-2207

Type of module

Undergraduate: Applied Physics – Major Core

Thermodynamics, Fluids and Statistical Mechanics



Modular credits

4

Total student
engagement

56 hours

Prerequisite

None

Anti-requisite

None

Aims

To provide students with a strong foundation in thermodynamics, fluid mechanics and statistical mechanics, enabling them to analyse and predict the behaviour of various real-world physical systems relevant to energy, materials and environmental challenges.

Module learning outcomes (MLO)

On successful completion of this module, a student will be expected to be able to:

MLO 1

Apply the laws of thermodynamics and conservation principles to energy systems, cycles, and fluid flows.

MLO 2

Calculate key physical quantities (e.g. work, heat, efficiency, pressure, flow velocity) using thermodynamic and fluid mechanics relations.

MLO 3

Relate the macroscopic properties of physical systems to their microscopic origins using statistical mechanical arguments.

MLO 4

Analyse and solve standard problems in thermodynamics, statistical mechanics, and fluid mechanics using appropriate mathematical techniques.

Module contents

Review of zeroth, first and second laws of thermodynamics

Pressure–volume and temperature–entropy diagrams

Combining the first and second laws (Maxwell's relations)

Non-ideal gases and the Van der Waals equation	Statistical basis of entropy and temperature	Energy distributions functions: Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein
Density of states and partition functions	Fluid properties and types of fluid flow	Hydrostatic forces and buoyancy
Bernoulli's equation and its applications	Dimensional analysis and similitude	Applications of thermodynamics and fluid mechanics to real-world systems and machines

Assessment

60% **40%**
Examination Coursework



Formative assessment

Weekly discussion and feedback

Summative assessment

COMPONENT	WEIGHTING
Examination	60%
Coursework	40%
Individual	30%
Class tests	20%
Assignments	10%
Group	10%
Presentation	10%

Graduate attributes and skills

Programme learning objectives (PLO) addressed

1 PLO 1 (Core Disciplinary Knowledge)	2 PLO 2 (Critical Thinking and Comparative Analysis)
4 PLO 4 (Numerical and Analytical Competence)	6 PLO 6 (Communication and Professionalism)

Sustainability concept addressed

7

SDG 7 Affordable and Clean Energy

9

SDG 9 Industry, Innovation and Infrastructure

Digital skills/software used (not limited to)

- Word processing software (e.g. Microsoft Word)
- Spreadsheet software (e.g. Microsoft Excel)
- Presentation software (e.g. Microsoft PowerPoint)
- Reference management software (e.g. Mendeley)
- Scientific computing and graphing software (e.g. Origin, Python, Wolfram Mathematica, MATLAB)
- Online literature search (e.g. Google Scholar, Elsevier Scopus)
- AI-assisted research and productivity tools (e.g. ChatGPT, Claude, Gemini)

Micro-credentialling option

No

Stackable towards GenBESTARI Undergraduate Degree Programme or other relevant Lifelong Learning Programmes

No

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