**Liverpool** John Moores University

| | |
|---|---|
| Title: | FLUID MECHANICS AND POWER ENGINEERING |
| Status: | Definitive |
| Code: | **5066ENG** (115886) |
| Version Start Date: | 01-08-2018 |
| Owning School/Faculty: | Maritime and Mechanical Engineering |
| Teaching School/Faculty: | Maritime and Mechanical Engineering |

| Team | Leader |
|---|---|
| Allan Carrier | Y |

| | | | | | |
|---|---|---|---|---|---|
| **Academic Level:** | FHEQ5 | **Credit Value:** | 20 | **Total Delivered Hours:** | 72 |
| **Total Learning Hours:** | 200 | **Private Study:** | 128 | | |

**Delivery Options**
Course typically offered: Standard Year Long

| Component | Contact Hours |
|---|---|
| Lecture | 42 |
| Practical | 6 |
| Tutorial | 21 |

**Grading Basis:** 40 %

**Assessment Details**

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|---|---|---|---|---|
| Exam | AS1 | Examination | 60 | 3 |
| Portfolio | AS2 | Portfolio of Fluid Mechanics laboratory/assignments | 20 | |
| Portfolio | AS3 | Portfolio of Power Engineering laboratory/assignments | 20 | |

**Aims**

*To provide an insight into the physical behaviour of fluid flow and heat transfer and their mathematical modeling.*
*To study thermal power generation and analyze typical thermodynamic power cycles.*

**Learning Outcomes**

After completing the module the student should be able to:

1 Apply dimensional analysis to practical problems.
2 Evaluate pressure losses due to friction and fittings in pipeline systems
3 Determine the flow and pressure distribution in subsonic and supersonic nozzles
4 Analyse multimode heat transfer in plane, cylindrical and spherical geometries
5 Apply the second law of thermodynamics to simple systems and calculate entropy changes
6 Analyse combustion processes and apply the first law of thermodynamics to combustion processes.
7 Analyse simple refrigeration cycles
8 Calculate power developed in different types of power plant, calculate thermal efficiencies and account for energy losses

**Learning Outcomes of Assessments**

The assessment item list is assessed via the learning outcomes listed:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EXAM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Fluid Mechanics laboratory/ass | 1 | 2 | 3 | 4 | | | | |
| Power Engineering laboratory/a | 5 | 6 | 7 | 8 | | | | |

**Outline Syllabus**

*Descriptive treatment of real fluid flow. Dimensional analysis and model testing. Laminar and turbulent pipe flow. Reynolds number. Friction and minor losses in pipes and pipe networks. Use of the Moody chart.*
*1-d compressible flow. Mach no., isentropic flow, stagnation conditions, use of tables. Flow through nozzles. Choked conditions. Critical pressure ratio.*
*Multimode heat transfer and resistance analogy.*

*The second law of thermodynamics.*
*T-S diagrams and entropy changes for gases, vapours and liquids.*
*Stoichiometry, application of the first law to combustion processes, exhaust emissions and associated pollution.*
*Power plant, energy balances and auxiliary requirements.*
*Refrigeration and heat pumps, properties of refrigerants and operating cycles.*
*Review of renewable/sustainable energy resources.*
*Introduction to heat exchangers.*

**Learning Activities**

Combination of lectures, tutorials and laboratory assignments

**Notes**

This module aims to develop an understanding of real fluid flow. Compressible flow and its effect on the conservation equations is considered. Heat transfer is extended to cover multimode effects and more general geometries.
The second law of thermodynamics and the property entropy are introduced. The laws of thermodynamics are then applied to a range of processes, including combustion, refrigeration, and power cycles. The power cycles covered include vapour and gas cycles.