MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME948 HYDRAULICS- Online

Module Registrar: Dr P Capobianchi paolo.capobianchi@strath.ac.uk	**Taught To (Course): Advanced Mechanical Engineering by distance learning**	
Other Lecturers Involved:	**Credit Weighting: 10 (ECTS 5)**	**Semester: 1 (Online learning)**
Compulsory/ optional/ elective class	**Academic Level: 5**	**Suitable for Exchange: N**

Required prerequisites

Note: It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.

Mathematical methods:
Linear algebra, vectors & matrices.

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
					36		24	40	100

Educational Aim

This module aims to introduce the principles and basic theory of hydraulics for internal flow and builds upon standard undergraduate engineering and physics courses. The purpose of the course is to provide the foundations for calculations of fluid flows in pumping systems. It is intended that the course participant will have achieved a variety of competencies by the end of the course including an understanding of the fundamental analysis of steady and unsteady flows and the ability to design and analyse basic hydraulic networks.

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 Understand the basic equations of hydraulic analysis for steady and unsteady flows

LO2 Be able to identify appropriate pumping and control valve components for hydraulic control

LO3 Be able to design basic hydraulic circuits and pipe network systems

LO4 Be able to recognise and calculate hydraulic requirements for slurry flows.

Syllabus

The module will teach the following:

Topic 1 Introduction to real fluid flows in pipes: Overview of Internal flows, system design and modelling.

Topic 2 Governing equations for one-dimensional analysis of pipe systems: Steady state analysis methods using energy equation, pressure loss and calculation methods, pressure loss, K values and sources of data.

Topic 3 Pump systems: Pump types, pump and system characteristics, scaling laws, NPSH, cavitation, pumps in series and in parallel.

Topic 4 Pipe networks: Network analysis

Topic 5 Unsteady Flow analysis: Tank filling and drainage, Introduction to water hammer

Topic 6 Hydraulic components: Valve types, valve characteristics, Flow control valves, pressure control

Topic 7 Software Design of hydraulic networks: Introduction to software analysis of pipe systems

Topic 8 Introduction to slurry flows in pipe systems: flow patterns, particle settling, pressure drop, pumping of slurries

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1
C1 Have a sound understanding of the fundamentals of hydraulic analysis

LO2 and LO3
C1 be able to identify the appropriate pumping and control valves for controlling a specified hydraulic circuit

LO4
C1 be able to model and analyse a simple hydraulic circuit by hand and a more complex network using a commercial 1D hydraulic network analysis tool such as FlowMaster

LO5
C1 the ability to recognise the issues relating to hydraulic analysis of slurry based flows.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback
(within Assessment and Feedback Policy at: https://www.strath.ac.uk/professionalservices/staff/policies/academic/)

Assessment will be by on-line class tests to assess LO1 to LO5. Regular feedback and discussion will be available in online tutorial sessions using MyPlace online discussion forum. Feedback from the quizzes will enable students to reflect on their understanding of the subject material. Individual feedback will be available by appointment with the course lecturers.

Discussion of the course material between teacher-student and also amongst peers will be encouraged in discussion forums. Students will also be encouraged to discuss progress with their peers to improve learning. Summative feedback:

The summative feedback will be provided by the assessment results of the on line class test

Formative feedback: Tutorial sessions will provide opportunities for students to discuss their work and course material with members of staff. Students are expected to prepare accordingly for the tutorial sessions. Formative feedback may also be given during personal appointments with the course lecturers.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams *(individual weightings)*

Examination				**Coursework**		**Practical**		**Project**	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***	Number	***Weighting***
10 (online)		1hr	100% (10% each)						
LO1 – LO5				*		*		*	

* ***L/Os:*** *Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.*

Coursework / Submission deadlines (*academic weeks*): End of semester 1 diet of examinations

Resit Assessment Procedures:
Completion of new on-line ^^examinations prior to the end of the August exam diet.

^^Students must contact the module Registrar for full details as soon as results confirm that they are required to resit this class.

Recommended Reading

***Purchase recommended **Highly recommended reading *For reference**

*** Fluid Mechanics, Munsen and Okiishi, Wiley 978-1-118-31867-6

** Internal Flow Systems, D S Miller, Miller Innovations; 2nd Revised edition (1 April 2009) 978- 0956200204

* Engineering Fluid Mechanics, H. Yamaguchi ISBN: 978-1-4020-6741-9 (Print) 978-1-4020-6742-6 (Available online through SU library)

* Fluid Mechanics with Problems and Solutions, and an Aerodynamic Laboratory, Prof. Dr. Egon Krause ISBN: 978-3-540-22981-0 (Print) 978-3-540-27223-6 (Available online through SU library)

Additional Student Feedback
(Please specify details of when additional feedback will be provided)

Date	Time	Room No
		Check timetable webpages for details

Session: 2021/22

Approved:

Course Director Signature: E Henderson

Date of Last Modifications: 20/08/2021

(Updated July 2021-MAE)

MODULE TIMETABLE

Module Code:	**ME948**	**Module Title:**	**HYDRAULICS**

Brief Description of Assessment:

Online quizzes which are taken at the student's own pace during semester 1. All quizzes must be complete by the end of the December exam diet.

Assessment Timing

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment. Dropdowns may be left blank. Add extra notes below the dropdowns where relevant.

Please note: Timings can and will change, this should only be used as a guide.

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Online Test	Online Test	Online Test	Online Test	Online Test	Online Test	Online Test	Online Test	Online Test	Online Test	Choose an item.

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item.