MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME948 HYDRAULICS- Online

Module Registrar: Dr Paolo Capobianchi paolo.capobianchi@strath.ac.uk	**Taught To (Course): Advanced Mechanical Engineering (online)**	
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.

Fundamentals of fluid mechanics and thermodynamics are essential prerequisites. Previous exposure to the Mathcad software would be beneficial.

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 using Mathcad
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 A sound understanding of the fundamentals of hydraulic analysis

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

LO4
C1 The ability to model and analyse a simple hydraulic circuit by hand and a more complex network using Mathcad.

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/staff/policies/academic/*http://www.strath.ac.uk/learnteach/informationforstaff/staff/assessfeedback/12principles/
)

Assessment will be by two 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 lecturer.

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 online 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 lecturer.

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

Online Assessment				Coursework		Practical		Project	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***	Number	***Weighting***
2 (Time-constrained quiz)		2hr each	100%						
LO1 – LO4				*		*		*	

* ***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*): Two online time-constrained quizzes must be completed in weeks 6 and 11

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

^^Students must contact the module Registrar for details as soon as results confirm that a resit is required

PLEASE NOTE:
Students must gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-assessed before the August diet. This re-assessment will consist entirely of online (time-constrained) quizzes. No marks from any previous attempts will be transferred to a new resit attempt.

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: 2023/24

Approved:

Course Director Signature: Olga Ganilova

Date of Last Modifications: 28/08/23

(Updated August 2023)

MODULE TIMETABLE

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

Brief Description of Assessment:

Online time-constrained quizzes (in week 6 and 11) which are taken at the student's own pace during semester 1. All quizzes must be complete by the end of week 11.

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.	Choose an item.	Choose an item.	Online Test	Choose an item.	Choose an item.	Choose an item.	Choose an item.	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.