MODULE DESCRIPTOR 2019/20

CL987 Engineering Hydrology

Course Registrar: Dr D BERTRAM	**Taught To (Programme): MSc**	
Other Lecturers Involved:	**Credit Weighting: 10crs**	**Semester:** 2 / 3
Assumed Pre-requisites: Basic working knowledge of Mathematics, Geography and Physics	**Compulsory/ ~~optional/ elective course~~**	**Academic Level: 5**

Class Format and Delivery (hours):

Lecture	Tutorial	Laboratory	Coursework	Project	Private Study	**Total**
20			20	30	30	100

Class Aim(s)

This class aims to:

- Explore the hydrological cycle and the influence of weather, climate and the key processes on the environment
- Develop application of hydrological cycle for engineering analysis and design, including:
  - Estimating precipitation, including spatial distribution analysis techniques
  - Estimating evaporation and evapotranspiration
  - Estimating other hydrological losses, including infiltration
- Develop skills examining catchments using Engineering Hydrology approaches, including:
  - Analysing relationships between precipitation, runoff and storage
  - Analysing hydrographs
  - Examining the influence of urbanisation and land management practices
  - Introducing drainage design techniques and analysis
  - Sustainable Urban Drainage systems

Learning Outcomes

On completion of the class the student is expected to be able to

LO1 Outline the significance of the water cycle in the environment, developing appropriate engineering models for the hydrological process and applying the hydrological cycle as a tool in analysing catchments.

LO2 Undertake a range of design and calculation activities based on engineering hydrology, analysing spatially distributed real and synthetic rainfall, surface runoff, base flows and appreciating the underlying relationships and uncertainties.

Syllabus

The course will teach the following:

Hydrological cycle; homogeneous measurements; records with missing data
Atmospheric water; Water vapour, Precipitation, Evapotranspiration
Hydrologic Measurement of atmospheric water and surface water; rain gauges, calculation of catchment inflow from multiple rain gauges – Theissen polygons, isohyets
Catchment water balance
Catchment Hydrology: Precipitation; evaporation; overland flow; groundwater flow; rainfall and runoff analysis; the Unit Hydrograph; reservoir routing; flood frequency analysis.
Storm Drainage systems and SUDs basic principles

Assessment Criteria

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

LO1 Outline the significance of the water cycle in the environment, developing appropriate engineering models for the hydrological process and applying the hydrological cycle as a tool in analysing catchments.
C1 Detail the underlying principles and individual components of the hydrological cycle
C2 Use catchment and environmental characteristics to determine contributions of hydrological cycle components
C3 Ability to perform catchment water balance analysis techniques
C4 Detail various possible sources of uncertainty in each hydrological process and outline suitable means of addressing each

LO2 Undertake a range of design and calculation activities based on engineering hydrology, analysing spatially distributed real and synthetic rainfall, surface runoff, base flows and appreciating the underlying relationships and uncertainties.
C1 Ability to spatially distribute and convert rain gauge data to estimate inflow to a catchment
C2 The ability to review, adjust and analyse basic hydrological data to convert rainfall to runoff
C3 The ability to solve complex hydrological analyses to determine rainfall-runoff responses
C4 The ability to solve complex model drainage systems involving hydrological processes.

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

Principles of Assessment and Feedback (*https://www.strath.ac.uk/staff/policies/academic/*)

Please state briefly how these are incorporated in this module.

1. All assignments and assessments combine straightforward and challenging tasks. Assessment criteria are set clearly in advance, as are marking rubrics and resources.
2. All assessed coursework assignments are returned to students with feedback including annotations and comments. Model solutions are provided for some coursework assignments.
3. Tutorial problems with answers to encourage and guide private study are provided. These are supported with online learning technology and resources focusing on relevant problem sets..

Opportunity for one-to-one interaction between instructors and students and timely feedback will be made at least every two weeks but is planned on a weekly basis. Online forums and discussion environments will be used and participation encouraged for peer learning on problems.

Recommended Reading

Shaw. Hydrology in Practice, 4th Ed. Routledge, Taylor Francis
Wilson, Engineering Hydrology, 4th Ed, Palgrave MacMillan.
Hamil, Understanding Hydraulics, 3rd Ed, Palgrave MacMillan.

PLEASE NOTE:
Students need to gain a summative mark of 40% / 50% ***(please delete as appropriate)*** **to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of exam / coursework / viva** ***(please delete as appropriate).***

Resit Arrangements

Resit examinations will be held in the resit diet and consist of a resit coursework and online test. Further course work resubmissions at the discretion of the lecturer.

Approved

Programme Director Signature:
Date of Last Modifications:

Assessment and Feedback Schedule

Class Code	CL987	Class Title	Engineering Hydrology

Brief Description of Assessment

Assessments include:

Two formal submissions

1. Catchment Water Balance and hydrograph Coursework, ”Mono Lake” (25%) - approximately week 9 (as agreed with tutor)
2. Drainage Design Project (35%) – approximately week 14 (as agreed with tutor)

Online quiz assessments and interactive activities

1. One online quiz for each topic of study (7 topics; 10% total mark for quizzes). Students have one attempt at this.
2. One online end of course test (15%) covering all topics. Students have one attempt at this.
3. Online case study development and interactive discussion activities (one – two for each topic; 15% total mark).

Students need to gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist of online exam & coursework.

Indicate in the tables below the Hand-Out (H), Submission (S) and Feedback (F) dates for each lab report/coursework/project and the timing of each Exam/Class Test (E), (T). Include duration of exam in brackets (e.g. E (2)).

Semester 2 or 3 (Summer period)

Assessment type (& title)	LOs	Weight (%)	Individual / Group	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
Course Activities	LO1, LO2	15	Individual	H											SF
Quizzes	LO1, LO2	10	Individual	H											SF
Mono Lake	LO1 Lo2	25	Individual	H								S			F
Rainfall-Runoff Project	LO1, LO2	35	Individual								H				SF
End of course test	LO1, LO2	15	Individual												HSF