MODULE DESCRIPTOR 2021/22

CL971 Air Pollution, Climate Change & Human Health

Course Registrar: Dr Iain Beverland	**Taught To (Programme):** Civil Engineering; Civil & Env Engineering; Env Engineering; Env. Health Sci; Sustainability & Env Studies; Interested students from any other discipline.	
Other Lecturers Involved:	**Credit Weighting:** 10	**Semester:** 1
Assumed Pre-requisites: An open-minded interest in the world around us and how it affects people.	**Compulsory/ optional/ elective course**	**Academic Level:** 5

Course Format and Delivery (hours):

Online Lecture	Online Tutorial	Online Laboratory	Coursework	Project	Private Study	**Total**
20	2	18		60		100

Course Aim(s)

The class provides students with knowledge & skills applicable to atmospheric pollution and climate change impacts, ranging from local to global scales. This includes a focus on the assessment & management of impacts on human health through effective interface between the public health sciences of environmental epidemiology and environmental toxicology; and environmental engineering approaches to manage environmental risks.

The class achieves these aims through research-led teaching at the interface between public health and environmental engineering, with a particular focus on methodologies based on risk-centred approaches. The class is delivered using lectures based on a well-established textbook, computer laboratories and project-based teaching. Student interaction is encouraged throughout the class through directed reading, project work, student-led question sessions, and structured feedback.

Learning Outcomes

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

LO1 Understand underlying processes that determine atmospheric pollution 'climates'

LO2 Understand and make informed judgement about methods used to assess & manage impacts of air pollution and climate change on human health

LO3 Ability to critically evaluate & synthesise complex information from primary research and technical literature

Syllabus

- Principles of risk, exposure assessment & environmental epidemiology
  - Hazard identification
  - Exposure assessment
  - Risk assessment (including environmental epidemiology)
  - Risk management (including health-based environmental standard setting)
- Urban air pollution
  - Air pollution episodes & long-term pollution climates
  - Risk-based assessment & management of impacts on human health (including civil & environmental engineering solutions to environmental pollution problems)
- Climate change
  - Physical & chemical processes
  - Evidence of climate change
  - Prediction of future change
  - Risk-based assessment & management of impacts on human health (including civil & environmental engineering approaches to mitigation & adaptation)

Assessment Criteria

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

LO1 Understand underlying processes that determine atmospheric pollution 'climates'

- C1 Ability to identify roles & importance of processes that influence atmospheric composition.
- C2 Understanding of primary determinants of processes and feedback mechanisms
- C3 Understanding of interactions between processes at different temporal and spatial scales

LO2 Understand and make informed judgement about methods used to assess & manage impacts of air pollution and climate change on human health

- C1 Understanding of the concepts and main components of risk-based approaches to assessing & managing environmental pollution effects on human health
- C2 Quantitative technical understanding of approaches to quantify human exposure to air pollutants
- C3 Ability to discriminate between association and causation in relationships between environmental quality and human health
- C4 Ability to demonstrate how civil & environmental engineering can provide solutions to environmental pollution problems

LO3 Ability to critically evaluate & synthesise complex information from primary research and technical literature

- C1 Ability to critically evaluate primary research & technical literature and to synthesise large amounts of complex information across different disciplines
- C2 Ability to analyse and interpret quantitative example information to illustrate general concepts
- C3 Ability to summarise and present complex inter-disciplinary information, including scientific writing & presentation skills

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 *see https://www.strath.ac.uk/staff/policies/academic/*
Use of University principles of assessment include (but are not restricted to) the following:

ASSESSMENT AND FEEDBACK PRACTICES PROMOTE EFFECTIVE STUDENT LEARNING
Information issued at start of Semester includes simple & clear guidance on the overall assessment load throughout the Semester. Expectations in terms of time and effort are outlined clearly in the presentation of each assignment. These expectations are communicated clearly in class. Weightings for each assignment underscore the time expectations.

Students are given opportunities to engage in optional (research-led) extensions to some project/portfolio work using carefully managed mechanisms of only counting the contribution of this additional work if these the marks are in the student's favour. This encourages students who may be subject to less time pressure and/or more able students to try to achieve higher overall marks by taking their learning to a more advanced level, while at the same time avoiding overly penalising potentially overloaded and/or less-able students who may be overwhelmed by the additional workload in these extensions to the 'standard' assessment portfolio.

ASSESSMENT AND FEEDBACK PRACTICES ARE APPROPRIATE, FAIR, AND TRANSPARENT
Criterion based feedback to students is an integral part of teaching. This is collated into 'generic' feedback that is shared with the whole class, to complement individual feedback for each student. The generic feedback is particularly useful inasmuch as any common or recurring difficulties experienced by many in the class could suggest ways in which teaching and guidance could be improved. The individual feedback is directed at how each student can improve, in all cases avoiding comparisons between students. Opportunities are provided to students to close gaps between current and desired performance by the prompt return of feedback on early formative assignments.

A range of formative and summative assessment methods are used to provide feedback to students, including formative assessment of draft material, group and/or individual presentations. Feedback sheets provide information allow students to compare their work to the expectations for each assignment and reflect on improvements for future work.

Formative and summative assessments are aligned by giving students opportunities to gain practice on tasks that are later formally assessed (e.g. through formative feedback on draft material). Experience with this approach has found that students are highly motivated to utilise formative feedback they receive on practice examples of work that will be subject to subsequent formal assessment. Self-assessment tasks are included to support student self-assessment and reflection.

ASSESSMENT & FEEDBACK PRACTICES ARE CLEARLY COMMUNICATED TO STUDENTS AND STAFF
Information issued at the start of the class, includes simple & clear guidance on performance criteria by reference to the University Guidance on Marking for Undergraduate Courses*. Reference is made to equivalent p/g marking schemes in MSc handbooks. Marking criteria are outlined clearly in the assignment handout and multiple opportunities for clarification are available in class. The criteria-based marking sheet is provided in the assessment description document. Feedback sheets demonstrate what constitutes 'excellent' ranging to 'poor' work.

Further specific guidance is given to students via formative feedback on major and/or example components of assessment, including formative assessment of draft material, including plans for case-study work. The course includes some assessment scenarios where creativity and ability to solve open-ended problems are valued (e.g. research-led posters). In such scenarios tightly specified goals or outcomes in advance may be inappropriate. Instead students are guided about the nature of the assignment and actively engaged in making their own judgements about what would constitute quality.

* Guidance on Marking for Undergraduate Courses: https://www.strath.ac.uk/staff/policies/academic/

ASSESSMENT AND FEEDBACK PRACTICES ARE CONTINUOUSLY REVIEWED
Assessment practice is continually reviewed in response to curriculum changes, peer and student feedback. Students are involved in decision-making about assessment policy and practice through representation on committees that discuss assessment policies and practices.

Recommended Reading

- Tiwary A, Williams I, Colls J (2019) Air Pollution: Measurement, Modelling and Mitigation. Fourth Edition, Taylor & Francis, ISBN 13: 978-1-4987-1945-2. **Recommended textbook for class.**
  Library holds short loan and electronic book copies:
  https://suprimo.lib.strath.ac.uk/permalink/f/k7ss9a/SUALMA51111918010002996
- Houghton J (2015) Global Warming: The Complete Briefing. Cambridge University Press, 5th Ed: https://suprimo.lib.strath.ac.uk/permalink/f/k7ss9a/SUALMA2163661080002996 (Electronic book available for 4th Ed: https://suprimo.lib.strath.ac.uk/permalink/f/k7ss9a/SUALMA5168164450002996)

Further specific reading will be recommended during class lectures.

PLEASE NOTE:
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 entirely of coursework.

Resit Arrangements

Resubmission of assignment portfolio.

Approved

Programme Director Signature:	Iain Beverland
Date of Last Modifications:	30 August 2021

Assessment and Feedback Schedule

Class Code	CL971	Class Title	Air pollution, climate change, and human health

Brief Description of Assessment

Learning objectives are assessed in relation to criteria specified above through an assignment portfolio covering all of the main syllabus areas:
Part A: Assessment and management of risks to human health from urban air pollution (Research report)
Part B: Assessment and management of risks to human health from climate change (Research report)
Part C: Research poster on air pollution or climate change (Research poster)
Part D (optional): Interpretation of practical exposure measurements in Glasgow (Student choice of research poster or extended abstract)

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 1

Assessment type (& title)	LOs	Weight (%)	Individual / Group	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
Air pollution report	1-3	28	Individual	Assessment portfolio instruction Hand –Out (H). Initial work possible from this time.					Deadline – air pollution component of assignment portfolio (S).			Feedback – air pollution component of assignment portfolio (F).			
Climate change report	1-3	28	Individual	Assessment portfolio instruction Hand–Out (H). Initial work possible from this time.										Deadline – climate change component of assignment portfolio (S)	
Research poster	1-3	14		Assessment portfolio instruction Hand –Out (H). Initial work possible from this time.										Deadline – research poster component of assignment portfolio (S)	
Optional exposure assessment assignment	1-3	30	Individual	Assessment portfolio instruction Hand–Out (H). Initial work possible from this time.										Deadline – exposure assessment component of assignment portfolio (S)	

.Mapping Module Learning Outcomes to AHEP

Module Learning Outcome	**Engineering Council AHEP competencies:** **Knowledge, Understanding and Ability**
LO1 Understand underlying processes that determine atmospheric pollution 'climates'	• Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards • Work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies • Apply advanced problem-solving skills, technical knowledge and understanding to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal • Plan and manage the design process, including cost drivers, and evaluate outcomes • Communicate their work to technical and non-technical audiences • Demonstrate wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations
LO2 Understand and make informed judgement about methods used to assess & manage impacts of air pollution and climate change on human health	• Understanding of the need for a high level of professional and ethical conduct in engineering, a knowledge of professional codes of conduct and how ethical dilemmas can arise • Knowledge and understanding of the commercial, economic and social context of engineering processes • Knowledge and understanding of management techniques, including project and change management, that may be used to achieve engineering objectives, their limitations and how they may be applied appropriately • Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, risk assessment and risk management techniques and an ability to evaluate commercial risk • Understanding of the key drivers for business success, including innovation, calculated commercial risks and customer satisfaction.
LO3 Ability to critically evaluate & synthesise complex information from primary research and technical literature	• Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate • Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues, and an awareness that these may differ internationally • Ability to extract and evaluate pertinent data and to apply engineering analysis techniques in the solution of unfamiliar problems. • Apply their skills in problem solving, communication, working with others, information retrieval and the effective use of general IT facilities • Understanding of, and the ability to apply, an integrated or systems approach to solving complex engineering problems • Ability to use fundamental knowledge to investigate new and emerging technologies

Programme Threads

Thread	Primary	Secondary	Contributory
Design			Relevant to design of engineering-based solutions to environmental pollution problems in LO 2.
Health, Safety & Risk Assessment	Major component of course LO 1, 2, 3.		
Sustainability	Major component of course LO 1, 2, 3..		
Maths for Engineers			Contributory to LOs 1, 2, 3
Industrial Engagement		Component of LOs 1, 2, 3	
Digital Technologies	Major component of course LO 2, 3..		