IL905-15 Thinking Water

21/22

Department
Institute for Advanced Teaching and Learning
Level
Taught Postgraduate Level
Module leader
Elena Riva
Credit value
15
Module duration
10 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

Issues related to water are among the main challenges of our time and only a global, interdisciplinary approach to them can ensure steps towards possible solutions.
During the course of the module you will consider the effects of scientific discoveries in the field of water on our planet's history, ecology and future. You will also consider the central role of water in our society and how exceptional and extraordinary it is - despite the fact that we all take it for granted.

Module web page

Module aims

The main aim of this module is to present to students a global topic such as water in its complexity and to engage them so they can discover, research and experiment the great potentialities of an interdisciplinary approach to the matter.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The module will consist of ten two hour sessions, for up to twenty students, from across the University's departments. The module leader will attend all of each session, to integrate and stimulate the interdisciplinary learning.
The core design is that each week the module leader and a subject specialist will choose how they wish to deliver a combination of 1hr of discipline or application grounded material with 1hr in which the students (with the module leader) will develop their learning in an interdisciplinary style that will help them to explore and deepen their knowledge of that week's theories and set texts/materials. Active learning methods (i.e. Team Based Learning; Open Space Learning) will be implemented in order to heighten student engagement and understanding of the week's topic.

Weekly topics
Here reported the topics of the lectures held by the experts. The second part of the session will always be a workshop led by the module leader for facilitating the learning experience of the students.

Week 1: Water – not an ordinary liquid!
The module leader will introduce the module and deliver a lecture that will permit students to scientifically explore this little molecule that has shaped our history. We will look at water's unusual physical properties (i.e. it is one of only a very small number of molecules which expand when cooled) and how it 'dodges' chemical rulings. In particular, we will analyse water's ingenious chemistry and how its peculiar propensity for bonding – with itself and with almost all other substances – accounts for its extraordinary versatility as a solvent, as a chemical reactant, as a barely compressible liquid, as a solid that can adopt umpteen crystal forms and as the vital context for the DNA, RNA and proteins that have concocted all living things – or at least the ones that we know of.
In summary, the lecture will help students to understand how exceptional and out of ordinary is this liquid that we take for granted but we still don't understand. "Of all known liquids," wrote the great water chemist Felix Franks, "water is probably the most studied and least understood."

Week 2: Ecosystems and water
Prof. Rosemary Collier (School of Life Sciences)
Although much of the water cycle is controlled by physical processes, ecosystems, and in particular, wetland ecosystems such as rivers, lakes, marshes and coastal areas provide many 'services' that contribute to human well-being. Examples of such ecosystem services are the regulation of flooding, erosion protection, soil formation, the retention, recovery and removal of excess nutrients and pollutants, and provision of habitats for resident and transient species (e.g. migratory birds). This lecture will consider the diversity and importance of ecosystem services related to water and will discuss some of the pressures that industry, agriculture and other human activities puts on them.

Week 3: Water ecology – an engineering perspective
Prof. Ian Guymer (School of Engineering – Warwick Water) will present to students aspects of water engineering. In particular he will focus on environmental and water ecology problems and he will help students to understand the fate of soluble pollutants and contaminated fine sediments within rivers, urban drainage systems and the coastal environment.
The workshop that will follow the lecture will be a field study on campus. Students, under the guidance of Guymer's PhD students and utilising Guymer's group equipment, will identify and quantify the dominant transport and mixing processes of pollutants running a field experiment on one of the water stream of Warwick campus.

Week 4: Water in the solar system and beyond
Dr Roberto Raddi and Prof. Boris Gaensicke (Department of Physics)
The presence of liquid water on Earth-like planets, and its persistence for a long interval of time, is thought to be the crucial requirement for life to develop and evolve, and is often adopted to define whether a planet is "habitable" or not. Having liquid water is linked to many parameters, including the properties of the host star, the distance of the planet from the star, the formation history of the planetary system, and the geodynamical activity of the planet.

Water in the Solar System is found under the most diverse conditions, and it presence becomes more common the farthest away from the Sun. Although apparently rich in water, the Earth itself contains just 0.2-2% of water by mass, most of which is mixed to rocks and magma in its crust, mantle, and core. Water has been observed on other terrestrial planets: ice has been found in craters on the surface of Mercury; liquid water is suggested to form seasonally on Mars; water vapour is present in the atmosphere of Venus. The asteroid belt hosts several bodies thought to contain large masses of ice under their surfaces. Traces of water are detected in the atmospheres of all giant planets, and some of their moons display evidence for large reservoirs of ice or liquid water buried under their surfaces (i.e. Enceladus, Europa, Titan). At the coldest extremities of the Solar system water appears to be one of the dominant components of comets, and icy minor planets. This variety of water content in the Solar system bodies poses important questions regarding the formation and evolution of planets, how the inner planets gained their water content, and if most of the water we see now on Earth was delivered via water-rich asteroids or comets.

Water is also common outside our Solar system. In fact, it is detected in active sites of star formation, which are the precursors of Solar systems like our own. Given the ubiquity of water, searches for the Earth 2.0 around Solar-like stars are in act, with numerous candidates to be confirmed. Water is now found in the hot equivalents of our Jupiter, i.e. giant planets that orbit closer to their suns. Convincing evidence for the existence of Solar-like systems also comes from the study of white dwarfs, which are the final stage of evolution for stars like our Sun. A number of white dwarfs has been observed to contain large amounts of hydrogen in their atmospheres, resulting from the disruption of water-rich asteroids.

Week 5: Does water have a history?
Dr John Morgan (Economic History Society Power Fellow at the Institute of Historical Research, at the School of Advanced Study, University of London and at the University of Exeter).
Does water have a history? How does understanding the past change our understanding of water? And how does looking at water change our understanding of history?
In this session, we will read, analyse, and critically interrogate works by scholars who have addressed these questions and we will also understand the social, cultural and political impact of flooding as a case of study.

Week 6: Water memories
Dr Joanne Garde-Hansen (Centre for Cultural Policy Studies) will give a lecture about the relationship between culture and water, rivers, flooding/drought. In a time when flooding, drought and water management (particularly in cities) is a growing future global concern, she will draw students' attention to the issues linked to the cultural management of water, the social value of city rivers and the concept of memorialising floods using digital media.

Week 7:
A guest practitioner (performing or visual arts) will be invited in consultation with Dr Jonathan

Heron. Subject to other embedded projects at IATL, either through the Student Ensemble or the Emerge programme (in collaboration with Warwick Arts Centre), an artist with a specific interest in the aquatic or seafaring cultures will be selected to stage a pedagogic intervention. This may take the form of a practical workshop (open-space learning, practice-as-research and/or performance installation) to explore the relationship between the human body and water.

Week 8: Healing with water
Dr Jane Adams (Centre for the History of Medicine)
Water has had an established place in the western healing tradition for some two thousand years, its therapeutic potential harnessed through drinking and bathing. This session will investigate the medical and cultural factors that influenced the emergence of a competitive market in water cures across Europe in the second half of the nineteenth century. Specialist spa and hydropathic resorts offered the wealthy a proliferation of complicated treatments in luxurious settings while advice manuals and simple equipment meant that water therapies could also be applied in domestic settings. A selection of primary source material will be used to investigate how science and consumer culture shaped changing ideas and practices.

Week 9: Discovering water trough archives
In the light of giving students the possibility to learn different methodologies that ‘belong’ to different disciplines so that they can utilise them for enrich their own research practises, Dr Meleisa Ono-George (Modern Records Centre) will give a lecture held at the Modern Records Centre, an internationally-renowned archive based on the University of Warwick campus, where students will learn about archives and how to engage in archival research. This session will include a short introduction to the MRC, followed by tour of the storerooms. Students will then work together in small groups to complete an exercise based on a specific archival collection related to ‘water’ and present their findings to the class. By the end of the lecture/workshop students will have learned how to search, handle, interpret and analyse archival documents.

This lecture complements the engineering field research undertaken in week 3 for promoting a transdisciplinary approach to the matter.

Week 10: Water module conclusion
This lecture will be delivered by the module leader. It will be an interactive lecture that students will find useful as recap for their learning process.

Learning outcomes

By the end of the module, students should be able to:

- Understand the effects of scientific discoveries in the field of water on our planet’s history, ecology and future.
- Explain the central role of water in our society, in the organisation of our cities and in the development of political scenarios.
- Demonstrate a good theoretical knowledge and understanding of disciplinary theories, positions and research themes related to the field of water.
- Understand the importance of a global, significant and different approach to issues pertaining to water based on dialogue across the boundary.
- Summarise their multidisciplinary learning into a global approach to water related issues and problems (= interdisciplinarity), developing their own research in a holistic way that crosses

disciplinary boundaries (= transdisciplinarity).
- Understand how to apply this more systematic and global approach to problems in order improve their own learning and investigative practices both in and beyond academic disciplinary studies.
- Effectively work on independent and collaborative projects.

Indicative reading list

Week 1 :
1- Alok Jha, The Water Book, 2015, Headline Book Publishing (selected chapters)
2- Alok Jha, Water: the weirdest liquid on the planet, The Guardian, May 2015 http://www.theguardian.com/global/2015/may/11/water-weirdest-liquid-planet-scientists-h2o-ice-firefighters
3- Philip Ball, H2O A Biography of Water, 2000, W&N; New Ed edition (selected chapters).

Week 2:
1- Ecosystems And Human Well-being: Wetlands and Water www.unep.org/maweb/documents/document.358.aspx.pdf
2- What Has Nature Ever Done For Us?: How Money Really Does Grow On Trees. Tony Juniper. Profile Books
3- Woodland for Water: Woodland measures for meeting Water Framework Directive objectives. Forest Research Monograph 4. http://www.forestry.gov.uk/pdf/FRMG004_Woodland4Water.pdf/$FILE/FRMG004_Woodland4Water.pdf

Week 3:
1- Dr Hemant Pathak, Water Pollution, 2012, CreateSpace Independent Publishing Platform; 1 edition.
2- Dr Luxmy Begum, Water Pollution: Causes, Treatments and Solutions!, 2015, CreateSpace Independent Publishing Platform; 1 edition.

Week 4:
1- Encrenaz T. 2008, "Water in the Solar System", ARA&A, 46, 57.
2- Farihi J., Gaensicke B. T., & Koester D. 2013, "Evidence for Water in the Rocky Debris of a Disrupted Extrasolar Minor Planet", Science, 342, 218.
3- Kasting J. F., Whitmire D. P., & Reynolds R. T. 1993, "Habitable Zones around Main Sequence Stars", Icarus, 101, 108.
4- Lawrence D. J., Feldman W. C., Goldsten J. O. et al. 2013, "Evidence for water ice near Mercury's north pole from MESSENGER Neutron Spectrometer measurements", Science, 330, 292
5- Raddi R., Gaensicke B. T., Koester D. et al. 2015, "Likely detection of water-rich asteroid debris in a metal-polluted white dwarf", MNRAS, 450, 2083.
6- Raymond S. N., Quinn T., & Lunine J. I. 2004, "Making other earths: dynamical simulations of terrestrial planet formation and water delivery", Icarus, 168, 1.
7- Tinetti G., Vidal-Madjar A., Liang M.-C. et al. 2007, "Water vapour in the atmosphere of a transiting extrasolar planet", Nature, 448, 169.
8- van Thienen P., Benzerara K., Breuer D. et al. 2007, "Water, Life, and Planetary Geodynamical Evolution", Space Science Reviews, 129, 167.

Week 5:
1- Jamie Linton, What Is Water?: The History of a Modern Abstraction (UBC Press, 2010).
2- Ruth A. Morgan and James L. Smith, ‘Premodern Streams of Thought in Twenty-First-Century Water Management’, Radical History Review 116 (Spring, 2013), pp. 105–129.
3- Erik Swyngedouw, ‘The Political Economy and Political Ecology of the Hydro-Social Cycle’, Journal of Contemporary Water Research & Education, 142 (August, 2009) pp. 56-60.
4- Johann Templehoff et al, ‘Where has the water come from?’, Water History, 1 (2009), pp. 1-18.

Week 6:
1- Garde-Hansen, J, F Krause and N Whyte (2013) 'Flood Memories - media, narratives and remembrance of wet landscapes in England' Journal of Arts and Communities, 4: 1-2.

Week 7:
1- Csikzsentimihalyi (1975) Optimal Experience: Psychological Studies in the Flow in Consciousness (Cambridge University Press);
2- Kershaw (2007) Theatre Ecology: Environments and Performance Events (CUP);
3- Monk et al. (2011) Open-space Learning: A Study in Transdisciplinary Pedagogy (Bloomsbury)

Week 8:
1- Jane Adams, Healing with Water: English spas and the water cure, 1840-1960 (Manchester, Manchester University Press, 2015);
2- Hilary Marland and Jane Adams. ‘Hydropathy at home: the water cure and domestic healing in mid-nineteenth century Britain’, Bulletin of the History of Medicine, 83 (2009), 499-529;
3- Roy Porter, ’Introduction’ in Roy Porter (ed.) The Medical History of Waters and Spas, Medical History, Supp. No. 10 (London, Wellcome Institute for the History of medicine, 1990);
4- George Weisz, ‘Water cures and science: the French Academy of medicine and mineral waters in the nineteenth century’, Bulletin of the History of Medicine, 64(1990), 393-416.

Research element

Students will summarise their multidisciplinary learning into a global approach to water related issues and problems (= interdisciplinarity), developing their own research in a holistic way that crosses disciplinary boundaries (= transdisciplinarity). They will do this through undertaking their own research utilising the methodologies and the holistic approach presented throughout the course. For example, students will understand how high quality research in the water field is developed through field studies and archival research and will learn to critically communicate their reading and research both orally and through scholarly essay writing.

Interdisciplinary

During the course of the module students will learn to recognise the importance of employing a truly interdisciplinary approach for the global understanding of the water phenomenon and for implementing possible solutions to the risks and the problems connected to it. They will also learn to appreciate the value of adopting inter-disciplinary approaches and trans-disciplinary research methods for understanding global topics such as the water and for attempting solutions to difficult issues.

Subject specific skills

Appreciate the value of adopting inter-disciplinary approaches and trans-disciplinary research methods for understanding global topics such as the water and for attempting solutions to difficult issues.
Reflect on the possibility to implement this more global approach to their studies in their own master disciplines, potential research work and practises.
Become integrative system thinkers - independently identify and/or devise interdisciplinary connections between all disciplines.
Reflect on the value of the use of different methodologies (i.e. field studies and archival research) for tackling issues related to a diverse range of disciplines and for expanding the approach to their own research.
Comprehend how to utilise the communicative and collaborative skills used in the module in their professional life.

Transferable skills

Identification of transdisciplinary issues.
Manage their own learning and research time to meet deadlines.
Recognise the importance of collaboration and team effort through team-based learning activities.
Solve problems creatively
Theory-building

Study

Study time

Type	Required
Lectures	10 sessions of 1 hour (7%)
Seminars	10 sessions of 1 hour (7%)
Project supervision	2 sessions of 1 hour (1%)
Other activity	1 hour (1%)
Private study	47 hours (31%)
Assessment	80 hours (53%)
Total	150 hours

Private study description

Students will be expected to undertake directed reading, private study, independent research and reflection to an extent appropriate for the assessment being undertaken.

Other activity description

Students will be expected to undertake directed reading, private study, independent research and reflection to an extent appropriate for the assessment being undertaken.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Student Devised Assessment	50%	40 hours	Yes (extension)
Essay (1500 words)	50%	40 hours	Yes (extension)

Feedback on assessment

Detailed written and oral feedback will be provided by tutor to individual students for each element of assessed work, i.e. the student devised assessment and the essay.
Formative oral feedback will also be given to students at relevant points, i.e. within seminars throughout the module as they devise their own form of assessments and between the student's devised assessment and the essay.

Availability

Courses

This module is Optional for:

- TESA-H1A0 Postgraduate Taught Sustainable Energy Technologies
  - Year 1 of H1A0 Sustainable Energy Technologies
  - Year 2 of H1A0 Sustainable Energy Technologies
- Year 1 of TIMA-L99D Postgraduate Taught Urban Analytics and Visualisation