MODULE TITLE	**Mining the Future**	**CREDIT VALUE**	**15**
MODULE CODE	**CSMM220**	**MODULE CONVENER**	**Prof Frances Wall (Coordinator)**

DURATION: TERM	**1**	**2**	**3**
DURATION: WEEKS	**0**	**11**	**0**

Number of Students Taking Module (anticipated)	**25**

DESCRIPTION - summary of the module content

What raw materials will be needed in the future, where will they come from and how will they be extracted? This research-centred module will enable you to learn about what mining may look like in 10 or 20 years' time and also learn some of the skills required to innovate and change. With lectures on current topics from researchers and leading practitioners, seminars, and your own supervised investigations, this module will help prepare you for future leadership and development roles.
Knowledge of undergraduate geology is assumed together with a preliminary knowledge of mining, such as obtained from the CSMM135 Economics, Processing & Environment modules which is a pre- or co-requisite.

AIMS - intentions of the module

The module will teach a range of topics to cover some of the most exciting developments likely to revolutionise mining and provision of raw materials in the future. The topics will change from year to year to keep up with current research and innovation. Examples of likely topics include automation and remote mining, combining geothermal and mine waters, future manufacturing needs, life cycle assessment, circular economy, responsible sourcing, space mining, deep sea mining, , closing oil and coal and how mining maps to the Sustainable Development Goals. The aim is to present a range of topics so that all course participants have a good overview. Seminars will facilitate more discussion and understanding. A deeper understanding of two topics will come from assignments involving independent research and writing. These will help with learning and understanding about the innovations themselves, and how research is translated to industry innovation and change.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

On successful completion of this module **you should be able to**:

Module Specific Skills and Knowledge:	
1	Knowledge and understanding of technical topics of research and innovation relevant to mining
2	Knowledge and understanding of socio-economic topics of research and innovation relevant to mining
3	Knowledge and understanding of value chain (customer) and investor requirements for mining in the future
Discipline Specific Skills and Knowledge:	
4	Knowledge of how the extractive industries are likely to change in the future
5	Knowledge of the kind of research being carried out to improve mining in the future
6	Understanding of drivers for change in the extractive industries
Personal and Key Transferable/ Employment Skills and Knowledge:	
7	Knowledge of how research translates to industry innovation and change
6	Skills to assess complex and potentially conflicting information
8	Skills in writing about complex technical topics in a way understandable to the public
9	Skills in imagining the future and what is needed to achieve change
10	Management skills for research and business innovation

SYLLABUS PLAN - summary of the structure and academic content of the module

Topics include automation, remote mining, 'solution mining', remote sensing, 'big data', artificial intelligence, geothermal and mine waters, future manufacturing needs, critical raw materials, Life Cycle Assessment, Circular economy, including combining primary and secondary raw materials, Environmental, Social and Corporate Governance (ESG) and responsible sourcing, New frontiers – space mining, deep sea mining, Sustainable Development Goals (SDGs), Closing oil and coal, leadership skills for creativity, innovation, interdisciplinary working and managing change. The topics will be presented as a series of lectures by university staff and guest lecturers. The plan is to have two lectures, usually one a general introduction and a more in detailed view of a particular part of the topic and then a seminar to facilitate further discussions on each topic. For example:
Week 1 – Intro lecture and session on leadership skills (FW)
Week 2 - How will we mine (DV) Guest lecture e.g. on automated mining, narrow vein mining, seminar (DV)
Week 3 - What resources will we need (FW) Guest lecture Seminar (FW)
Week 4 –'Big Data, IoT (guest lecture) Satellite applications (Guest lecture, e.g. Sat Cat.) Seminar (FW)
Week 5 – Mining in Space (guest) Mining in the deep oceans (guest) Seminar (FW)
Week 6 - Life Cycle Assessment (Guest) Circular economy (Guest lecture e.g Business School) Seminar (FW)
Week 7 – ESG and SDGs lecture (FW), Guest lecture, seminar
Week 8 – seminars on assignments, further guest lecture
Week 9 - 11 assignments/provide flexibility for weeks where students are on mapping classes etc.
Students will each choose two aspects of the topics presented that particularly interest them and do two pieces of assessed work: an article or other presentation aimed at the general public, and a longer report and discussion that will contain either literature review or some original research such as structured

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	30.00	**Guided Independent Study**	120.00	**Placement / Study Abroad**	0.00

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Lecture	16	One hour lectures to introduce the main topics
Seminar	12	Seminar to discuss the week's lectures and gain more insight into the topic

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

Form of Assessment	Size of the assessment e.g. duration/length	ILOs assessed	Feedback method
Seminars	1 hour each week	1-10	Verbal

SUMMATIVE ASSESSMENT (% of credit)

Coursework	100	Written Exams	0	Practical Exams	0

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of credit	Size of the assessment e.g. duration/length	ILOs assessed	Feedback method
Article for public audience	40%	10 pages or equivalent piece of social media, infographic, blog, vlog	1,2 or 3 and 4 - 9	Written and/or verbal
Report on a topic of innovation	60%	20 pages	Two of 1,2 or 3 (so all three ILOs are covered in the assessments) and 4,5,6,7,9,10	Written

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original form of assessment	Form of re-assessment	ILOs re-assessed	Time scale for re-assessment
Article for public audience	Article for public audience	1,2 or 3 and 4 - 9	Ref/ Def Period
Report on a topic of innovation	Report on a topic of innovation	Two of 1,2 or 3 (so all three ILOs are covered in the assessments) and 4,5,6,7,9,10	Ref/ Def Period

RE-ASSESSMENT NOTES

Resubmission of either the article for public audience or Report on a topic of innovation depending on overall module performance. All referral marks are capped at 50%.

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Basic reading:
Lecture notes will be provided, and lectures will be video captured where possible. They will be suitable for online delivery, e.g. by MS Teams. Guest lecturers will be asked to suggest further reading.
Most learning will come from papers, online research and direct from researchers and companies rather than from text books
Links to general reference text books and relevant background materials in other modules will be given as relevant to the topics being covered
Web-based and electronic resources:
Further reading will involve websites (such as company websites) and journal papers available as online resources
ELE – http://vle.exeter.ac.uk/
A list of web resources and academic papers are available through ELE. In addition, the course site contains comprehensive online resources including lectures, PowerPoint presentations, documents and reference material in pdf format, mp3 podcasts, videos, e-tivities, discussion boards; and links to the University of Exeter electronic library and its comprehensive resources.
Other resources:
Research may also be done direct with company staff, e.g. via a structured interview

Reading list for this module:
There are currently no reading list entries found for this module.

CREDIT VALUE	15	ECTS VALUE	7.5
PRE-REQUISITE MODULES	None		
CO-REQUISITE MODULES	None		
NQF LEVEL (FHEQ)	7	AVAILABLE AS DISTANCE LEARNING	No
ORIGIN DATE	Monday 22 June 2020	LAST REVISION DATE	Thursday 16 December 2021
KEY WORDS SEARCH	Mining, life cycle assessment, automation, critical raw materials, sustainable development goals, future change		