Education Special Interest Group Climate Change Action Plan

Introduction Overall problem statement	The Education Special Interest Group (EdSIG) notes IChemE's position on climate change The action plan presented here follows on from this statement and forms part of IChemE's delivery against several of the commitments set out, namely to: develop target benefits, detailed positions and action plans for economically sustainable and secure transitions to net zero carbon emissions in all areas of chemical engineering practice and regions, where members are active; it will also help underpin work on several other commitments, including: provide policy advice to governments based on chemical engineeringexperience and expertise; engage in public outreach activities with businesses and communities, to understand their concerns about the threats and uncertainties posed by climate change; develop training courses and mandate CPD to provide the knowledge andskills to support members in the transition to a net zero carbon economy and in climate change adaptation; encourage all regional member groups and special interest groups to hold webinars and seminars as part of the CPD programme to enhance skills and knowledge in pursuit of zero carbon futures and understanding of climate risks, and to engage with the wider membership. The Education SIG has a special responsibility to ensure that chemical engineering graduates have the best preparation for a carbon-constrained future and will work in collaboration with all stakeholders towards achieving the goals set for a net-zero carbon future.
What actions need to be taken to address the issue?	At a strategic level, changes are required to the IChemE Accreditation Guidelines. It is noted that a new set of guidelines will be published shortly, which includes a requirement to demonstrate a sustainability culture rather than include thisunder ethics and EdSIG welcomes this change. However, EdSIG would also like some minor changes to wording in the Accreditation Guide to demonstrate the IChemE's proper understanding of sustainability.

	As economics is a key tenant of sustainability, it should not be listed separately as happens in at least 10 places in the guide (including the soon to be published new edition), ie: *A2.7 Sustainability and Economics, Ethics – Level B* and *B2.7 Sustainability and Economics, Ethics Level D* It should be sufficient to write: *A2.7 Sustainability and Ethics, Level B and* *B2.7 Sustainability and Ethics, Level D* Or *A2.7 Sustainability (including Economics) and Ethics, Level B* *B2.7 Sustainability (including Economics) and Ethics, Level D* This listing of economics outside of sustainability comes from a 20th century philosophy that economic viability is the most important and therefore needs to be differentiated from any other aspect of sustainability. This needs to be corrected, as soon as possible, as the Accreditation Guidelines is a public document. The Guidelines should also be worded more strongly, in the area of Design and Practice. At present it is left to the institutions to choose design problems and illustrative practice regardless of their sustainability. As educators, we need to lead in this area. An example of leading would be to change the section A4.1 to add the italicized sentence. In section A4.1 Chemical Engineering Design and Practice, it states: *"encourage the application of chemical engineering principles to problems of current and future industrial relevance including sustainable development, safety, and environmental issues. Where example processes have poor elements of sustainability such as high GHG emissions or waste generation, use these examples as a challenge to identify a more sustainable option and to measure accurately and reduce the carbon, water, and other environmental footprint.".* As part of the member survey, review the curriculum requirements for core chemical engineering units to determine the extent that sustainability concepts are appropriately recognised. An example of this is learning objectives associated with mass and energy balances: a basic understanding of global cycles such as water and carbon; able to differentiate different options for energy storage. EdSIG would assist with the production of resources derived from collaborations between different expert groups within IChemE on relevant topics to support education and training. In addition, the IChemE as a publisher of chemical engineering journals and textbooks may be able to formalise the resources (through publication) that have been derived from collaborations mentioned above.
What skills, training gap or facilitation requirements need to be addressed?	A gap analysis needs to be undertaken to determine how sustainability is currently being embedded in the curriculum. This gap analysis will try to identify the following (please add to this list): whether an engineering systems approach should focus more on product design than process design; what fraction of the chemical engineering content uses examples which are petrochemical-based and what fraction uses renewable feedstocks? what are the impediments to changing the content to more renewable feedstocks?

	what fraction of unit operation laboratories are based on non-fossil fuel,renewable chemicals? what are the impediments to changing these laboratories? for specific courses such as mass and energy balances, transport phenomena, heat, and mass transfer; based on a list of topics under eachcourse, evaluate using a point sharing method the relative priorities of each topic in your institutions current curriculum and what you believe isrequired for future graduates; what methods are being introduced and to what level of competency areyour graduates in undertaking life cycle assessment (LCA), foot printing and other sustainability metrics? how does your institution demonstrate a commitment to sustainability? how do the research topics available for final year and Masters students demonstrate one on the UNSDG? Is there a requirement to mention in the project brief? does your institution have a requirement for clubs and societies to have an environmental policy? are there any requirements on energy consumption and waste production?
What actions should the SIG and its members take to support delivery of the above actions?	Following the gap analysis, EdSIG will collect examples of case studies and good teaching practices, focussing on sustainability and climate action and disseminate these through webinars, chemical engineering education workshops and the EdSIG Newsletter. Additionally, EdSIG will continue to work with other groups within IChemE such as the Sustainability SIG to reward high standards in sustainability education in chemical engineering degrees through the Macnab-Lacey Prize and the Sustainability Teaching Award. These two are examples of aspirational goals that are aligned with the UNSDGs including SDG 12 Responsible Production and Consumption and SDG 13 Climate Action.
What actions will you encourage others to take?	The changes as listed above to the IChemE Accreditation Guidelines. Continued collaboration with all the regional member groups to provide continued development of resources and support to local universities and degree providers. Similarly, involvement with the Research & Innovation Community of Practice will be sought to support the integration of Research and Innovation in teaching practice.
Next steps	In the next 12 months, we will have completed the Gap Analysis and will start the dissemination of good practice. In the following 12 months, EdSIG will continue to disseminate good practice and share resources. In the medium and long term EdSIG will continue collaborating with other groups within and outside IChemE in supporting the community to achievethe goals of the Responsible Production priority area. *Note: Any opinions are those of the authors and do not necessarily represent those of IChemE.*