3.18/3.70: Materials Science & Engineering of Clean Energy

Tu/Th 1:30-3:00 pm
Prereq: 3.030 and 3.033 or permission of instructor
U (Spring)
3-0-9 units

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Develops materials principles, limitations, and challenges associated with clean energy technologies, including solar, wind, geothermal, fuel/electrolysis cells, nuclear, novel fuels and energy storage. Draws correlations between limitations and challenges related to key figures of merit and the basic underlying thermodynamic, structural, transport, and physical principles, as well as the means for fabricating devices exhibiting optimum operating efficiencies and extended life at reasonable cost. More broadly, challenges associated with the production of metals, glass, concrete and other high embodied energy materials are treated with respect to energy consumption and emissions reduction as well as challenges associated with recycling. Considers constraints on technological advances and implementation imposed by broader economic, policy and social trends. Encourage student involvement. *This class is an approved elective for the Energy Studies Minor – questions contact Rowan Elowe (rowane@mit.edu)*

Guest & Instructor Presentations (2024): *Photovoltaics & Photothermal Chemical Production & Development Incentives*: Professors Bulovic, Ghoniem and Jaramillo (MIT), Ms. Wien -Wells Fargo Bank; *Nuclear Energy*: Professor Buongiorno (MIT); *Battery Technology*: Professors Abate & Chiang (MIT); *Electrical Power*: Dr. Jill Engel-Cox (National Renewable Energy Laboratory); *Embodied Energy and Emissions*: Dr. Wicks (ARPA-E); *Metals Refining*: Dr. Daehn (MIT); *Recycling & Critical Materials*: Dr. Gaines (Argonne Nat. Lab.) & Dr. Harrington (Bath Univ.); *Clean Energy policy & Entrepreneurship*: Prof. Karplus (Carnegie Mellon) & Prof. Chiang (MIT); *CO_2 Capture*: Mr. Herzog (MITEI); *Energy Demand/usage; Hydrogen economy - Fuel cells/Electrolyzers*: Prof. Tuller (MIT) & Dr. Eaglesham (Electric Hydrogen), *Future Trends*: Dr. Assefa (C1 Ventures), Mr. Jacobs (Bipartisan Policy Center).

Professors Iwnetim Abate, Yet-Ming Chiang and Harry L. Tuller