ABET^{+EM} x EM@FSE 2.0 Indicator Coverage—Explained (July 5, 2019)

Please use this guide when planning EM coverage in your Fall 2019 and Spring 2020 course(s). EM@FSE 2.0 Indicators are grouped under the ABET^{+EM} ("ABET Plus") Outcomes. Coverage Levels of each indicator are:

***Introduced**—e.g. lecture or ungraded out-of-class reading

***Skills Developed**—e.g. individual or group activity or ungraded assignment

***Assessed**—a level of performance is assessed such that the instructor can determine whether 70% of students achieved 70% or better proficiency.

This document can be accessed at EM@FSE 2.0 Coverage Explained

Note: The EM@FSE initiative does not change how FSE programs cover or assess ABET 1-7 Outcomes

EM@FSE 2.0 Indicator	Explanation
ABET^{+EM} #1 *The FSE Engineer critically observes surroundings to recognize opportunities and apply engineering principles, technical skills, science, and mathematics to solve complex engineering problems.*	
a) Critically observes surroundings to recognize opportunity	Recognizing opportunity begins with being aware of what's going on around you, noticing what is so common that we don't even think about it as well as what's strange within the ordinary. The FSE Engineer recognizes opportunities to apply engineered solutions to everything from day-to-day problems all the way up to grand challenges.
g) Applies technical skills/ knowledge to the development of a technology/ product	This is ABET Student Outcome Criterion #1.
ABET^{+EM} #2 *The FSE Engineer can apply human-centered design principles to discover users' needs, value propositions and market opportunities, to meet specified needs with consideration of public health, safety, and welfare, and/or global, cultural, social, environmental, and economic factors. Explores multiple solution paths, suspending judgement on new ideas.*	
b) Explores multiple solution paths	The FSE Engineer frames and reframes social and engineering problems in order to generate multiple possible solutions with varying value propositions to a variety of stakeholders before determining the option that has the most value and/or impact.
d) Suspends initial judgement on new ideas	The FSE Engineer keeps an open mind when considering potential design solutions, neither discounting seemingly outlandish ideas nor embracing the most obvious ones. A Lean engineering principle is to *decide as late as possible*, so that more design choices are based on fact, rather than speculation.
i) focuses on understanding the value proposition of a discovery	The FSE Engineer does not ask "Can we build it?" Rather, s/he asks, "Should we build it?" This means discerning the pain points and needs of different customer segments to ensure that an innovation will add value to their lives.
k) Defines a market and market opportunities	The FSE Engineer determines the value proposition of an innovation to potential buyers, users, and/or decision-makers and understands the channels and funding streams that will move the innovation into the marketplace.
ABET^{+EM} #3 *The FSE Engineer c*an communicate effectively with diverse audiences, articulating how a discovery adds value from multiple perspectives (e.g., technological, societal, environmental, etc.).	
m) Articulates the idea to diverse audiences.	The FSE Engineer understands that to have impact engineers have to be able to communicate the value of their work to diverse audiences. "Articulates" can refer to communication in writing, speaking, videos, social media, etc. "Diverse audiences" can refer to engineers from multiple disciplines, laypeople of all ages and levels of education, a range of professionals (CEOs, CFOs, Chief Engineers, lawyers, etc.), and people of different ethnic and cultural backgrounds, including those from other countries.
n) Persuades why a discovery adds value from multiple perspectives (technological,	The FSE Engineer analyzes the impacts and value of an innovation to society, communities, the environment, and other relevant areas and conveys that impact and value with data.

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societal, financial, environmental, etc.).	
ABET^{+EM} #4 *The FSE Engineer can* recognize an engineer's ethical and professional responsibilities, understanding that potential solutions have the potential to lead to both gains and losses. Understanding how elements of an ecosystem are connected, can make informed judgements about expected and unanticipated impacts of engineering solutions in global, economic, environmental, and societal contexts.	
l) Engages in actions with the understanding that they have the potential to lead to both gains and losses.	The FSE engineer understands that innovation involves risk. Some risk can be calculated, but sufficient information may not be available in the design phase. The FSE engineer innovates with an understanding of the potential consequences (positive and negative) of new programs and/or technologies, communicates these potential consequences to supervisors and other stakeholders, and is prepared to pivot when more information becomes available and/or unexpected and undesirable outcomes arise.
o) Understands how elements of an ecosystem are connected.	The FSE engineer considers the interdependence of technology, the environment, society, the economy, and other areas and thinks holistically about potential consequences of an innovation.
ABET^{+EM} #5 The FSE Engineer can function effectively on teams whose members have diverse and complimentary skillsets, backgrounds, and/or expertise, creating an inclusive environment characterized by shared leadership to successfully establish goals, plan tasks, and meet objectives.	
p) Identifies and works with individuals with complementary skill sets, expertise, etc	The FSE Engineer can discern colleagues' strengths and leverage those strengths into work plans to complete projects on time and with high quality.
ABET^{+EM} #6 The FSE Engineer can develop and conduct appropriate experimentation and analyze and interpret data to support and refute ideas. Can collect feedback and data from customers and/or customer segments and use engineering judgment to draw conclusions to modify an innovation accordingly.	
c) Gathers data to support and refute ideas	The FSE Engineer tests the viability of an idea using existing or generated data.
f) Collects feedback and data from many customers and customer segments.	The FSE Engineer interacts with users to learn the effects and effectiveness of a potential innovation.
h) Modifies an idea/product based on feedback.	The FSE Engineer ensures that an innovation fulfills a need and value proposition by observing/studying users' experiences with a prototype and/or existing products and iterating accordingly. "Feedback" can also refer to data collected through testing.
ABET^{+EM} #7 The FSE Engineer can seek and apply new knowledge, synthesizing information from a range of sources and/or modalities to discern trends about the changing world and adopting a future-focused perspective to assess the sustainability and/or scalability of potential solutions.	
e) Observes trends about the changing world with a future-focused orientation/perspective.	The FSE engineer asks, "What's next?", seeking new approaches to existing solutions, or new solutions to existing problems. The FSE engineer observes and attempts to anticipate technological, social, environmental, and economic trends when framing problems, designing solutions, and considering the sustainability of an innovation. Maintaining a future-oriented perspective—even in the face of deadlines and resource and budget constraints—can reveal unexpected opportunities.
j) Describes how a discovery could be scaled and/or sustained, using elements such as revenue streams, key partners, costs, and key resources.	The FSE Engineer possesses skills to assess innovations' potential sustainability and scalability.
q) Integrates/ synthesizes different kinds of knowledge.	The FSE Engineer can synthesize data from different engineering disciplines, as well as from quantitative and qualitative sources.