Curriculum Exercise

10 minutes: Introduction of the goals of the exercise and how this relate to the GWW Strategic Plan (Dixon)

20 minutes: Groups of ~4-5 (all with the same selected theme) will take turns sharing their ideas using the question prompts below. This would give the chance for each person to speak for about 5 minutes within their group.

20 minutes: Collectively as a group come up with a consensus statement of key findings. Documenting these so that they can be collected.

Considering the projected hiring needs of B.S. mechanical engineering graduates within your company over the next 10-15 years, in the context of the following curriculum themes (societal challenges, ethics, or data science) think about your responses to the associated questions. As the goal of the strategic plan is to integrate this new content in an innovative way into our current curriculum, provided in the attached appendix is a list of each of our required ME courses with a very brief description. We will assign board members to a specific group on the day of the board meeting to make sure we can cover all three themes, but if you have a strong preference for one of them, please email dixon@gatech.edu ahead of time so that we can plan accordingly.

Curriculum

Societal Challenges

1) List the top 1-2 societal challenges that your company is developing solutions towards.
2) Referring to the ME course list in the attached appendix, which ME course(s) would be most relevant for addressing the selected societal challenge(s)?
3) Optional: If you have a specific idea for a special topic/problem project focused on a societal challenge that could be achieved as a part of one of our current UG courses, list the idea here. We are particularly interested in ideas where you (or someone in your company) would be particularly interested in engaging. The constraints for such a project would be: 1) something that could be achieved as in individual project of by a group of 3-4 students; 2) it should take no more than 3 weeks; and 3) an individual student should not have to work more than 4 hours/week on the project outside of class; 4) the project should integrate concepts learned in the course; and 5) it should take no more than 2 full lectures dedicated specifically to preparing students for the project (or delivering the final project – e.g. in class project fair).
4) Optional: if you are someone within your professional network would be an ideal external speaker to come speak to our UG students (virtually or in person) about their work in a specific societal challenge, please list their info here, along with a general description of their area of expertise.

Ethics

1) List the top 1-2 ethical scenarios that fall into one of the following categories: 1) situations that recent graduates in your experience are ill-equipped to handle or 2)

yet to be encountered ethical situations that could arise from emerging technologies and/or societal challenges

2) Referring to the ME course list in the attached appendix, which ME course(s) would be most relevant for addressing the selected ethical situation(s)?
3) Optional: If you have a specific idea for a special topic/problem project focused on engineering ethics that could be achieved as a part of one of our current UG courses, list the idea here. We are particularly interested in ideas where you (or someone in your company) would be particularly interested in engaging. The constraints for such a project would be: 1) something that could be achieved as in individual project of by a group of 3-4 students; 2) it should take no more than 3 weeks; and 3) an individual student should not have to work more than 4 hours/week on the project outside of class; 4) the project should integrate concepts learned in the course; and 5) it should take no more than 2 full lectures dedicated specifically to preparing students for the project (or delivering the final project – e.g. in class project fair).
4) Optional: if you are someone within your professional network would be an ideal external speaker to come speak to our UG students (virtually or in person) on the subject matter of engineering ethics, please list their info here, along with a general description of their area of expertise.

Data Science, AI, and ML to solve engineering problems

1) Provide a list of key soft skills that your company would ideally like to see in ***every*** BS/ME student as it relates to familiarity and/or mastery of common data science tools.
2) Provide a list of any specific data science software packages/languages/tools (if any) that you would like ***every*** student to have familiarity with.
3) Answer questions #1 and #2 above for an ME student that chooses to ***concentrate*** their depth electives (or minor) in an area of engineering applications in AI/ML/data science.
4) Provide an example(s) of specific challenges/opportunities in which new methods in data science are being utilized within your industry to solve an engineering problem.
5) Optional: If you have a specific idea for a special topic/problem project focused on a data science engineering application within your industry that could be achieved as a part of one of our current UG courses, list the idea here. We are interested in ideas where you (or someone in your company) would be interested in engaging and for which your company would be able to provide the relevant "real-world" data. The constraints for such a project would be: 1) something that could be achieved as in individual project of by a group of 3-4 students; 2) it should take no more than 3 weeks; and 3) an individual student should not have to work more than 4 hours/week on the project outside of class; 4) the project should integrate concepts learned in the course; and 5) it should take no more than 2 full lectures dedicated specifically to preparing students for the project (or delivering the final project – e.g. in class project fair). Ideally the project would leverage the new AI/ML Makerspace resource that will be coming on campus to support UG education in COE.

Appendix – List of current required ME courses within the curriculum

ME 1670. Introduction to Engineering Graphics and Design. 3 Credit Hours.
Introduction to engineering graphics and visualization including sketching, line drawing, and solid modeling. Development and interpretation of drawings and specifications for product realization.

ME 2016. Computer Applications. 3 Credit Hours.
An introduction to the use of computers and MATLAB programming for the solution of mechanical engineering problems. Topics include: sources of error in computing, the use of modular software design, basic numerical methods, and signal processing.

ME 2110. Creative Decisions and Design. 3 Credit Hours.
To learn fundamental techniques for creating, analyzing, synthesizing, and implementing design solutions to open- ended problems with flexibility, adaptability, and creativity through team and individual efforts.

ME 2202. Dynamics of Rigid Bodies. 3 Credit Hours.
Kinematics and dynamics of particles and rigid bodies in one, two, and three dimensions. Work-energy and impulse-momentum concepts.

ME 3017. System Dynamics. 3 Credit Hours.
Dynamic modeling and simulation of systems with mechanical, hydraulic, thermal and/or electrical elements. Frequency response analysis, stability, and feedback control design of dynamic systems.

ME 3057. Experimental Methodology and Technical Writing. 3 Credit Hours.
Introduction to basic instrumentation and experimental methodology used in mechanical engineering, including calibration, use, precision and accuracy. Consideration errors, precision and accuracy in experimental measurements and technical reports.

ME 3210. Design, Materials, and Manufacture. 3 Credit Hours.
Major manufacturing processes, capabilities, and costs. Interaction between design, materials and manufacturing process selection.

ME 3322. Thermodynamics. 3 Credit Hours.
Introduction to thermodynamics. Thermodynamic properties, energy and mass conservation, entropy and the second law. Second-law analysis of thermodynamic systems, gas cycles, vapor cycles.

ME 3340. Fluid Mechanics. 3 Credit Hours.
The fundamentals of fluid mechanics. Topics include fluid statics; control-volume analysis; the Navier-Stokes equations; similitude; viscous, inviscid and turbulent flows; boundary layers.

ME 3345. Heat Transfer. 3 Credit Hours.
Introduction to the study of heat transfer, transport coefficients, steady state conduction, transient conduction, radiative heat transfer, and forced and natural convection.

ME 4056. Mechanical Engineering Systems Laboratory. 3 Credit Hours.
Measurement and analysis of mechanical, acoustic, manufacturing, thermodynamic, fluid, and heat transfer phenomena. Emphasis on data acquisition, reduction, analysis, and report preparation.

Select one of the following (3180 or 4315):

ME 3180. Machine Design. 3 Credit Hours.
The selection, analysis, and synthesis of springs, joining and fastening methods, bearings, shafts, gears, and other elements. Design of assemblies. Computer-based methods.
OR
ME 4315. Energy Systems Analysis and Design. 3 Credit Hours.
Integrated concepts, laws, and methodologies from thermal sciences are used to analyze, model, and design energy systems and to predict system performance for fixed designs.
ME 4182/4723. Capstone Design. 3 Credit Hours.
Seniors will work in teams to apply a systematic design process to real multi-disciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, environmental, mechanical, industrial design, electrical and thermal/fluids. Projects must be based on the knowledge and skills acquired in earlier course work, and incorporate appropriate engineering standards and multiple realistic constraints. Emphasis is placed on the design process, the technical aspects of the design, and on reducing the proposed design to practice. The course consists of faculty and guest lectures, prototyping in design studios, and a multi-disciplinary design project.