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Motivation

Engineering education is undergoing a critical shift toward frameworks that emphasize social responsibility, sustainability, and ethical practice. Yet research consistently shows that traditional engineering curricula often undervalue these societal dimensions, contributing to a persistent “culture of disengagement.” To prepare engineers who can responsibly shape both society and the environment, programs must meaningfully integrate Sustainability, Inclusive Design, and Engineering Ethics into early coursework.

At NJIT’s Newark College of Engineering, the FED101 course—taken by more than 700 first-year students—offers an ideal entry point for this transformation. FED101 introduces the engineering design process while foregrounding values such as equity, resource stewardship, empathy, and moral reasoning. Building on prior NJIT initiatives that have incorporated Inclusive Design and DEIBJ principles into introductory engineering experiences, this project broadens the scope to embed sustainability literacy across courses, co-curricular programming, and academic pathways.

Supported by the ASEE EOP mini-grant, the project advances three mutually reinforcing initiatives:

1. Expanding FED101 modules through culturally responsive, active-learning materials.
2. Launching interdisciplinary pathways via a new Sustainability Minor.
3. Connecting students with practitioners through a campus-wide Sustainability Seminar Series.

Together, these efforts establish a scalable, institution-wide model for preparing “future-ready engineers” who are grounded in ethical, inclusive, and environmentally responsible design.

Curricular Intervention

1. Expanding Content on Inclusivity, Sustainability and Ethics

Culturally responsive teaching focused on active learning, reflection, and teamwork.

- **Inclusivity:** Human-centered design for diverse users and hands-on usability and bias analysis
- **Sustainability:** Product life cycles, resource use, waste reduction.
- **Ethics:** Moral reasoning and responsible design, biased sensors, AI ethics.



2. Sustainability Seminar Series

- Expert-led discussions on climate change, circular design, and environmental justice.
- Connect classroom concepts to real-world issues.
- Build engagement through practitioner dialogue and current events.

3. Sustainability-Focused Minor

- 15-credit interdisciplinary minor with core and elective courses across engineering, science, and policy.
- Prepare students for climate-resilient, sustainability-focused careers.
- Support capstones, research, and co-ops in sustainability.



Examples & Case Studies



Norma Door and a Kitchen Traffic Door as examples for non-inclusive and inclusive designs



Flooding in Hoboken, NJ as an example of the impacts of climate change



The Challenger space shuttle disaster as an example for ethical conflicts engineers might face

Methods

- Active learning through case studies, design critiques, and stakeholder simulation.
- Culturally responsive learning strategies integrated into modules.
- Faculty development workshops to standardize implementation.

Assessment Tools

- Surveys
- Design project rubrics
- Team-based peer evaluations

Conclusions

- Embedding Inclusivity, Sustainability, and Ethics in First Year curricula creates future-ready engineers.
- Seminar Series and Sustainability Minor add depth and long-term engagement for students and faculty.
- Approach is scalable, repeatable, and supports institutional DEIB and climate resilience commitments.

Future Work

- Launch interdisciplinary sustainability design challenge events.
- Integrate sustainability-focused AI/ML ethics content.
- Publish and present at ASEE and other national venues.

References

