University of Massachusetts Amherst

The Infrastructure Investment and Jobs Act ($1.2 trillion) directs approximately $550 billion for infrastructure needs including the highway system, airports, transit, electric vehicle infrastructure. Funding directed to highways, roads, and bridges is about $284 billion. The tremendous number of infrastructure projects anticipated within the next 5 years will necessitate a trained workforce in design and construction of structural systems that can be rapidly constructed and that results in infrastructure with resiliency and sustainability for the future. It is foreseen that precast concrete will play a fundamental role in infrastructure investment in the next 5 years and beyond.

The proposed project consists of the curriculum development and delivery of a 2-course sequence focusing on precast prestressed design of buildings and bridges. The first course in the sequence will cover basic precast prestressed concrete concepts as applied to a typical precast concrete building followed by a precast prestressed bridge design course. The proposal includes the full development of the first course in the sequence and the adaptation of a bridge design course that has been taught at the University of Massachusetts Amherst (UMass) that will focus entirely on precast prestressed bridges. Experiential components will be introduced in both courses by inviting speakers and organizing visits to plants and job sites. Collaboration with project partners will provide students with a broader educational experience. Project partners will be asked to provide real design examples of precast prestressed buildings and bridges that can be used as class projects to apply concepts developed in class. The first course in the two-course sequence will also implement the PCI Big Beam Competition into the course. After a committee formed by three members of the project partners evaluates designs submitted by all teams in the class, two winning teams will be selected to fabricate and test their beams to participate in the national competition. Innovations in the precast prestressed concrete industry will be introduced in class; students will become skilled at using software tools used by engineers in industry preparing them for a successful career in the field after graduation.

The main student learning goals can be summarized as follows:

1. Become skilled at design of precast building components and precast prestressed bridge components.

2. Understand the relationship between precast producers and PCI.

3. Familiarize themselves with new trends and technologies in the precast industry including design, materials, and fabrication methods.

4. Develop professional networks through participation in PCI Conventions and visits to precasting plants.

5. Understand the role that precast concrete plays in the development of sustainable infrastructure.

6. Gain professional oral and writing presentation skills through their involvement in team projects.

7. Appreciate the value of continuous learning in future professional development.

8. Familiarize themselves with software tools used for design of precast buildings and bridges.

9. Understand and use industry resources (PCI Design Handbook, AASHTO LRFD) to immediately become productive after joining the workforce.