# A Project-Based Integrated Curriculum for Civil Engineers


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***Abstract*** *— Changes in the needs of society and developments in computer science and information technology are changing the role of civil engineers and are opening a series of exciting challenges and opportunities. Computer technology has liberated civil engineers from the tedious task of time performing complicated, but routine computations, allowing them to concentrate on the more creative part of the design process, to integrate design and construction (or manufacturing), and to conside r explicitly the economic and social implications of their work. At the same time the question is no longer how a system behaves under specified actions but how it can be designed to behave in a desired way; in other words, how to control the performance o f the built environment. The future focus for civil engineers will be on designing, repairing, maintaining, protecting and preserving the built environment based on ensuring system performance during demand actions with varying probability of occurrences. As a result , the C ivil Engineering Department at Texas A&M University is planning a comprehensive revision of the philosophy and practice of undergraduate civil engineering education . A new curriculum is proposed built on a project -to-theme-to-topics mo del in which students are first presented with actual projects every academic year starting from the freshman level. A series of courses provide a central focus and structure for the curriculum with student teams addressing projects that cut across discip lines within civil engineering. The teams working on these projects would be guided to decompose a project into themes, such as dynamic analysis, environmental impact, geotechnical analysis, etc. so that they learn how engineering thoroughly breaks down l arge complex problems into conceptually manageable and interacting components. Then, students would use more traditional topics as analysis tools to generate quantitative analysis of the thematic issues. As the students are led to discover the knowledge needed to solve the problems arising from their projects, explicit links to specific subject courses in the curriculum will be made. Courses on individual subjects throughout the curriculum are then linked through the common context provided through the p roject sequence . The class material and presentation will be problem and project driven, incorporating just -in-time learning with a practical motivation for learning the needed skills. The project -theme-topic model will refocus attention of students and faculty away from the lowest two levels of Bloom's Taxonomy (knowledge, comprehensive) and toward the higher levels (application, analysis, evaluation, synthesis) that are expected and demanded of engineering graduates.*