

# **A Project-based Learning on Tension Membrane Structures in Architectural Education**

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## **Abstract**

This paper presents a case study on the application of project-based approach for learning on tensile membrane structures at an elective course at master studies of architecture. The course aims at architectural students to develop an understanding of (1) structural systems, and structural problematics relevant for architectural design, (2) building strategies and skills to integrate knowledge of structural principles and construction techniques; (3) properties of structural materials, components and systems, as well as their impact on environment, and to (4) acquire skills of form-finding methods and techniques [1].

In order to improve the course and to ensure achieving learning outcomes, over an extended period of time during outman semester of the school year 2018/2019 students worked on the project related to tensile membranes. Instead of covering many structural typologies, we decided to focus task and set learning experience which will give students opportunity to design complex membrane structures, and thus develop a deeper understanding of the behavioral properties of materials, technical, construction, and installation issues of tensile membranes. The project task was to design covering for small pedestrian streets/passages. Students in groups investigated applications of temporal and permanent membrane installations, and how these structures could improve the quality of open urban spaces and solve environmental problems. The task engaged students in innovative and creative solving a real-world problem, but also to deal with functionality, feasibility, practicality, ecology, and economy. The project, implemented through several phases, was realized through collaboration with scientific research project and company. This approach enabled students to understand the synthesis of structural analysis, material behavior, constructability and economic reality that occurs in the professional practice. Students demonstrated their knowledge by developing designs / public products, and preparing exhibition, presentation for a real audience. Project-based learning method enabled students to gain knowledge and skills by working in (inter)active and inclusive environment and to investigate and respond to engaging and complex problems and challenges. As a result, students developed deep content knowledge as well as critical thinking, creativity, and communication skills in the context of doing an authentic, meaningful project. This task unleashed contagious, creative energy among students and all the other participants engaged in its realization [2].

Finally, this paper may be interested to educators in architecture and structural engineering because it reviews challenges and opportunities of project-based learning as a method for teaching, learning and training tensile membrane structures.

## **References**

- [1] Course Curriculum (2018) [Online]. Available: [http://www.arh.bg.ac.rs/wp-content/uploads/201819\\_programi/201819\\_dokumenti/1819\\_MASA/201819\\_MASA\\_SVI\\_MODULI/201819\\_MASA-11020-07-IASA-47020-07-GENERISANJE-PROSTORNIH-STRUKTURA.pdf](http://www.arh.bg.ac.rs/wp-content/uploads/201819_programi/201819_dokumenti/1819_MASA/201819_MASA_SVI_MODULI/201819_MASA-11020-07-IASA-47020-07-GENERISANJE-PROSTORNIH-STRUKTURA.pdf). Accessed on: Feb 15, 2019.
- [2] Generating Architectural Structures, video presentation (2019) [Online]. Available: <https://www.youtube.com/watch?v=LOvhQJvLQDk>, Accessed on: Feb 15, 2019.