MECHANICAL ENGINEERING STUDENT SEMINAR

Wednesday, December 21, 2022, at 13:30, D. Dan and Betty Kahn Building, Auditorium 1.

Preliminary Design Tools for Hydrodynamic aspects of Submerged Impermeable Breakwaters

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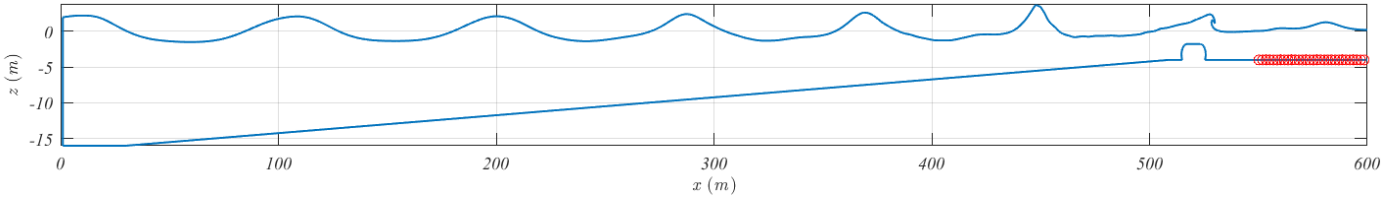
This study develops a Boundary Element Methods (BEM) model, for a mathematical two-dimensional wave flume which can simulate the hydrodynamics of wave shoaling over any coast profile, with submerged impermeable coastal structures of any shape. The developed model is applied to simulate and study Geotube structures. The model is able to estimate the wave loads acting on the Geotube structure and the limit of sliding stability, formulated as the minimum required friction coefficient between the structure and the seabed.

BEM with Lagrangian formulation are conceptually simple and efficient for the simulation of nonlinear wave shoaling, up to the wave breaking. However, in post breaking flows, the domain is no longer simply connected, and the BEM is not efficient for the generation of a new free surface. In this study, a mechanism of particle extraction is added to enable some continuation of simulations in post breaking stages.

Validation of the model, by comparison with OpenFOAM simulations, an open Volumes Of Fluid (VOF) model, which is formulated to track broken free surface, shows that the most critical state, regarding the sliding stability of the Geotube, occurs, typically, just before breaking. Hence, the BEM is a valid and efficient method for preliminary design.

Finally, the model is applied to simulate a practical design example of a complete shoaling process along a slopes shore with Geotube structure at shallow water, which develops of a plunging breaker. The simulation well captures the critical event considering the sliding stability of the structure.

In addition, we present a parametric three-dimensional preliminary-design tool in ANSYS AQWA, a commercial linear wave-body interaction model, for the investigation of the wave field in the presence of different Geotubes layouts.



Note: the seminar will be given in Hebrew

Seminars Coordinator: Assoc. Prof. Matthew Suss.