Course Brochure

Name of course: Non-linear problems in Hydroelasticity
Course level: PG
Duration: 13-17, December, 2021
Discipline: Ocean Engineering and Naval Architecture
Mode of lecture: Online mode
Lecture hours: 12
Pre-requisites: Classical Hydrodynamics, Potential Flows
Targetted Audience: Young faculty, RS and PG students specializing in Water Waves with Applied Mathematics or Ocean Engineering background

Course Description
In a one-week intensive the topical non-linear problems on wave-wave and wave-current interactions will be presented. This course contains 12 hours of lectures which will be equivalent to a two-credit course for post-graduate students at the IIT Kharagpur. Emphasis will be given to various physical problems arising in Ocean Engineering and Arctic Engineering. The course will be focused on the role of non-linearity in hydrodynamics and elasticity. In the context of hydroelasticity, it will be a highlight of the transition from linear to non-linear effects. Various non-linear problems of hydroelasticity will be introduced and demonstrated through specific problems and various techniques to solve hydroelasticity problems will be discussed.

Course Contents (# of lecture hours)

<table>
<thead>
<tr>
<th>Topic/Lecture</th>
<th>Contents</th>
<th># of hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-linearity in hydrodynamics and hydroelasticity</strong></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Lecture 1 (T. Sahoo)</td>
<td>Recent trends on blocking of flexural gravity waves</td>
<td>1</td>
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<tr>
<td>Lecture 2 (Y. Stepanyants)</td>
<td>Nonlinear waves in a rotating ocean</td>
<td>1</td>
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<tr>
<td>Lecture 3 (Y. Stepanyants)</td>
<td>Nonlinear waves in a rotating ocean</td>
<td>1</td>
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<tr>
<td>Lecture 4 (Y. Stepanyants)</td>
<td>The asymptotic approach to the description of two-dimensional symmetric soliton patterns</td>
<td>1</td>
</tr>
<tr>
<td>Lecture 5 (Y. Stepanyants)</td>
<td>The emergence of envelop solitary waves from initial localised pulses within the Ostrovsky equation</td>
<td>1</td>
</tr>
<tr>
<td>Lecture 6 (M. Meylan)</td>
<td>Nonlinear waves in infinite plates</td>
<td>1</td>
</tr>
<tr>
<td>Lecture 7 (M. Meylan)</td>
<td>Nonlinear effects of moving sources on ice plates</td>
<td>1</td>
</tr>
<tr>
<td>Lecture 8 (M. Meylan)</td>
<td>Nonlinear Waves in the Marginal Ice Zone</td>
<td>1</td>
</tr>
<tr>
<td><strong>Hydroelasticity in Ocean Engineering</strong></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Lecture 1 (Y. Stepanyants)</td>
<td>Waves on a compressed floating ice plate caused by motion of a dipole in water</td>
<td>1</td>
</tr>
<tr>
<td>Lecture 2 (M. Meylan)</td>
<td>Overwash of flexible plates</td>
<td>1</td>
</tr>
<tr>
<td>Lecture 3 (M. Meylan)</td>
<td>Effect of Tsunami waves on Very Large Floating Structures</td>
<td>1</td>
</tr>
<tr>
<td>Lecture 4 (S. Das)</td>
<td>Introduction to water compressibility and its effect on hydroelastic wave</td>
<td>1</td>
</tr>
</tbody>
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Reference:
Books:
3) K. F. Graff, Wave Motion in elastic solids, Dover Publication, 1975

Articles:
3) Stepanyants Y.A. Nonlinear waves in a rotating ocean (the Ostrovsky equation, its generalisations and applications). Izvestiya, Atmospheric and Oceanic Physics, 2020, v. 56, n. 1, 16–32.

Book Chapters:

Online materials:

Resource Personnel
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