

OE5580: IMPACT MECHANICS FOR MARINE STRUCTURES-OE5580

Course Content:

Review of continuum mechanics, jump conditions, plasticity theory, damage and failure theory, shock and wave propagation in both solid and fluid media using Eulerian, Lagrangian and Arbitrary Lagrangian-Eulerian frameworks, and the high pressure and high-rate response of materials. Fluid-structure interactions for marine structures. Design and analysis concepts for stiffened plate-shell structures. Advanced materials mechanics: Constitutive relations and fracture criteria for materials subjected to dynamic loads; Analysis of large plastic deformations; damage and fracture criteria. Concepts of strain rate effects and equations of state for relevant applications. Impact and energy absorption: Energy absorption in materials and components; Models for penetration and blast loading; and Modelling of materials for large plastic deformations. Elastic and plastic impacts, elastic and plastic stress-wave theory. Penetration mechanics: Empirical, analytical, and numerical methods and blast loading against marine structures (empirical, analytical, and numerical methods). Application-oriented examples: Effect of impact and explosion on stiffened plate structures; Estimation of crushing and the impact impulse in ship-to-ship and ship-to-offshore structures' collisions.

Text Books:

1. **James D. Walker** (2021), "Modern Impact and Penetration Mechanics", Cambridge University Press, UK.
2. **C. L. Rao, V. Naranmurthy, and K. R. Y. Sinha** (2016), "Applied Impact Mechanics", Ane Books, India.
3. **W. J. Stronge** (2000), "Impact Mechanics", Cambridge University Press, UK.

Reference Books:

1. **OTO 00053** (2000), "Collision Resistance of Ship Shaped Structures to Side Impact", MSL Engineering Limited, UK.
2. **Woisin G.** (1988), "Instantaneous loss of energy with unsymmetrical ship collisions", Vol. 40. Schiff and Hafen, 1988; 50-5.
3. **Pawlowski M.** (1995), "Energy loss in ship's collisions", Centrum Techniki Okretowej, Poland, 1995. International Maritime Organization (IMO). IMO Resolutions A265A, 1974.
4. **Pedersen PT, Jensen JJ.** (1991), "Ship impact analysis for bottom supported offshore structures", Advances in marine structures II. Elsevier Applied Sciences, Amsterdam, 1991; 276-95.

Prerequisite: