OCEAN ENGINEERING

Introduction to Ocean Structures: Classification: Fixed, floating, compliant structures; Functional requirements for oil & gas, offshore wind, and port infrastructure; Design criteria and regulatory overview (API, DNV, BIS standards); Coastal and Port Structures: Breakwaters, groins, seawalls, revetments; Structural systems for jetties, piers, RoRo,RoPax; Design considerations for RC and steel coastal structures; Ocean Environmental Forces: Wind systems, wave generation theories; Regular and irregular waves: Airy, Stokes, Pierson-Moskowitz, JONSWAP spectra; Tides, tidal currents, storm surge, and long-term sea level rise; Hydrodynamic Load Estimation: Wave kinematics and pressure distributions; Morison's equation: Drag and inertia force components; Diffraction and radiation theory basics for large structures; Wave slamming, slapping, and green water loading; Probabilistic Design Approaches: Return period, encounter probability; Extreme value statistics: Weibull and Rayleigh distributions; Joint probability models for multi-variable environments; Design load combinations and reliability assessment; Design Applications and Case Studies: Deck and crest elevation design; Design of offshore wind turbine foundations; Fatigue and fracture assessment under cyclic loading

Case studies: Fixed platforms, floating production units, coastal defence structures