

Jinsheng Lai

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Research Interests

Marine Renewable Energy, Floating Offshore Wind Turbines, Marine Structures

Education

South China University of Technology (985) Guangzhou, China

09/2024 – Present

Master of Civil Engineering

GPA: 3.63/4.0 (86.92/100)

(Admission with Entrance Exam Waived based on Top 5% Academic Ranking)

Hainan University (211) Haikou, China

09/2020 – 06/2024

Bachelor of Civil Engineering

GPA: 3.61/4.0 (88.26/100)

Publications

- Li, Y.-W., **Lai, J.-S.**, Zhou, B.-Z., & Cheng, L. (2026). Mechanical Properties and Feasibility of GFRP from Decommissioned Large-Scale Wind Turbine Blades for Wave Energy Converter: A Case Study. *Polymers*, 18(7), 892. <https://doi.org/10.3390/polym18070892> (SCI Q1, IF=4.9).
- Invention patent: A Corrugated Steel-Concrete Composite Floating Box Girder and Its Construction Method.
Co-inventor: Yanwen Li, Pan Zou, Yingzhi Sun, **Jin-Sheng Lai**, Yilin Ren.
Publication date: November 2024.

Research Experience

Design of raft-type wave energy converter with GFRP from decommissioned large-scale wind turbine blades

Master's Thesis Project

2024–Present

Proposed a sustainable "Waste-to-Energy" solution by repurposing decommissioned wind turbine blades into wave energy converters.

Phase 1: Material Characterization (Completed): Conducted mechanical testing (240+ specimens) and CT scanning on a 2MW decommissioned blade to map defects and property gradients. Developed a zonal reuse strategy to maximize material residual value based on performance variations.

Phase 2: Connection Design (Completed): Engineered a GFRP-Duplex Stainless Steel hybrid (adhesive/bolted) connection system tailored for the raft-type WEC, optimizing the bolt hole geometry via Abaqus simulations to mitigate stress concentrations. Executed single-lap shear and bearing tests to quantify the ultimate static load-bearing capacity and failure modes, validating the fundamental structural safety of the design for prototype assembly.

Phase 3: System Verification (In progress): Designed a 12m dual-body hinged raft Wave Energy Converter utilizing repurposed blade segments, and conducted hydrodynamic simulations via ANSYS AQWA to optimize the initial geometric parameters for the prototype. Designed a comprehensive wave tank experiment to physically quantify the Capture Width Ratio (CWR) and 6-DOF motion responses, and validated the system's actual hydrodynamic efficiency under realistic irregular wave conditions.

Full-coupled analysis of floating semi-submersible wind turbine platforms

Research Interest Projects

2024 – 2025

Performed fully coupled aero-hydro-servo-elastic simulations of benchmark semi-submersible wind turbine platforms (IEA 15MW/VolturnUS-S and NREL 5MW/OC4-DeepCwind), mastering multi-physics workflows by calculating aerodynamic loads in OpenFAST and utilizing the F2A interface to seamlessly transfer data to ANSYS AQWA and Sesam for complex hydrodynamic analysis.

Vibration damping performance analysis of graded yield metal dampers in a steel frame structure

Undergraduate Thesis Project

2023–2024

Investigated the energy dissipation mechanism of a graded yield metal damper in steel frame structures by conducting Modal Decomposition Response Spectrum Analysis and Elastic Time-History Analysis across various earthquake scenarios (minor, moderate, major) using SAP2000, successfully verifying its effectiveness in controlling inter-story drift and shear forces to prevent structural collapse.

Flexural properties and microscopic mechanisms of coir-FRP seawater and sea-sand concrete for artificial fish reefs

Served as a undergraduate student research assistant

2022–2023

Optimized coir-fiber-matrix compatibility through a combined chemical modification technique and independently fabricated 78 test specimens to evaluate fiber parameters, integrating a MATLAB non-linear prediction model to identify the optimal mix proportion (achieving a 47.2% flexural strength increase), and subsequently conducting SEM analysis to elucidate the underlying fiber bridging toughening mechanism.

Honors & Awards

- Outstanding Graduate, Hainan University. 2024
- First Prize, National University Structural Design Information Technology Contest, China. 2023
- First-Class Comprehensive Scholarship Twice, Hainan University. 2021 & 2022
- Meritorious Student Twice, Hainan University. 2021 & 2022
- Outstanding Student Cadre Twice, Hainan University. 2021 & 2022

Technical Skills

- **Simulation:** OpenFast, Sesam (DNV), ANSYS AQWA, ABAQUS.
- **Programming:** Python, MATLAB, and AI-Assisted Scripting (LLMs / Gemini Pro).
- **Languages:** Chinese (Native), English (Proficient - IELTS 7, Mar 2026).