TEXAS A&M
UNIVERSITY

2021

DEPARTMENT OF

OCEAN ENGINEERING

LETTER FROM THE DEPARTMENT HEAD

This has been a challenging year for us all. Together, we have overcome many hurdles and made many changes. While we may have stumbled at times, we have become all the stronger for it.

Ocean engineers must be ready to handle both rough waves and calm seas — metaphorically and literally. Adaptability, resourcefulness and resiliency are skills honed by former students and taught to currents students in the Department of Ocean Engineering at Texas A&M University.

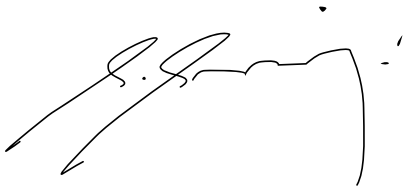
As we enter a new normal, the world looks to the oceans for a sustainable source of food and energy and to spur economic growth. The rise of the blue economy has reinvigorated interest in ocean-based technologies and stewardship of ocean and coastal ecosystems. An ocean engineering degree provides our students with a broader set of career opportunities than ever before. Ocean robotics, autonomous underwater vehicles, offshore renewables, and coastal and deep-sea infrastructure development are some of the emerging areas in which the new generation of engineers can make a significant impact.

As our students face growing challenges and opportunities, their educational experience has evolved to include innovative engineering instruction with novel laboratory and field experiments. Throughout these changes, the department continues to be involved in fundamental research, developing technology in partnership with industry, and serving the public in ocean-related planning and policy development.

Along this same line, we have grown our 30-credit Master of Science in Ocean Engineering engineering degree program in Galveston. This nonthesis degree program can be completed by full-time students in one calendar year while also allowing working professionals to complete the program at their own pace.

As one of our former students, Arun Duggal '92, said in our inaugural departmental industry panel, "The ocean engineering program provides you a foundation. You, as a person, get to figure out how to use it based on your interests and where the industry leads you."

Sincerely,



Sharath Girimaji
Department Head; Holder of Wofford Cain Chair II
Joint Faculty – Professor, Aerospace Engineering and Mechanical Engineering
Chief Scientist – ASTRO Center
Faculty Advisor – High Altitude Balloon Club

TEXAS A&M UNIVERSITY
Department of
Ocean Engineering

BY THE **NUMBERS**

COLLEGE OF ENGINEERING (2022)

#8 Undergraduate Program
Ranked No. 8 (Public)
(*U.S. News & World Report*)

#7 Graduate Program
Ranked No. 7 (Public)
(*U.S. News & World Report*)

ENROLLMENT* (FALL 2021)

**preliminary, 5th class day*

159 Undergraduate

76 Graduate

DIVERSITY

23% Minority Students

20.9% International Students

23.8% Female Students

14.5% First-Generation Students

FACULTY

13 Academic Professional Track

12 Tenured

6 Tenure-Track

3 National Academy of Engineering Members

RESEARCH AREAS

- Offshore Environment and Loading
- Coastal and Offshore Processes
- Ocean Surface and Subsurface Robotics
- Naval Architecture
- Ocean Renewable Energy

STUDENT SPOTLIGHT:
SCHOLARSHIP RECIPIENTS CONTINUE ACADEMIC JOURNEYS

Patricia "Itzel" Rodriguez

Senior Patricia "Itzel" Rodriguez was awarded the 2021 Alan C. McClure Graduate Scholarship.

"I know that my professors were really pushing for me," Rodriguez said. "It feels amazing to know that there are people out there who support me. It really does mean something that my education means a lot to them too."

Named after the maritime arts and sciences innovator and pioneer, the Alan C. McClure Graduate Scholarship is part of the Society of Naval Architects and Marine Engineers' (SNAME) Graduate Scholars Program.

For Rodriguez, it serves as a foundation for her doctoral degree at Texas A&M where she will harness her lifelong fascination with ships with a focus in naval architecture.

Rodriguez joined SNAME her sophomore year as an underclassman ambassador. As a junior, she served as vice president and is now president of the local student branch.

Ashley Mullen

"I've always loved the ocean," said Ashley Mullen, graduate student at Texas A&M University at Galveston. "I've always been intrigued by it because it's just so massive and vast, and there's so much we don't know about it."

A recipient of the 2021 Engineering Graduate Merit Doctoral Fellowship, Mullen was introduced to ocean engineering as a freshman. Now, she is pursuing her master's and doctoral degrees.

"I'm super blessed and thankful to not only have the rest of my education paid for, but also to be paid to do what I love," Mullen said. "It's one thing to be an undergrad and to do well, but this fellowship is a reminder that people want me here."

Mullen's main interests lie in wave energy — a branch of power generation and renewable energy in which power is produced by floating devices placed on the ocean's surface.

RESILIENCE AFTER STORMS

Drs. Orencio Duran Vinent and Ignacio Rodriguez-Iturbe are investigating the resilience of barrier islands and coastal dunes after high-water events and storms. In doing so, they are helping engineers and researchers assess the vulnerability of coastal landscapes.

Their findings were published in the *Proceedings of the National Academy of Sciences*.

Generally speaking, there are two types of coastal high-water events: natural disasters — which devastate the shoreline — and lesser storm surges — which do not cause large-scale damage but still affect the coastal environment. It is these latter, routine events that control the post-storm resiliency of dunes and barrier islands.

The team studied the structure and properties of such events worldwide, utilizing buoy and other data to calculate characteristics such as beach elevation, wave runup and water level.

Their findings were twofold: first, they confirmed that high-water events happen randomly and unrelatedly to one another. Second, they discovered that these high-water events shared similar characteristics and had the same typical frequency per year with a given intensity when measured at beach level.

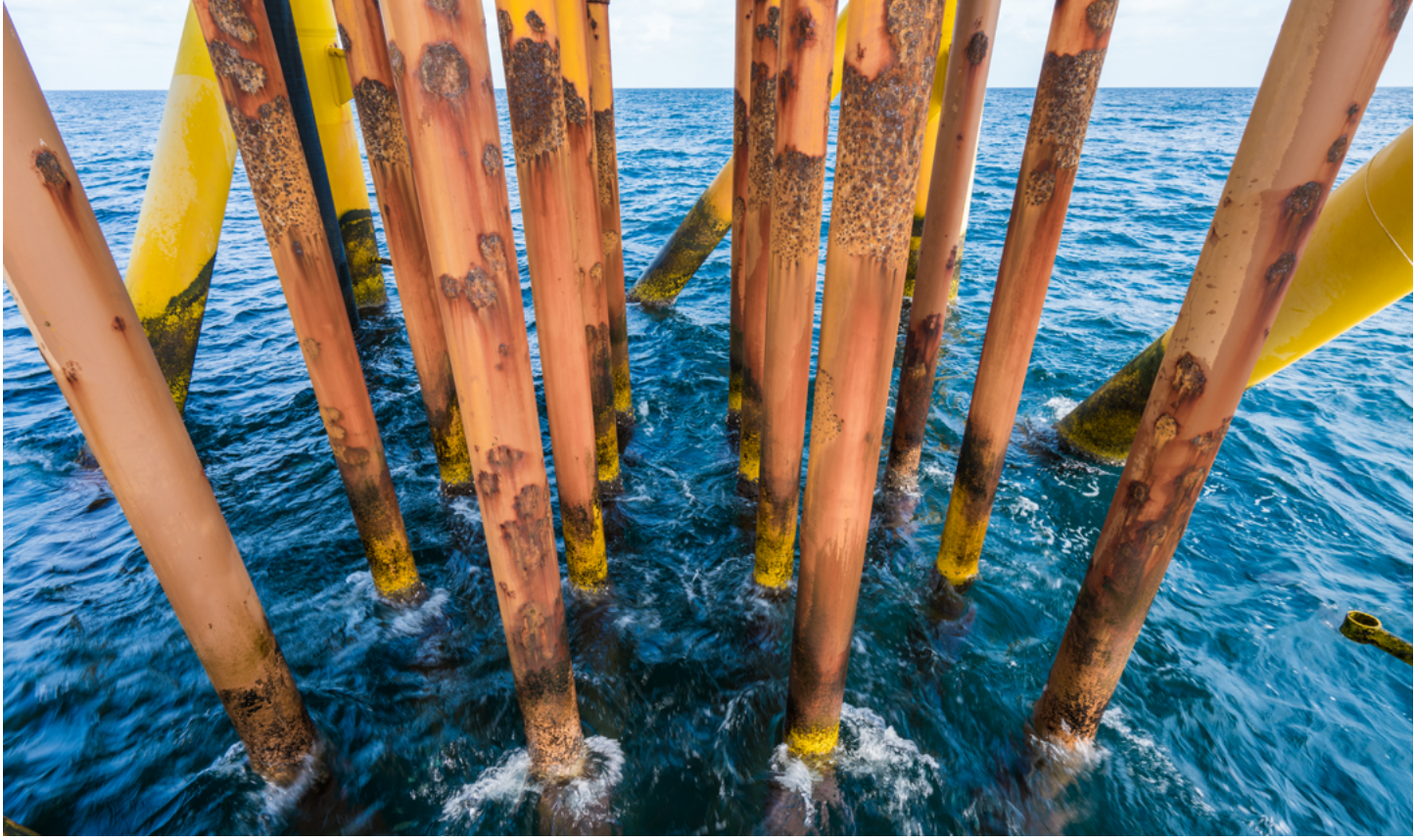
"Regardless of location, we have a unified description," Duran Vinent said. "This simplifies the work for policymakers or managers because they don't need complex calculations."

The team developed a model based on their findings that determines the elevation of a barrier island and whether or not a dune will succeed. This provides a valuable tool in rebuilding coastlines that have been broken down and deteriorated over time, giving engineers a way to see how tall a dune or barrier island needs to be to prevent frequent overwashes and ensure ecosystem survival.

FEATURED RESEARCHERS

Dr. Orencio Duran Vinent
Assistant Professor
oduranvinent@tamu.edu

Dr. Ignacio Rodriguez-Iturbe
Professor
irodriguez@ocen.tamu.edu



COMBATING CORROSION:

RESEARCHERS FIGHT UNDERWATER DEFORMATION WITH ENHANCED METALS

In the saline-rich waters of the sea, corrosion is an engineer's enemy.

To help combat this, Dr. Marcelo Paredes has been working on materials modeling — especially for engineering materials widely used by automotive, offshore and nuclear industries — and researching how corrosion affects high entropy alloys (HEAs).

"The corrosion resistance of metallic materials has always been a critical aspect in safety and design protocols for marine infrastructures," Paredes said. "This study is widespread in many areas of knowledge, such as materials science, chemistry, mechanical engineering, etc., with important contributions toward its full understanding. Despite those efforts, still very little is known about corrosion-resistance properties of HEAs."

As Paredes explained, HEAs — alloys formed by mixing equal or relatively large proportions of five or more elements — offer new opportunities in engineering areas due to their enhanced qualities.

In an international and multidisciplinary effort to better understand the corrosion process and design two distinct corrosion-resistant HEAs, Paredes has teamed up with researchers from the National Corrosion and Materials Reliability Lab in the Department of Materials Science and Engineering and Dr. Pradeep Konda from the Indian Institute of Technology Madras. They hope to understand how corrosion influences various mechanisms of deformation at different acidity levels and loading modes.

The materials' mechanical behavior will be analyzed at Texas A&M. The materials' phase formation, stability and evolution will be examined — down to near-atomic resolutions — at the Indian Institute of Technology Madras.

"I believe that tackling this challenging problem of materials design is a very productive joint cooperation that could be established to explore the potentials of HEA as next-generation materials for engineering applications in aggressive environments," Paredes said.

FEATURED RESEARCHER

Dr. Marcelo Paredes

Assistant Professor

lparedes@tamu.edu

INSIDE LOOK:

30-CREDIT MASTER OF SCIENCE IN OCEAN ENGINEERING

The 30-credit Master of Science in Ocean Engineering degree, offered exclusively at Texas A&M University at Galveston, provides students with a unique education and career preparation. The program is filled with hands-on experience, direct access to the coast, on-the-water field data collection adventures, industry collaboration, close proximity to Houston and world-class resources.

Having graduated in May 2020 from Southwestern University in Georgetown, where he played football while studying physics and math, Hayden Smith always wanted to be an Aggie and an engineer.

"The fact that I would be able to get my degree in one year was really attractive," said Smith. "I'll have a bachelor's and a master's at 23 years old."

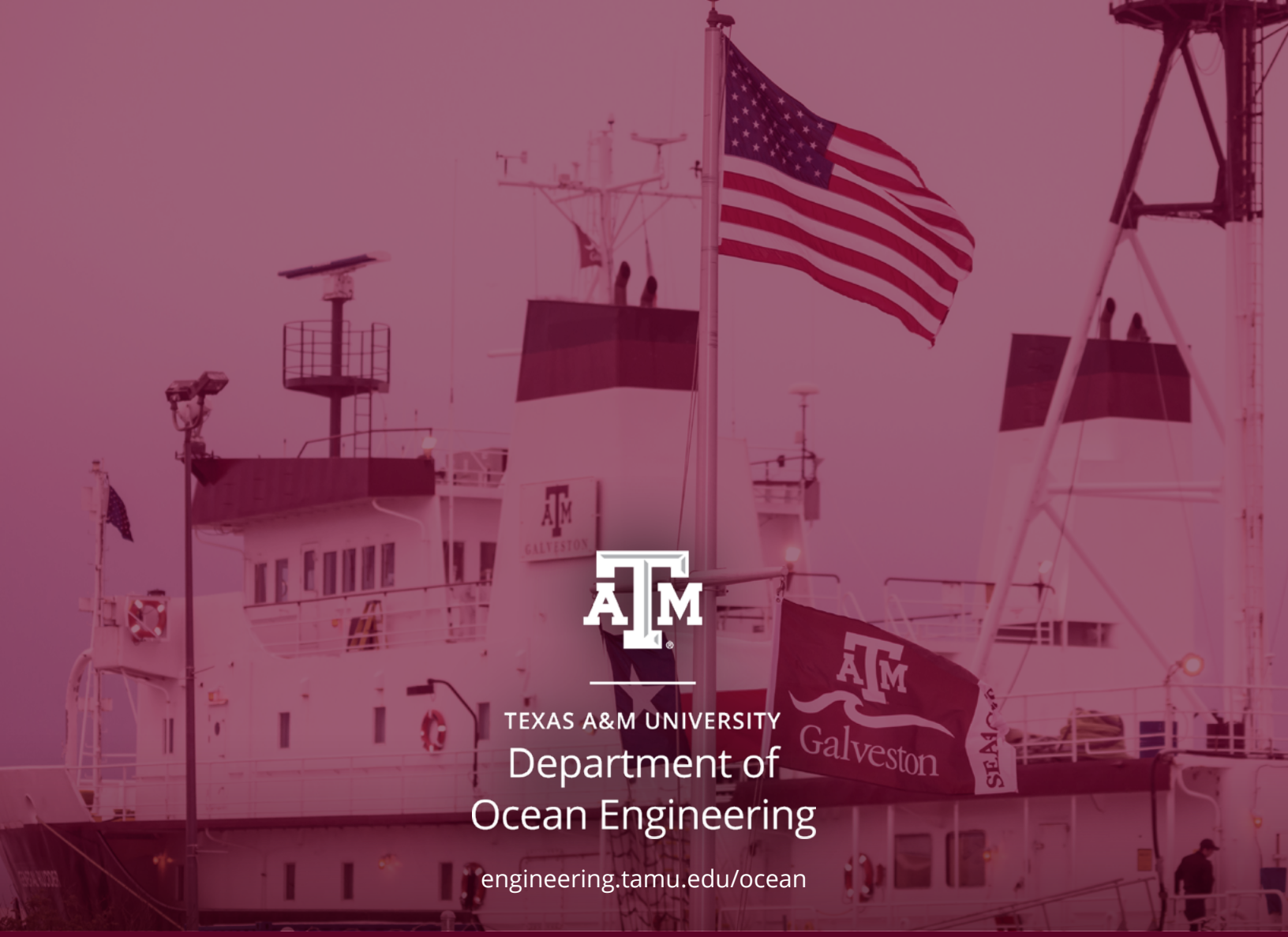
Smith plans to apply his passion for coastal protection and fisheries to his career by designing breakwaters or artificial reefs for game fish to have a refuge to reproduce and live safely. However, he explained that his studies have also piqued his interest in offshore renewable energy.

Ideal for students and professionals with an undergraduate degree or equivalent international degree in any engineering or related field, the curriculum covers a wide variety of ocean engineering topics.

"You can come in with any degree and get experience in ocean engineering," graduate student Morgan Humphrey said.

Having obtained her environmental and civil engineering degree at Florida Gulf Coast University, Humphrey plans to pursue a career in natural disaster research.

She explained that a background in ocean engineering would give her a foundation to base her research on, particularly the possibility of harvesting the energy produced by natural disasters to use as backup power sources for areas affected by such phenomena.



DEPARTMENT OF OCEAN ENGINEERING

AREAS OF FOCUS

Offshore environment and loading

Coastal and offshore processes

Ocean surface and subsurface robotics

Naval architecture

Ocean renewable energy