Cross Listing:
May be repeated two times for credit.

process models, viscous RDT, RDT for velocity gradients, equipartion of
processes: viscous, advective/inertial, role of pressure; elementary
Reynolds, arbitrary averaging, realizability; elementary turbulence
characteristics, spectrum; statistical (filter/average) description: scales,
properties; flow features: laminar, transition, turbulence regimes,
OCEN 640/AERO 640 Turbulence Processes
of instructor.
Prerequisites: One undergraduate level course in wave mechanics and
one in fluid mechanics, or OCEN 671 and OCEN 678.

OCEN 615 Ocean Engineering Experiments and Oceanographic
Measurements
Credits 3. 3 Lecture Hours.
Applications of instrumentation and measurements through lectures
during a ship-borne cruise with topics pertaining to ocean engineering
including vessel/platform motions, remote operated vehicles/
autonomous underwater vehicle operation, vortex induced vibrations ,
ocean current profiles, internal waves, geotechnical sampling, wind and
meteorological data acquisition, bathythermograph measurements,
corectivity/temperature/depth instrumentation, sidescan sonar and
compressed high-Intensity radiated pulse, sub-bottom seismic profiling;
familiarization with shipboard operations and ship-borne scientific data
collection.
Prerequisites: Undergraduate level courses including wave mechanics
and one in fluid mechanics, or OCEN 671 and OCEN 678.

OCEN 621 Advanced Naval Architecture
Credits 3. 3 Lecture Hours.
Analysis and prediction of resistance and propulsion of ships and self-
propelled marine vehicles, dynamics and control of ships and marine
vehicles in calm water and waves, maneuvering, sea-keeping, station-
keeping, applying what is learned to ship-shaped and non-ship-shaped
offshore structures.
Prerequisites: OCEN 362, OCEN 402, or equivalent.

OCEN 630 Dynamics of Ocean Vehicles
Credits 3. 3 Lecture Hours.
Dynamics and stability of motion of immersed and floating structures
and ocean vehicles; maneuverability and control; behavior of ocean
vehicles and stationary platforms in waves; design considerations
leading to motion reduction; applications to surface vessels,
submersibles and drilling rigs.
Prerequisites: CVEN 311/EVEN 311, MEEN 459 or equivalent, or approval
of instructor.

OCEN 640/AERO 640 Turbulence Processes
Credits 3. 3 Lecture Hours.
Fundamentals of conservation, Lagrangian, transformation, variance
properties; flow features: laminar, transition, turbulence regimes,
characteristics, spectrum; statistical (filter/average) description: scales,
Reynolds, arbitrary averaging, realizability; elementary turbulence
processes: viscous, advective/inertial, role of pressure; elementary
process models, viscous RDT, RDT for velocity gradients, equipartition
of energy, restricted Euler equations; isotropic, homogeneous turbulence.
May be repeated two times for credit.
Cross Listing: AERO 640/OCEN 640.

OCEN 651 Elements of Natural Marine Process Design
Credits 3. 3 Lecture Hours.
Engineering design applications and outcomes for individual elements
typically used in managed marsh environments; elements including
built hydraulic and sediment structures, as well as living marine and
estuarial featuring plants, oyster reefs and grassy flats; designing effects
of individual elements on hydraulic, bio-chemical, biologic and sediment
processes; focusing on the selection of individual elements to meet
specific design objectives on relatively small spatial- and temporal-
scales.
Prerequisite: OCEN 311, OCEN 300 or OCEN 362, or equivalent.

OCEN 660 Data Science for Ocean Engineers
Credits 3. 3 Lecture Hours.
Engineering analysis of large amounts of complex raw and processed
information; identifying data patterns and surveying well-known data
science techniques; communicating through the language of data
science; constructing prototype data analytics pipelines demonstrations
Prerequisite: Graduate classification; approval of instructor.

OCEN 661 Analysis of Uncertainties for Ocean Engineers
Credits 3. 3 Lecture Hours.
Introduction to the analysis of uncertainties due to the nature of the
process involved, lack of knowledge, either because of lack of data or lack
of knowledge, or lack of data commonly present in Ocean Engineering
modelling and inferences; review of the most common probability models
including those related the Poisson process in several dimensions as
well as the analysis of extremes; combination of multiple sources of
information via de Bayes theorem, statistical hypothesis testing.
Prerequisites: Working knowledge of fundamental probability and
statistics at upper undergraduate level.

OCEN 662 Probabilistic Modeling in Ocean Engineering
Credits 3. 3 Lecture Hours.
Introduction to the stochastic modelling of natural phenomena such
as ocean, coastal, ecological and hydrological processes wherein
the probabilistic structure of the processes considered are of fundamental
importance for description and understanding.
Prerequisites: Working knowledge of fundamental probability and
statistics including distribution theory, parameter estimation and
correlation at the upper undergraduate level or introductory graduate
level.

OCEN 665 Offshore Random Processes
Credits 3. 3 Lecture Hours.
Spectral analysis and random vibration theory with application to
offshore processes and structures; Gaussian and non-Gaussian
processes; irregular structural excitation and response; brief review of
probability and statistics; development of extreme values used in design
of ocean structures.
Prerequisites: OCEN 671; OCEN 676 or concurrent enrollment; or approval
of instructor.

OCEN 667 Ocean Wave Mechanics
Credits 3. 3 Lecture Hours.
Wave theory and applications to engineering problems; linear and
non-linear theories of regular gravity waves; wave properties and
transformation in shoaling water; spectral analysis of irregular waves;
forecasting, hindcasting and theoretical spectra.
Prerequisite: CVEN 311/EVEN 311 or equivalent.
OCEN 672 Coastal Engineering  
**Credits 3. 3 Lecture Hours.**  
Effects of waves on coastal structures; design of seawalls breakwaters, jetties, harbors, ship channels and pipelines; intentional and accidental discharge of pollutants; diffusion and spreading; oil spill containment and collection.  
**Prerequisite:** OCEN 671.

OCEN 673 Nonlinear Hydrodynamic Problems in Ocean Engineering  
**Credits 3. 3 Lecture Hours.**  
Nonlinear hydrodynamic problems involved with the complex offshore structures in high sea environment; nonlinear waves application of Volterra model to weakly nonlinear systems; generation of nonlinear model waves; nonlinear hydrodynamic interaction between waves and structure; dynamic analysis of nonlinear response of integrated offshore structures.  
**Prerequisites:** OCEN 671 and OCEN 678.

OCEN 674 Ports and Harbors  
**Credits 3. 3 Lecture Hours.**  
Basic port planning including site selection, environmental factors and economic conditions; design of wharves, quays, jetties, breakwaters, terminals, navigational channels and fenders; harbor sedimentation and maintenance dredging; design of fishing, small craft and recreation boat harbors.  
**Prerequisite:** Approval of instructor.

OCEN 675 Nonlinear Wave Dynamics  
**Credits 3. 3 Lecture Hours.**  
Nonlinear wave-wave interactions in steep ocean waves significantly affect wave properties and long-term wave evolution; strong and weak wave interactions and their respective effects on waves are studied, using various perturbation methods; applications are shown through using Hybrid Wave Models to analyze wave measurements and predict wave loads on structures.  
**Prerequisite:** OCEN 671.

OCEN 676 Dynamics of Offshore Structures  
**Credits 3. 3 Lecture Hours.**  
Review of concepts of linear structural dynamic analysis for time and frequency domain simulations, functional design of off-shore platforms, pipelines, floating structures and moorings; environmental loading problems; hydrodynamic phenomena including wind and current interaction, vortex shedding and wave forces; structure-fluid interaction models.  
**Prerequisites:** OCEN 671 or approval of the instructor.

OCEN 677 Environmental Fluid Mechanics  
**Credits 3. 3 Lecture Hours.**  
Introduction to fluid and mass transport in naturally occurring flows; topics include molecular and turbulent diffusion; dispersion; river, estuary, and ocean mixing; dissolution boundary layers; tidal mixing; offshore wastewater outfalls; introduction to environmental quality numerical modeling.  
**Prerequisite:** CVEN 311/EVEN 311 or equivalent.

OCEN 678 Fluid Dynamics for Ocean and Environmental Engineering  
**Credits 3. 3 Lecture Hours.**  
General conservation laws: Navier-Stokes equations; steady and unsteady Bernoulli’s equation; potential flow theory and basics of panel methods; laminar and turbulent boundary layer; dispersion and diffusion processes in laminar and turbulent flow; flow past a body of any shape.  
**Prerequisite:** CVEN 311/EVEN 311 or equivalent.

OCEN 681 Seminar  
**Credits 0-1. 0-1 Other Hours.**  
Reports and discussion of current research and selected published technical articles.

OCEN 682 Coastal Sediment Processes  
**Credits 3. 3 Lecture Hours.**  
Sediment properties and size distribution, fluvial sediment transport equations, movement of material by the sea, review of pertinent wave theories, littoral drift, inlet stability, coastal protection structures, similarity in sediment transport, movable bed models, sediment tracing, Aeolian sand transport, case studies.  
**Prerequisite:** OCEN 671 or approval of instructor.

OCEN 683 Estuary Hydrodynamics  
**Credits 3. 3 Lecture Hours.**  
Development of applicable equations for tidal dynamics applied to real estuaries; technology for determination of mean velocities, circulation patterns, water depths, turbulent dispersion patterns, etc. for solution of environmental problems in estuaries; physical and mathematical models.  
**Prerequisites:** OCEN 678 or approval of instructor.

OCEN 684 Professional Internship  
**Credits 1 to 3. 1 to 3 Other Hours.**  
Ocean Engineering research and design experience at government or industry facilities away from the Texas A&M campus; project supervised jointly by faculty and personnel at these locations; projects selected to match student’s major. May be taken three times for credit.  
**Prerequisites:** Graduate classification and approval of committee chair and department head.

OCEN 685 Directed Studies  
**Credits 1 to 12. 1 to 12 Other Hours.**  
Special topics not within scope of thesis research and not covered by other formal courses.

OCEN 688 Marine Dredging  
**Credits 3. 3 Lecture Hours.**  
Dredge pump selection; pump and system characteristics; cavitation; types of dredges; continental shelf and deep-ocean dredging; head loss in horizontal and vertical pipes for two and three-phase flow; design of disposal methods for dredged material; environmental effects of dredging.  
**Prerequisite:** Approval of instructor.

OCEN 689 Special Topics in...  
**Credits 1 to 4. 1 to 4 Lecture Hours.**  
Selected topics in an identified area of ocean engineering. May be repeated for credit.

OCEN 691 Research  
**Credits 1 to 23. 1 to 23 Other Hours.**  
Research for thesis or dissertation.