

# OCEANOGRAPHY - 5-YEAR BACHELOR OF SCIENCE AND MASTER OF OCEAN AND SCIENCE TECHNOLOGY

The Department of Oceanography offers a 5-year combination degree program that allows a Bachelor of Science in Oceanography major to enter the Master of Ocean Science and Technology at the start of their senior year (typically year four) at Texas A&M University. This enables students to receive their Oceanography undergraduate degree (BS) and a Master of Ocean Science and Technology (MOST) graduate degree in five years.

The BS in Oceanography curriculum: 1) Provides students with an interdisciplinary understanding of the oceans and the processes affecting them for use in careers in marine science or other related fields; 2) Provides students with the skills to retrieve, evaluate, and analyze large oceanographic datasets such as those generated from long term oceanographic studies and observing systems; and 3) Emphasizes critical thinking and problem solving skills.

The BS in Oceanography has four themes: Ocean Observing Science and Technology (OOST), Ocean Climate (OC), Marine Ecosystems Processes (MEP) and Marine Chemistry and Geochemistry (MCG). All four themes share common requirements but allow for specialization depending on a student's interest. The OOST theme provides more emphasis in statistics and ocean observing systems; all students will gain skill in handling, evaluating and analyzing large datasets. The OC theme provides more emphasis in advanced math skills that can be applied to understanding ocean climate interactions; all students will gain skill in handling, evaluating and analyzing large datasets. The MEP theme provides more emphasis in biological and ecological processes; all students will gain skill in understanding and applying a biological framework to understanding the ocean. The MCG theme provides more emphasis on marine chemistry and geochemistry; all students will gain skill in understanding and applying a chemical and geochemical framework to understanding the ocean.

The Master of Ocean Science and Technology (MOST) is a non-thesis degree. It provides students with education and training from scientists who are active researchers and educators working at the cutting edge of ocean sciences throughout the global ocean, from the Gulf of Mexico to the waters around Antarctica.

The curriculum is designed to: 1) Provide students with a basic understanding of the major concepts in oceanography that can be applied in their Ocean Sciences careers, 2) Provide students with the skills and tools to evaluate and analyze data, particularly large datasets of the type generated by ocean observing systems, and 3) Facilitate critical thinking and problem solving.

Many graduates will obtain jobs in a variety of fields including marine technical support, energy and transportation industries, insurance industries, hazard mitigation, marine operations, homeland security, oil spill response, etc.

For additional information, please visit <https://ocean.tamu.edu/>.

## Program Requirements

First Year		Semester
Fall		Credit Hours
CHEM 119	Fundamentals of Chemistry I	4
ENGL 104	Composition and Rhetoric	3
MATH 151	Engineering Mathematics I <sup>1</sup>	4
OCNG 101	Succeeding in Oceanography	1
OCNG 251 & OCNG 252	The Blue Planet - Our Oceans and The Blue Planet - Our Oceans Laboratory	4
<b>Semester Credit Hours</b>		<b>16</b>
Spring		
BIOL 111	Introductory Biology I	4
CHEM 120	Fundamentals of Chemistry II	4
MATH 152	Engineering Mathematics II <sup>1</sup>	4
American history ( <a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#american-history">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#american-history</a> )		3
<b>Semester Credit Hours</b>		<b>15</b>
Second Year		
Fall		
BIOL 112	Introductory Biology II	4
OCNG 203	Communicating Oceanography	3
PHYS 206 & PHYS 226	Newtonian Mechanics for Engineering and Science and Physics of Motion Laboratory for the Sciences	4
STAT 211	Principles of Statistics I	3
Creative arts ( <a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#creative-arts">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#creative-arts</a> )		3
<b>Semester Credit Hours</b>		<b>17</b>
Spring		
COMM 203 or COMM 205	Public Speaking or Communication for Technical Professions	3
OCNG 330	Geological Oceanography	3
PHYS 207 & PHYS 227	Electricity and Magnetism for Engineering and Science and Electricity and Magnetism Laboratory for the Sciences	4
American history ( <a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#american-history">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#american-history</a> )		3
Theme requirement <sup>2,3</sup>		3-4
<b>Semester Credit Hours</b>		<b>16</b>
Third Year		
Fall		
OCNG 456 or OCNG 469	MATLAB Programming for Ocean Sciences <sup>4</sup> or Python for Geosciences	3
OCNG 470	Data Analysis Methods in Geosciences	4

Government/Political science ( <a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#government-political-science">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#government-political-science</a> )	3
Theme requirement <sup>2,3</sup>	3-4
Theme elective <sup>2,5</sup>	2-3

**Semester Credit Hours 16**

**Spring**

OCNG 303 Professional Communication in Oceanography	3
OCNG 320 Biological Oceanography	3
OCNG 340 Chemical Oceanography	3
OCNG 443 Oceanographic Field and Laboratory Methods	3
Theme elective <sup>2</sup>	3

**Semester Credit Hours 15**

**Fourth Year**

**Fall**

OCNG 608 Physical Oceanography <sup>6</sup>	3
OCNG 655 Experimental Design and Analysis in Oceanography	3
Government/Political science ( <a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#government-political-science">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#government-political-science</a> )	3
Social and behavioral sciences ( <a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#social-behavioral-sciences">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#social-behavioral-sciences</a> )	3
Theme elective <sup>2,5</sup>	2-3

**Semester Credit Hours 15**

**Spring**

OCNG 657 Data Methods and Graphical Representation in Oceanography	3
Select one of the following:	3
OCNG 620 Biological Oceanography	
OCNG 630 Geological Oceanography	
OCNG 640 Chemical Oceanography	

Language, philosophy and culture ( <a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#language-philosophy-culture">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#language-philosophy-culture</a> )	3
Technical elective <sup>7</sup>	4
Theme elective <sup>2</sup>	3

**Semester Credit Hours 16**

**Fifth Year**

**Fall**

OCNG 604 Ocean Observing Systems	3
OCNG 656 MATLAB Programming for Ocean Sciences or OCNG 669 <sup>4</sup> or Python for Geosciences	3
Advanced specialized OCNG graduate course	3
Advanced specialized OCNG graduate course	3

**Semester Credit Hours 12**

**Spring**

OCNG 603 Communicating Ocean Science	3
OCNG 661 Advanced Oceanographic Data Analysis and Communication <sup>6</sup>	3

Advanced specialized OCNG graduate course	3
Advanced specialized OCNG graduate course	3
<b>Semester Credit Hours</b>	<b>12</b>
<b>Total Semester Credit Hours</b>	<b>150</b>

- <sup>1</sup> A grade of C or better is required.
- <sup>2</sup> Select one of the following tracks: Marine Ecological Processes, Marine Chemistry and Geochemistry, Ocean Climate, Ocean Observing Science and Technology
- <sup>3</sup> If Marine Chemistry and Geochemistry track is chosen, this will be 4 credits instead of 3 credits
- <sup>4</sup> Students will not be permitted to receive credit for both the 400- and 600-level versions of certain courses because the content and learning outcomes are too similar (OCNG 404/OCNG 604; OCNG 470/OCNG 655)
- <sup>5</sup> If Marine Chemistry & Geochemistry track is chosen, this will be 2 credits instead of 3 credits.
- <sup>6</sup> Applied toward both the Bachelor of Science in Oceanography and the Master of Ocean Science and Technology.
- <sup>7</sup> Select from ATMO 201, ATMO 203, ATMO 251, ATMO 300-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/atmo/>); BIOL 213, BIOL 214, BIOL 300-399 (<http://catalog.tamu.edu/undergraduate/course-descriptions/biol/>); BICH 300-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/bich/>); CHEM 300-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/chem/>); CVEN 221; GENE 300-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/gene/>); GEOG 442/GEOL 442, GEOG 361, GEOG 370/MARS 370, GEOG 390; GEOS 442; MATH 251; MATH 300-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/math/>); PHYS 221; PHYS 300-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/phys/>); OCEN 300-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/ocen/>); OCNG 400-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/ocng/>); STAT 212, STAT 400-499 (<http://catalog.tamu.edu/undergraduate/course-descriptions/stat/>).

Any of the required courses may be taken during the Summer Sessions to diminish the heavy semester loads during Years 2 and 3.

The program includes a total of 156 hours with 6 hours being applied toward both the Bachelor of Science in Oceanography and the Master of Ocean Science and Technology.

Code	Title	Semester Credit Hours
<b>Marine Ecosystem Processes Theme</b>		
BIOL 214	Genes, Ecology and Evolution	3
BIOL 357	Ecology	3
Select 12 hours from the following:		12
BIOL 213	Molecular Cell Biology	
BIOL 335	Invertebrate Zoology	
BIOL 351	Fundamentals of Microbiology	
BIOL 440	Marine Biology	
BIOL 451	Bioinformatics	
CHEM 383	Chemistry of Environmental Pollution	
GEOG 410/ OCNG 412	Global Change	
GENE 302	Principles of Genetics	
OCNG 350	Marine Pollution	

OCNG 411	Global Oceanography
OCNG 425	Microbial Oceanography
OCNG 453	Hydrothermal Vents and Mid-Ocean Ridges
OCNG 456	MATLAB Programming for Ocean Sciences
OCNG 469	Python for Geosciences
OCNG 491	Research (limit to 3 credits)
<b>Total Semester Credit Hours</b>	<b>18</b>

Code	Title	Semester Credit Hours
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**Marine Chemistry and Geochemistry Theme**

Select 4 hours from the following: 4

CHEM 227	Organic Chemistry I & CHEM 237 and Organic Chemistry Laboratory
CHEM 257	Organic Chemistry I - Structure and Function

Select 4 hours from the following: 4

CHEM 228	Organic Chemistry II & CHEM 231 and Organic Chemistry Laboratory
CHEM 258	Organic Chemistry II - Reactivity and Applications

Select 10 hours from the following: 10

ATMO 363	Introduction to Atmospheric Chemistry and Air Pollution
CHEM 315	Fundamentals of Quantitative Analysis
CHEM 362	Descriptive Inorganic Chemistry
CHEM 383	Chemistry of Environmental Pollution
CHEM 415	Analytical Chemistry
CHEM 483	Green Chemistry
GEOG 443/	Global Biogeochemical Cycles
GEOL 443	
GEOL 451	Introduction to Geochemistry
OCNG 350	Marine Pollution
OCNG 411	Global Oceanography
OCNG 425	Microbial Oceanography
OCNG 453	Hydrothermal Vents and Mid-Ocean Ridges
OCNG 456	MATLAB Programming for Ocean Sciences
OCNG 469	Python for Geosciences
OCNG 491	Research (limit to 3 credits)
<b>Total Semester Credit Hours</b>	<b>18</b>

Code	Title	Semester Credit Hours
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**Ocean Climate Theme**

MATH 251	Engineering Mathematics III	3
MATH 308	Differential Equations	3
Select 12 hours from the following:		12
ATMO 201	Weather and Climate	
ATMO 203	Weather Forecasting Laboratory	

ATMO 210	Climate Change
ATMO 324	Physical and Regional Climatology
ATMO 441	Satellite Meteorology and Remote Sensing
GEOG 442/	Past Climates
GEOL 442	
MATH 304	Linear Algebra
OCNG 411	Global Oceanography
OCNG 451	Mathematical Modeling of Ocean Climate
OCNG 456	MATLAB Programming for Ocean Sciences
OCNG 469	Python for Geosciences
OCNG 491	Research (limit to 3 credits)
PHYS 221	Optics and Thermal Physics
STAT 212	Principles of Statistics II

**Total Semester Credit Hours 18**

Code	Title	Semester Credit Hours
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**Ocean Observing Science and Technology Theme**

STAT 212	Principles of Statistics II	3
OCNG 404	Ocean Observing Systems	3
Select 12 hours from the following:		12

ATMO 201	Weather and Climate
ATMO 203	Weather Forecasting Laboratory
ATMO 251	Weather Observation and Analysis
GEOG 361	Remote Sensing in Geosciences
OCNG 350	Marine Pollution
OCNG 411	Global Oceanography
OCNG 456	MATLAB Programming for Ocean Sciences
OCNG 469	Python for Geosciences
OCNG 491	Research (limit to 3 credits)
STAT 407	Principles of Sample Surveys

**Total Semester Credit Hours 18**