

 FLORIDA ATLANTIC UNIVERSITY	NEW COURSE PROPOSAL Graduate Programs		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____	
	Department Marine Science and Oceanography College Science (To obtain a course number, contact erudolph@fau.edu)			
Prefix OCE Number 6265	(L = Lab Course; C = Combined Lecture/Lab; add if appropriate) Lab Code	Type of Course Lecture	Course Title Ocean optics and remote sensing	
Credits (Review Provost Memorandum) 3	Grading (Select One Option) Regular ☒ Sat/UnSat ☐	Course Description (Syllabus must be attached; see Guidelines) This course explores the field of bio-optics and associated applications towards ocean color remote sensing of the environment, including open ocean, coastal ocean, and inland lake systems.		
Effective Date (TERM & YEAR) Fall 2022				
Prerequisites		Corequisites	Registration Controls (Major, College, Level) Graduate standing	
Prerequisites, Corequisites and Registration Controls are enforced for all sections of course				
Minimum qualifications needed to teach course: Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)		List textbook information in syllabus or here		
Faculty Contact/Email/Phone Tim Moore, PhD, mooret@fau.edu, 6-2273		List/Attach comments from departments affected by new course This course will be included as an elective in the Marine Science and Oceanography program; there is currently no equivalent course being taught. The College of Engineering has no objection to this course being offered.		

Approved by Department Chair <u>Peter McCarthy</u> College Curriculum Chair <u>[Signature]</u> College Dean <u>William David Kalie</u> UGPC Chair <u>[Signature]</u> UGC Chair <u>[Signature]</u> Graduate College Dean <u>[Signature]</u> UFS President _____ Provost _____	Digitally signed by Peter McCarthy DN: cn=Peter McCarthy, o=Florida Atlantic University, ou=Harbor Branch Oceanographic Institute, email=pmccar@fau.edu, c=US Date: 2022.02.07 08:33:23 -0500	Date 1/18/2022 02/07/2022 02/07/22 Mar 3, 2022 Mar 3, 2022 Mar 3, 2022 _____ _____
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Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

Course Syllabus: Fall 2022

OCE 6265

Ocean Optics and Remote Sensing, 3 credits

Instructors:

Lead Instructor: Tim Moore, Ph.D.; Research Professor, Room 129, HB-50

Phone: (772) 242-2273 E-mail: mooret@fau.edu

Office hours: Mondays: TBD, or by appointment.

Co-Instructor: Michael Twardowski, Ph.D.; Research Professor, Room 229, HB-50

Phone: (772) 242-2220 E-mail: mtwardowski@fau.edu

Office hours: Mondays: TBD, or by appointment.

Course Assistants: Srinivas Kolluru, Ph.D.; Post-Doc, Room 128, HB-50

Phone: (772) 242-2273 E-mail: skolluru@fau.edu

Alberto Tonizzo, Ph.D.; E-mail: alberto.tonizzo@gmail.com

Office hours: TBD, or by appointment.

TA Contact Information: None

Course Location: TBD.

Prerequisites:

Required: Graduate standing

Recommended: basic physics, basic programming

Course Description: This course explores the field of bio-optics and associated applications towards ocean color remote sensing of the environment, including open ocean, coastal ocean, and inland lake systems.

Course Objectives/Student Learning Outcomes

Fundamentals of Remote Sensing - Electromagnetic radiation, atmospheric windows, light interaction with materials, resolutions, sensors and satellites.

Optical constituents of the aquatic water bodies - Phytoplankton, Dissolved organic matter, suspended sediments, bubbles and water itself. Phytoplankton function types,

Fundamentals of Inherent and apparent optical properties - Inherent optical properties: absorption and scattering, Apparent optical properties: reflectances and diffuse attenuation coefficient, radiative transfer approximations, light polarization, classification of water bodies: Case 1 & Case 2, optically deep and shallow, trophic status, ecological regions.

Models for deriving water quality parameters - Link between IOPs, AOPs and biogeochemical constituents: Chlorophyll, turbidity, particulate organic carbon, particulate inorganic carbon, fluorescence line height, photosynthetically available radiation; levels of processing remote-sensing data

Measuring IOPs, AOPs and biogeochemical constituents - Measuring absorption, attenuation, scattering, water-leaving radiance, chlorophyll, suspended sediments, PAR; sensors for measuring the parameters; buoys, gliders, ARGO, flow-through systems

Atmospheric correction - Atmospheric constituents: water vapor, gases and dust, radiance to reflectance conversion, Sun glint, cloud-masking; algorithms for removing the full or partial contribution of atmosphere (aka atmospheric correction).

Remote sensing applications - Underwater light environment, models for shallow-waters and turbid-waters, seagrass, coral reefs, sand beds; Fisheries and aquaculture; turtle research; harmful algal blooms

Lab Session-1 In situ data sets

Working with optical field data: Focus will be on importing optical data sets into Matlab (or Python) environment and developing/testing various bio-optical algorithms.

Lab Session-2 Satellite image processing

Image processing basics: Exploring level-1 and level-2 image processing levels from various ocean color sensors in Matlab/Python; processing images from level-1 to level-2 images using standard ocean color processing packages (NASA SeaDAS).

Lab Session-3

Integrating satellite and field data: Evaluating atmospheric correction processing performance and bio-optical algorithm performance with field data, focusing on match-up analyses and using results to re-develop algorithms.

Recommended Text/Readings

Textbooks: TBD

Readings:

Relevant readings will be provided before lectures.

Course Policies and Procedures

Course Evaluation Methods

Final grades will be determined by averaging together grades for four activities:

Mid-Term Exam (200 points)	25%
Final Exam (200 points)	25%
Special Topic Presentation (200 points)	25%
Lab Reports (300 points)	25%

Course Grading Scale

Percentage Score:	Grade:	Percentage Score:	Grade:
92% - 100%	A	72% - 77%	C
90% - 91%	A-	70% - 71%	C-
88% - 89%	B ⁺	68% - 69%	D ⁺
82% - 87%	B	62% - 67%	D
80% - 81%	B-	60% - 61%	D-
78% - 79%	C ⁺	0% - 59%	F

Attendance Policy: Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances, debate activities, or research activities condoned by a thesis advisor, with permission from the instructors. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

Religious Accommodations: Students who wish to be excused from coursework, class activities or examinations **must notify the instructor in advance of their intention to participate** in religious observation and request an excused absence.

Incomplete Grade: A grade of Incomplete ("I") is reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances. A grade of "I" will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student must show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate. As per university policy, an incomplete grade will only be given to a student who fulfills all of the following criteria:

1. Misses multiple exams or the final examination due to a legitimately documented emergency as defined by the FAU Academic Policies and Regulations:
http://www.fau.edu/academic/registrar/09-10_catalog/academics.html
2. Has a grade of C or better
3. Submits evidence of the emergency and signs an incomplete agreement.

Safety: No food or drinks are permitted in the laboratory.

Field work: The course has a planned all-day field excursion to provide students with the opportunity to experience oceanographic instrumentation and data collection. The virtual excursion will be planned with the OCE 6097 Physical/Geological Oceanography Course and will be all day. Students should make necessary arrangements to attend a portion of this activity as it is instrumental to the course. There will be a data workup as well and presentation later in the semester.

Classroom Etiquette Policy: University policy on the use of electronic devices states: “In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions.” You may be asked to leave the class session for noncompliance.

Code of Academic Integrity Statement: Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001: http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf

Cheating is a serious offense. If you are caught cheating, you will receive an F in the course. In addition, you will be referred to the Dean of Student Services and charged with an academic crime. Test procedures and rules will be stated at the beginning of each exam.

Disabilities Policy Statement: In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU’s campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

Counseling and Psychological Services (CAPS) Center: Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU’s Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few –

offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>.

Important Dates: The following dates are based upon the current university academic calendar. Changes to these critical dates have occurred in the past and you are responsible for checking the academic calendar on the university website for any changes during the academic term.

Academic calendar: <https://www.fau.edu/registrar/pdf/AcademicCalendar2022-2023.pdf>

Last day to Drop/Add	August 26 th
Labor Day Holiday	September 5 th
Last day to drop with a “W”	October 28 th
Veteran’s Day	November 11 th
University Thanksgiving Break	November 24-27 th

University Final exam Schedule: <http://www.fau.edu/registrar/courses/final-exams.php>

COVID-19 Statement:

All students in face-to-face classes are required to wear masks during class, and students must sanitize their own workstations upon entering the classroom. Taking these measures supports the safety and protection of the FAU community. Students who do not adhere to these rules will be asked to leave the classroom and/or be removed from the course. Students experiencing flu-like symptoms (fever, cough, shortness of breath), or students who have come in contact with an infected person should immediately contact FAU Student Health Services (561-297-3512).

Special Topic Paper/Presentation

Goal: Get students familiar with project possibilities with bio-optical and remote sensing data..

Assignment: Identify a topical research theme (e.g., shallow water optics, bioluminescence, phytoplankton functional groups) that is being supported (i.e., has been recently or is currently awarded) by a federal agency.

Using the information on what's been funded and your background on the topic, identify a new federal funding opportunity that could support future research, and propose a project idea that leverages current/past research on the topic. You can use search engines like grants.gov (<https://www.grants.gov/web/grants/home.html>) to help you identify opportunities (closed opportunities are acceptable).

Note: Your topic will require something that interweaves oceanography and bio-optics and must be approved by your instructors prior to engaging in your research. Feel free to work with your thesis advisors and use projects/ideas that may relate to your lab's research.

Paper/Presentation Outline:

Identification of Problem/Background

Current Award(s)/Research on Topic

Unanswered Questions/Ideas

Proposed Activities/Funding Opportunity

References

Format:

Paper: 5 pages maximum, 12 point font,

Presentation: 10 min, oral

Tentative Schedule:

Lecture	Topic (tentative)
1	Introductions/The Nature of Light
2	The underwater light field
3	Intro to Radiative Transfer/Absorption
4	Scattering/IOPs
5	AOPs/Lab I
6	Intro to Ocean Color Remote Sensing
7	Remote Sensing II/Lab II
8	Mid-Term/Remote Sensing III
9	Instrumentation - measuring the light properties
10	Bio-optical Algorithms I
11	Semi-Analytic Algorithms/Lab III
12	Natural light sources & processes/Polarization
13	Bio-optical Applications
14	Review

Peter McCarthy

From: Mihaela Cardei
Sent: Tuesday, January 18, 2022 9:32 AM
To: Peter McCarthy
Cc: Manhar Dhanak; Francisco Presuel-Moreno; Hanqi Zhuang; Yan Yong
Subject: Re: Support for new proposal for Bioptics Course?

Hello Dr. McCarthy,

College of Engineering and Computer Science does not have any objections to the new proposal for the "OCE 6265 Bio-optics and Remote Sensing" course.

Best regards,
Mihaela Cardei

From: Peter McCarthy <PMCCART5@fau.edu>
Sent: Thursday, January 13, 2022 9:03 AM
To: Mihaela Cardei <mcardei@fau.edu>
Subject: FW: Support for new proposal for Bioptics Course?

Hello Dr. Cardei,

Please see the message below that I sent to Dr. Dhanek a few days ago. I realize that this is the start of the semester, and everyone is very busy, but I have been advised by Bill Kalies that it would be good to get a note of support for this new course proposal from the College of Engineering so that it is less likely to get held up in review. Is this something that you could help with? I am trying to submit this paperwork by the 18th (next Tuesday).

Best Regards,
Peter

Peter J. McCarthy, Ph.D.
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From: Peter McCarthy
Sent: Tuesday, January 11, 2022 3:21 PM

To: Manhar Dhanak <dhanak@fau.edu>

Subject: Support for Biooptics Course?

Dear Dr Dhanek,

Two of the HBOI Research Faculty, Tim Moore and Mike Twardowski, are proposing a new graduate course "OCE 6265 Bio-optics and Remote Sensing" which would be taught as a part of the Marine Science and Oceanography program; hopefully this is something in which your department would also have interest. I am attaching the syllabus, if you are supportive, could you please provide me with a brief note to that effect which I can attach to the new course proposal?

Best Regards,

Peter

Peter J. McCarthy, Ph.D.

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