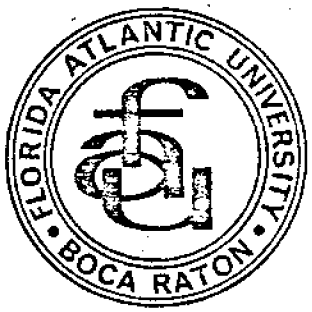
Report of Cooperative Education Project in Ocean Engineering at Florida Atlantic University

An Upper Division State University at Boca Raton, Florida



Supported by the U. S. National Sea Grant Program

July, 1972

REPORT

of

A COOPERATIVE WORK/STUDY PROGRAM

in

OCEAN ENGINEERING

between

FLORIDA ATLANTIC UNIVERSITY

and

OCEAN ENGINEERING INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS

1968-1972

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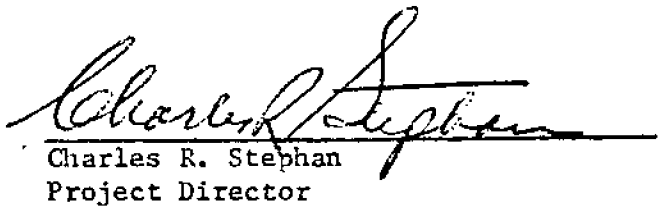

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COOPERATIVE WORK/STUDY PROGRAM IN OCEAN ENGINEERING AT FLORIDA ATLANTIC UNIVERSITY

ABSTRACT On July 1, 1968 a Sea Grant project to establish a Cooperative Work/Study program in Ocean Engineering was started at Florida Atlantic University. This project was designed and conducted to provide students with an opportunity to participate in a cooperative work experience in ocean engineering activities as an integral part of his (or her) educational program at FAU. A total of 7 work/study periods for 75 students have been completed since the start of the program. This report describes the program in detail; its administration; evaluates its results in terms of benefit to the students, participating companies and agencies, faculty and the participating university.

1. BACKGROUND

In September 1965 the first undergraduate educational program in ocean engineering started at Florida Atlantic University with 22 full time students in the program. Florida Atlantic University, being an upper division University, admitted these students at the junior year level. There were four faculty members in the department, one secretary and one part time student technician. The department grew to the point where in 1967, 108 students were enrolled, the department had 7 full time and 1 part time faculty, a full time technician, a secretary and a typist. Eleven graduates of the original class had received good positions in industry and acceptance to graduate programs. In addition, the good practical work experiences of our students during their required "Summer Internship" programs indicated a strong probability that a full cooperative work/study program with ocean engineering organizations could provide important educational benefits to many students; improve the practical work portion of their education; encourage closer cooperation and coordination between our university and employers of our students; and in general, strengthen the program overall appreciably.

2. PROPOSALS

In 1967, the new National Sea Grant Program was announced. Florida Atlantic University submitted a proposal to establish and develop a Cooperative Work/Study Program in Ocean Engineering. The proposal basically sought additional faculty, staff, and administrative support to give two offerings of each course per year and thereby enable students to spend alternate six month periods of study at Florida Atlantic University and on-the-job work experience with ocean engineering organizations.

A grant of $193,000, effective July 1, 1968, for a two year period to accomplish this task was received on February 20, 1968 under Sea Grant No. GH-7. Reports on the initial grant were made on March 4 and October 15, 1969. An extension of the project for 2 additional years was made on April 15, 1969 by a grant of $180.000 effective July 1, 1970 until June 30, 1972 under project number GH-84.

3. PREPARATION

Dr. William Mudge, a former coordinator of Cooperative Work/Study programs for the International Nickel Company, New York, and a part time faculty member of the Department of Ocean Engineering during 1966-1969, provided outstanding guidance and help in preparing and initiating this Cooperative Work/Study program. He, together with other faculty members, contacted 30 companies and 9 governmental organizations engaged in ocean engineering to enlist their support and participation in the FAU program. Of these, 25 stated an interest to participate, 6 encouraged the program and indicated that they would participate if possible, and 2 showed an interest but made no commitment. The procedures for administering, publicizing and advertising the program were developed by Dr. Mudge. Samples of the brochures, forms, letters, etc. are contained in the Appendices of this report.

4. PARTICIPATION

Participation of organizations and students in seven classes of the program is summarized in Tables 1 and 2. In March of 1969, when Class I of the cooperative work program started, the cooperative student enrollment was lower than had been anticipated. Ten students were enrolled but 9 organizations that desired to hire co-op students could not be accommodated. In the fall of 1969, three companies that desired cooperative work students could not be accommodated. By the Summer of 1970, the situation had reversed to the point where there were less jobs available than there were potential co-op students seeking them. In the Spring/Summer of 1972, Class VII, 18 students were placed but 5 qualified students could not be accommodated. While it is not yet certain, it appears probable that all 14 students desiring co-op positions in Class VIII starting in September 1972 will be placed, indicating that a balance of students desiring cooperative work assignments and available cooperative work positions may have stabilized at least temporarily.

NUMBER OF STUDENTS ENROLLED IN
OCEAN ENGINEERING
COOPERATIVE WORK/STUDY CLASSES

Class No.	Dates	Number
I	Spring-Summer 1969	10
II	Fall-Winter 1969-70	5
III	Spring-Summer 1970	15
IV	Fall-Winter 1970-71	7
V	Spring-Summer 1971	15
VI	Fall-Winter 1971-72	5
VII	Spring-Summer 1972	18
*VIII	Fall-Winter 1972-72	14(est.)
	TOTAL	75 14(est.)

*Processing in progress, July-August 1972.

TABLE 1

RECORD OF EMPLOYMENT OF
OCEAN ENGINEERING COOPERATIVE WORK/STUDY STUDENTS
SPRING 1969 - SUMMER 1972

Employer	No. Students	Work Period
Amoco Production Company	1	Spr.-Sum. 1969
	2	Fall-Wint. 1969-70
	1	Spr.-Sum. 1970
	1	Fall-Wint. 1970-71
	1/6	Spr.-Sum. 1971
Connell Associates	1	Spr.-Sum. 1971
Fluor Ocean Services	1	Spr.-Sum. 1971
	2/3	Spr.-Sum. 1972
Gee and Jenson, Consulting Engineers	1	Spr.-Sum. 1971
	1/2	Spr.-Sum. 1972
General Dynamics	1	Spr.-Sum. 1969
Electric Boat Division	1/2	Fall-Wint. 1969-70
Global Marine, Inc.	1	Spr.-Sum. 1969
	2/3	Spr.-Sum. 1972
Hydrospace Research Corporation	1	Spr.-Sum. 1969
	1/2	Spr.-Sum. 1970
International Nickel Company	1	Spr.-Sum. 1969
	1	Spr.-Sum. 1970
	1/3	Spr.-Sum. 1971
Link Group, Sublimnos Project	1	Spr.-Sum. 1970
Link SeaDiver Corporation	2	Fall-Wint. 1971-72
Marine Acoustical Services, Tracor	1	Spr.-Sum. 1969
	2/3	Spr.-Sum. 1972
Massa Division	1	Spr.-Sum. 1969
Dynamics Corporation of America	1/2	Spr.-Sum. 1970
Raytheon Marine Research Laboratory	1	Spr.-Sum. 1970

TABLE 2

RECORD OF EMPLOYMENT OF OCEAN ENGINEERING COOPERATIVE WORK/STUDY STUDENTS
SPRING 1969 - SUMMER 1972 (Cont.)

Sub Sea International	1	Spr.-Sum. 1971
Test-Rodi Yacht Basin	1	Spr.-Sum. 1971
USN Ammunition Depot, Crane, Indiana	1	Spr.-Sum. 1972
U. S. Navy, AUTEC	1	Spr.-Sum. 1970
	2	Fall-Wint. 1970-71
	3	
USN Civil Engineering Laboratory	1	Fall-Wint. 1969-70
Port Hueneme, California	1	Fall-Wint. 1970-71
	2	
USN Ordnance Laboratory, White Oak, Md.	1	Spr.-Sum. 1971
USN Ordnance Unit, Key West, Florida	1	Spr.-Sum. 1971
	1	Fall-Wint. 1971-72
	1	Spr.-Sum. 1972
	3	
USN Research Laboratory, Washington, D. C.	2	Spr.-Sum. 1972
USN Ship Research and Development Center	2	Spr.-Sum. 1970
Bethesda, Maryland	4	Spr.-Sum. 1971
	1	Fall-Wint. 1971-72
	1	Spr.-Sum. 1972
	8	
USN Shipyard, Bremerton, Washington	1	Spr.-Sum. 1971
USN Undersea R & D Center, San Diego, Cal.	1	Spr.-Sum. 1972
Underseas Engineering, Inc.	2	Spr.-Sum. 1969
	2	Spr.-Sum. 1970
	1	Spr.-Sum. 1972
	5	
Vector Cable Company	1	Spr.-Sum. 1970
	2	Spr.-Sum. 1972
	3	
Vitro Corporation	1	Fall-Wint. 1969-70
Westinghouse Ocean Research Laboratory	1	Spr.-Sum. 1970
Woods Hole Oceanographic Institution	1	Spr.-Sum. 1970
	2	Fall-Wint. 1970-71
	1	Spr.-Sum. 1971
	1	Fall-Wint. 1971-72
	2	Spr.-Sum. 1972
	7	
World Wide Divers	1	Spr.-Sum. 1969
	1	Spr.-Sum. 1970
	1	Fall-Wint. 1970-71
	3	

5. COSTS

A summary and breakdown of the costs of the FAU Cooperative Work/Study program to the National Science Foundation and the National Oceanographic and Atmospheric Administration under the Sea Grant Program is contained in Table 3.

SUMMARY OF
SEA GRANT SUPPORT COSTS
TO
FAU COOPERATIVE WORK/STUDY PROGRAM
IN OCEAN ENGINEERING

Sea Grant No. / Date	GH-7 1968-70	GH-84 1970-72
Category		
Faculty	$109,000	$107,507
Secretarial/Clerical	17,200	12,221
Technical	14,000	18,500
Fringe Benefits	8,000	9,322
Laboratory and Classroom Equipment	9,520	0
Expendables	1,480	900
Travel	3,000	1,000
Publication Costs	800	550
Indirect Costs	30,600	30,000
	$193,600	$180,000
FAU Matching Funds	$133,768	$190,330

TABLE 3

6. PROGRAM DETAILS

A detailed description of the "Cooperative Education Program at Florida Atlantic University" is contained in the booklet attached as Appendix 1. This booklet is distributed to all organizations and students participating in the program. A small "Cooperative Education in Ocean Engineering" flyer, copy attached as Appendix 2, is distributed each year to all junior and four year colleges in the State of Florida, plus those other out-of-state universities and colleges from which we have received students or those from which we believe we can recruit new ocean engineering

students. Students returning the Business Reply postcards included as part of the flyer, Appendix 2, receive the large Co-op Booklet that describes the program in detail.

As indicated on page 9 of Appendix 1, a typical co-op study and work schedule covers alternate six month 'study' and 'work' periods. Technical papers are required from each student after each work period. Reports covering evaluations of the student's performance on-the-job are obtained for each work period from the student's job supervisor. The student's evaluation of his employer is obtained at the end of each work period in the Coordinator's Interview after Completion of Training Period. The student's technical report is submitted on his return to FAU; reviewed and graded by three faculty members of the department and grades assigned. The paper grade is averaged with the grade assigned for his work to obtain the final grade for the co-op work period. Four credit hours are assigned for each co-op work period.

7. STUDENT SELECTION PROCEDURES

Students are informed about the program through brochures distributed prior to their arrival at FAU; a description of the program given by the Coordinator at their FAU orientation meeting; comments in the Ocean Engineering Department Student Handbook; posted information and discussions with their academic advisors.

About two months before the start of a Cooperative Work period, notices are posted for students to prepare interview data (Appendix 4) and report to the Program Coordinator for interviews. During this interview, the Coordinator makes his initial evaluation of the student which is recorded on the Interview Report (Appendix 5).

Concurrent with these interviews, the Coordinator contacts all organizations that have previously conducted successful co-op programs with the Ocean Engineering Department of FAU to ascertain the number of co-op students that they can accommodate for the coming period. The Coordinator also contacts other new organizations that might hire co-op students and discusses the program in detail with the person or manager responsible for co-op placement. These information exchanges are made by letter, telephone or personal visit.

Having determined the number and qualifications of students desiring to 'go co-op', and the number and type of 'co-op' work assignments available, the Coordinator discusses the job prospects and requirements with the candidates and, using interview data, analyses of academic records, students' expressed interests and other pertinent details; selects and submits the student's Resume' (Appendix 6), academic transcript, and special application forms such as the SF-171 needed for federal positions, etc., to two or three prospective employers of each student candidate. From this exchange, the organizations' personnel directors advise the FAU Coordinator of their choice(s) and the FAU Coordinator then makes the most advantageous matches possible to provide the best educational experiences for the student and informs both parties. At this point the "Approval of Parent or Guardian" forms (Appendix 7) are obtained for students under 21 years of age and the "Student Agreement" form (Appendix 8) is executed.

The student then is directed to report to his job at a mutually acceptable time and a copy of this directive (Appendix 9) is sent. Prior to his departure, the student is briefed in detail by the Coordinator on his responsibilities 'on-the-job' and is given papers for reporting his address while on the job (Appendix 10) and other papers for additional reports needed during his work period (Appendices 11-13).

8. ADMINISTRATIVE PROCEDURES

After arrival on the job, the student reports his address, job assignment and the name of his work supervisor using forms given to him at his departure briefing. About one month after arrival he is required to submit two recommended subjects for his technical paper (Appendix 11). The Coordinator approves one of the subjects and advises the student of the selection by a memorandum (Appendix 12). At midterm (about three months after arrival) the student submits his Midterm Report form (Appendix 13). The data in this report is used by the Coordinator for advisement of students for the next co-op period. About two months before the end of the co-op period the student is sent a copy of the Final Report by Student on Training Period (Appendix 14) and the FAU class schedules for the Quarter in which he will return to permit him to make his pre-registration selections. Scheduling information returned by the student is forwarded to his Advisor for registration planning. When the Final Report is returned it is filed in the student's co-op folder for use as a summary of his experiences in the Cooperative Work/Study program. At this time also an Employer's Evaluation of Cooperative Student (Appendix 15) is sent to the student's work supervisor. When this is returned to the Coordinator it is placed in the student's co-op file for use in evaluating his work and assignment of a grade for the work period.

On the student's return to campus he is given one month to submit his technical report for evaluation and grading. The grade assigned for the co-op period is an average of his technical report grade (3/4) and his 'graded' supervisor's evaluation (1/4). Within one month after return to the campus, the program Coordinator holds a final interview in which he discusses a full review of the student's work record, attitudes, recommendations, etc. using Appendix 16 as a guide.

9. STUDENT WORK ANALYSES

After all reports are received from students and employers and interviews are completed, each student's total cooperative work/study record is analyzed. Summaries of these analyses are contained in Appendix 3. A summary of Employers and Student's Evaluations of the Cooperative Work/Study experiences are contained in Table 4. Thirteen (13) Cooperative Work/Study students are now employed full time by their previous co-op employers or associates and at least 3 others were offered positions which they did not accept for various reasons. In addition, at least 2 students now on co-op assignments have been offered permanent positions on their graduation.

EVALUATIONS OF COOPERATIVE WORK/STUDY
EXPERIENCES EXTRACTED FROM EVALUATIONS
AND REPORTS

I. Evaluations of Students by Employers

Outstanding/Excellent	22
Very Good/Good	28
Satisfactory/ Average	7
Unsatisfactory	1
Incomplete (Still on Co-op)	18
No Evaluation	5
	78

II. Evaluations of Employers and Work Experiences by Students

Outstanding/Excellent	16
Very Good/Good	35
Satisfactory	2
Unsatisfactory	3
Incomplete (Still on Co-op)	18
No Evaluation	4
	78

TABLE 4

10. ADVISORY COMMITTEE REPORT

In March 1969, during the initial stages of the Cooperative Work/Study program, a special Advisory Committee was invited to examine and review the program and make recommendations for its improvement. The Advisory Committee consisted of:

Dr. Cornelius Wandmacher, Dean of Engineering, University of Cincinnati;

Dr. Foster H. Middleton, Chairman, Department of Ocean Engineering, University of Rhode Island;

Dr. Francis LaQue, Vice President, International Nickel Company, New York, New York;

Mr. Leo F. Blickley, Head, Sea Operations, AC Electronics Division, General Motors, Goleta, California;

Dr. Clarence C. Crawford, Distinguished Professor of Education and Assistant to the Dean, Office of Graduate Studies, Florida Atlantic University; and

Dr. Charles B. Franklin, Jr., Associate Professor of Finance, Florida Atlantic University.

The Advisory Committee met on March 17, 1969 and made a full review of the Cooperative Work/Study program and the Ocean Engineering curriculum at FAU. Comments and constructive criticisms made by the Committee members were reported in detail in the Second Progress Report to the National Science Foundation NSF GH-007 on October 15, 1969. The most important recommendations of the Committee that were implemented included:

a. The principal objective of the program must be educational, not training or placement.
b. FAU must establish a center of technical excellence with a moderate number of excellent students, not a large number of good-to-fair students. Poor students should not be permitted to participate in the program.
c. Academic qualification for the program is set at a 2.5 grade point average, with allowances made for a limited number of students who show greater promise than their academic records indicate but whose grade point averages are not less than 2.0. Each case should be subject to Departmental faculty review and approval.
d. Three credit hours per quarter should be given for work/study periods which are rated "Satisfactory" by the employer. (This credit was later increased to 4 credit hours.)
e. More information about the cooperating corporations should be secured and made available to all students by staff visits, correspondence, and reports by students upon their return from work/study assignments.
f. Major immediate emphasis by the Ocean Engineering Department should cover the following: Students must be impressed with the fact that they represent the University at all times when they are on work/study assignments. Maximum personal contacts with industry should be established by the Coordinator. The direction of the program should remain academic, and assignments should be made for work/study training and not for job orientation. Effort should be made to have one pair of students in as many cooperating corporations as possible. Returning students can assist by describing their experiences to incoming students.
g. Future actions should include conferences at the University with corporation representatives; extension of the co-op program to students in all disciplines if desired by new departments when a College of Engineering is established; cooperation with other universities, colleges and junior colleges, and foreign corporations; inclusion of graduate students in the program; financial support for the program after Sea Grant sponsorship ceases; grouping of two or more corporations for rotating work/study periods; securing information about co-op programs in other universities; efforts to have more non-technical subjects included in junior college curricula to assist in ECPD accreditation; and establishment of follow-up procedures to compare accomplishments of co-op students with in-residence students.

11. PROJECT REVIEW

The Cooperative Work/Study program started slowly with some reluctance on the part of students to participate at a time when jobs on graduation were plentiful and the students did not desire to extend their programs for 6 to 12 months while 'co-oping'. In 1970 and 1971 when

general engineering opportunities slowed and prospective employers placed a premium on the practical work experiences of the Cooperative Work/Study students, it was noted that more students applied for 'Co-op' than there were work opportunities available. In addition, the reports of many returning cooperative work/study students on the benefits of their work experiences, including job offers on graduation, increased the number of applicants for the program. A review of Table 3 indicates that many ocean engineering organizations were satisfied with the program and hired co-op students repeatedly since the program started. The generally very favorable evaluations by both the work supervisors and the students in the Cooperative Work/Study program indicated in Table 4 clearly shows the benefits of the program to the students and cooperating organizations. The fact that many students received job offers from their co-op companies or organizations also indicates a very tangible benefit from the program and project. The cooperative work/study program now is fully accepted by the Ocean Engineering students at FAU and, with the recognition that the best students get the best 'co-op' jobs, the serious students are working harder to qualify for the program and its best job.

There have been many other indirect but important benefits to the Department of Ocean Engineering and the university beyond those specifically associated with the cooperative education of Ocean Engineering students. These include:

a. Provision of additional highly qualified "Sea Grant" faculty at a time when rapid expansion of the department was taking place, enabling the Department of Ocean Engineering to expand its offerings in Electrical and Mechanical Engineering subjects to the point where it was possible to develop a full College of Engineering including Departments of Electrical Engineering and Mechanical Engineering as well as Ocean Engineering. The new departments now conduct their own programs and provide service courses to the Department of Ocean Engineering and its co-op students. Expansion from a single department to a full college headed by a Dean, with three departments, has greatly strengthened the quality and productivity of all engineering programs at FAU.
b. Enabling the department to offer courses at least twice each year to 'non co-op' students who fall out-of-step for financial or academic reasons as well as regular co-op students and thereby accelerate their academic progress.
c. Favorable publicity created by Sea Grant support of the FAU Cooperative program and good reputations made by Cooperative Work/Study students in industry, government and research organizations has increased the reputation of the Ocean Engineering program and the university; has increased applications from students and improved the placement opportunities of its graduates.
d. Discussions, talks and classroom activities of Cooperative Work/Study students has improved the practical outlook and competence of all students in the ocean engineering program. The co-op students bring 'real life' experiences into theoretical classroom discussions that emphasize the practical aspects of the educational objectives of the program.
e. In a few cases, the cooperative work/study experiences have shown some students that they are <u>not</u> suited for, or truly interested in, careers in engineering or ocean engineering. Learning this practical fact early enough to redirect their efforts has given obvious benefits to those concerned.

12. FUTURE PLANS

Continuation of the Cooperative Work/Study program in Ocean Engineering at Florida Atlantic University is definitely planned for the indefinite future. At the time of this report, the Department of Ocean Engineering is facing stringent restrictions in the transfer of faculty and staff positions previously supported by Sea Grant Project GH-84 to the State of Florida rolls. The problem is not one of unsatisfactory productivity, or lack of interest, but rather that of rising inflationary costs with a concurrent reduction in funds available. A Renewal proposal dated February 29, 1972 has been submitted to the Sea Grant Office for additional support at approximately 50 percent of the level of previous grants requested, in order to make it possible to complete the project to the point where increased enrollment in the ocean engineering department and the cooperative work/study program will exceed the productivity level required to perpetuate the program without further outside assistance. With such assistance, the full potential of the program established by this project is assured.

13. CONCLUSIONS

a. This project has demonstrated very real and material benefits to the participating students, cooperating agencies, the faculty, department, college and university, both educationally and administratively.
b. It has created strong and effective cooperation and liaison between the University and ocean engineering industry and governmental agencies which will continue to increase as national, state and educational programs expand and more students enter the program.
c. The project has established a firm base for further expansion and branching out to other related cooperative work/study programs in engineering and other disciplines at Florida Atlantic University.
d. Initial development of the program was slow and its expansion in 1970-71 was restricted during the periods of reduced engineering employment. However, recent trends indicate increased applications from students and employment opportunities in Cooperative Work/Study programs.
e. The program is viable but not yet fully self-supporting in terms of faculty and administrative support needed to maintain its full effectiveness.

14. RECOMMENDATIONS

a. That Florida Atlantic University continue its efforts to improve and expand its Cooperative Work/Study program in Ocean Engineering and that Cooperative Work/Study programs be established in other engineering and non-engineering disciplines when student demand and teaching facilities exist for such expansion.
b. That other universities planning or considering Cooperative Work/Study programs review the procedures contained in this report. The Project Coordinator of this project will be pleased to provide help or advice as desired and requested.
c. That consideration be given by the Office of the Sea Grant, NOAA, to the additional final support requested by FAU in its proposal of February 29, 1972 to permit successful completion of the project.

d. That appropriate recognition be afforded to the Office of the Sea Grant Programs, for its important contributions to the development, strengthening and improved posture of our national programs in ocean science, engineering and education.

Cooperative Education in Ocean Engineering at Florida Atlantic University

An Upper Division State University at Boca Raton

Supported by the National Science Foundation as part of the U.S. National Sea Grant Program of 1966.

Revised January, 1970

Appendix 1

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OPPORTUNITIES IN OCEAN ENGINEERING

OCEAN ENGINEERING, the application of oceanographic knowledge and engineering skills to the development of the oceans' resources is making rapid strides as a recognized engineering discipline in today's world.

Increasing demands for oil, minerals, chemicals, food and national defense to serve and protect our nation and the world's rapidly increasing populations, and to improve their standards of living, make the development and profitable use of the oceans' resources essential. As resources of the land are used and depleted, those of the oceans become increasingly important. The ocean engineer is one who will make these ocean developments possible.

The fields of interest today for an ocean engineer include: offshore oil development, underwater mining and chemical extraction, ocean defense systems, Man-in-the-Sea, underwater structures, vehicles and communications systems, engineering associated with the development of sea food resources, desalination, and prevention of deterioration of submerged metals and materials. New fields will be developed as technology is improved.

Today there are few trained ocean engineers to meet the demand. Most have entered ocean engineering from other fields. At Florida Atlantic University the first undergraduate Ocean Engineering program started in 1965. Graduates from this upper division program in 1967 are now employed in such organizations as Ocean Systems, Inc. of Union Carbide Corp.; Pan American Petroleum Corp. (offshore oil); General Dynamics Corp. (Deep Star and Acoustics Branches); North American Rockwell Corp. (Ocean Operations Division); U. S. Naval R & D Center, San Diego (Naval Electronics Laboratory); RCA (Atlantic Undersea Test and Evaluation Center); Westinghouse Electric Corp. In addition, ocean engineering graduates of Florida Atlantic University are now enrolled in, or accepted for, Master's ocean engineering programs at the University of Rhode Island, Massachusetts Institute of Technology, the University of Washington, and the University of Hawaii. Graduates of the current senior class have offers from many of the same companies and from others engaged in similar ocean engineering work.

Ocean Engineering graduates from Florida Atlantic University are prepared for positions in offshore petroleum and mining industries, underwater defense, construction and exploration companies, governmental and private ocean laboratories doing instrumentation, underwater habitation, Man-in-the-Sea, acoustics and related systems work. They are equipped for work in Research and Development laboratories doing work

related to the exploration and exploitation of ocean resources. To date, graduates of the Ocean Engineering program who received their B. S. degrees at Florida Atlantic University have received starting salaries between $8,700 and $12,800 per year, with averages about $10,500 per year. This salary average and the demand for these engineers are increasing.

A newly approved Cooperative Work/Study Program in Ocean Engineering at Florida Atlantic University supported by the National Science Foundation under the National Sea Grant Program Act will give qualified students the opportunity to divide their time between class work at Florida Atlantic University and practical on-the-job experience in ocean industries or laboratories. This program will enhance their practical education and offer the students an opportunity to earn money to meet educational costs.

Ocean engineering offers great opportunities to the qualified graduate in an exciting, rapidly expanding, important field.

FLORIDA ATLANTIC UNIVERSITY

Florida Atlantic University is the first university in the United States to give only the Junior and Senior years of undergraduate work. It is located on a 1200 acre site in Boca Raton, a few miles west of the Atlantic Ocean, midway between Palm Beach to the north and Fort Lauderdale and Miami to the south. It is easily accessible from major north-south highways and enjoys a subtropical climate with an average year-round temperature of 75 degrees. Its buildings now in use or nearing completion have a value of approximately $30 million. The University was established in 1961 as a State University and accepted its first students in 1964. In 1965, the first undergraduate program in Ocean Engineering anywhere in the world was established.

The University is fully accredited by the Southern Association of Colleges and Schools and the State Board of Education. Its graduates are accepted for further study by other universities in the State and in the nation. Current enrollment is approximately 5,000. A student body of 10,000 is anticipated by 1975.

The University operates on a yearly basis of four quarters and is organized into Colleges of Business and Public Administration, Education, Humanities, Science and Social Science, and the newly established College of Engineering. Each division operates under University-wide policies, is granted the widest latitude, and is encouraged to develop new and unique programs which will best serve the student in the disciplines within its jurisdiction. Graduate work leading to the Master's degrees in Arts, Science, and Education are available, and programs for the Doctorate will be established in the near future.

The faculty consists of a distinguished group of 300 scholars who hold a balanced dedication to both teaching and research; the majority of them hold the doctorate or a professional degree.

OCEAN ENGINEERING EDUCATION AT FLORIDA ATLANTIC UNIVERSITY

The Department of Ocean Engineering offers a comprehensive and practical curriculum in science and engineering which will prepare the student for graduate study and for professional positions in industry, government, and science. The Department is presently a part of the newly authorized College of Engineering at Florida Atlantic University. Expansion to the Master's Program is planned for 1970 and to the Doctorate level at a later date.

The program of study requires a firm foundation in English, mathematics, and science at the lower division level; and courses in the social sciences and the humanities for a balanced background for the engineering profession. These are provided in the pre-engineering (University Parallel) programs of the junior colleges in Florida and the lower division pre-engineering programs of most four-year colleges.

The Ocean Engineering Program covers integrated classroom and laboratory work units encompassing basic engineering sciences and mathematics; study of the oceans and their environment in relation to other sciences and engineering; and instrumentation and processing of data for applications to problems connected with work in, on, or under the ocean to develop its resources. Emphasis is placed upon the solution of problems related to and associated with working in the ocean in areas such as underwater acoustics, fluid mechanics, structures, electronics, materials, desalination and corrosion. Other courses are included to insure a broad and comprehensive education. A summer quarter devoted to practical work is required in the Regular program. This is <u>not</u> required in the Cooperative Work/Study Program.

Facilities are being expanded rapidly. Equipment is continually being secured to expand and improve laboratories in materials science, electricity, electronics, mechanics, ocean processes, and corrosion. Shore facilities and oceanographic ships on charter are available for departmental projects and related research and development work. The Department presently has two small boats available for student projects. Other boats are leased or borrowed when needed for sea operations.

Students preparing for the Bachelor of Science degree in Ocean Engineering will follow the program on pages 4 - 6. Modifications of this program must be approved by the Chairman of the Department. The degree of Bachelor of Science will be awarded to students who meet all requirements for graduation. Students will be eligible to receive the degree 'with honor' upon completion of all required residence work with a 3.2 grade point average (based on a 4 point system).

REQUIREMENTS FOR ADMISSION TO THE OCEAN ENGINEERING PROGRAM

Subject	Quarter Hour Credits
English composition and grammar	9
Social Sciences	9
Humanities	9
Chemistry including chemistry laboratory work	12
Mathematics (through 1 year of Calculus)	12 - 21
Engineering Physics (Physics with Calculus)	12
*Electives	27 - 18
	90

*At least one course in engineering drawing or descriptive geometry should be included in elective selections. Additional studies in the humanities or the social sciences, pursuing an area in depth, are encouraged at the lower level since this additional work is required at FAU if not completed prior to entry.

Selected students with grade point averages above the overall minimum average of 2.0 (C) in all work may be accepted for a special three year program if they have met all entrance requirements except prerequisites in physics and calculus. These students complete physics, calculus and courses not requiring these prerequisites during the first year at FAU. If attendance has been at an institution which is a member of the State of Florida University or Junior College System, completion of the General Education Program of that institution is required.

DEGREE REQUIREMENTS

The degree of Bachelor of Science in Engineering will be awarded to students who meet the following requirements for graduation in the Department of Ocean Engineering:

1. All general degree requirements of the University.
2. Maintain a 2.0 grade point average in all professional (OCEN) courses.
3. Complete satisfactorily each of the engineering core courses listed below:

		Quarter Credits
OCEN 401	Materials I	3
OCEN 402	Materials II	3
OCEN 404	Physical Oceanography	3
OCEN 405	Chemical Oceanography	3
OCEN 406	Geological Oceanography	3
OCEN 412	Mechanical Vibrations	3
OCEN 414	Electrical Circuit Analysis	4

OCEN 415	Electronics	4
OCEN 416	Electrical Energy Conversion and Control	3
OCEN 420	Acoustics	3
OCEN 421	Transducer Design	3
OCEN 425	Statics	4
OCEN 426	Dynamics	4
OCEN 429	Fluid Mechanics I	3
OCEN 430	Fluid Mechanics II	4
OCEN 434	Strength of Materials I	3
OCEN 435	Strength of Materials II	3
OCEN 437	Engineering Thermodynamics I	3
OCEN 438	Engineering Thermodynamics II	3
OCEN 440	Heat Transfer	4
OCEN 460	Ocean Engineering Seminar	1
OCEN 462	Design Planning and Engineering Practices	1
OCEN 463	Ocean Influences and Perspectives	1
MATH 370	Differential Equations	4
MATH 472	Computer Programming and Numerical Analysis	3
BIOL 315	Marine Biology for Ocean Engineers	3
	Total	78

4. Complete satisfactorily 9 hours of technical electives chosen from among the following course offerings:

OCEN 422	Underwater Sound Propagation	3
OCEN 423	Instrumentation	3
OCEN 431	Fluid Mechanics III	3
OCEN 432	Underwater Structures	3
OCEN 451	Communications Theory I	4
OCEN 452	Communications Theory II	2
OCEN 453	Experimental Stress Analysis	3
OCEN 454	Environmental Susceptability of Materials	3

5. Complete an out-of-college studies program. This program must meet both of the following requirements:

   a. To meet University regulations, at least 18 quarter hours must be completed in out-of-college courses for graduation. Required core subjects include 10 of these credits. An additional 8 credit hours of elective work must be completed outside the College of Engineering.

   b. A total of 27 credit hours must be completed satisfactorily in the combined areas of the Humanities and Social Sciences at the upper and lower divisions, prior to graduation, including an in-depth study in one area of these disciplines. Entrance requirements specify a minimum of 18 credit hours in these combined subjects in the lower division. The balance of the 27 hours, if not taken in the lower division, must be completed at FAU.

6. Complete a professional development program consisting of one of the following options:

Option I - Two six month periods of work in government or industry in the Department of Ocean Engineering's Cooperative Education program. Credit for work and papers for each work/study period is covered by enrollment in courses:

OCEN 449 OCEN 450	OCEAN ENGINEERING PRACTICAL WORK AND INDEPENDENT STUDY	3 credits each

Option II - A final quarter of work at the University consisting of one additional technical elective and the completion of:

OCEN 490	DESIGN AND INSTRUMENTATION LABORATORY	6 credits

Option III - One six month period of cooperative education work and completion of:

OCEN 407	OCEAN ENGINEERING LABORATORY	2 credits

Option IV - One quarter of internship in ocean oriented industry

OCEN 449	OCEAN ENGINEERING PRACTICAL WORK AND INDEPENDENT STUDY	3 credits

and completion of:

OCEN 407	OCEAN ENGINEERING LABORATORY	2 credits

Course descriptions are found on pages 11 - 18.

COOPERATIVE OCEAN ENGINEERING EDUCATION

at

FLORIDA ATLANTIC UNIVERSITY

Cooperative education was initiated at the University of Cincinnati, Cincinnati, Ohio, in 1906. Today, nearly 100 universities and colleges in the United States include the programs in their curricula. The Program integrates classroom and practical work experiences. Modern business is so complex that it is virtually impossible for an undergraduate student to accurately visualize his professional life. Classroom instruction cannot give all the knowledge required for a successful professional career. Practical "on-the-job" work experience supplements academic study. Some minimum amount of it, and of standards of performance in it, are included in the requirements for the baccalaureate degree to assist the student to orient himself to the modern world.

In February, 1968, the Florida Atlantic University received a grant from the National Science Foundation to establish a Cooperative Work/Study Program in Ocean Engineering under the National Sea Grant College and Program Act of 1966. The award supports faculty and facilities in the new program. It does not provide direct financial assistance to students. Cooperative Program students can apply for regular student financial aid.

Classes in cooperative education begin in September and March of each year. Both the University and the Cooperating Company will have students at work at all times.

The cooperative education program integrates classroom and practical experience in industry, business, government, and service-type work situations. Its underlying philosophy is that supervised employment in the occupational field for which the student is preparing enhances comprehensive learning and vocational adaption. The program emphasizes competency, comprehensiveness, and continuity in vocational guidance and placement.

The basic strength of the cooperative plan is the diversity and flexibility of its programs. For the student, it gives reality to learning, increases motivation, develops greater human understanding, accelerates maturation, offers orientation to the world of work, provides useful employment contacts, and insures financial aid for all or a large part of academic expenses. For the University, it permits more efficient use of plant facilities, encourages greater community support, and enhances the effectiveness of its teaching faculty. For the cooperating corporation, it offers an excellent source of technically educated personnel, facilitates recruitment and retention, and permits better utilization of personnel.

The Coordinator of the Program will interview and evaluate each student's ability for both academic and practical excellence before admitting him into the program, at the University and later in industry. Thereafter, he will advise the student for optimum success both as a student and as leader in a professional career.

Every effort will be made to give the student maximum practical experience in his work assignments so that he can better visualize his future role in the industrial world.

There is no one procedure which will be effective for all students at all times. But the student can confirm his own judgement by his experiences and associates, in both the University and in business, by profiting from transfer values, and thereby see the business world in its proper perspective.

SELECTION OF STUDENTS FOR COOPERATIVE PROGRAM

Procedure - Students may be nominated by either the University or the Cooperating Organization. Applications and qualifications will be screened by the originating agency to assure eligibility. Students found eligible will be presented to the cooperating partner with documented qualifications for acceptance. Agreement on students' qualifications will permit them to apply for admission to the program.

Qualifications for Admission to Cooperative Program - The student must have satisfactorily completed all prerequisites for enrollment in the Department of Ocean Engineering; must have a grade point average of above 2.00 in his work; must submit a minimum of three favorable recommendations from former instructors, employers, or associates other than relatives; and must agree to remain in the program until completion if his accomplishments qualify him to do so.

Application - A student at the University will usually apply for designation as a cooperative student during the first or second quarter of his first, or junior, year. A student now at the cooperating company will submit his application and qualifications to the Department of Ocean Engineering, at the University, in time for its review and his enrollment in September or March of the academic year.

Interviews - When desired or necessary, interviews with prospective students and the cooperating organization will be arranged.

Admission - A student must apply in adequate time for admission into the program in September or March of the entering year. Special arrangements for tuition and fees for students sponsored by a cooperating corporation may be made if desired by the corporation.

PROGRAM ADMINISTRATION

Work Plan - After a student has been accepted into the Program, and prior to his first work period, the Coordinator at the University will contact the organization supervisor, under whom the student will work, to coordinate all educational and work objectives. From this, a work plan will be prepared for each student. While it is expected and intended that the student will earn wages during the work phases of the program, the educational objectives of practical work will always receive greater emphasis.

Typical Coop Study and Work Schedule

Calendar	Location	Program
First 6 months	At the University	First and second quarters of the Ocean Engineering curriculum.
Second 6 months	At the cooperating organization	On-the-job experience, first technical paper.
Third 6 months	At the University	Third quarter of the junior year and first quarter of the senior year of the Ocean Engineering curriculum.
Fourth 6 months	At the cooperating organization	On-the-job experience, second technical paper.
Fifth 6 months	At the University	Second and third quarters of the senior year of the Ocean Engineering curriculum. Graduation.

Technical Papers - Prior to the end of each work period, the student will prepare a technical paper on a subject pertinent to his assigned work; the subject must be approved by his work supervisor and the University Coordinator. The student will present the paper orally before his classmates and instructors at the University, and will receive a grade for the quality of his work, the excellence of his presentation, and his employer's evaluation. This grade will count toward his degree.

Review and Evaluation - Upon completion of each student's academic period, his grades will be sent to his work supervisor at the cooperating organization. After each work period, an evaluation of his performance will be sent to the University Coordinator. All grades will be reviewed carefully with the student. Modifications will be made when necessary to improve the quality of the program and the student's work in it.

OCEAN ENGINEERING DEPARTMENT FACULTY

Charles R. Stephan, B. S.	- Professor and Chairman
Robert N. Brannock, Ph. D.	- Associate Professor, Civil Engineering
James Blaine Davidson, M. S.	- Associate Professor, Acoustics
Stanley Dunn, Ph. D.	- Assistant Professor, Acoustics
William H. Hartt, Ph. D.	- Assistant Professor, Materials Science
Raymond F. McAllister, Ph. D.	- Professor, Oceanography
Maylo Murday, M. S.	- Assistant Professor
William Tessin, Ph. D.	- Professor, Ocean Engineering
Douglas K. Warinner, M. S.	- Instructor
Jack Sewell	- Boat Technician
Richard Demarest	- Electronic Technician

DIRECTION OF THE COOPERATIVE EDUCATION PROGRAM

Manager and Coordinator	- Professor Charles R. Stephan Chairman, Department of Ocean Engineering
Cooperating Corporation	- The Director of Educational Training, or another official designated by the Corporation
Advisory Committee	- An Advisory Committee consisting of selected members of the Ocean Engineering Industry, Education and the Scientific community will be asked to serve as advisors to the Chairman and Coordinator to insure proper direction and administration of the program

SCHEDULE OF FEES FOR ONE QUARTER

Application Fee	$ 15.00
Registration Fee	190.00
Non-Florida Resident Fee (In addition to Registration Fee)	350.00
Residence Hall Charge (Includes telephone and linen. All air conditioned suites.) Meals are available in the cafeteria for about $3.00/day and up.	145.00

Fees at Florida Atlantic University are comparable to those charged at other state universities in Florida. They are subject to change by action of the State Legislature and other governing boards.

APPLICATIONS FOR ADMISSION

Application forms to enter Florida Atlantic University, and the University BULLETIN describing all courses, campus regulations, housing and student assistance, can be obtained from:

The Director of Admissions
Florida Atlantic University
Boca Raton, Florida 33432

Further information on the Ocean Engineering Cooperative and Regular Programs can be obtained from the Ocean Engineering Cooperative Program Coordinator or the Chairman of the Department of Ocean Engineering.

Students interested in applying for the Cooperative Ocean Engineering Program should apply EARLY.

DESCRIPTION OF COURSES
OCEAN ENGINEERING DEPARTMENT

NOTE: Some changes in the following course offerings will be noted in the new catalog. Be certain to check for such changes as you plan your program.

OCEN 301 Introduction to Oceanography — 4 Credits

Prerequisites: None. Engineering majors may not offer this course for credit.

Survey course including: Origin of ocean basins, continents, and sea water; physical and chemical oceanography, marine biology, marine geology, meteorological oceanography. A brief introduction to Florida oceanography and ocean engineering will be included.

OCEN 401 Engineering Materials I — 3 credits
OCEN 402 Engineering Materials II — 3 credits

PREREQUISITES: College Physics (with Calculus)
College Chemistry

Relations of atomic structures to properties and uses of metallic, semi-metallic, inorganic, organic, composite, and surface-coated materials at ambient, elevated and cryogenic temperatures. Sources, winning, refinement, alloying, fabrication, phases, thermal treatments, and resistance to corrosion.

OCEN 404 Oceanography I (Physical Oceanography) — 3 credits

PREREQUISITES: Engineering major or
permission of Instructor

The World Ocean; physical dimensions and characteristics; distribution of salinity, temperature and pressure; density and water mass distribution; waves, tides, and currents; sound and electromagnetic radiation; heat budget of the oceans; sea-air interface studies, etc. Course stresses applications where pertinent.

OCEN 405 Oceanography II (Chemical Oceanography) — 3 credits

PREREQUISITES: Engineering major or
permission of Instructor

Sea water; its chemical nature and distribution of major and minor elements, gases and nutrients in the sea; salinity and chlorinity and their measurement; principal marine chemical processes; the carbonate cycle in sea; geo-chemistry of sediments; problems in marine chemistry.

OCEN 406 Oceanography III (Geological Oceanography) — 3 credits

PREREQUISITES: Engineering major or
permission of Instructor

Ocean boundaries and geological characteristics; beaches and beach phenomena; continental shelves, slopes, and deep sea floor; marine sediments, their classification, origin and history; sediment analysis; processes active in formation, transportation and deposition of marine sediments; eustatic and local sea level changes; coral reefs; problems in marine geology.

OCEN 401 Engineering Materials I — 3 credits
OCEN 402 Engineering Materials II — 3 credits

PREREQUISITES: College Physics (with Calculus)
College Chemistry

Relations of atomic structures to properties and uses of metallic, semi-metallic, inorganic, organic, composite, and surface-coated materials at ambient, elevated and cryogenic temperatures. Sources, winning, refinement, alloying, fabrication, phases, thermal treatments, and resistance to corrosion.

OCEN 404 Oceanography I (Physical Oceanography) — 3 credits

PREREQUISITES: Engineering major or
permission of Instructor

The World Ocean; physical dimensions and characteristics; distribution of salinity, temperature and pressure; density and water mass distribution; waves, tides, and currents; sound and electromagnetic radiation; heat budget of the oceans; sea-air interface studies, etc. Course stresses applications where pertinent.

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permission of Instructor

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OCEN 406 Oceanography III (Geological Oceanography) — 3 credits

PREREQUISITES: Engineering major or
permission of Instructor

Ocean boundaries and geological characteristics; beaches and beach phenomena; continental shelves, slopes, and deep sea floor; marine sediments, their classification, origin and history; sediment analysis; processes active in formation, transportation and deposition of marine sediments; eustatic and local sea level changes; coral reefs; problems in marine geology.

OCEN 407 Ocean Engineering Laboratory 2 credits

PREREQUISITES: OCEN 404, OCEN 405, OCEN 406, OCEN 462, Senior Standing

Solution of practical problems related to ocean engineering. Projects are assigned in which students design, construct and install equipment in the ocean to perform designated tasks. Data is collected and from this data a report is written.

Grading: Satisfactory - Unsatisfactory

OCEN 412 Mechanical Vibrations 3 credits

PREREQUISITES: Differential Equations
OCEN 426

Equivalent springs, masses, driving systems; rigid-body dynamic analysis, steady-state response, phase-plane, normal modes, shock spectra, single and two degree of freedom systems, computer analysis, mechanical impedance methods, lumped and distributed parameter mechanical systems, dynamic behavior of foundation-like structure, vibration isolation.

OCEN 414 Electrical Circuit Analysis 4 credits

PREREQUISITES: Math through Calculus
College Physics with Calculus
COREQUISITE: Differential Equations (MATH 370)

Analysis of AC and DC electrical circuits. Kirchhoff's Laws; Thevenin and Norton Theorems; Nodal and Loop analysis; Fourier Series analysis and complex or S plane conversions.

Three hours lecture - Three hours lab

OCEN 415 Electronics 4 credits

PREREQUISITE: OCEN 414

Introduction to solid state and vacuum tube electronic circuits. Amplifiers, rectifiers, modulation, oscillators. Electronic design parameters.

Three hours lecture - Three hours lab

OCEN 416 Electrical Energy Conversion and Control — 3 credits

PREREQUISITE: OCEN 415

Magnetic circuits and transformers; Electromechanical Energy Conversion; AC and DC machines; Feedback control systems.

OCEN 420 Acoustics — 3 credits

PREREQUISITES: Differential Equations
OCEN 415

Fundamentals of acoustics, wave equation, sound propagation in solids and fluids, loudspeakers, microphones, speech hearing, noise, architectural acoustics, resonators and filters.

OCEN 421 Transducer Design — 3 credits

PREREQUISITE: OCEN 420

Principles of acoustic transducers; microphones, loudspeakers, hydrophones, projectors and arrays, are studied along with methods of construction, mounting and calibration.

OCEN 422 Underwater Sound Propagation — 3 credits

PREREQUISITE: OCEN 421

Sound propagation in the ocean utilizing ray acoustics and normal mode theory. Scattering reverberation, reflectivity, attenuation and long range propagation path. Sonar Equation. Natural and man made noise.

OCEN 423 Instrumentation — 3 credits

PREREQUISITES: Differential Equations
OCEN 416

Definition, classification of variables, measurement errors, statistical analysis, performance characteristics of instruments, comparison measurements, physical measuring devices, transducers, operational amplifiers for measurement and control; manipulation, transmission recording of data, electronic switching, timing, digital counting systems, data processing techniques, indicators, recorders, telemetry systems.

OCEN 425 Statics — 4 credits

PREREQUISITE: Mathematics through Calculus

Forces and force systems and their external effects on bodies; principally, the condition of equilibrium. Techniques of vector mathematics employed.

OCEN 426 Dynamics — 4 credits

PREREQUISITE: OCEN 425

Principles of dynamics, kinematics, kinetics of particles and rigid bodies including work and energy impulse and momentum periodic motion. Techniques of vector mathematics employed.

OCEN 429 Fluid Mechanics I — 3 credits
OCEN 430 Fluid Mechanics II — 4 credits

PREREQUISITES: OCEN 426, OCEN 437

Physical properties of fluids; fluid statics and dynamics; dimensional analysis; viscous flow; potential flow; fluid measurements and control; turbomachinery; flow in closed conduits and open channels.

OCEN 430 includes a fluids laboratory.

OCEN 431 Fluid Mechanics III — 3 credits

PREREQUISITE: OCEN 430

An introduction to the hydrodynamics of the ocean. Potential flow. Theory of waves of small amplitude. Long waves in shallow water. Waves on sloping beaches, etc.

OCEN 432 Underwater Structures — 3 credits

PREREQUISITE: OCEN 435

Introduction to theory of plates and shells, thick wall pressure vessels; elements of buckling of plates, shells, and cylinders.

OCEN 434 Strength of Materials I — 3 credits
OCEN 435 Strength of Materials II — 3 credits

PREREQUISITE: OCEN 425

Concepts of stress and strain, Hooke's Law, deformation of elastic materials, torsion, bending, strain energy, limit analysis, statically indeterminate elastic systems, Castigliano's Theorum, thin wall rings and shells, rivited and welded joints, columns and struts.

OCEN 437 Engineering Thermodynamics I 3 credits
OCEN 438 Engineering Thermodynamics II 3 credits

PREREQUISITE: Calculus

Definitions, properties and state of a pure substance, macroscopic thermodynamic processes, systems and cycles, work and heat, the first and second laws, entropy, availability, irreversibility and efficiency. Applications of concepts to ideal gases, mixtures of gases and vapors, vapor and gas cycles, combustion.

OCEN 440 Heat Transfer 4 credits

PREREQUISITES: OCEN 438, OCEN 430

Elements of steady state heat transfer; thermal conduction, convection, radiation; condensation and boiling heat transfer; thermal resistance; introduction to transient heat conduction. Includes a heat transfer laboratory.

OCEN 449 Ocean Engineering Practical Work and Independent Study 3 credits

A cooperative work/study program with ocean oriented organizations for ocean engineering students who have completed at least two quarters of Ocean Engineering. On-the-job training and instruction. A technical report is required related to cooperative work.

Grading: Satisfactory - Unsatisfactory.

OCEN 450 Ocean Engineering Practical Work and Independent Study 3 credits

PREREQUISITE: OCEN 449

A second period of cooperative work/study for students enrolled in the cooperative program who have completed one previous six month work period. Requirements are the same as for OCEN 449, but additional industrial and practical experience is provided.

Grading: Satisfactory - Unsatisfactory.

OCEN 451 Communications Theory I 4 credits
OCEN 452 Communications Theory II 2 credits

PREREQUISITE: OCEN 416

Fourier transform principles, signal transmission through electric networks; probability applications, noise in electric components and circuits, information theory, optimum linear filtering and modulation, all as applied to acoustic signal processing.

OCEN 453 Experimental Stress Analysis 3 credits

PREREQUISITES: OCEN 434, OCEN 435, or permission of Instructor

Theory and application of strain gages; strain measurement and transducer applications. Photoelasticity. Brittle coating techniques.

OCEN 454 Environmental Susceptability of Materials 3 credits

PREREQUISITES: OCEN 401, OCEN 402

Review of the theories of deformation in crystalline solids and the basic concepts of corrosion in metals. Application of these theories to the interpretation of the behavior of stressed materials in a corrosive environment with regard to stress corrosion, corrosion fatigue, and hydrogen embrittlement.

OCEN 460 Ocean Engineering Seminar 1 credit

Seminar session with invited leaders in the ocean engineering profession; presentation of technical papers by students on topics and projects selected with consent of instructor.

Grading: Satisfactory - Unsatisfactory.

OCEN 462 Design Planning and Engineering Practices 1 credit

PREREQUISITE: Permission of Instructor

Incorporates the elements of engineering design, ethics and the practics of engineering in industry and government. The course is a prerequisite for OCEN 407 or OCEN 490. Students plan and design a project for the follow-on laboratory course.

OCEN 463 Oceanic Influences and Perspectives 1 credit

PREREQUISITE: Permission of Instructor

Lectures and discussions on ocean science and engineering influences in local, national and international affairs; effects of laws and regulations affecting ocean operations; important national and international oceanic development programs; future trends in ocean development.

OCEN 480 Directed Independent Study 1-5 credits

PREREQUISITE: Permission of Instructor

OCEN 490 Design and Instrumentation Laboratory 6 credits

PREREQUISITES: All engineering core subjects

The practical application of engineering principles in the construction and installation of ocean oriented instrumentation or equipment. Consists of occasional lectures, laboratory experiments, project construction and practical experience at sea.

OCEN 491 Special Topics in Ocean Engineering 3 credits

PREREQUISITE: Permission of Instructor

New developments in Ocean Engineering and related areas.

Florida Atlantic University

Florida Atlantic University is the first upper division university to be established in the United States. It offers the junior and senior years of undergraduate study and graduate opportunities in selected disciplines. The University is accredited by the Southern Association of Colleges and Schools.

The University's Department of Ocean Engineering is the first of its kind anywhere in the world to offer an integrated program in this new and rapidly expanding field.

Cooperative Education in Ocean Engineering began in September, 1968, with the assistance of the National Science Foundation as part of the National Sea Grant Program. In this program, the student will have equal and alternate six-months (two quarters) periods of academic instruction and of on-the-job training in cooperating industrial organizations which are engaged in one or more ocean engineering activities. Students will study and work in pairs, and both the University and the Corporation will have students at work throughout the calendar year. After satisfactory completion of six quarters of academic study and twelve months of practical work, the student will receive his baccalaureate degree.

Cooperative Education offers the student an excellent opportunity to appraise industry for his future career and to earn sufficient funds to defray all or a large part of his university expenses; also, it enables the Corporation to evaluate the student for permanent employment.

Cooperative Program students may be chosen by the versity or by the Corporation, following car investigation to assure eligibility. The applicant must h completed all prerequisites for enrollment in Department of Ocean Engineering at the Univers must have a grade point record of above 2.00 for his wo at the junior or senior college from which he transf must be well recommended by his former instruct and must agree to remain in the program until completio if his accomplishments qualify him to do so.

Students interested in further information about program should give the information requested on attached post card. No postage is required for mail

SCHEDULE OF FEES FOR ONE QUARTER

Application Fee	$ 15.00
Registration Fee	190.00
Non-Florida Resident Fee (In addition to Registration Fee)	350.00
Residence Hall Charge	145.00

Fees at Florida Atlantic University are comparable to those charged at other state universities in Florida. They are subject to change by action of the State Legislature and other governing boards.

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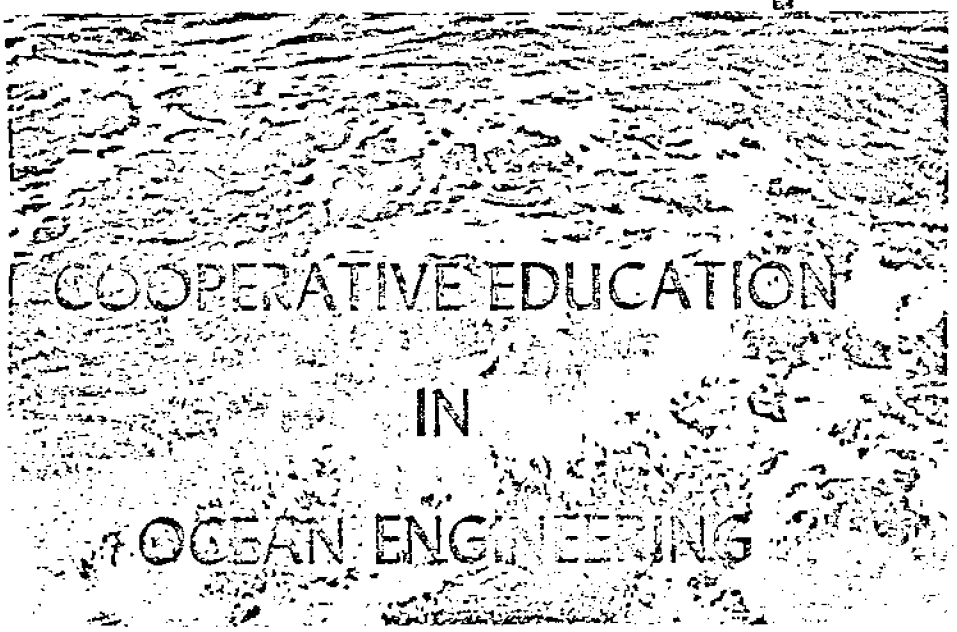
Coordinator, Cooperative Education
Department of Ocean Engineering

FLORIDA ATLANTIC UNIVERSITY

A State University at Boca Raton

Announces

COOPERATIVE EDUCATION IN OCEAN ENGINEERING



Admission to Florida Atlantic University is open to graduates of junior colleges and to transfer students from other colleges and universities who have successfully completed their first two years of undergraduate work and who are recommended by their schools for further study. The prerequisites for admission to specific programs, including those for ocean engineering, insure that the student is adequately prepared and has a reasonable chance for success.

Complete details are available from advisors at the colleges from which the student transfers and from the Director of Admissions at Florida Atlantic University, Boca Raton.

Name _____ Date _____
Last First Middle

Permanent Address _____
No. and Street City State

Date of Birth _____

Marital Status _____ Are you a U.S. Citizen? _____

High School Attended _____ Date of Graduation _____

College Attending _____ Date of Graduation or Transfer _____

Do you have use of a car? _____ Driver's License No. _____ State _____

Military Service? _____ Branch of Service _____ Dates _____

Present Principal Field of Interest _____

Offering Courses of Study in . . .

The College of Business and Public Administration

The College of Education

The College of Engineering

The College of Humanities

The College of Science

The College of Social Science

Florida Atlantic University

OCEAN ENGINEERING

The Department of Ocean Engineering provides a comprehensive curriculum in science and engineering which will prepare the student for graduate study in oceanics and for professional positions in industry, government, and science. The program comprises integrated work in basic engineering, science, and mathematics; study of the ocean environment and its relations to other sciences and fields of engineering; instrumentation and processing of data; and practical applications to exploitation of the resources of the ocean. Emphasis is placed on problems related to underwater acoustics, power, structures, instrumentation, mining, food, and corrosion. Electives in the humanities and social sciences are included to insure a well-rounded education.

ANALYSIS OF FAU OCEAN ENGINEERING
COOPERATIVE WORK/STUDY PERFORMANCE

Student, Assignments, Co-op Wage and Present Placement	Work involved, Supervisor's Evaluation of Student, and Student's Evaluation of Co-op Job
AGEN, LOUISE M.(Mrs.D.J. Karl) 1. Woods Hole Oceanographic Institution 9/9/70-3/71 $408.40/month Employed, USN Ship Engineering Center, Hyattsville, Md.	Assisted in design and test of buoy system components. Supervisor's Evaluation: Should listen rather than interrupt with her own conclusions. Has been a great help and improved greatly while here. Student's Evaluation: Enjoyed work at WHOI--had opportunity to use knowledge acquired so far in school.
BOHRES, GARY 1. USN Ships R&D Center 4/6/71-9/71 $517/month Employed, USN Ship R&D Center	Sonar self-noise involving submarine trials. Supervisor's Eval: Outstanding, hired immediately upon graduation. Student's Eval: Working conditions excellent, living conditions expensive.
BOURGAULT, THOMAS P. 1. Woods Hole Oceanographic Institution 3/18/72- $408.50/month On co-op job	Design, deployment and retrieval of ACODAC moorings (3 mile long hydrophone array which listens to ambient noise). July 27 we leave to implant these in Madeira and Sicily.
BRITCH, JAMES A. 1. Amoco Production Co. 3/25/70-9/17/70 Employed, Amoco Production Co.	Work on inspection of fabrication of platform to be installed in Gulf of Mexico; basic assignment was corrosion protection. Supervisor's Eval: Intelligent, industrious, consistent; would be good permanent employee. Student's Eval: Gained basic idea of areas of academic study to be stressed during completion of FAU study period.
BROWN, ERIC 1. Amoco Production Co. 3/29/71-8/31/71 $700/month	Inspected offshore platform fabrication; fitting, welding, painting and load out. Basically keeping watch and making sure Amoco's best interests are served. Supervisor's Eval: Average, needs to apply himself and push a little harder. Student's Eval: Good job, could have had better communications with employer.
2. SeaDiver Corporation 1/3/72-3/24/72 $400/month At FAU	Drafting, purchasing, general labor. Supervisor's Eval: Needs better drafting ability as do other students from FAU. Dependable, industrious.

BROWN, cont...
SeaDiver Corporation — Student's Eval: Restrictive work environment, not much engineering work.

CARGILL, JOHN STEVEN
1. Underseas Engineering, Inc.
4/1/70-8/70
$400/month
Employed, Underseas Engineering, Inc.

Work on pressure vessel strain analysis.
Supervisor's Eval: Very good except for lack of technical sophistication.
Student's Eval: Very good working conditions, relations with other workers, locality, etc.

CERMAK, VINCE
1. General Dynamics Electric Boat Division
9/9/69-

Did not complete co-op period. Enrolled at University of Rhode Island.

CLAY, PETER R.
1. Woods Hole Oceanographic Institution
3/20/72-
$350/month
On co-op job

Assistant engineer and apprentice; ranging from paperwork to drafting and design of deep sea mooring. Specifically assigned to design and deployment of deep sea hydrophone mooring.

CURRY, AL J.
1. International Nickel Co.
4/1/71-8/71
$625/month
Employed, "SeaFinders, Inc." Bahama Islands

Measurement of factors effecting corrosion in marine environment, special attention given to chloride measurement. Compile study of deep sea water corrosion data for company use only.
Supervisor's Eval: Interested and enthusiastic, little day to day guidance needed, worked almost entirely independently, but gave up too quickly when immediate results did not show.
Student's Eval: Good job; given free hand in research and good guidance if needed, supervisor always interested.

DAMAN, HENDRIK
1. Nova University Physical Oceanography Laboratory
3/71-6/71
$220/month

Assisted in program involved with development of instrument to measure frictional stress ocean currents exert on sea bottom.
Supervisor's Eval: Eager, conscientious worker, will prepared and qualified.
Student's Eval: Gained much practical experience, good employer.

2. Test-Rodi Yacht Basin
6/14/71-12/71
$875/month
At FAU

Redesign, estimate cost, manufacture and install load bearing members on power boat which was breaking apart due to use of undersize parts and materials.
Supervisor's Eval: Qualified, original, efficient ideas, credit to his employer.
Student's Eval: Excellent employer, good pay.

DANIEL, WILLIAM H.

1. Naval Research Lab
   4/3/72-
   $538/month
   Research aide, artificial and natural surface films at air-sea interface; construction of experimental equipment used.

On co-op job

DAVENPORT, ROBERT G.

1. Fluor Ocean Services
   4/10/72-
   $452.50/month
   Work as diver tender offshore, some commercial diving.

On co-op job

DORSEY, MARGARET

1. USN Undersea Research & Development Center
   3/72-
   Study of quality of underwater cables in Metallurgy/Materials Branch, Computer Sciences and Engineering Department.

On co-op job

DURRANCE, DALLAS H. III

1. Gee & Jenson Consulting Engineers
   3/29-71-8/71
   $486.25/month
   Coastal engineering, bulkhead and groin construction, channel construction and other structures.
   Supervisor's Eval: Outstanding
   Student's Eval: Excellent employer, fellow employees interesting and helpful.

2. Gee and Jenson
   3/20/72-
   $486.25/month
   Design of channel connection for inland waterway, permits for ocean and waterway construction, remedial measurements for local ports.

On co-op job

DYER, MICHAEL M.

1. Electric Boat Div.
   General Dynamics
   3/31/69-9/13/69
   $700/month
   Analysis and overhaul.
   Supervisor's Eval: Willing to get with a job, is a ready learner and mixes well.
   Student's Eval: Fine employer and good job, but not for permanent position.

Employed, Hawaiian American Co., Kauai, Hawaii

ELSEY, DOUGLAS R.

1. Undersea Research Ltd.
   Tobermory, Canada
   3/28/70-9/6/70
   $65/month
   Project engineer in charge of all maintenance and design of all life support systems on Sublimnos habitat, communications, etc.
   Supervisor's Eval: Learns very quickly, overall above average.
   Student's Eval: Money was poor but experience gained priceless, contacts made and responsibility on job more than made up.

2. Fluor Ocean Services
   3/29/71-8/16-71
   $452.50/month
   Diver's tender, taking complete care of diver and equipment and acting as labor force on diving operations. As engineering aide, helped work existing problems in diving industry such as shock absorbing system for diving bells and concept design on umbilical winch for bell.

Employed, ACCESS Corp. (Perry Engineering) Toronto, Canada

ELSEY, cont...

Fluor Ocean Services

Supervisor's Eval: Good problem solving capability and enthusiasm. Has tendency to envision future rather than expedite job at hand (cart before horse).
Student's Eval: Poor work environment and supervisor but gained valuable experience.

ERWIN, ROBERT D.

1. USN AUTEC
   9/14/70-3/16/71
   $612.50/month

Work with and aid in any way possible engineers engaged in program management (undersea cable).
Supervisor's Eval: Agressive in researching and completed assignments, excellent attitude and worked well with others.
Student's Eval: Good people to work with, overcrowded conditions.

2. USN Air Development Center
   9/17/71-3/17/71
   $616/month

Assist contractors with sea tests, diving, communications, boat handling, etc.
Supervisor's Eval: Very dependable, needs to be less reserved.
Student's Eval: Employer concerned about future career; sometimestoo much overtime.

At FAU

FARABEE, THEODORE M.

1. USN Ship R&D Center
   4/6/71-9/14/71
   $485/month

Investigation of fluctuation pressure field at the wall of pipe due to fully developed turbulent flow, and other projects of classified nature.
Supervisor's Eval: Readily tackles difficult concepts, draws conclusions a bit too hastily, diligent.
Student's Eval: Excellent supervisor,good job.

2. USN Ship R&D Center
   3/27/72-
   $616/month

Acoustical data reduction and classified work.

On co-op job.

GOUGH, EDWARD C.

1. SeaDiver Corporation
   9/13/71-12/22/71
   $486.25/month

Manual labor to construct and finish crane; draftsman preparing submersible for ABS certificate.
Supervisor's Eval: Outstanding person in group of four workers.
Student's Eval: Poor work environment.

2. Woods Hole Oceanographic Institution
   1/3/72-3/72
   $387/month

Planned engineering projects with deep sea buoy and mooring systems.
Supervisor's Eval: Excellent co-op student, one of best so far, would certainly consider his application for renewed appointment in our group.
Student's Eval: Exceeds expectations, friendliest and most stimulating community.

At FAU

HENDERSHOT, ROBERT G.

1. Amoco Production Co.
   3/31/69-9/19/69
   $550/month
   Employed, Amoco Production Co.

   Overall quality control of offshore oil platform fabrication including welding, inspections, reports, recommending changes and customer-contractor coordinating.
   Supervisor's Eval: Exceptionally good judgement, agressively tackles work assignments, assumes responsibility well.
   Student's Eval: Excellent place to work.

ISERT, RICHARD J.

1. Marine Acoustical Services
   3/31/69-9/3/69
   $376.25/month
   With Peace Corps

   Draftsman, assistant in engineering calculations, seaman, decca navigator.
   Supervisor's Eval: Very good, needs to check math accuracy.
   Student's Eval: Good job, got along well with other workers.

KARL, DONALD J.

1. Massa Division
   Dynamics Corp. of America
   3/31/69-9/12/69
   $473/month

   Experiments on hydrophones and transducers for resonance, noise level, capacitance, receiving and transmitting, sensitivity, beam patterns and vibration tests.
   Supervisor's Eval: Very good, shy, quiet.
   Student's Eval: Very good job, helpful supervisor

2. Massa Division
   3/30/70-9/11/70
   $537.50/month
   Employed, USN Ship R&D Center, Bethesda, Md.

   Transducer testing, design, calibration and construction.
   Supervisor's Eval: Willing to work and good intellect, lack of self confidence improving all the time.

KELLER, WALTER H.

1. International Nickel Co.
   4/1/69-9/12/69
   $550/month

   Research project on hot spot corrosion (denickelfication); design, building, testing to produce test for hot spot corrosion and initial testing of 70:30 copper-nickel tubes.
   Supervisor's Eval: Average, needs greater diligence, personal application and interest in work.
   Student's Eval: Job training very beneficial.

2. USN AUTEC
   3/30/70-9/18/70
   Employed, Hydrosurveys, Inc. Fort Lauderdale, Fla.

   In air tracking systems.
   Supervisor's Eval: Highly intelligent and agressive.
   Student's Eval: When specific project was assigned, learned much from job.

KEPLINGER, JOHN D.

1. Naval Air Development Center, Key West, Fla.
   3/17/71-9/10/71

   Assist in development of ASW techniques and equipment maintenance, development and installati
   Supervisor's Eval: Adapts quickly, intelligent, tends to be lax in arriving on time, works long without complaining.

KEPLINGER, cont...

1. USN Air Dev. Center
   Student's Eval: Superb employer, highly satisfied with job.

2. USN Air Development Center
   3/20/72-
   $612.50/month
   Sea support to ASW projects, aspects of ocean engineering including acoustics and mechanical and electrical engineering.

On co-op job.

KOENIG, FRED O.

1. Vitro Corporation
   Silver Spring, Md.
   7/69-12/69
   Assisted in preparation of proposals for company.
   Supervisor's Eval: Needs more initiative and self discipline, but can do well when interested.

Employed, Black, Crow and Eidsness, Boca Raton

KOVER, DONALD J.

1. Raytheon Company
   3/30/70-9/4/70
   Field technician, dye studies, circulation studies by drogue migration analysis.
   Supervisor's Eval: Extremely valuable addition to staff.
   Student's Eval: Very satisfied with job training received.

Employed, USN Ship R&D Laboratory, Annapolis, Md.

KUHLMAN, JAMES B.

1. International Nickel Co.
   4/1/70-9/11/70
   Worked on denickelfication of 70:30 Cu-Ni alloy.
   Supervisor's Eval: Needs to show greater interest and drive, good basic attitude.
   Student's Eval: Very interesting project, in all a good co-op job.

LaBONTE', ANDRE W.

1. Amoco Production Co.
   9/22/69-3/20/70
   Work on corrosion prevention on offshore platforms and research and findings pertaining to culturing of oysters on offshore platforms.
   Supervisor's Eval: Will work well when motivated, eager to learn, not as industrious as other co-ops on this job.
   Student's Eval: Good experience, outstanding.

Employed, Miami-Dade Junior College, Instructor

LAMBERT, MICHAEL F.

1. Global Marine, Inc.
   3/31/69-9/13/69
   $525/month
   Junior design engineer.
   Supervisor's Eval: Outstanding.
   Student's Eval: Excellent, would have preferred longer term specific project.

Employed, Offshore Technology Poway, California

LAUGHLIN, THOMAS J.

1. USN Ammunition Depot
   Crane, Indiana
   3/21/72-
   $551.25/month
   Test equipment for hydrophone pressure and sensitivity. Sent to deep water test facility in St. Croix, V. I.

On co-op job

LEITHAUSER, DAVID C.
1. Naval Research Lab
Washington, D. C.
3/20/72-
$540/month
On co-op job.

Navigator at sea. On land, filing and updating of nautical information.

LIVELY, WILLIAM DAVID
1. USN Civil Engineering Lab
Port Hueneme, California
9/1/70-2/20/71
$498/month

Model tests concerning breakout forces of objects embedded in sea floor.
Supervisor's Eval: Very good, dependable.
Student's Eval: Work went well, gathering data for report very interesting.

2. USN Ship Research and Dev. Center
9/13/71-12/22/71
Employed, USN R&D Center
Bethesda, Md.

Field Experience in submarine acoustic trials.
Supervisor's Eval: Learns quickly, very good employee.
Student's Eval: Very good opportunity for college student to learn.

McELWEE, JOSEPH
1. Hydrospace Research Corp.
4/1/70-9/2/70
$525/month

Use computer to average and process acoustic data.
Supervisor's Eval: Very good
Student's Eval: Good job, aided understanding of acoustics problems.

MILLER, JAMES C.
1. Amoco Production Co.
9/8/69-3/3/70
Employed, Amoco Production Co.

Offshore platform work.
Supervisor's Eval: Very good
Student's Eval: Excellent employer.

MULLEN, PATRICK J.
1. USN AUTEC
9/7/70-3/26/71
$612.50/month
At FAU

Worked on sonar target simulator for the acoustic test bed and surplus equipment needs.
Supervisor's Eval: Very good employee.
Student's Eval: Gained valuable insight into interface between government as a contractor and civilian sub-contractors.

NADEL, IAN S.
1. USN Civil Engineering Lab, Port Hueneme, Cal.
10/1/69-3/20/70
Employed, Miami-Dade Junior College, Instructor

Underwater construction and test of underwater excavators (planning stages only).
Supervisor's Eval: Excellent employee.
Student's Eval: Job would have been better if complications had not arisen in project.

NELSON, PETER J.
1. USN Ship R&D Center
4/6/71-9/2/71
$521.50/month
Employed, USN Ship R&D Center

Odd jobs for technicians, act as technician on trials, write reports.
Supervisor's Eval: Average-not overly interested
Student's Eval: Enjoyed co-op job very much but did not fit into capacity to which assigned.

NOBLE, ARTHUR D.

1. World Wide Divers
   Morgan City, La.
   3/24/69-9/13/69
   4/17/70-9/15/70

   Diver
   Supervisor's Eval: Outstanding
   Student's Eval: Good

2. SubSea International
   New Orleans, La.
   7/71-9/71
   $1900 month

   Diver
   Supervisor's Eval: Good worker, dependable, very interested and industrious.
   Student's Eval: Co-op period highly educational in broad sense of the word. FAU students should have more stringent requirements for report writing, it is very important to be able to communicate with the written word.

Employed, Odom Offshore Industries, Morgan City, La.

NORRIS, JAMES W.

1. Connell Associates
   Miami, Florida
   3/22/71-7/17/71

Field survey work, plan preparation, quantity take-off work; in Machinery Design Department, design of special machine and structural design for launch facilities at Cape Kennedy.
Supervisor's Eval: Very good, quick to learn, enthusiastic.
Student's Eval: Not much ocean engineering or supervision on the job.

PARADIS, JOHN B.

1. Naval Ordnance Lab
   White Oak, Md.
   5/3/71-9/71
   $517/month

Assist project engineers in construction of equipment for ambient noise survey aboard AG-SPAR, includes component wiring, rack assembly, equipment calibration, etc.
Supervisor's Eval: Very good.
Student's Eval: General atmosphere conducive to good work.

Employed, NOL, White Oak

PATCH, MICHAEL L.

1. Tracor/MAS
   Port Everglades, Fla.
   3/20/72-
   $539/month

Drafting, basic design work, blueprints, shipbuilding tasks.

On co-op job.

PETERSON, EDWARD H.

1. Amoco Production Co.
   8/31/70-3/12/71
   $705/month

Flotation and installation of offshore platforms.
Supervisor's Eval: One of better co-op students; has high potential, needs to improve ability to present material, his general character, attitude is asset.
Student's Eval: Good job, enjoy working with other employees.

Presently at USN CEC School, Port Hueneme, California (Officer, USN)

PETTERS, RICHARD A

1. Vector Cable Co.
   Houston, Texas
   3/27/72-
   $559.75/month

Building of solid seismic streamer cable. Mold flotation material, mount hydrophones, tape solder and splice molds.

On co-op job.

POTTS, SHERRILL S. (Miss)

1. Woods Hole Oceanographic Institution
   9/17/70-3/19/71
   $408.50/month

Assist engineering problems, drafting, testing equipment and design of apparatus for deep submergence vehicles. Also, computer use and navigation, at sea experience.
Supervisor's Eval: Neat, determined, reliable, somewhat introverted and needs success.
Student's Eval: Gained valuable experience in computer use and at sea work.

RASMUSSEN, PETER C.

1. Vector Cable Co.
   3/27/72-
   $559.75/month

On co-op job.

Build prototype oceanographic acoustic surveying solid streamer cables, layout and assembly.

REAGAN, GEORGE E.

1. USN Ship R&D Center
   1/13/71-3/71
   $521.50/month

At FAU

Test and evaluate electronic and electro-acoustic equipment; participation in and data analysis of full scale at sea noise trials of USN test vehicles.
Supervisor's Eval: Dependable, works well with others.
Student's Eval: Excellent job, very interesting.

RIBAKOFF, STEPHEN B.

1. Underseas Engineering, Inc.
   3/31/69-9/13/69
   $400.25/month

At graduate school, University of Hawaii

Engineer's aide, doing calculations on pressure vessels such as volumes, weight and trim.
Supervisor's Eval: Enthusiastic and learns quickly, tends to be somewhat careless.
Student's Eval: Poor work environment, crowded but valuable work experience.

SEIFERT, BEN W.

1. Underseas Engineering, Inc.
   3/31/69-9/13/69
   $300/month

Underwater construction, etc.
Supervisor's Eval: Very mature, learns quickly, sometimes a bit casual.
Student's Eval: Gained useful experience, satisfied with job.

2. Westinghouse Ocean Research Laboratory
   4/6/70-9/18/70

Employed, Offshore Technology
Poway, California

Worked on ONR sound scattering project in marine systems engineering division.
Supervisor's Eval: Satisfactory initiative but could have advanced much more through self initiated research.

SHOEMAKER, KAREN G. (Miss)

1. Woods Hole Oceanographic Institution
   3/30/70-9/11/70
   $387/month

Calculation and design of moorings; buoys, wire rope, nylon rope, instrumentation, etc. Analysis of failures due to such things as defective materials, corrosion, failure under stress. Also assemblying and deployment.

SHOEMAKER, cont...
Woods Hole Oceanographic Institution

Supervisor's Eval: Great help to WHOI group, recommended as excellent engineering student.
Student's Eval: Extremely educational, academically and practically. Fellow workers anxious to help and explain if you express an interest to learn.

2. Woods Hole Oceanographic Institution
3/28/71-8/71
$408.50/month
(married)

Design and test for shallow and deep sea moorings, routing analysis of tensiometer and inclinometer data. Review and calculations for graduate study course given by Mr. Berteaux, current studies and various permanent data stations.
Supervisor's Eval: Very good, could do better if she tried.
Student's Eval: Good theoretical experience, not too much practical work.

SHOAFF, RAYMOND L.
1. Hydrospace Research
3/26/69-9/2/69
$525/month
Employed, USN Numerical Weather Station, Monterey, California
U. S. Naval Officer

Aide to engineers in physical acoustics division. Research, calculations, plotting and simple experiments.
Supervisor's Eval: Willing to work on challenging tasks, mentally alert, friendly attitude.
Student's Eval; Excellent possibilities for permanent job.

SMISEK, THOMAS E.
1. Underseas Engineering
4/1/70-9/70
$452.50/month
Employed, Plastiline, Inc.

Mechanical engineering calculations on small submersibles.
Supervisor's Eval: Very good, short on background, has aptitude for computer work.
Student's Eval: Increased ability in making computer calculations.

TUMOSZWICZ, RONALD
1. USN Ship R&D Center
3/30/70-9/11/70
$460/month

Predict ship motions and dynamic ballasting of scale models.
Supervisor's Eval: Very good.
Student's Eval: Good working conditions, gained a lot of practical knowledge.

2. USN Shipyard
Bremerton, Washington
3/29/71-9/6/71
$521.50/month
Employed, USN R&D Center Bethesda, Md.

General and technical assistance to engineers and technicians in field of hydrofoil craft.
Supervisor's Eval: Eager to learn and tackle any job.
Student's Eval: Increased association with professionals very helpful.

WARD, ROGER M.
1. Fluor Ocean Services
3/72-
On co-op job

WATKINS, RANDOLPH M.

1. Tracor/MAS
   Port Everglades, Fla.
   3/72-

On co-op job.

WATSON, BRUCE A.

1. Global Marine, Inc.
   Los Angeles, California
   3/22/72-
   $575/month

Assistant to Naval Architect, dead weight survey, preparation of trim and stability, booklet, computer programming, proposal to jumboize a drillship.

On co-op job.

WEAVER, GREGORY S.

1. Vector Cable Co.
   Houston, Texas
   3/30/70-9/11/70
   $559/month

Worked on converting the engineering drawing and accounting stock list systems to better numbering systems.
Supervisor's Eval: Very good employee, interested and dependable.
Student's Eval: Not much ocean engineering involved but generally a good place to work.

Employed, Western Electric, Winston-Salem, N. C.

WEBSTER, BRUCE L.

1. USN Ship R&D Center
   3/30/70-9/11/70
   $490/month

Analyze data taken during tests; make calculations, prepare graphs and other work. Also did some work on the tests.
Supervisor's Eval: Very good, enthusiastic and quick to learn.

2. USN Ship R&D Center
   3/29/71-9/10/71
   $586.50/month

Reduction of dynamic data obtained from sea trials and evaluation of dynamic computer program designed to predict such data. Adaptation of several computer programs to increase their versatility.
Supervisor's Eval: Outstanding
Student's Eval: Good job excellent conditions.

Employed, USN Ship R&D Center Bethesda, Md.

WIDDOWS, EDWIN J.

1. Underseas Engineering
   3/27/72-7/20/72
   $402.50/month

Hydrostatic testing, inventory, cutting steel, stockroom.
Supervisor's Eval: Very poor worker, unsatisfactory, quit job.
Student's Eval: Unsatisfactory.

At FAU (expects to transfer to College of Science)

FLORIDA ATLANTIC UNIVERSITY
Cooperative Education, Department of Ocean Engineering

Interview Form and Report

Date _____

Name _____ Class _____
Last First Middle

College Address _____
Street City State Zip Code

Telephone _____ Date of Birth _____

Height _____ Weight _____

Physical Defects _____

Marital Status _____ Children _____ U.S. Citizen _____

Social Security Number _____

High School _____ Graduation _____

Honors _____, Activities _____

College _____ Graduation _____

Honors _____ Activities _____

Scholarship _____ Source _____

Amount _____ Overall Academic Average _____

Father's Name _____

Address _____ Occupation _____

Father's Employer _____

Do you use a typewriter _____ Words per minute _____

Do you know shorthand _____ Words per minute _____

Do you have use of a car _____ Driver's License _____

State _____

Greatest interest in H.S. studies _____

Greatest interest in College studies _____

(Retained in Student's Co-op File)

General interests and hobbies _____

Military Service _____ Branch _____

Dates _____ Reserve _____ Active _____

Other colleges or schools attended _____

_____

WORK EXPERIENCE

Arrange in order of last work first. Include military assignments.

Company	Duties	From	To	Wages	Reason for leaving

Part-time work this year _____ Hours per week _____

Expected Earnings _____ Plans for summer _____

_____

What is your ultimate vocational goal _____

What percentage of University expenses must you earn _____

Previous coop experience _____

What kind of coop work would you like _____

Where would you like to work _____

What companies do you perfer _____

References _____

_____

_____

INTERVIEW REPORT

Check appropriate characteristic:

APPEARANCE	MATURITY	PECULIARITIES
Attractive	Average	Manner
Careless	Immature	Movement
Neat	Very Mature	Speech
Ordinary		
Well groomed		

PERSONALITY & POISE	PLACABILITY
Awkward, dominant, passive	Average
Negative	Excellent
Balanced, offensive, quiet	Good
Colorless, ordinary, reserved	Marginal
Commonplace, strong	Poor
Confident, overbearing	
Talkative	

COMMENTS _____

_____

_____

_____

SUGGESTIONS FOR COOP PLACEMENT _____

_____

_____

DATES AVAILABLE FOR PLACEMENT _____

_____

(Retained in Student's Co-op File)

FLORIDA ATLANTIC UNIVERSITY
OCEAN ENGINEERING
Cooperative Work/Study Student
Resume

Date _____

NAME _____ S.S. No. _____

Address at FAU: _____

_____

_____

Home Address: _____

_____

Year of Study: __ Junior __ Senior __ Graduate

Previous Military Service: _____ From _____ To _____

Professional Fields of Interest: _____

_____

Previous Work Experience:

From	To	Organization	Job Assignment

Special Qualifications, Honors or Awards:

Any health or other restrictions that could affect work?

Remarks:

_____
Signature

(Sent to Prospective Employer with a copy of the Student's Academic Record)

COOPERATIVE EDUCATION PROGRAM
DEPARTMENT OF OCEAN ENGINEERING
FLORIDA ATLANTIC UNIVERSITY
BOCA RATON, FLORIDA 33432

APPROVAL OF PARENT OR GUARDIAN

(All students under 21 years of age must have the approval of a parent or legal guardian when making application for the Cooperative Education Program.)

As a (parent)(legal guardian) of the student making this application, I approve (his)(her) placement in the University's Cooperative Education Program whereby (he)(she) will alternate periods of academic study with periods of on-the-job work-training assigments. I understand that this alternating pattern will continue until the student shall be graduated or leaves the University for other reasons.

_____
(parent or guardian)

_____
(street address)

_____
(city, state, and zip code)

_____
(phone number)

Most students are placed outside the Boca Raton Area, many outside the State of Florida. When on a training period, a student is legally a full-time student. If the parent or guardian has any objection or restrictions on where the student may be placed, this should be given in the "Remarks" area below.

_____

_____

_____

_____

cc:Student's Co-op File
Employer
Parent

COOPERATIVE EDUCATION PROGRAM
DEPARTMENT OF OCEAN ENGINEERING
FLORIDA ATLANTIC UNIVERSITY
BOCA RATON, FLORIDA 33432

STUDENT AGREEMENT

Date_____

I, _____ agree to an assignment with

_____
(Name and Address of Employer)

as a student in the Cooperative Education Program in accordance with the regulations described in the brochure "Cooperative Education in Ocean Engineering at Florida Atlantic University". I understand that I am to be assigned, (with the permission of my parents or legal guardian if under age 21), to the above employer on an alternating, six-months program of study and training until I shall be graduated, or until released or transferred by the Coordinator of the Cooperative Education Program at the University.

Further, I understand that at the end of each training period, I will submit a report covering the training period to the Coordinator of the Cooperative Education Program at the University and that my employer will submit a report covering the quality of my work during this period. An evaluation of these reports will be the basis of a grade of "Satisfactory" or "Unsatisfactory" for the work period. The grade will be entered on my academic record at the University. Failure to comply with this agreement will result in disciplinary action.

This agreement does not bind my employer to continue my services beyond the time when he has need for them.

Signature:_____ Student Number_____

Social Security Number:_____ Selective Service Number_____

Signature:_____
(Director of Coordinator, Cooperative Education)

Remarks:

COOPERATIVE EDUCATION PROGRAM
DEPARTMENT OF OCEAN ENGINEERING
FLORIDA ATLANTIC UNIVERSITY
BOCA RATON, FLORIDA 33432

Date _____

NOTICE TO STUDENT TO REPORT TO COOPERATING EMPLOYER

YOU, _____, are scheduled to report to

_____

_____

on _____, 19___, for a six months training period which

will terminate _____, 19___.

Any event that may prevent you from keeping this schedule must be reported immediately to the Coordinator of Cooperative Education, Department of Ocean Engineering, Florida Atlantic University, Phone: Area Code 305, 395-5100, extension 2291.

cc:employer
faculty advisor
student's co-op file

:dg
2-3-72

FROM _____
(FULL NAME)

_____
(STREET NUMBER)

_____
(CITY) (STATE) (ZIP CODE)

First Class
Permit No.
13
Boca Raton
Florida

BUSINESS REPLY
no postage stamp necessary if mailed in the U S

POSTAGE WILL BE PAID BY -

Florida Atlantic University

Boca Raton, Florida 33432

Coordinator, Cooperative Education
Department of Ocean Engineering

I reported for my Training Period assignment: _____
(day and date)

Name and Address of Employer _____

My immediate supervisor is: _____

I am located in _____ Phone _____
(room, division)

My residence address is: _____
(Street) (City) (State) (Zip Code)

Note: If you give a P.O. Box Address, give a street address also, so that you may be located in an emergency.

IF APPLICABLE:

I am taking the following course, _____
(number and title)

at _____
(college, university or extension)

If taking the course at FAU, indicate by: Independent Study; Credit by Exam; Class Attendance

Signature of Student: _____

(mail first card after one week, second card after one month, and third card after three months.)

Date _____

FROM: _____

_____

_____

TO: Professor C. R. Stephan, Cooperative Work Program Coordinator
Department of Ocean Engineering
Florida Atlantic University
Boca Raton, Florida 33432

SUBJECT: OCEN 450 - Technical Paper, Subject Selection

1. My technical supervisor(s) for my Cooperative Work period is/are:

   Name: _____

   Title: _____

   Company: _____

   Address: _____

   Telephone No. _____

2. I have discussed the choice of a subject for the summer term with my supervisor. The following subjects are recommended:

   (1) _____

   _____

   (2) _____

   _____

3. I understand that you will notify my supervisor and me which subject is approved.

FLORIDA ATLANTIC UNIVERSITY

Boca Raton, Florida 33432

DATE: _____

TO: _____

_____

_____

_____

FROM: Cooperative Work/Study Program Coordinator
Department of Ocean Engineering

SUBJECT: Technical Paper, Subject Selection, Approval of

1. Your selection of the following topic for your technical paper for OCEN ____ is approved.

2. Maintain close liaison with your supervisor, while at work, in the preparation of your paper. Thorough preparation on the job and careful presentation of the subject matter in the paper will assure a high grade.

3. By copy of this letter, your supervisor is advised of the subject approval. Any and all help given to you will be greatly appreciated.

4. Your paper will be due one month after classes start on your return to FAU. Follow the format in "Guide to Technical Reports" by Piper and Davie.

5) Be certain to register for OCEN ____ for the _____ quarter _____.

cc: Faculty Advisor
Student's Co-op File

_____

_____

_____

_____

COOPERATIVE EDUCATION PROGRAM
DEPARTMENT OF OCEAN ENGINEERING
FLORIDA ATLANTIC UNIVERSITY
BOCA RATON, FLORIDA 33432

MID-TERM REPORT BY STUDENT ON TRAINING PERIOD

(Return to Coordinator, Co-op Education Program after 3 months of training period.)

Student_____ Social Sec. No._____

Date reporting for training period_____

Employer and Address_____

_____

Rate of Pay_____ Hours per Week_____

Nature of Assignment (in some detail):_____

_____

_____

_____

_____

Immediate supervisor and title_____

Has your assignment helped you understand better your field of interest?_____

Do you plan to live in a residence hall on return to campus?_____

Are you currently enrolled in a course? _____ If so, list the university,

and course_____

Is the course an independent study?_____

Add any other comments concerning your assignment, such as working conditions,

housing, recreation, fellowship with other employees, opportunities for co-op

students in your job for next session starting in _____, etc._____

_____

_____

_____

(Use other side if necessary)

CRS:dp
cc:Faculty advisor
6-27-72

COOPERATIVE EDUCATION PROGRAM
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FINAL REPORT BY STUDENT ON TRAINING PERIOD

(Return to Coordinator, Cooperative Education Program after completion of training period and before the first day of classes.)

Student _____ Date _____

Employer _____ Total hours of training _____

Supervisor _____

Nature of Assignment (explain in detail) _____

Date assignment started _____ Date training period ended _____

Rate of Pay _____ Gross earnings for entire period _____

On the back of this page, give your view of your experience on this training period. Do you feel it had educational and/or training value? How might you have a more successful experience during your next training period? Can the Cooperative Education office of your employer help? Have you any advise for future co-op students who might be working for your employer, or have a co-op job in your locale? Discuss as fully as you wish.

7/72

COOPERATIVE EDUCATION PROGRAM
FLORIDA ATLANTIC UNIVERSITY

EMPLOYER'S EVALUATION OF COOPERATIVE STUDENT
(Comparison with other students of comparable academic level, with other personnel assigned to the same or similarly classified job and with individual standards. Retain one copy for your files.)

Company or Agency _____ Address _____

Student _____ Training Period _____ to _____

Assignment _____ Supervisor _____

RELATIONS WITH OTHERS
( ) Exceptional
( ) Works well with others
( ) Gets along satisfactorily
( ) Has some difficulty working with others
( ) Works poorly with others

JUDGEMENT
( ) Exceptionally mature
( ) Above average in making good decisions
( ) Usually makes the right decision
( ) Often uses poor judgement
( ) Consistently uses poor judgement

ABILITY TO LEARN
( ) Learns very quickly
( ) Learns readily
( ) Average in learning
( ) Rather slow to learn
( ) Very slow to learn

OVER-ALL PERFORMANCE
( ) Outstanding
( ) Very good
( ) Average
( ) Marginal
( ) Unsatisfactory

ATTITUDE-APPLICATION TO WORK
( ) Outstanding in enthusiasm
( ) Very interested and industrious
( ) Average in diligence and interest
( ) Somewhat indifferent
( ) Definitely not interested

DEPENDABILITY
( ) Completely dependable
( ) Above average
( ) Usually dependable
( ) Sometimes neglectful or careless
( ) Unreliable

QUALITY OF WORK
( ) Excellent
( ) Very good
( ) Average
( ) Below average
( ) Very poor

ATTENDANCE
( ) Regular
( ) Irregular

PUNCTUALITY
( ) Regular
( ) Irregular

WHAT TRAITS MAY HELP OR HINDER THE STUDENT'S ADVANCEMENT? _____

_____

_____

This report has been discussed with the student. Yes _____ No _____

_____ DATE _____
(Immediate Supervisor)

Please make additional remarks on the back of this form.

DEPARTMENT OF OCEAN ENGINEERING
FLORIDA ATLANTIC UNIVERSITY
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COORDINATOR'S INTERVIEW WITH STUDENT AFTER COMPLETION OF TRAINING PERIOD

DATE _____ COORDINATOR _____ GRADE _____

Employer _____

Training Period No. _____

Gross Earnings _____ Net Sav. _____

Transportation from/to campus _____

Cost of living/month _____

Apartment/month _____

Utilities/month _____

Food/month _____ Other _____

Sex: Female ( ) Male ( )

Married: Yes ( ) No ( )

Living at home, training period:
Yes ( ) No ( )

Employer Evaluation _____

Evaluation of Supervisor _____

Relations with fellow employees _____

Student satisfaction/job training _____

Work environment _____

Community living _____

Community participation: Much ( )
None ( )

Recreation: Legitimate theater ( )
Museums ( ) Art galleries ( )
Concerts ( ) Tours ( )
Sports ( ) Libraries ( )

WORK ASSIGNMENTS:

Production ( ) Design ( )
Laboratory ( ) Sales ( )
Administration ( ) Research ( )
Other ( )

BENEFITS OF TRAINING TERM:

Practical Experience ( )
Financial Aid ( )
Increased Field Knowledge ( )
Increased Contacts w/People ( )
New Methods, Procedures ( )
Job Offer After Graduation ( )
Association with Professionals ( )
Increased Maturity, Confidence ( )
Character Development ( )
Managing Time and Money ( )
Supervise/train Others ( )
Strengthened Interest in Major ( )
Reduced Interest in Major ( )
Learned of Strengths ( )
Learned of Weaknesses ( )
Travel/Cultural Experience ( )
"Big City" Living ( )

HOW TRAINING COULD BE IMPROVED:

More work in major ( )
More challenge, responsibility ( )
More formal training ( )
Specific work assignments ( )
Change of assignment ( )
Better pay ( )
Better supervision ( )
More communication with employer ( )
Longer training period ( )
Shorter training period ( )
Other (Specify on reverse side) ( )

GEOGRAPHIC LOCATION:

Local ( ) SE ( ) NE ( ) NW ( )
NW ( ) SW ( ) State ( )

Sociological activity ( )
Dramatics activity ( )
Church activity ( )
Educational activity ( )
Political activity ( )
Musical activity ( )

Course taken? Yes ( ) No ( )

Course title _____

How taken:

Examination ( )
Independent study ( )
Correspondence ( )
Class ( )

Grade _____

If no course, why not?

Too busy ( )
Overtime problem ( )
Community activities ( )
Not count for graduation ( )
Oppose correspondence course ( )
Needed academic rest ( )
Other (Specify on reverse side) ( )

Any communication problems with FAU?
Yes ( ) No ( )

Conflicts in scheduling of courses?
Yes ( ) No ( )

Courses you could not get?
Yes ( ) No ( )

Explain "yes" answers on reverse side.

Student ID No. _____

Date of training term _____

Address-phone, study term _____

_____

_____

Return next term?

Yes ( ) No ( )

Community size: 50,000 ( )
50,000 - 100,000 ( )
100,000 - 500,000 ( )
500,000 - 1,000,000 ( )
1,000,000 + ( )

WORK ATTENDANCE:

Days absent _____

Sick ( )
Leave ( )
Excused, personal ( )
Other ( )

Days late _____

Overslept ( )
Traffic ( )
Weather ( )
Other ( )

Training terms remaining in program. ( )

Total credits completed to date. ( )

Credits taking this term. ( )

IF STUDENT IS NOT RETURNING NEXT TERM, PETITION MUST BE COMPLETED.

NAME:
