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Brevard Engineering College Announcement 1965

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BREVARD ENGINEERING COLLEGE ANNOUNCEMENT

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BREVARD ENGINEERING COLLEGE
ESTABLISHED IN 1958

"The purpose of the Brevard Engineering College shall be to provide scientific and engineering educational curricula related to the field of Space Technology ... leading to undergraduate and graduate degrees; to provide specialized courses, services and seminars fundamental to the field of Space Technology; to engage in basic and applied research in science and engineering and other areas related to the field of Space Technology."

By Resolution of the Board of Trustees
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Austin College  
Oklahoma University  

Arthur B. Ward, B.E.E., M.S.E.E.  
Georgia Institute of Technology  
Rutgers  

Ralph Weller, B.S., M.S.  
Columbia University  
University of Arizona  

William T. Wells, B.S., M.S., Ph.D.  
College of William & Mary  
North Carolina State  

John M. Wessner, A.B.  
Amherst College  

Eugene West, B.S.  
Massachusetts Institute of Technology  

Bradford H. Whitaere, B.A.E., M.Ed.  
University of Florida  

John E. White, B.A., M.S.  
Bridgewater College  
Virginia Polytechnic Institute  

John G. Whitman, B.A., M.S.  
Williams College  
MIT  

Robert E. Wilkinson, A.B.  
Syracuse University  

Britain J. Williams, B.S., M.A., Ph.D.  
University of Georgia  

MATHMATICS  
Data Reduction, RCA  

ELECTRICAL ENGINEERING  
Capt., USAF  

ELECTRICAL ENGINEERING  
Data Reduction Analyst, RCA  

MATHEMATICS  
Engineer, RCA  

MATHEMATICS  
Technical Staff, PAA  

MATHEMATICS  
Instructor, Brevard Board of Public Instruction  

QUALITY CONTROL  
Director, Product Assurance, Radiation, Inc.  

ENGLISH  
Group Leader, RCA  

MATHEMATICS  
Engineer, RCA  

ELECTRICAL ENGINEERING  
Staff Engineer, Radiation  

HUMANITIES  
Supervisor, Personnel & Public Relations, General Electric Co.  

MATHEMATICS  
Statistician, RCA  

Mrs. Elizabeth G. Williams, B.A., M.A.  
Wake Forest College  
Columbia University  

Glynn B. Williams, B.S.  
University of Florida  
Assoc. Mathematician, RCA  

James R. Williams, E.E.  
Commercial Radio  
Lead Engineer, Circuit Design, Radiation  

Joseph N. Williams, Bachelor of Building Construction  
Bachelor of Architecture  
College of Architecture  
University of Florida  

Earl V. Wood, B.A.  
Bridgewater College  
Data Reduction Mathematician, RCA  

David D. Woodbridge, B.S., M.S., Ph.D.  
University of Washington  
Massachusetts Institute of Technology  
Oregon State University  

Ray A. Work, Jr., B.E.E., M.S., P.E.  
The Ohio State University  
The State of Ohio  
The State of Florida  

John R. Wright, B.S.M.E., M.S.  
University of Miami  
Purdue University  
The State of Florida  

John F. Yardley, B.S., M.S.  
Iowa State University  
Washington University  

Colonel Raymond A. Yerg, B.S., M.S., Ph.D., M.D.  
Seaton Hall  
Georgetown University  
Harvard School Public Health  

ENGLISH  
BEC  

PHYSICS  
BEC  

MATHEMATICS  
Engineer, RCA  

ENGINEERING  
Engineer, PAA  

SPACE TECHNOLOGY  
Manager, McDonnell Aircraft  

SPACE TECHNOLOGY  
Deputy for Bioastronautics, AFMTC
FOREWORD

HISTORY AND AIMS

Brevard Engineering College was founded in 1958 by engineers and scientists working in the nation's space industry at Cape Kennedy. The campus is located in Melbourne, Florida, a few miles south of Patrick Air Force Base, the center of engineering and scientific activities for the Eastern Test Range.

It is the objective of the college to provide opportunities for higher education in engineering, science, and the new field of space technology. Although the college has been primarily an evening school for those working at the Cape Kennedy Complex, full daytime programs were established in 1962 to fit the needs of others seeking quality education at the college.

Many of those associated with the college are regularly employed in the missile test industry as scientists, engineers, or technical managers. Each is expert in his own particular field, and it is this expertise that is brought into the classrooms. There are few colleges that can boast of such depth of technical experience in their teaching staff.

In spite of skyrocketing educational expenses, Brevard Engineering College demonstrates that a private school . . . voluntarily supported by the community and by industry . . . can become a successful, growing organization. At present, 850 students are enrolled, a third of them in the graduate school. Like the faculty, most of the students are employed in the aerospace industry at Cape Kennedy.

Undoubtedly the most important achievement of the college is the contribution now being made to America's growth in space technology. Education in space technology for scientists and engineers can best be secured where problems occur and where they are being solved at the nation's major missile development center.

Brevard Engineering College was planned and organized with foresight to meet a present need and to match its growth with the challenge of the future.

CAMPUS

The Brevard Engineering College campus is situated on approximately fifty acres of partially wooded land in the City of Melbourne, Brevard County, Florida. The present college buildings are located along Country Club Road upon which the campus fronts. A stream, abounding with a natural growth of palm trees, circles around the campus forming a tropical "backdrop" to the campus proper. An administration building with two modern, completely air-conditioned classroom wings was completed in 1961. An additional structure containing five classrooms and two offices was completed in 1962, and a science building for chemistry, physics and engineering laboratories was opened in the fall of 1963.

The William August Bartholomae Library was dedicated in January 1965. Brownlie Hall, a new men's dormitory, will be ready for occupancy in April 1965. A second and larger dormitory is scheduled for completion in September. A student union building containing a cafeteria and bookstore will be completed for the opening of the spring 1965 term.

ACCREDIATION

Brevard Engineering College is fully accredited by the Southern Association of Colleges and Schools as a specialized institution in support of the space activity at Cape Kennedy. Also, it is the policy and practice of the college to carry out engineering curricula in conformity with criteria established by the Engineers' Council for Professional Development.


Brevard Engineering College is a full member of the Florida Association of Colleges and Universities.

OPERATION AND CONTROL

The Brevard Engineering College is incorporated as a non-profit educational institution and chartered to confer undergraduate and graduate degrees. Under the provisions of the corporate charter, control of the college is vested in a self-perpetuating Board of Trustees. The Trustees, elected to the Board, are outstanding civic and industrial leaders in the community and serve without pay. The charter provides that the college operate as a co-educational, non-sectarian, private institution of higher learning.
FINANCIAL SUPPORT

The college is primarily supported by the tuition and fees of students. Careful attention to sound business policies, help from dedicated friends of the college, and insistence on a balanced budget have placed the institution on a sound financial basis.

The U. S. Bureau of Internal Revenue has declared the Brevard Engineering College to be tax-exempt, thereby allowing donations to the college to be tax deductible.

Dr. Dan Dahle conducting class in the Chemistry Laboratory.

LIBRARY

The William August Bartholomae Library is the focal point of academic activity for students and faculty on the campus. It also provides service to the entire Cape Kennedy area, supplementing the facilities of the public and industrial libraries of Brevard County. Its development is aimed at providing the intellectual resources of books, periodicals, documents, and other library materials to support and enrich the academic curricula and graduate research programs.

The college library currently contains more than 11,000 books, subscribes to about 200 technical journals, and receives more than 400 United States Government documents each month.

The book collection is planned primarily to support the college curriculum but contains, in addition, numerous volumes in all areas of interest to college students. The aeronautics and space flight section is the area of major concentration. Two other noteworthy special collections are the LINDEMANN HISTORY COLLECTION and the HOWE COLLECTION OF CLASSICAL LITERATURE.

The periodical department consists of an outstanding collection of technical journals, many of them bound.

The library is a federal depository for U. S. Government publications, one of two permissible depositories in the 11th Congressional District. Government documents are included in the reference department and have limited circulation, but are available for all adults in the community to consult in the reading room of the library. Among them are current publications of the National Bureau of Standards, the National Aeronautics and Space Administration, the Education Office, the Civil Defense Office, and many others.

A professionally trained librarian is in charge of the library. Student assistants form an important part of the staff and receive practical experience in library service. The regular staff is assisted by volunteers called "Friends of the Library".

The two-story building was completed in January, 1965, and has 11,000 square feet of floor space. Reading room space is provided for 200 patrons and shelf space for 40,000 volumes, as well as the necessary offices and other facilities.

The library is a member of the American Library Association and the Florida Library Association.
HOUSING

Brownlie Hall, a sixty-four student men's dormitory, is located on campus. A second dormitory is scheduled for completion for September, 1965.

It is the policy of the college that non-commuting students live in the dormitory facilities provided. In cases where a dormitory facility may not be available, the student will be housed in college approved housing.

STUDENT CENTER

A student center building is located on campus. It contains a lounge, snack bar, cafeteria, and bookstore.

The lounge area is located adjacent to the tables in the cafeteria. During the hours that the cafeteria is closed, students may use the lounge and associated area. The lounge is closed to recreation during the serving hours, but is available for small group discussions.

FOOD SERVICE

A modern cafeteria seating eighty students at one time is located in the student center. The cafeteria serves breakfast, lunch, and dinner, and remains open as a snack bar in the evening. The cafeteria is operated by the college.

BOOKSTORE

A bookstore is maintained for the accommodation of the students, and is located in the student center. New and used textbooks and other collegiate articles are available.

MEDICAL SERVICE

No medical facilities are presently provided by the college. However, a new modern hospital, fully staffed and equipped, is a three minute drive from the campus. The student's parents will be notified in the event of serious injury or illness.

College regulations require that full time students carry health insurance. Students without coverage may obtain policies through the college upon entrance.

COUNSELING SERVICES

The guidance services of the college are designed to assist the students with educational, vocational, financial, social and personal problems as they arise, and to help them take full advantage of the academic and social opportunities offered to them by the college.

PLACEMENT SERVICE

The Placement Bureau will assist students in obtaining part-time and summer employment as well as permanent employment toward a career.

TRANSPORTATION

Students must provide their own transportation. Downtown Melbourne is within easy bicycling distance of the campus.

STUDENT GOVERNMENT

All full time day students of Brevard Engineering College automatically become members of student government when they register. They elect officers who serve as a direct liaison between the administration and students.

STUDENT REGULATIONS

All regulations pertaining to student behavior, dress, smoking, drinking of intoxicating beverages, and operation of automobiles on the campus are covered fully in the Student Handbook.
ACADEMIC REGULATIONS

CREDIT HOURS

The credit hours of each course are normally represented by the number of class meeting hours per week for one term. Since there may be exceptions to this general rule, particularly for laboratory periods, the Course Description should be consulted for the credit hours of specific courses.

THE GRADING SYSTEM

The system of grading is as follows:

- A (excellent) — 90 - 100  4 credit points
- B (good) — 80 - 89  3 credit points
- C (average) — 70 - 79  2 credit points
- D (poor) — 60 - 69  1 credit point
- F (failed) — 0 - 59  0 credit points
- I (incomplete)  0 credit points
- N (no grade)
- WP (withdrawal—passing)
- WF (withdrawal—failing)

INCOMPLETE WORK

A grade of “I” is given for incomplete work and indicates that the work of the student in the course is qualitatively satisfactory and that there is reasonable expectancy that completion of the remaining work may result in a passing grade. The instructor shall furnish the Chairman of the Department or the Dean with a statement of the work required to be completed. The student must complete the work, and the instructor must report the final grade at the earliest possible time, but not later than six weeks following the quarter in which the “I” was received except with special permission of the Dean. If there is no possibility of the student’s receiving a passing grade, even if he should complete the remaining work, the grade entered shall automatically be an “F”. As soon as the incomplete work has been made up, the instructor, or in the case of his absence from the college, the Department Chairman or Dean, shall file the proper mark in the Registrar’s Office. Until such time as the final mark is recorded, the credit hours in the uncompleted course shall not be counted or considered for any purpose.

AUDIT

A student may audit a course with the permission of the Dean and payment of the regular tuition and fees for the course. An auditor does not receive a grade, but an “N” is entered in the grade space of the final grade report. This shall indicate that the auditor has in general maintained a satisfactory course attendance.

No changes in registration from credit to audit will be permitted after the first week of classes.

WITHDRAWAL

In order to withdraw officially from any registered course, the student shall make written application to the Dean for permission to withdraw. Application shall be made on a form provided for this purpose by the Office of the Registrar.

Students who withdraw with permission from a course at any time prior to the first day of the sixth week of classes will have a “W” entered on their grade card.

Students who drop out of a course without permission of the Dean will be automatically credited with a failure.

The policy on tuition refund is described under the section, Financial Information.

Students who are granted permission to withdraw on or following the first day of the sixth week of classes, and whose work to date has been “passing”, will have “WP” (Withdrawal—Passing) entered on their grade card.

Students who are granted permission to withdraw on or following the first day of the sixth week of classes, and whose work to date has been "failing", will have "WF" (Withdrawal—Failing) entered on their grade card.

The college will not entertain requests for withdrawal after the start of the ninth week of classes.

POINT HOUR RATIO

A student’s academic standing for a term is expressed by his point hour ratio. This is determined by dividing the total number of points earned by the total number of credit hours scheduled or undertaken. The number of points is obtained by multiplying the
number of credit points by the number of credit hours for each course. The following is an example:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Credit Hours</th>
<th>Grade</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>5</td>
<td>A</td>
<td>20</td>
</tr>
<tr>
<td>No. 2</td>
<td>3</td>
<td>C</td>
<td>6</td>
</tr>
<tr>
<td>No. 3</td>
<td>(3)</td>
<td>I</td>
<td>0</td>
</tr>
<tr>
<td>No. 4</td>
<td>3</td>
<td>B</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35</td>
</tr>
</tbody>
</table>

Point hour ratio 3.18

When the final grade on Course No. 3 is recorded, the points and hours will be included in computing the student's point hour ratio. When a student has a record for two or more terms, he will have a cumulative grade point average determined by dividing the total points earned by the total hours undertaken. The point hour ratio of transfer students will be computed only on the work done at Brevard Engineering College.

WARNING AND DISMISSAL

"1.5 Rule." If a student's cumulative point-hour ratio is below 1.5 at the end of the third, or any subsequent term of residence, he shall be dropped from the degree candidacy.

"Special Action." The Dean may dismiss a student if at any time his preparation, progress or success in his assigned work is deemed unsatisfactory.

"Transfer Students." Students who have transferred credit from another college or university will have two Quarters at Brevard Engineering College before the above dismissal rules apply. The point-hour ratio of such a student will be computed on the work done at Brevard Engineering College.

REMOVAL OF FAILURE IN REQUIRED COURSE

The student is responsible for repeating in class, at his first opportunity, a required course in which he has failed.
FINANCIAL INFORMATION

TUITION

Tuition for full time students (15 to 21 hours) is charged at the rate of $630 per academic year or $210 per term. Tuition for part time students for lecture courses is charged at the rate of $14 per credit hour for undergraduate courses and $18 per credit hour for graduate courses. Tuition for laboratory courses is charged at the rate of $48 per course, except chemistry laboratory which is $28 per course. Full time students will be billed at the rate of $15 per hour for any hours in excess of 21.

Effective with the Fall 1965 Term, tuition for full time students will be $675 per academic year or $225 per term. Tuition for part time students for lecture courses will be charged at the rate of $15 per credit hour for undergraduate courses, and $19 per credit hour for graduate courses. Tuition for laboratory courses will be charged at the rate of $50 per course, except chemistry laboratory which will be $28.

DEPOSITS

Term bill and dormitory deposits are required of full time students upon their acceptance by the college.

FEES

An entrance fee of $5 is charged. This fee is not refundable.

A fee of $5 is charged for special examinations.

A fee of $1 is charged for transcripts after the first copy.

Graduation fees are charged as follows:

<table>
<thead>
<tr>
<th>Degree Type</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate certificate</td>
<td>$10</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>$15</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>$20</td>
</tr>
</tbody>
</table>

The charge for dormitory housing is $100 per term or $300 per academic year.

BOOKS

Full time students should budget approximately $100 per year for books and supplies.

TUITION REFUND POLICY

Since the college bases its budget for the term upon the full collection of tuition from all students who are accepted, tuition refunds can be made only in accordance with the following schedule and upon written application:

<table>
<thead>
<tr>
<th>Week of Classes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>First week</td>
<td>100%</td>
</tr>
<tr>
<td>Second week</td>
<td>70%</td>
</tr>
<tr>
<td>Third week</td>
<td>40%</td>
</tr>
<tr>
<td>Fourth week</td>
<td>10%</td>
</tr>
</tbody>
</table>

No tuition refund will be made after the end of the fourth week of classes.

Refunds to veterans enrolled under PL550 and 889 are strictly in accordance with the requirements of the Veterans Administration.

SCHOLARSHIPS AND LOANS

Various scholarships are available to students. The Canaveral Post, Society of American Military Engineers, Patrick Air Force Base, has established the "William H. Starnes Memorial Fund" as a student loan fund. The National Defense Student Loan Program is available to students at Brevard Engineering College.
THE BACCALAUREATE DEGREE PROGRAMS

DEGREES

Bachelor of Science degrees are offered in Electrical Engineering, Physics, Mathematics, and Space Technology.

THE COLLEGE YEAR

The college operates on the quarter or term basis. Each of these terms comprises approximately 11 weeks. They are designated the summer term, fall term, winter term, and spring term. Students may enter at the beginning of any term. A calendar of events will be found on the last page of the catalogue.

ARRANGEMENT OF CLASSES

Students may pursue courses of study on either a part time or full time basis. The baccalaureate degrees may be earned on either basis or on a combination depending on the students' needs.

The day time classes parallel the evening classes so that employed students may attend throughout the year in either class with no conflict with their regular employment schedule.

Undergraduate evening classes meet on Monday, Wednesday, and Friday evenings, from 7:00 to 10:00 P.M. Recitation sessions are divided into two periods of 80 minutes each, giving a total of six periods per week. Each subject occupies two periods per week, on different evenings, allowing for a maximum load of three subjects per term.

Undergraduate day time classes are scheduled throughout the day from Monday through Saturday.

REQUIREMENTS FOR ADMISSION

To be admitted to the College, an applicant must be at least 17 years of age and a graduate of an accredited high school, or must have been granted a high school equivalency diploma. The applicant must have attained a scholastic average which indicates a reasonable probability of success in college.

APPLICATION FOR ADMISSION

All correspondence concerning admission to Brevard Engineering College should be addressed to the Registrar, Brevard Engineering College, Melbourne, Florida. An application blank should be requested, filled out, and returned to the Office of the Registrar. The applicant should also request his High School to send his transcript to the college.

APTITUDE TESTING

An aptitude examination (ACE) is given to all entering undergraduate students. The object of the examination is to guide the faculty in assisting individual students.

ADVANCED STANDING

Credit for work completed with a grade of "C" or above at another institution may be granted if an official transcript is presented, and if it is determined that the work is equivalent to that given at the Brevard Engineering College in course content and hours. In doubtful cases, credit may be granted by written examination. A minimum of 45 quarter hours, however, must be taken at Brevard Engineering College in the appropriate program to satisfy any of the undergraduate degree requirements.

SPLIT SCHEDULE

Students may split their work among different years of the curriculum as best fits their entrance qualifications, subject to conflict in classroom hours.

SPECIAL STUDENTS

Students who are not candidates for a degree may take any of the courses they desire, provided they are able to satisfy the course prerequisites. Such students are classified as Special Students.

SPECIAL COURSES

Nearly every term, the college offers one or more special courses which are outside the regular degree programs. These courses are offered on demand and some carry college credits.
CLASS SCHEDULES

A specific class schedule is available approximately one month before the beginning of each term. The class schedule states the courses to be offered, the days of the week, and the hours of the day. Copies will be mailed upon request.

CORRESPONDENCE WORK

The college offers no correspondence courses.

RESIDENCE

No less than forty-five quarter hours of work must be completed at Brevard Engineering College. The final fifteen (15) quarter hours before graduation must be earned in residence. The college reserves the right to change requirements for graduation when it is decided that such changes are necessary. A student is generally graduated according to degree requirements at the time of admission unless attendance has not been continuous. In case of re-admission, degree requirements at the time of re-admission must be met.

DEGREE PROGRAMS

BACHELOR OF SCIENCE DEGREE

Brevard Engineering College confers the degree of Bachelor of Science upon students of high moral character who meet the requirements for the degree. Baccalaureate degrees are awarded in Space Technology, Electrical Engineering, Mathematics, and Physics.

ASSOCIATE PROGRAM

The Associate Certificate is awarded to part time students who successfully complete a planned program of 102 quarter hours in the basic courses with a minimum grade point average of 2.0. The Associate program forms the foundations for all curricula at Brevard Engineering College and is identical in content in the curricula in Space Technology, Electrical Engineering and Physics. The associate program at Brevard Engineering College is not intended to be a terminal program, but rather a milestone of academic achievements in a baccalaureate pursuit.

ACADEMIC REQUIREMENTS FOR THE BACHELOR OF SCIENCE DEGREE

Candidates for the Bachelor of Science degree are required to complete a minimum of two hundred and five (205) quarter hours of college work with a minimum grade point average of 2.0. Recommended programs of study are outlined below. Deviation from the program may be made only with the approval of the Dean. Each baccalaureate program must include at least 39 quarter hours, devoted to the humanities.

SPACE TECHNOLOGY

This curriculum leads to the degree of Bachelor of Science in Space Technology. In the upper division, the student receives training in courses unique to the profession of aerospace engineering. The program is designed to yield a broad training in both aerospace engineering and humanities, with an emphasis on the scientific aspects of space technology. The curriculum is geared to meet the needs of the aerospace industry for scientifically trained personnel and of the individual to enter the exciting profession devoted to the conquest of space.
ELECTRICAL ENGINEERING

The electrical engineering curriculum is primarily devoted to the principles which underline modern electronic engineering. In the early years emphasis is placed on mathematical and physical principles. The later years emphasize the basic analysis techniques of the engineer . . . the ways in which the engineer views physical situations and utilizes mathematical techniques in order to design a useful system or product. Finally, emphasis is placed on design of physical systems including electronic communications systems such as radar and telemetry. Communications, one of man's impelling desires, is the basic theme of the curriculum. Radar, radio, and wire telephony, measurement, electronic, computation are the fields of study designed to prepare the student for a career in engineering profession in the age of space.

MATHEMATICS

The curriculum in mathematics embraces required and elective courses in mathematics, allied scientific and technical areas, and the humanities, all of which provide the proper background for a career as a professional mathematician.

PHYSICS

The curriculum in physics is designed to train the student in both experimental and theoretical physics. Emphasis has been placed upon a curriculum that will provide a broad scientific basis for the development of the student in aerospace research. Before the student is granted a B.S. degree in physics he must demonstrate his ability to perform independent research in the aerospace field. By performing research under the direction of members of the staff of the physics department the student develops capabilities so that he is prepared for a successful career of research or to continue on in a graduate program. A central core of physics is required with a minor in mathematics. The curriculum is also designed to provide the student with an adequate background in Engineering, English, Foreign Language, Social Science, and other Humanities.
### FULL TIME PROGRAM

**Bachelor of Science Degree Curriculum in Space Technology**

#### JUNIOR

<table>
<thead>
<tr>
<th>Summer</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>H 201  History of Science</td>
<td>ST 300 Intro. to Space Tech.</td>
<td>ST 311 Mechanics of Flight</td>
<td>ST 312 Mechanics of Flight II</td>
</tr>
<tr>
<td>EE 202 A-C Circuit Theory II</td>
<td>P 341 Electrical Measurements</td>
<td>P 342 Electrical Measurements</td>
<td>P 403 Thermodynamics</td>
</tr>
<tr>
<td>ME 201  The Study of Statics</td>
<td>M 301 Engineering Analysis</td>
<td>ME203 Thermodynamics and Special Topics</td>
<td>M 455 Vector Analysis</td>
</tr>
</tbody>
</table>

#### SENIOR

<table>
<thead>
<tr>
<th>Summer</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>H 201  History of Science</td>
<td>ST 421 Structure Design</td>
<td>ST 431 Astronautics</td>
<td>EE 411 Transmission Lines</td>
</tr>
<tr>
<td>EE 202 A-C Circuit Theory II</td>
<td>P 401 Electromagnetic Theory</td>
<td>ME 302 Machine Design</td>
<td>ME 455 Vector Analysis</td>
</tr>
</tbody>
</table>

*Summer term between Junior and Senior years left free for job experience in industry.*
### Brevard Engineering College

#### Full Time Program

**Bachelor of Science Degree Curriculum in Mathematics**

<table>
<thead>
<tr>
<th><strong>Junior</strong></th>
<th><strong>Senior</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summer</strong></td>
<td><strong>Summer</strong></td>
</tr>
<tr>
<td>M 405 Digital Computers</td>
<td>Summer term between Junior and Senior years left free for job experience in industry.</td>
</tr>
<tr>
<td>H 201 History of Science</td>
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</tr>
<tr>
<td>Humanity Elective</td>
<td></td>
</tr>
<tr>
<td>Technical Elective</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th><strong>Fall</strong></th>
<th><strong>Fall</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>M 302 Mathematical Analysis</td>
<td>M 481 Partial Differential Equations</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>ST 300 Intro. to Space Tech.</td>
</tr>
<tr>
<td>P 304 Astronomy</td>
<td>M 456 Vector Analysis II</td>
</tr>
<tr>
<td>M 406 Digital Computers II</td>
<td>M 411 Intro. to Statistical Methods</td>
</tr>
<tr>
<td>PH 331 Logic</td>
<td>M 491 Numerical Methods</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Winter</strong></th>
<th><strong>Winter</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>M 303 Mathematical Analysis II</td>
<td>M 401 Intro. to Modern Math</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>M 412 Statistical Methods II</td>
</tr>
<tr>
<td>P 305 Astronomy II</td>
<td>M 461 Intro. to Matrix Theory</td>
</tr>
<tr>
<td>PH 332 Logic II</td>
<td>Technical Elective</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Spring</strong></th>
<th><strong>Summer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>M 304 Mathematical Analysis III</td>
<td></td>
</tr>
<tr>
<td>Foreign Language</td>
<td></td>
</tr>
<tr>
<td>M 455 Vector Analysis</td>
<td></td>
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### Full Time Program

**Bachelor of Science Degree Curriculum in Physics**

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<td>P 350 Optics</td>
<td>M 411 Intro. to Statistical Methods</td>
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<td>P 341 Electrical Measurements</td>
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<td>EE 301 Circuit Theory of Electron Devices</td>
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Evening Program
All Curricula

First Year

Summer Term
(M 101) Algebra*)

Fall Term
(M 102) Algebra*)
C 101 Chemistry
C 111 Chemistry Laboratory
D 101 Graphic Science

Winter Term
(M 103) Algebra*)
C 102 Chemistry
C 112 Chemistry Laboratory
D 102 Graphic Science

Spring Term
(M 104) Trigonometry*)
C 103 Chemistry
C 113 Chemistry Laboratory
D 103 Graphic Science

Summer Term
M 105 Calculus
EC 101 Economics
E 101 English

* (Credit for M 101, M 102, M 103, M 104 may be obtained by passing comprehensive examinations at time of admission to the College).

Second Year

Fall Term
M 106 Calculus
P 101 Physics
E 102 English

Winter Term
M 107 Calculus
P 102 Physics
P 103 Physics Laboratory

Spring Term
M 201 Differential Equations
P 201 Physics
E 103 Technical Report Writing

Summer Term
M 202 Differential Equations
P 202 Physics
P 203 Physics Laboratory

Third Year

Fall Term
M 203 Intermediate Calculus
EE 201 A.C. Circuit Theory
H 101 American History

Winter Term
EE 202 A.C. Circuit Theory
P 301 Physics

Spring Term
P 302 Physics
EE 203 A.C. Circuit Theory
P 303 Physics Laboratory

Note: Mathematics majors may substitute electives for D 101, D 102, D 103 and EE 201, EE 202, EE 203.
### Evening Program

**Bachelor of Science Degree Curriculum in Space Technology**

#### Fourth Year

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## Evening Program

### Bachelor of Science Degree Curriculum in Space Technology

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#### Fifth Year

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**Evening Program**

**Bachelor of Science Degree Curriculum in Electrical Engineering**

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### Evening Program

#### Bachelor of Science Degree Curriculum in Mathematics

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### Evening Program

#### Bachelor of Science Degree Curriculum in Physics

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<td>EE 301</td>
<td>Circuit Theory of Electron Devices</td>
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<td>Spring Term</td>
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<td>Electrical Measurements</td>
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<td>Vector Analysis</td>
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<td>Summer Term</td>
<td>P 342</td>
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<td>Atomic and Nuclear Physics</td>
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<td>P 423</td>
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<td>H 102</td>
<td>American History</td>
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</table>
THE GRADUATE SCHOOL

PURPOSE AND OBJECTIVES

It is the purpose of the Graduate School degree program, within the framework of the general objectives of the College, to achieve in the student mastery of an area of technical learning and the development of independent scholarship. Graduate degrees are awarded only to individuals who have demonstrated a breadth of knowledge and a maturity of scholarship. They are not awarded for routine completion of course requirements.

DEGREES OFFERED

Five Master of Science programs are offered in the Graduate School. Degrees may be earned in the fields of Electrical Engineering, Applied Mathematics, Physics, Space Technology, and Operations Research. Three options are offered in the Applied Mathematics program: Mathematics, Reliability, and Mathematical Statistics.

CLASS SCHEDULE

Graduate classes normally meet on Tuesday and Thursday evenings. However, the College reserves the right to schedule classes on other evenings when necessary. Each class period is normally of 1½ hours duration.

COURSE ANNOUNCEMENTS

Courses offered during a given term are listed in the quarterly Graduate School Bulletin.

CLASSIFICATION OF STUDENTS

REGULAR STUDENTS are those who intend to meet requirements for a degree and who have been unconditionally approved to work toward a graduate degree by the Chairman of the Department in which the student expects to major and by the Dean of the Graduate School. Such approval does not imply acceptance of the student as a candidate for a degree. Approval of candidacy is subject to the considerations indicated in the Requirements for the Master of Science Degree. A program of study will be outlined for a Regular Student. The program must be approved by the Dean of the Graduate School and may be modified from time to time as circumstances may require.

PROVISIONAL STUDENTS are those admitted to graduate study who intend to meet requirements for a degree but

(a) Who are deficient in previous academic grade average or
(b) who are deficient in course or subject prerequisites or
(c) whose applications, transcripts or other required information are received after application deadlines.

Upon removal of all deficiencies a Provisional Student may be reclassified as a Regular Student.

SPECIAL STUDENTS are those holding baccalaureate degrees who have been admitted to study in the Graduate School and who wish to have such study become a matter of record, but who do not seek a graduate degree. Such students must comply with all regular requirements for admission to the course or courses desired, but waivers of admission requirements may in certain cases be granted by the Dean of the Graduate School. Should a Special Student subsequently desire to become a Regular Student, credit earned is subject to evaluation by the department in which he expects to specialize and may or may not be accepted to apply toward minimum degree requirements in the College.

DEGREE CANDIDATES are those students who have fulfilled all requirements for the grade of Regular Student and have in addition fulfilled the requirements for admission to candidacy (see Requirements for Master of Science Degree).

AUDITORS are those students holding baccalaureate degrees who have been admitted to study in the Graduate School but who do not wish to have such study become a matter of record. Admission as an auditor must be approved by the instructor and by the Dean of the Graduate School. Auditors will be permitted, but are not required, to take course examinations. They will not receive a grade in the course. They must pay the full tuition and fee requirements. No changes in registration from credit to audit will be permitted after the close of registration at the end of the first week of classes.
ADMISSION REQUIREMENTS

The following general requirements must be met by all applicants for admission to the Graduate School:

(1) The applicant must have been granted a Bachelor’s Degree in a field of science, mathematics or engineering from an institution of standard collegiate rank recognized by an appropriate accrediting agency. An applicant who is a graduate of a non-accredited institution is evaluated on an individual basis to determine his eligibility for admission. A graduate of a non-accredited institution may be required to raise his standing by taking additional courses at the undergraduate level in Brevard Engineering College as required by the Dean of the Graduate School.

(2) The applicant must have had a B average in undergraduate work and specifically a B average in the field in which the applicant expects to major in the Graduate School.

(3) The applicant must submit to the Dean of the Graduate School one copy of an official transcript of his undergraduate record. This transcript must be sent directly from the applicant’s college or university to the Brevard Engineering College.

(4) His application must be approved by the Dean of the Graduate School.

ADMISSION PROCEDURE

Application for admission to the Graduate school shall be made by new students on a form that may be obtained from the College Office. Upon completion of the application form the applicant shall present himself at the Office of the Dean of the Graduate School for assignment to an adviser who will then check the applicant’s qualifications for admission and, if satisfactory, work out with the applicant an acceptable course of study based on the applicant’s objectives and qualifications. The adviser will then approve the application for admission and the agreed upon course of study.

Students previously enrolled in the college who wish to take new, but previously approved, courses or who wish to take the second or third term of a previously approved course just completed with a passing grade shall make application on a form provided by the Office of the Registrar.

Students previously enrolled in the college who wish to take a new, but not previously approved, course shall make application on the form provided by the Office of the Registrar. Approval of the application must be given by the Department Chairman.

REQUIREMENTS FOR MASTER OF SCIENCE DEGREE

ADMISSION TO CANDIDACY — Admission to the Graduate School does not imply that the work taken by the student will be credited toward a degree. No commitment in this matter has been made until the student is admitted to candidacy for a degree. The following are the requirements for admission to candidacy:

(1) Completion of a minimum of two terms in residence and the completion of a minimum of nine term hours of study.

(2) Certification by the Chairman of the Department that the Graduate Record Examination has been taken and all other requisite preliminary examinations have been passed.

(3) Foreign language requirements, if specified, have been met.

(4) A general course average of no lower than B with no individual course grade lower than C. A student may have a “D” in a course which is not counted for credit towards the degree.

(5) The presentation of an outline of the student’s program of study, and a plan of work proposed as a basis for his thesis, if required, which have the approval of the Chairman of the Department and the Dean of the Graduate School.

Application for admission to candidacy for a Master’s Degree must be made by the student on a form to be obtained from the Office of the Dean of the Graduate School and must be filed with the Dean of the Graduate School upon completion.

LANGUAGE REQUIREMENTS — At the option of the Department a reading knowledge of one foreign language must be demonstrated prior to admission to candidacy. This requirement may be met by one of the following methods: (1) by examination, or (2) presentation of two years of college credit (at least 12 semester hours or 18 quarter hours) in one of the following foreign languages: French, German, Russian. The examination will consist of 1 1/2 hours in which to write an acceptable translation of a technical document, with the aid of a dictionary. No student will be permitted a re-examination in a foreign language during the same quarter in which he failed the examination. Permission for re-examination in subsequent terms can be granted only upon evidence of sufficient work done to justify re-examination.
GRADUATE RECORD EXAMINATION — This examination is required for all students seeking the Master of Science Degree unless waived by the Dean of the Graduate School. It should be taken not later than the student's second quarter of residence, but must be taken before admission to candidacy can be approved. Information as to the dates on which the examination may be taken may be obtained from the Office of the Registrar.

PROGRAM OF STUDY — A program of study, and thesis plan if required, must be submitted on the proper forms for approval by the student's Department Chairman, and the Dean of the Graduate School. This should be completed not later than the student's second quarter of residence and must be done before the student is admitted to candidacy. These approved programs must be on file in the Office of the Registrar.

Two courses per term are considered a full load for evening students in the Master of Science programs. Thus the study program may be expected to require at least two calendar years. In general, however, it is anticipated that a longer time will be required. Additional departmental requirements are given in the section on Graduate Degree Programs.

REQUIRED STANDING — An average of "B" must be maintained on the program of study used to satisfy degree requirements. No single grade lower than "C" will be accepted.

It should be noted in the section "grading System," that although a passing grade of "D" may be issued, a "D" is not acceptable for course credit toward a Master's degree. A student who intends to apply for admission to candidacy for a Master's Degree should be fully cognizant of the consequences of the effect of a "D" grade on his future program. If a student receives a "D" in a course required for the degree, he may apply to the Dean of the Graduate School for a re-examination. Upon approval of the instructor, Department Chairman and Dean of the Graduate School, and upon payment of the Special Examination fee, the re-examination will be given. If the re-examination grade is not adequate to raise the original course grade above "D", the course must be repeated at the next opportunity. If the grade of "D" is received in an elective course, the student may apply for re-examination, elect to repeat the course, or select another elective. Application for re-examination must be received at the Office of the Dean of the Graduate School not later than two weeks from the date of mailing of the original grade.

EXAMINATIONS — In addition to all examinations required for admission to candidacy and all examinations on the courses taken, the candidate must pass a comprehensive written examination covering his field of specialization, and at the option of the Department, an additional oral examination. An oral examination shall be conducted by a committee appointed by the Department Chairman, but will be open to any member of the faculty who may desire to attend.

RESIDENCE—The minimum residence requirement for a Master's Degree is six (6) quarters. All work credited toward a Master's Degree must be completed within six (6) years.

TRANSFER OF CREDITS — Transfer of credits for graduate courses is never automatic. In a program of study for a graduate degree the courses taken must constitute a logical whole. In cases in which a course taken at another recognized institution does constitute a logical part of the student's program, transfer of credit may be allowed if recognized by the Chairman of the Department and approved by the Dean of the Graduate School. Such transfer of credit cannot exceed 9 quarter hours. Work done at extension or by correspondence will not be credited toward the Master's Degree.

THESIS — At the option of the student's major department, a thesis may be required for the Master of Science Degree. It must show that the student has used independence of judgment in developing a problem from primary source materials. A thesis adviser will be appointed by the Chairman of the student's major department. The Master's thesis must be approved by the adviser and placed on file with the Dean of the Graduate School for a reading committee at least six (6) weeks before the date of graduation. Three file copies must be deposited with the College Library before the degree is granted. These copies must contain the written approval of the adviser, Chairman of the final reading committee, and the Dean of the Graduate School.

GRADUATE DEGREE PROGRAMS
GENERAL — The degree of Master of Science may be conferred upon satisfactory completion of the requirements for Master of Science degree as described in the previous sections and in addition the departmental requirements described in this section.
DEPARTMENT OF ELECTRICAL ENGINEERING -
The Electrical Engineering option for the degree of Master of Science requires a minimum of 48 hours of course work. The following courses are required:

- **M-505** Advanced Calculus (3 hours)
- **M-507** Advanced Calculus (3 hours)
- **EE-502** Engineering Probability (3 hours)
- **EE-515** Advanced Theory of Servomechanisms (3 hours)
- **EE-525** Synthesis of Passive Networks (3 hours)
- **EE-526** Synthesis of Passive Networks II (3 hours)
- **EE-560** Electromagnetic Field Theory and Applications (3 hours)

* Note: M 585 and M 586, Advanced Engineering Math, may be substituted with permission of the Department Chairman.

Nine hours must be taken from the following list:

- **EE-517** Analysis of Non-Linear Control Systems (3 hours)
- **EE-518** Analysis of Non-Linear Control Systems II (3 hours)
- **EE-527** Synthesis of Passive Networks III (3 hours)
- **EE-531** Random Processes (3 hours)
- **EE-532** Communication Theory (3 hours)
- **EE-561** Electromagnetic Field Theory and Applications II (3 hours)
- **EE-562** Electromagnetic Field Theory and Applications III (3 hours)

The remaining 18 hours may be chosen from the above list and the list given below. These courses must be selected so as to form a unified program bearing on the field of study selected by the student. It is recommended that the student take enough mathematics courses to constitute a strong mathematics minor of 15 quarter hours. EE 502, Engineering Probability, and EE 531, Random Processes, are considered acceptable courses for complying with this recommendation.

- **EE-501** Transient Analysis (3 hours)
- **EE-545** Logical Design of Digital Computers (3 hours)
- **EE-546** Logical Design of Digital Computers II (3 hours)
- **EE-547** Digital Computer Engineering Principles (3 hours)
- **EE-548** Digital Computer Engineering Prin. II (3 hours)
- **EE-550** Introduction to Analog Computers (3 hours)
- **EE-551** Advanced Analog Computers (3 hours)
- **EE-557** Transistor Theory (3 hours)
- **EE-558** Properties of Electronic Materials (3 hours)
- **EE-559** Properties of Electronic Materials II (3 hours)

A final comprehensive written examination covering the entire range of the candidate's program of study must be taken before the degree of Master of Science is granted.

Students who hold the B.S. or A.B. degree in a field other than electrical engineering must complete certain preparatory course work before starting the program leading to the M.S. degree in electrical engineering. In general, these students should complete the following studies or their equivalents:


**MECHANICS** -- Statics, kinematics, fluid mechanics, thermodynamics (ME-201, -202, -203, -402, -403, -404).

**PHYSICS** -- Mechanics, heat, sound, electric and magnetic fields, electromagnetic waves, light, atomic physics (P-101, -102, -103, -201, -202, -203, -301, -302, -303, -401).


The exact preparatory program required will depend upon the student's previous training and experience. Each student is expected to work out a suitable program in conference with the Chairman of the graduate Electrical Engineering Department.
DEPARTMENT OF MATHEMATICS - The Master of Science degree in Mathematics requires a minimum of 48 quarter hours of graduate credit in approved courses, of which not more than 6 hours may be elected for thesis preparation. The Graduate Department of Mathematics offers three options: Mathematics, Mathematical Statistics, and Reliability. A thesis is required in all programs.

In order to enter the Graduate Department of Mathematics, the equivalent of an undergraduate degree in Mathematics is required. Such a program would have included calculus, differential equations, and vector analysis.

Required courses in the degree programs are as follows:

A. MATHEMATICS OPTION

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>M-505</td>
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<tr>
<td>M-507</td>
<td>Advanced Calculus II</td>
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<td>M-512</td>
<td>Advanced Calculus III</td>
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<tr>
<td>M-535</td>
<td>Theory of Determinants and Matrices</td>
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<tr>
<td>M-538</td>
<td>Theory of Determinants and Matrices II</td>
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<td>M-527</td>
<td>Real Variables</td>
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<td>M-536</td>
<td>Modern Algebra</td>
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<td>M-525</td>
<td>Complex Variables</td>
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<td>M-526</td>
<td>Complex Variables II</td>
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Total: 27 hours

B. MATHEMATICAL STATISTICS OPTION

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<td>Mathematical Statistics</td>
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<tr>
<td>M-546</td>
<td>Mathematical Statistics II</td>
<td>3</td>
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<tr>
<td>M-550</td>
<td>Mathematical Statistics III</td>
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</tr>
<tr>
<td>M-551</td>
<td>Experimental Design</td>
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<tr>
<td>M-553</td>
<td>Special Topics in Statistics</td>
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<tr>
<td>M-547</td>
<td>Least Squares and Error Analysis</td>
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<tr>
<td>M-548</td>
<td>Reliability Theory and Application</td>
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</tr>
<tr>
<td>M-505</td>
<td>Advanced Calculus</td>
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</tr>
<tr>
<td>M-535</td>
<td>Theory of Determinants and Matrices</td>
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Total: 27 hours

C. RELIABILITY OPTION

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<tr>
<td>M-507</td>
<td>Advanced Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>M-535</td>
<td>Theory of Determinants and Matrices</td>
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<tr>
<td>M-545</td>
<td>Mathematical Statistics</td>
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<tr>
<td>M-546</td>
<td>Mathematical Statistics II</td>
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<td>M-547</td>
<td>Least Squares and Error Analysis</td>
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<td>M-548</td>
<td>Reliability Theory and Application</td>
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<td>M-549</td>
<td>Systems Reliability Problems</td>
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<td>M-551</td>
<td>Experimental Design</td>
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<td>M-592</td>
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<td>EE-545</td>
<td>Logical Design of Digital Computers</td>
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Total: 33 hours

To complete the course requirements for the degree, courses may be selected from those offered in the Graduate Mathematics Department and from other graduate departments as approved, including the following:

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<td>P-515</td>
<td>Analytical Mechanics</td>
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<tr>
<td>P-516</td>
<td>Wave Equation and Relativity</td>
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<tr>
<td>P-517</td>
<td>Classical Electromagnetic Theory</td>
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</tr>
<tr>
<td>P-520</td>
<td>Astrophysics</td>
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</tr>
<tr>
<td>P-530</td>
<td>Quantum Mechanics</td>
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</tr>
<tr>
<td>P-531</td>
<td>Quantum Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>ST-540</td>
<td>Astrodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ST-541</td>
<td>Astrodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>EE-531</td>
<td>Random Processes</td>
<td>3</td>
</tr>
<tr>
<td>EE-532</td>
<td>Communication Theory</td>
<td>3</td>
</tr>
<tr>
<td>EE-545</td>
<td>Logical Design of Digital Computers</td>
<td>3</td>
</tr>
<tr>
<td>EE-546</td>
<td>Logical Design of Digital Computers II</td>
<td>3</td>
</tr>
<tr>
<td>OR-523</td>
<td>Mathematical Programming</td>
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</tr>
<tr>
<td>OR-521</td>
<td>Inventory Theory</td>
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<tr>
<td>OR-531</td>
<td>Statistical Decision Theory</td>
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</tr>
<tr>
<td>OR-524</td>
<td>Competitive Strategies</td>
<td>3</td>
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</tbody>
</table>

A comprehensive written examination must be passed covering the general field of mathematics and including all courses taken. An oral examination in defense of the thesis is also required.

Professor Sebastian J. D'Alli, Chairman of Space Technology, teaches Rocket Propulsion with the help of a Vanguard Rocket engine first stage.
DEPARTMENT OF PHYSICS—The degree of Master of Science may be conferred upon students who have satisfactorily completed a minimum of 48 quarter hours including a thesis. Applicants for admission to the program should have a Bachelor's degree in physics, mathematics, physical science, or engineering from an institution acceptable to the Graduate School. All graduate physics students are required to have a mathematical background through vector analysis.

The following courses are required:

M-585 Advanced Engineering Mathematics 3 hours
M-586 Advanced Engineering Mathematics 3 hours
M-505 Advanced Calculus 3 hours
M-507 Advanced Calculus 3 hours
P-515 Analytical Mechanics 3 hours
P-516 Wave Equation and Relativity 3 hours
P-517 Classical Electromagnetic Theory 3 hours
P-518 Classical Electromagnetic Theory II 3 hours
P-530 Quantum Mechanics 3 hours
P-531 Quantum Mechanics II 3 hours
P-540 Nuclear Physics 3 hours
P-580 Statistical Mechanics 3 hours
P-605 Thesis 3 hours

The balance of 9 hours may be elected from the following list:

P-510 Electrical Discharges in Gases 3 hours
P-520 Astrophysics 3 hours
P-537 Molecular Vibration 3 hours
P-541 Nuclear Physics II 3 hours
P-558 Quantum Electronics 3 hours
P-560 Magnetohydrodynamics 3 hours
P-570 Selected Topics in Physics 3 hours
EE-557 Transistor Theory 3 hours
ST-540 Astrodynamics 3 hours
ST-541 Astrodynamics II 3 hours
M-545 Mathematical Statistics 3 hours
M-546 Mathematical Statistics II 3 hours
M-575 Numerical Analysis 3 hours
M-576 Numerical Analysis II 3 hours

A comprehensive written examination must be passed covering the general field of physics including all courses taken. An oral examination in defense of the thesis is also required.

THE GRADUATE SCHOOL

DEPARTMENT OF SPACE TECHNOLOGY - The Space Technology option for the degree of Master of Science requires a minimum of 48 hours. The following courses are required:

M-585 Advanced Engineering Mathematics 3 hours
M-586 Advanced Engineering Mathematics 3 hours
P-515 Advanced Dynamics 3 hours
ST-530 Inertial Guidance 3 hours
ST-510 Rocket Propulsion 3 hours
ST-540 Astrodynamics 3 hours
ST-541 Astrodynamics II 3 hours
ST-542 Geodesy 3 hours
ST-550 Range Instrumentation I--Optical 3 hours
ST-552 Range Instrumentation II--Telemetry 3 hours
ST-553 Range Instrumentation III--Pulse Radar 3 hours
ST-554 Range Instrumentation IV--C. W. Radar 3 hours

36 hours

Twelve hours must be elected from one of the groups A, B, or C:

GROUP A (ELECTRONICS OPTION)

ST-531 Inertial Guidance II 3 hours
M-545 Probability Theory 3 hours
EE-515 Advanced Theory of Servomechanisms 3 hours
EE-531 Random Processes 3 hours

12 hours

GROUP B (PROPULSION OPTION)

ST-511 Rocket Propulsion II 3 hours
ST-512 Rocket Propulsion III 3 hours
ST-595 Space Vehicle Launch Operations 3 hours
ST-597 Rocket and Re-entry Vehicle Materials 3 hours

12 hours

GROUP C (SYSTEMS ANALYSIS OPTION)

M-545 Probability Theory 3 hours
M-546 Mathematical Statistics II 3 hours
M-547 Least Squares and Error Analysis 3 hours
M-550 Mathematical Statistics III 3 hours

12 hours

Modifications to the above requirements in individual cases require the written approval of the Department Chairman and the Dean of the Graduate School.

A final comprehensive written examination, covering the entire range of the candidate's program of study, must be taken. A final oral examination may also be required.
DEPARTMENT OF OPERATIONS RESEARCH - The Operations Research option for the degree of Master of Science requires the satisfactory completion of a minimum of 42 quarter hours of course work and 6 quarter hours of thesis credit. The following courses are required:

- M-535 Theory of Determinants and Matrices 3 hours
- M-545 Mathematical Statistics 3 hours
- M-546 Mathematical Statistics II 3 hours
- M-548 Reliability Theory and Applications 3 hours
- M-549* Systems Reliability Problems 3 hours
- M-551 Experimental Design 3 hours
- OR-501 Statistical Quality Control 3 hours
- OR-502 Systems Economy 3 hours
- OR-511 Operations Research 3 hours
- OR-512 Operations Research II 3 hours
- OR-513 Operations Research III 3 hours
- OR-521 Inventory Theory 3 hours
- OR-523 Mathematical Programming 3 hours
- OR-524* Competitive Strategies/Decisions 3 hours
- OR-605 Thesis 3 hours
- OR-606 Thesis 3 hours

* To permit flexibility in study plans and/or specialization by students, OR 601 and OR 602, Special Topics, may be substituted. Similarly, substitution of mathematics courses and those from other disciplines, either by transfer (maximum of 9 quarter hours) or taken at Brevard Engineering College, may be approved if considered complementary to the OR program and as satisfying the particular need of the student.

Transfer of other credits may be approved on equivalence based on the presentation of an official transcript and submission by the student of course descriptions from official publications, course syllabi, and text books used.

A Bachelor of Science degree in one of the physical sciences is a requirement for entry into a program of study and subsequent application for candidacy for a Master of Science degree in Operations Research.

Successful completion of written and oral examinations over the course work are required. Oral examination in defense of the thesis is required.
C 301 GEOLGY Cr. 3
A survey of structural and historical geology including principal geological formations, rocks and minerals, and a history of the earth's crust.

ECONOMICS
EC 101 ECONOMICS Cr. 3
Basic course dealing with the problems of production and distribution of wealth, pricing, business organization, money, credit, public finance, and the economic organization of society.

EC 201, 202 ECONOMICS Cr. 3, 3
(Prerequisite: EC 101)
A further study and extension of the principles of economics including cost of production, elements of money and banking, and applications of economics to public policy in a democratic society.

EC 210 LABOR RELATIONS Cr. 3
A critical appraisal of the labor problems including the history, organization, and operation of American trade unionism, collective bargaining, and public control of labor relations.

ELECTRICAL ENGINEERING
EE 201, 202, 203 A-C CIRCUIT THEORY Cr. 3, 3, 3
(Prerequisites: M 107, P 201)
Concepts of resistance, inductance, and capacitance as electric circuit elements; series and parallel circuits; resonance phenomena; real and apparent power; Kirchoff's voltage and current laws; network equations on loop and node basis. Bridge circuits; network theorems; coupled circuits; impedance transformation and matching; tuned coupled circuits.

EE 204 ADVANCED A-C CIRCUIT THEORY Cr. 3
(Prerequisites: EE 203, M 202)
Network equations; Laplace transformation; time domain, frequency domain; impedance and admittance functions; network functions; network functions in terms of poles and zeros.

EE 211, 212 ELECTRON DEVICES Cr. 3, 3
(Prerequisites: P 302, M 203)
Particles and waves; bound particles; Fermi energy; electron emission; charged particle dynamics; classical vacuum devices; continuity equation; Boltzman and Einstein relations; gaseous processes, band theory of solids; semiconductors; semiconductor devices; physics of electron beams; modern amplifiers.

EE 301, 302, 303 CIRCUIT THEORY OF ELECTRON DEVICES Cr. 3, 3, 3
(Prerequisite: EE 203)
Power supplies; filters; four-terminal networks; vacuum-tube amplifier circuits: noise sources; transistor amplifier circuits; small-signal amplifiers; feedback; audio-frequency amplifiers; R-F amplifiers; oscillators; modulation; demodulation; power rectification; gaseous control tubes and circuits. Vacuum-tube and transistor applications presented concurrently.

EE 304 ELECTRON DEVICES LABORATORY Cr. 2
(Prerequisite: EE 303)
Laboratory experiments to illustrate the principles of EE 301, 302, 303.

EE 311, 312 ELECTROMECHANICS Cr. 3, 3
(Corequisite: EE 204)
Ampere's law, the magnetic field; electromotive force; rotating generators; D-C motors; A-C motors; synchronous machines; transformers; electrical and mechanical relations; transfer functions; Laplace transfer functions; induction devices; electromechanical systems; magnetohydrodynamics; ion propulsion.

EE 321, 322 PULSE TECHNIQUES Cr. 3, 3
(Corequisite: EE 303)
Linear wave shaping; linear pulse amplifiers, non-linear wave shaping; bistable multivibrator; monostable and astable multivibrators; voltage time-base generators; current time-base generators; pulse transformers and blocking oscillators; electromagnetic delay lines; counters; digital computer circuits; transmission gates; pulse and digital systems. Vacuum-tube and transistor applications presented concurrently.

EE 323 PULSE TECHNIQUES LABORATORY Cr. 2
(Concurrent with EE 322)
Laboratory experiments to illustrate principles presented in EE 321, 322.
EE 331, 332  INFORMATION TRANSMISSION, MODULATION AND NOISE  Cr. 3, 3  (Prerequisites: EE 303, M 202)

Information and system capacity; transmission through electric networks; modulation and modulation systems; AM; FM; SSB generators; periodic sampling and pulse modulation; thermal noise; shot noise; signal-to-noise and noise figure; noise in transistors; transistor noise figure; noise in vacuum tubes; signal and noise power spectra; signal-to-noise ratios in FM, AM, and PPM; quantization noise and S/N in PCM.

EE 411  TRANSMISSION LINES  Cr. 3  (Prerequisites: EE 203, M 202)

Voltage and current relations; traveling and standing waves; propagation, phase, and attenuation constants; incident and reflected waves; reflection coefficient; wavelength and phase velocity; characteristic impedance; standing-wave ratio; the Smith and z-0 charts; transmission line measurements; impedance matching; directional couplers; wave guides; cavity resonators.

EE 421  ANTENNAS  Cr. 3  (Prerequisite: EE 411)

Point sources; radiation patterns; directivity; antenna gain; field and phase patterns; antenna aperture; antenna arrays; dipole, loop, helical, biconical, slot, horn, and reflector-type antennas; self and mutual impedances; antenna measurements; noise temperature of antennas.

EE 431, 432  SERVOMECHANISMS  Cr. 3, 3  (Prerequisites: EE 312, M 202; Corequisite: EE 303)

General background of servomechanisms; Laplace transformation; equations of physical systems; transient analysis; transfer functions; design; gain adjustment; comprehension. Nyquist diagram, Bode plots, root locus.

EE 441  R-F PROPAGATION  Cr. 3  (Prerequisite: EE 421)

Propagation of electromagnetic waves in the troposphere, ionosphere and outer space; ducting; refraction; atmospheric, precipitation and plasma absorption; modes of propagation; ground waves; sky waves; space or tropospheric waves; propagation in a plasma, cosmic, solar, and man-made noise; noise temperature.

EE 461  ELECTRONIC COMPUTERS  Cr. 3  (Prerequisites: EE 322, M 203)

Theory of digital and analog electronic computers and basic computer programming for the electronics engineer.

EE 471  ELECTRONIC SYSTEMS  Cr. 3  (Prerequisite: EE 303, 411, 421, 431, 441; Corequisite: EE 331, 322)

Application of basic principles to major electronic systems. The "systems" concept. Transmitters, receivers, pulse and C-W radar, telemetry, television, communications, data transmission and control systems.

EE 491  ADVANCED EE LABORATORY  Cr. 2  (Prerequisite: EE 411; concurrent with EE 421)

Laboratory associated with EE 421.

EE 492  ADVANCED EE LABORATORY  Cr. 2  (Concurrent with EE 431)

Laboratory associated with EE 431.

EE 493  ADVANCED EE LABORATORY  Cr. 2  (Concurrent with EE 471)

Laboratory associated with EE 471.

EE 501  TRANSIENT ANALYSIS  Cr. 3

This course covers the basic operational methods of linear systems analysis. The fundamental results of Fourier series, Fourier transforms and Laplace transforms are discussed. Methods of analyzing systems of differential equations, circuits and other linear systems are treated in terms of the frequency domain. The notions of frequency spectrum, impulse responses, convolution, etc. are treated.

EE 502  ENGINEERING PROBABILITY  Cr. 3

An introductory course in probability theory. This course is a prerequisite to electrical engineering courses on random processes and communications theory. The topics covered are combinations and permutations, continuous and discrete random variables, distribution and density functions, correlation and regressions, and estimators.
Phase plane analysis of non-linear systems; application of Z-transfors to sampled systems; statistical approach to systems analysis by way of Fourier transforms, autocorrelation and cross correlation techniques.

EE 517 ANALYSIS OF NON-LINEAR CONTROL SYSTEMS
(Prerequisite: EE 515)
General theory of "quasi-linear" systems (for the description of periodic and random input behavior) and topological phase space techniques (for the description of transient behavior); analysis of non-linear systems by describing functions, phase plane, Liapounoff's method and Lagrange's method, and extensions of these techniques.

This term covers description and classification of non-linearities; general techniques for solving non-linear control problems, introduction to quasi-linearization and the describing function technique; describing functions of simple non-linearities, frequency invariant non-linearities and frequency variant non-linearities; quasi-linear closed loop systems.

EE 518 ANALYSIS OF NON-LINEAR CONTROL SYSTEMS II
(Prerequisite: EE 517)
A continuation of EE 517. This term covers random input describing functions; Gaussian and other type describing functions; the phase plane method; trajectories and stability; Liapounoff's method and Lagrange's method, and relay servos.

The first of a three term series concerned with the study of the techniques for the synthesis of passive networks. As most of the practicing engineer's problems are those of designing rather than analyzing circuits, this course is designed to provide the basic tools necessary to perform this task. This term covers the basic introduction to the required mathematics. The basic energy relations that must exist for a network to be realizable are developed, and techniques for determining the existence of these conditions established.

EE 526 SYNTHESIS OF PASSIVE NETWORKS II
(Prerequisite: EE 525)
The techniques for deriving functions that satisfy the basic conditions for a physically realizable network are established. Methods for deriving two element parameter networks (RL, RC, and LC) based on input impedance parameters are developed and many examples considered.

EE 527 SYNTHESIS OF PASSIVE NETWORKS III
(Prerequisite: EE 526)
Three element (RLC) input network synthesis is developed. Techniques for the development of transfer impedance synthesis are derived and examples illustrating the most powerful schemes are presented.

EE 531 RANDOM PROCESSES
(Prerequisite: EE 502)
A basic course in the methods of random processes. The topics to be covered are average, sampling, spectral analysis, noise, Gaussian processes, linear and non-linear systems. The course is intended to give the engineer the capability of analyzing the effects of statistical inputs to communication systems.

EE 532 COMMUNICATION THEORY
(Prerequisite: M 545. EE 531 recommended)
A basic course in the methods of analyzing and optimizing statistical communication systems. The topics to be discussed are information theory, detection theory, parameter estimation, and signal-to-noise ratios. The course is intended to review the basic methods used to analyze and compare various communication systems. Notes will be distributed which summarize and reference the fundamental papers in these fields.

EE 545 LOGICAL DESIGN OF DIGITAL COMPUTERS
Basic principles and circuits in logical design of digital systems. Covers Boolean algebra, computer arithmetic, minimization of combinational logic, basic circuits, design of simple sequential circuits.

EE 546 LOGICAL DESIGN OF DIGITAL COMPUTERS II
(Prerequisite: EE 545)
Continuation of EE 545. Simplification of sequential logic by Huffman-Mealy technique. Design of arithmetic units including multipliers. Includes memory and input-output techniques, and design of a small digital computer.

EE 548 DIGITAL COMPUTER ENGINEERING
PRINCIPLES
Worst case design, statistical considerations, optimization reliability considerations; cross talk, delay, and grounding problems in pulse transmission systems; design by computers.
### EE 550 INTRODUCTION TO ANALOG COMPUTERS

This course presents the fundamentals necessary for the programming and solving of numerous types of problems on the electronic analog computer. Included are methods of determining scale factors, time scales, non-linear phenomena, multiplying, dividing, coordinate transformation and function generation. Also covered are the repetitive operation and digital differential analyzers.

### EE 551 ADVANCED ANALOG COMPUTERS

(Prerequisite: EE 550)
A continuation of EE 550 with particular emphasis on real time computers and hybrid systems.

### EE 557 TRANSISTOR THEORY

Cr. 3
Physical concepts of transistors and other related semiconductor devices; P-N Junction theory; characteristics and parameters of transistors; equivalent circuits; basic amplifier circuits; and miscellaneous solid state devices.

### EE 558 PROPERTIES OF ELECTRONIC MATERIALS

Cr. 3
Theory of basic physical, electrical, mechanical, and chemical properties of metallic, ceramic, and plastic materials. Review of atomic structure, quantum mechanics and crystallography. Introduction to the theory of phases in materials, multiphase materials and phase diagrams; plasticity of materials; oxidation and corrosion; reaction rates; and diffusion. Methods of physically studying and analyzing materials.

### EE 559 PROPERTIES OF ELECTRONIC MATERIALS II

(Prerequisite: EE 558)
A continuation of EE 558.

### EE 560, 561, 562 ELECTROMAGNETIC FIELD THEORY AND APPLICATIONS

Cr. 3, 3, 3
A three course sequence in which exact and approximate methods of solving boundary-value problems in electromagnetic theory are developed. Some of the topics treated are scalar and vector potential theory, separability conditions, integral representations, Green's function, uniqueness theorems, equivalence properties, duality, image theory, induction and reciprocity. The approximate methods include geometrical and physical optics, quasi-statics, perturbation, and variational methods. Applications to engineering problems involving antennas, waveguides, radar cross sections, and radio wave communications are emphasized. Analogous situations in acoustic problems are also stressed.

### ENGLISH

#### E 101, 102 ENGLISH

Cr. 3, 3
The concentrated study of the basic mechanics of written communications; sentence and paragraph structure; vocabulary; punctuation; clarity of expression.

#### E 103 TECHNICAL REPORT WRITING

(Prerequisite: E 102)
Cr. 3
Evaluation of data, their sources and uses in preparing reports; practice in the organization of material and preparation of concise and accurate reports; training in practical writing for industry, business and research, with emphasis on the special requirements and techniques of the professional report.

#### E 201 PUBLIC SPEAKING

(Prerequisite: E 102)
Cr. 3
Presentation of concepts and ideas to technical and non-technical audiences; instruction and practice in platform speaking, group or conference participation, use of visual aids, preparation, planning and presentation.

#### E 202 LITERATURE

Cr. 3
Reading and discussion of selected modern plays and essays.

#### E 203, 204 SURVEY OF ENGLISH LITERATURE

Cr. 3, 3
Study and evaluation of English literature from Beowulf to modern times. Reading and discussion of selected English classics.

#### E 232 CREATIVE WRITING

Cr. 3
Methods of involving the reader audience in fiction and non-fiction writing. Review of modern approaches to magazine, radio, TV writing, and the novel.

### GRAPHICS

#### D 101, 102, 103 GRAPHIC SCIENCE

Cr. 3, 3, 3
Engineering drawing. Instruments and their use; applied geometry; lettering; theory and practice of projection drawing; auxiliary and oblique views; sections and conventions; pictorial views; drawings and the shop; dimensions, notes, limits and precision; working drawings. Descriptive geometry and graphical solutions. Point, edge, and normal views; points and straight lines and planes; curved lines; curved and warped surfaces; intersections, developments; vector geometry; charts, graphs and diagrams; functional scales, nomography.
**HISTORY**

H 101 AMERICAN HISTORY  Cr. 3
Survey of the backgrounds of American history; the colonial period, the war for American independence; the Confederation of the constitution; and the national period to 1840.

H 102 AMERICAN HISTORY  Cr. 3
Political history forming the framework, with economic, social, cultural, and intellectual history interwoven. Introduction to historical literature, source material, and criticism is included.

H 111, 112, 113 HISTORY OF WESTERN CIVILIZATION  Cr. 3, 3, 3
Study of the growth and spread of Western civilization from its beginning in the Near East to the present.

H 201 HISTORY OF SCIENCE  Cr. 3
Study of the great events and personalities in the fields of science and engineering from the time of the ancient Greeks to the present day; development of an appreciation for the heritage of modern science.

**LANGUAGES**

L 211, 212, 213 FRENCH  Cr. 3, 3, 3

L 215 SCIENTIFIC FRENCH  Cr. 3

L 221, 222, 223 GERMAN  Cr. 3, 3, 3

L 225 SCIENTIFIC GERMAN  Cr. 3

L 261, 262, 263 RUSSIAN  Cr. 3, 3, 3

L 265 SCIENTIFIC RUSSIAN  Cr. 3

**MANAGEMENT**

G 361 PRINCIPLES OF MANAGEMENT  Cr. 3
A survey course to examine the principles of management and the problems incident to their application. The course deals with decision making, organizing, planning, and controlling of business organizations.

**MATHEMATICS**

M 101, 102, 103 COLLEGE ALGEBRA  Cr. 3, 3, 3
Factoring and fractions; exponents and radicals; functions and their graphs; equations and their solutions; systems of linear equations; quadratic equations; ratio, proportion, and variation; progressions; mathematical induction; binomial theorem; inequalities, complex numbers; theory of equations, logarithms; permutations, combinations, and probability; determinants; partial fractions.

M 104 TRIGONOMETRY  Cr. 3
(Prerequisite: M 102)
Trigonometric functions; functions of acute angle; related angles, identities; radian measure; graphs; functions of two angles, trigonometric equations, logarithms; solving right and oblique triangles; inverse trigonometric functions.

M 105, 106, 107 CALCULUS  Cr. 3, 3, 3
(Prerequisite: M 103, M 104, or equivalent)
Differentiation and graphical representation of algebraic functions and of the sine and cosine. Integration of simple algebraic and trigonometric functions. Applications of problems
in geometry and mechanics; maxima and minima; velocity and acceleration; plane areas; volumes; arc length; area of surfaces of revolution; center of gravity; movement of inertia; analytic geometry; analytic geometry of the conic sections. Trigonometric, inverse trigonometric, exponential, logarithmic and hyperbolic functions. Polar coordinates and parametric representation. Elementary vector analysis in the plane.

M 151, 152, 153 ENGINEERING MATHEMATICS Cr. 5, 5, 5
A thorough treatment of fundamental mathematics; college algebra, trigonometry, analytic geometry, and differential calculus. (Equivalent to M 101 - M 105)

M 201, 202 DIFFERENTIAL EQUATIONS Cr. 3, 3
(Prerequisite: M 107)
Solutions of ordinary differential equations including first order equations, linear differential equations with constant coefficients, simultaneous systems, methods of numerical solution, series solutions and application to physics and engineering problems.

M 203 INTERMEDIATE CALCULUS Cr. 3
(Prerequisite: M 107)
Special topics including vector velocity and acceleration in plane curvilinear motion; three dimensional analytic geometry; partial differentiation, multiple integration; Laplace transformations.

M 251, 252, 253 CALCULUS AND DIFFERENTIAL EQUATIONS Cr. 5, 5, 5
(Prerequisite: M 105 or M 153)
A thorough treatment of integral calculus (analytic geometry), differential equations, and intermediate calculus. (Equivalent to M 106 - M 203)

M 301 ENGINEERING ANALYSIS Cr. 3
(Prerequisite: M 202, 203, EE 204)
Introduction to the mathematical treatment of advanced problems arising in various branches of engineering and science. Emphasis is placed on the application of calculus, differential equations, matrices, Fourier methods, vector analysis, etc., to engineering problems.
M 412  STATISTICAL METHODS II  Cr. 3
(Prerequisite: M 411)
Hypothesis testing, analysis of variance, curve fitting, regression, and correlation.

M 455  VECTOR ANALYSIS  Cr. 3
(Prerequisites: M 202, M 203)
A study of the algebra and geometry of vectors and linear vector spaces and matrices. The following topics will be included: vector algebra; dot, cross and continued products; equations of lines, planes, and surfaces; application to mechanics and dynamics; vector calculus; vector motion; scalar and vector fields; gradient; divergence and curl.

M 509  CALCULUS OF VARIATIONS  Cr. 3
Introduction to elementary topics such as functionals, variation of a functional, necessary conditions for extrema, simple variational problems, Euler's equation, variational derivative, fixed and variable end point theory, variational problems in parametric form, variational problems with constraints, broken extremals, Weierstrass-Erdmann corner conditions, canonical form of the Euler equation and related topics, and an introduction to direct methods in the calculus of variations.

M 511  DIFFERENTIAL EQUATIONS  Cr. 3
Method of successive approximations, including Lipschitz condition; systems of ordinary equations, including the equation of the M-th order; systems of equations of higher order and total differential equations; interpolation and numerical integration; symbolic methods; the numerical solution of differential equations; linear equations, including reduction of the order of the equation and the Euler equation; certain classical equations, including solutions in series; regular singular points; the hypergeometric differential equation; the Legendre differential equation; Bessel's differential equation.

M 512  ADVANCED CALCULUS III  Cr. 3
(Prerequisite: M 507)
Multiple and line integrals; vector analysis; infinite series; sequences of functions; improper integrals; Fourier series and integrals.

M 525  COMPLEX VARIABLES  Cr. 3
(Prerequisite: M 507)
Complex numbers, analytic functions, continuity. Cauchy-Riemann conditions, harmonic functions, exponential function, logarithmic function, geometry of elementary functions, mapping; the point at infinity, the linear fractional transformation, successive transformations; line integrals, Cauchy-Goursat theorem, multiply connected regions; derivatives of analytic functions, Morera's theorem; the fundamental theorem of algebra.

M 526  COMPLEX VARIABLES II  Cr. 3
(Prerequisite: M 525)
Power series, Taylor's series, Laurent's series, uniform convergence, uniqueness of representations by power series; residues and poles, the residue theorem, computation of residues at poles, evaluation of real infinite integrals, integration around a branch point; conformal mapping, the Schwarz-Christoffel transformation, analytic continuation, Riemann surfaces.
M 527  REAL VARIABLES  Cr. 3
(Prerequisite: M 526)
Set theory, real number system, measure theory, sequence of
functions, implicit functions and integration theory.

M 528  REAL VARIABLES II  Cr. 3
(Prerequisite: M 527)
Continuation of M 527.

M 535  THEORY OF DETERMINANTS AND MATRICES  Cr. 3
(Prerequisite: M 202)
Algebra of matrices; submatrices; transposition; elementary
transformation; determinants; special matrices; rational equiv-
alence of rectangular matrices; multiplication of matrices; the
associative law; elementary transformation matrices; determin-
ant of a product; non-singular matrices; inverse of a matrix;
equivalence of rectangular matrices; multiplication of matrices,
of square matrices; skew matrices and skew bilinear forms;
symmetric matrices and quadratic forms; non-modular fields;
addition of matrices; real quadratic forms; linear spaces, linear
sub-spaces; linear independence, linear mappings, and linear
transformations.

M 536  MODERN ALGEBRA  Cr. 3
The general plan of work in this course consists of the follow-
ing: an introduction to abstract algebra and an account of most of the
important algebraic concepts. The course goes beyond the
foundations and basic properties of algebraic systems and pre-
sents comprehensive accounts of selected topics. Included in
the first term are semi-groups and groups including transforma-
tion groups and the fundamental theorem of homomorphisms
for groups; rings; integral domains and fields.

M 537  MODERN ALGEBRA II  Cr. 3
(Prerequisite: M 536)
A continuation of M 536. Includes extension rings and fields;
groups with operators, including Schreier's theorem and the
Jordan-Holder theorem.

M 538  THEORY OF DETERMINANTS AND MATRICES II  Cr. 3
(Prerequisite: M 535)
Matrices with polynomial elements; elementary divisors; matrix
polynomials, the characteristic matrix, function and equation;
eigenvalues; invariant factors; characteristic matrices with pre-
scribed invariant factors; reduction to canonical forms; applica-
tions of matrices.

M 539  THEORY OF GROUPS  Cr. 3
Introduction to groups and related topics, subgroups, isomor-
phisms, homomorphisms, cosets, theorem of Lagrange, cyclic
groups, order of a group. Normal subgroups, homomorphism
properties, elementary abelian group theory, Sylow theorems.

M 545  MATHEMATICAL STATISTICS  Cr. 3
Fundamentals of probability theory; distribution theory for dis-
crete and continuous random variables. Expected values and
moment generating functions; practical applications using dis-
tributions such as normal, binomial and Poisson.

M 546  MATHEMATICAL STATISTICS II  Cr. 3
(Prerequisite: M 545)
Continuous distributions; the law of large numbers; the central
limit theorem; applications of the $\chi^2$, $F$ and $t$ distributions; funda-
mentals of estimation and hypothesis testing.

M 547  LEAST SQUARES AND ERROR ANALYSIS  Cr. 3
(Prerequisites: M 546, M 535)
Basic principles of error analysis; error models; statistical
theory of error; generalized least squares; error propaga-
tion; geometric dilution of precision; application to complex
systems.

M 548  RELIABILITY THEORY AND APPLICATION  Cr. 3
(Prerequisite: M 546)
Generalized theory of element and system reliability. Deriva-
tion of exponential, Weibull, log-normal and truncated normal
life distributions. Mixed and composite life distributions. Esti-
mation of the hazard function and life distribution parameters.
Aging test and accelerated life tests. The "burn-in" problem.

M 549  SYSTEMS RELIABILITY PROBLEMS  Cr. 3
(Prerequisite: M 546)
Additional study of the "burn-in" problem, step stress tech-
niques, redundancy techniques including redundant information,
redundant hardware, majority voting, adaptive voting, stochas-
tic repair models, statistical circuit design, and discrete failure
distributions.

M 550  MATHEMATICAL STATISTICS III  Cr. 3
(Prerequisites: M 545, M 535)
Multivariate distributions; regression and correlation analysis;
introduction to analysis of variance; sequential testing; and non-
parametric methods.
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M 551 EXPERIMENTAL DESIGN
(Prerequisite: M 546)
Basic concepts of statistical design of experiments, Latin squares, factorial experiments, covariance analysis, and variance components.

M 553 SPECIAL TOPICS IN STATISTICS
(Prerequisite: M 550)
Topics may include distribution free methods, decision theory, sequential testing, multivariate analysis, or other specialized areas of interest.

M 554 TIME SERIES
(Prerequisite: M 550)
Problems of observations ordered in time; correlation and regression of time series, methods for correcting for lack of independence, cross-covariance analysis of two time series, cross-spectral analysis of two time series, and other topics.

M 557 OPTIMIZATION TECHNIQUES
An introduction to linear and non-linear programming; simulation methods; theory of games.

M 561 NUMBER THEORY
A general introduction to the theory of numbers; properties of numbers; number systems; Euclid’s Algorithm; prime numbers; Mersenne and Fermat Primes; the distribution of primes; the Aliquot Parts; perfect numbers; amicable numbers; indeterminate problems; problems and puzzles; theory of linear indeterminate problems; Diophantine problems; Fermat’s last theorem.

M 575 NUMERICAL ANALYSIS

M 576 NUMERICAL ANALYSIS II
(Prerequisite: M 575)
Approximation of functions by polynomials, rational functions, and periodic functions; Fourier series and Fourier integrals; applications of linear filters; survey of algorithms for matrix inversion; simulation and Monte Carlo methods.

M 581 ADVANCED ANALYTIC GEOMETRY
Cr. 3
A thorough review of the analytic geometry of Euclidean space, beginning with elementary propositions on real vectors; coordinates; planes and lines; transformation of coordinates; types of surfaces and some properties of quadric surfaces including study of invariants under rotations and translations, and of conformal quadrics; tetrahedral coordinates and quality in such coordinates, quadric surfaces in tetrahedral coordinates; linear systems of quadrics; hyperbolic coordinates; pencils of quadrics; bundle of quadrics; webs of quadrics; apolarity; transformations of space; curves and surfaces.

M 582 TOPOLOGY
Cr. 3
Introduction to topology. Fundamentals; continuity and homeomorphism; construction of topologies including neighborhood topology, induced topologies, relative topology, product topology, quotient topology, metric spaces, separate compactness, connectedness, uniform spaces and completeness.

M 583 DIFFERENTIAL GEOMETRY
Course includes such topics as curves in space, coordinate transformations, and tensor calculus. Curves in space will include curves, surfaces, linear elements, tangent, osculatory planes, curvature, various normals, Frenet formulae, intrinsic equations, and related topics. Coordinate transformations will include curvilinear coordinates as well as quadratic forms. The tensor calculus will include contra and covariant vectors, symmetric and skew symmetric tensors, algebra of tensors, and an introduction to Christoffel symbols.

M 585 ADVANCED ENGINEERING MATHEMATICS
(Not for students in the Graduate Department of Mathematics)
Sequences, series, operation as series; Power series; functions represented by Power series, Taylor series; practical methods for obtaining Power series; Power series solution of differential equations; Fourier series and integrals; Laplace transformation.

M 586 ADVANCED ENGINEERING MATHEMATICS II
(Prerequisite: M 585)
The second of a two-part course in advanced mathematics particularly directed to the needs of the graduate engineer who requires a comprehensive program in advanced topics of applied mathematics.
ME 201  THE STUDY OF STATICS  Cr. 3  
(Prerequisites: P 101, M 107)  
Resultants of force systems, equilibrium of force systems, internal forces in members of structures and machines, friction, virtual work, minimum potential energy, stability of equilibrium.
OR 502  SYSTEMS ECONOMY  Cr. 3
Methods for evaluation and selection of alternative equipments, systems, or operations using economic criteria and other realistic opportunities and restraints. Depreciation schedules, time-value of money, operations costs, dollar and time equivalence, replacement theory, and optimization procedures are covered.

OR 511  OPERATIONS RESEARCH  Cr. 3
(Prerequisites: OR 501, M 545, M 535)
Introductory concepts and philosophy in the inception, growth, and potential of operations research. Emphasis is on operations research methods, techniques, tools, and classical applications in inventory, queueing, replacement, programming, and competitive strategy situations.

OR 512  OPERATIONS RESEARCH II  Cr. 3
(Prerequisites: OR 511, M 545, M 546)
A continuation of OR 511 with emphasis on the mathematical foundation of models with the objective of increasing capability for their alteration, and manipulation to fit particular circumstances.

OR 513  OPERATIONS RESEARCH III  Cr. 3
(Prerequisite: OR 512)
Recent developments in operations research. A study of advanced topics—the formulation and use of models of systems.

OR 521  INVENTORY THEORY  Cr. 3
(Prerequisites: OR 511, OR 512)
Deterministic and probabilistic inventory models to involve price breaks, manufacturing progress, restrictions, multsource supply, etc.

OR 523  MATHEMATICAL PROGRAMMING  Cr. 3
(Prerequisites: OR 511, OR 512)
Involves both linear and dynamic programming problems. The objective is to satisfy some objective criteria or identify alternatives where many variables and restraints are involved. Also treatment of multistage systems and attention to finite, continuous, and sequential Markov processes, with emphasis on the functional algorithm rather than iterative procedures.

OR 524  COMPETITIVE STRATEGIES/DECISIONS  Cr. 3
(Prerequisites: OR 511, OR 512)
Symbolic definition and methods of solution of games of strategy: rectangular, extensive form, and continuous. Also, theory of selection from alternative hypotheses considering probability functions and risks.

OR 601, 602  SPECIAL TOPICS  Cr. 3, 3
(Prerequisites: OR 511, OR 512, or consent of instructor)
Individual study in queuing theory, competitive strategies, statistical decision theory, dynamic programming, industrial dynamics.

OR 605, 606  THESIS  Cr. 3, 3
(Prerequisite: Consent of advisor)
Individual research under the direction of a major advisor approved by the Chairman of the Department or committee as appropriate.

PHYSICS

P 101, 102  PHYSICS  Cr. 3, 3
(Prerequisite: M 105 or M 105 concurrently)
A study of mechanics including statics, Newton's laws, work and energy, circular motion, elasticity, hydrostatics, harmonic motion and viscosity; temperature, heat, and laws of thermodynamics; thermal properties of matter; sound-wave motion, vibrating bodies, and acoustical phenomena.

P 103  PHYSICS LABORATORY  Cr. 2
Physics laboratory to accompany P 101, 102.

P 201, 202  PHYSICS  Cr. 3, 3
(Prerequisite: P 102)
Coulomb's law, the electric field, potential; dielectrics; D.C. circuits, motors, and generators; the magnetic field; meters; induction and capacitance; alternating currents and electromagnetic waves; electronics.

P 203  PHYSICS LABORATORY  Cr. 2
Physics laboratory to accompany P 201, 202.

P 251  PHYSICS  Cr. 6
(Prerequisite: M 105)
Mechanics, heat, and sound. (Equivalent to P 101, 102)
P 252  PHYSICS  
(Prerequisite: P 251)  
Electricity and magnetism. (Equivalent to P 201, 202)  
Cr. 6

P 253  PHYSICS  
(Prerequisite: P 252)  
Optics and modern physics. (Equivalent to P 301, 302)  
Cr. 6

P 301  PHYSICS  
(Prerequisite: P 202)  
The nature and propagation of light; the principles of optics, lenses, and optical instruments; illumination, color interference, diffraction, and polarization.  
Cr. 3

P 302  PHYSICS  
(Prerequisite: P 301)  
Introduction to atomic and nuclear physics; quantum theory of radiation, atomic models and spectra, relativity, X-rays, waves and corpuscles, radioactivity, nuclear reactions, radiation hazards, nuclear energy, cosmic rays and fundamental particles.  
Cr. 3

P 303  PHYSICS LABORATORY  
Physics laboratory to accompany P 301, 302.  
Cr. 2

P 304, 305  ASTRONOMY  
(Prerequisite: P 301, or P 301 concurrently)  
The solar system and stellar astronomy; distribution, structure, and evolution of stars and galaxies; introduction to astrophysics.  
Cr. 3, 3

P 330  PHYSICAL ELECTRONICS  
(Prerequisite: P 302)  
Electron ballistics, mass spectroscopy, introduction to accelerators, space charge theory, Fermi-Dirac statistics, thermionic emission; Schottky effect, high field, and secondary emission.  
Cr. 3

P 341, 342  ELECTRICAL MEASUREMENTS  
Theory of basic electric and magnetic measurements. Description and operational methods of standard measurement techniques. Laboratory experiments carried out intermittently throughout the course.  
Cr. 3, 3
P 434 INTRODUCTION TO SOLID STATE PHYSICS Cr. 3
(Prerequisite: P 413)
Free electron theory of metals and semiconductors. The band approximation; zone structure; the Hall effect and properties of semiconducting materials.

P 435 INTRODUCTION TO NUCLEAR PHYSICS Cr. 3
(Prerequisite: P 413)
An introduction to the study of the nucleus. Correlation of experimental evidence with theory; alpha and beta decay; gamma radiation; meson theory and the fundamental particles; cosmic rays.

P 450 PHYSICS OF THE ATMOSPHERE AND SPACE Cr. 3
(Prerequisites: M 301, P 302)
Study of the model of the atmosphere, and space, from the ground level to intergalactic space. Atmosphere of the sun, planets, and moons will be investigated and the effect of solar storms on their behavior.

P 460 X-RAYS AND CRYSTAL PHYSICS Cr. 3
(Prerequisite: P 302)
Production of X-rays, absorption, scattering, X-ray spectra, refraction; theory and application of the diffraction of X-rays in matter to the determination of the structure of crystals; introduction of crystallography.

P 491 EXPERIMENTAL RESEARCH—THESIS Cr. 3
(Prerequisite: Permission of instructor)
Introduction to experimental research techniques by participation in active research program. Familiarization with research laboratory equipment and techniques; selection of thesis research project and presentation by each student to the group. Designed to bridge the gap between elementary laboratory and research in modern physics.

P 492 EXPERIMENTAL RESEARCH II—THESIS Cr. 3
Continuation of P 491.

P 510 ELECTRICAL DISCHARGES IN GASES Cr. 3
(Prerequisite: P 302)
Fundamental processes of electron emission from cathodes and interaction with gas; high frequency discharges; Townsend discharge, Geiger Mueller tubes, cathode fall, plasma, glow discharges and arcs.
P 535  SOLID STATE PHYSICS  Cr. 3  
(Prerequisite: P 530)
Classification of solids and crystal structures; lattice energy of ionic crystals; elastic constants of crystals; lattice vibrations; thermal properties of solids; dielectric properties; Ferroelectric crystals; diamagnetism, paramagnetism, superconductivity; free electron theory of metals; band theory of metals; semiconductors.

P 537  MOLECULAR VIBRATION  Cr. 3  
(Prerequisite: P 530)
Vibration of molecules; wave mechanics and molecular vibration; more advanced methods of studying vibrations; symmetry considerations; application of group theory to the analysis of molecular vibration; vibration selection rules and intensities; potential functions; methods of solving the secular determinant.

P 540  NUCLEAR PHYSICS  Cr. 3  
(Prerequisite: P 435)
Experiments and theoretical principles underlying our understanding of the fundamental properties of nuclei; nuclear masses and binding energies; alpha, beta, and gamma ray spectra; nuclear models.

P 541  NUCLEAR PHYSICS II  Cr. 3  
(Prerequisite: P 540)
Elementary particles; scattering of protons and neutrons; nuclear reactions; energy release; cross section; resonance effects; nuclear levels; fusion and fission; origin of the elements.

P 550  PHYSICAL OPTICS  Cr. 3  
(Prerequisite: P 350)
Study of wave motion; reflection and refraction on Huygen's principle; lenses, dispersion; spectrum, interference; diffraction; Fraunhofer diffraction; double refraction; plane polarized light; rotary polarization, electromagnetic theory of light.

P 558  QUANTUM ELECTRONICS  Cr. 3  
(Prerequisite: P 530)
Molecular beam masers; atomic beam oscillator; parallel plate resonators; atomic frequency standards and clocks; optical pumping; parametric amplifiers.

P 559  QUANTUM ELECTRONICS II  Cr. 3  
(Prerequisite: P 530)
The interaction of the quantized electromagnetic field with matter is analyzed using perturbation theory. Quantum statistical methods introduced via the density matrix formalism. These techniques are applied to selected problems in radiation and solid state physics.

P 560  MAGNETOHYDRODYNAMICS  Cr. 3  
(Prerequisite: P 517)
Study of the interaction of moving and conducting fluids with magnetic fields and their application to energy device development; plasma acceleration studies; application to space propulsion; magnetogasdynamic shock layer flow; space-charge waves and plasma diagnostics; microwave reflection and absorption by a non-uniform plasma sheath; thermonuclear power.

P 570  SPECIAL TOPICS IN PHYSICS  Cr. 3  
Individual study in specific problems of physics. The student must obtain special permission from the head of the department before registering for this course.

P 580  STATISTICAL MECHANICS  Cr. 3  
(Prerequisite: P 404)
Classical statistical mechanics; system phase space; representative ensembles; the ergodic surmise; Liouville theorem; point-mass perfect gas; molecular distribution; the most probable distribution; temperature; entropy; Boltzmann's distribution; equipartition of energy; second law of thermodynamics; entropy and probability; relativity and statistical theory.

P 605  THESIS  Cr. 3  
Individual work under the direction of a member or members of the graduate faculty on a selected topic in the field of physics.

PHILOSOPHY

PH 131  INTRODUCTION TO PHILOSOPHY  Cr. 3  
Survey of classical philosophy with selected reading and discussion of the works of the great philosophers of history.

PH 331, 332  LOGIC  Cr. 3, 3  
Study of the principles of reasoning involved in normal human thought processes; inter-relationship of logic, philosophy, and mathematics.
PSYCHOLOGY

PS 141  GENERAL PSYCHOLOGY  Cr. 3
Study of the principles of psychology of normal behavior.

PS 241  INDUSTRIAL PSYCHOLOGY  Cr. 3
Survey of the uses of psychology in industry; selection, placement, and training of workers; familiarization with tests commonly used in industry; significance of individual differences; factors influencing attitude and morale; causes of job dissatisfaction; analysis of individual problems.

SOCIOLOGY

S 261  PRINCIPLES OF SOCIOLOGY  Cr. 3
Systematic explanation of man's social nature, types of groups and institutions, social processes and social change.

SPACE TECHNOLOGY

ST 300  INTRODUCTION TO SPACE TECHNOLOGY  Cr. 3
Introductory study of space vehicle systems; rocket propulsion; guidance; telemetry; controls, instrumentation and tracking networks; communications; celestial mechanics and cosmology; geophysics and astrophysics; space medicine and geodesy.

ST 311  MECHANICS OF FLIGHT  Cr. 3
Fundamental principles of aerodynamics, air foil theory, lift and drag, control surfaces and stability.

ST 312  MECHANICS OF FLIGHT II  Cr. 3
(Prerequisite: ST 311)
Analysis of forces acting on aircraft and space craft. Determination of vehicle performance and trajectories.

ST 351, 352, 353  SPACE TECHNOLOGY SEMINAR  Cr. 1, 1, 1

ST 411  PROPULSION  Cr. 3
(Corequisite: Thermodynamics)
Fundamental principles of operation and performance of ramjet, turbojet, turboprop and turbofan, reciprocating engine, and chemical rocket propulsion systems.

ST 412  PROPULSION II  Cr. 3
(Prerequisite: ST 411)
Fundamental principles of operation and performance of nuclear, electrical, plasma, and solar sail propulsion systems.

ST 421  STRUCTURE DESIGN  Cr. 3
(Prerequisite: ST 412)
Fundamental principles of operation and design of structures and components of launch vehicles and satellites.

ST 431  ASTRODYNAMICS  Cr. 3
Gyroscopic theory; introduction to celestial mechanics; vibration generalized coordinates and forces, and the Lagrangian formulation of dynamics equations.

ST 441  PRINCIPLES OF GUIDANCE AND CONTROL  Cr. 3
Investigation of fundamental principles of rocket and spaceship guidance and control. Investigation of inertial and radio controlled systems.

ST 451, 452, 453  ADVANCED SPACE TECHNOLOGY SEMINAR  Cr. 1, 1, 1

ST 510  ROCKET PROPULSION  Cr. 3
(Prerequisite: P 403 or ME 403)
Thrust equation and performance parameters; development of the differential equations for frictionless, one-dimensional fluid flow with heat addition and area change; application of the differential equations to rocket propulsion; rocket nozzle design; application of propulsion principles to chemical, nuclear, and electrical propulsion systems.

ST 511  ROCKET PROPULSION II  Cr. 3
(Prerequisite: ST 510)
Liquid propellant feed systems, rocket engine controls and instrumentation; design of typical liquid propellant rocket power plant; properties, storage and handling of liquid propellants; properties of solid propellants, types, configurations and performance parameters of solid propellants.

ST 512  ROCKET PROPULSION III  Cr. 3
(Prerequisite: ST 511)
Solid propellant rocket power plant; configuration and composition of various solid propellant grains; performance parameters; controls and instrumentation, properties, storage and handling of solid propellants; design of a typical solid propellant rocket power plant. Types of exotic propulsion systems and comparison with chemical propulsion systems.
ST 513 ADVANCED ROCKET PROPULSION Cr. 3
(Prerequisite: ST 513)
Properties, storage, and handling of cryogenic propellants; performance of cryogenics; types of nuclear rocket reactors, performance of nuclear rocket systems, principles of plasma dynamics and electrostatics; ion, plasma, and photon propulsion system fundamentals.

ST 514 NUCLEAR REACTOR PRINCIPLES Cr. 3
Introduction to nuclear power reactors, principles, radiation effects, shielding and control, special equipment, nuclear fuel systems, moderators, nuclear coolant systems, reactor types and designs, maximum credible accidents and safety, in-pile and out-of-pile testing, power testing, and applications to rocket propulsion systems.

ST 530 INERTIAL GUIDANCE Cr. 3
(Prerequisite: EE 406)
Theory of inertial navigation; rocket vehicle guidance; error analysis; performance optimization, performance analysis; application to space missions.

ST 531 INERTIAL GUIDANCE II Cr. 3
(Prerequisite: ST 530)
Theory of inertial sensing devices; testing of inertial components; stable platforms; initial conditions and platform alignment; steering dynamics and control system integration.

ST 540 ASTRODYNAMICS Cr. 3
(Prerequisite: M 202)
Basic principles of applied mechanics applied to the calculation of orbits of planets and satellites; the solar system; the central force field, orbit determination; perturbation analysis; introduction to celestial navigation.

ST 541 ASTRODYNAMICS II Cr. 3
(Prerequisite: ST 540)
Three body problem; special and general perturbation; ballistic missile trajectory; ascent into and perturbation of satellite orbit; orbit transfer; libration points in earth–moon systems.

ST 542 GEODESY Cr. 3
Techniques of measurement of large portions of the earth's surface; form and dimensions of the earth; ellipticity; utilization of observations of the stars; use of ballistic cameras in geodesy.

ST 543 GEODESY II—THEORETICAL GEODESY Cr. 3

ST 550 RANGE INSTRUMENTATION I—OPTICAL Cr. 3
(Prerequisite: P 301)
Types of optical instrumentation used in tracking launch vehicles and satellites; design principles and operation of these instruments; computation of trajectory from data; capabilities and limitations.

ST 552 RANGE INSTRUMENTATION II—TELEMETRY Cr. 3
Modulation techniques, FM/FM, PAM, PDM, PCM: vehicle and ground systems; telemetry transmitters and receivers; antennas, transmission lines, preamplifiers and multcouplers; phase-lock, diversity techniques; recording and display; systems design.

ST 553 RANGE INSTRUMENTATION III—PULSE RADAR Cr. 3
Pulse radar principles and basic operating equations; range and angle measurements; precision radar techniques; performance evaluation; acquisition; tracking of missiles and space vehicles.

ST 554 RANGE INSTRUMENTATION IV—C.W. RADAR Cr. 3
C.W. radar principles; tracking systems and systems equations.

ST 580 SPACE MEDICINE Cr. 3
Role of man in the space program; review of the physiology of the cardio-pulmonary and nervous systems; dynamic forces, acceleration, deceleration and weightlessness; life support systems, oxygen-respiration requirements, waste disposal, closed ecological systems, CO disposal, nutritional requirements, pressure suits; medical monitoring and data acquisition systems; radiation; psychological aspects of isolation and confinement, perception-reaction, stress factors and stress relieving systems, day-night cycle, work-adaptation to environment.
ST 585 ANALYSIS OF A MANNED SPACE CRAFT  Cr. 3
Consideration of the problems associated with designing, establishing, and maintaining a manned earth-orbiting space craft, including the following: space craft configuration, artificial gravity versus gravity-free environment, structural problems, space power requirements, human factors and safety, vehicle and orbital stabilization and control problems, booster requirements for placing the craft in orbit, rendezvous and resupply operations.

ST 595 SPACE VEHICLE LAUNCH OPERATIONS  Cr. 3
Analysis of flight test organization; booster-space craft interfaces; range facility dependence; guidance; instrumentation; destruct systems; safety; propellant and propulsion systems; flight preparations, final checkout; countdown and launch.

ST 597 ROCKET AND REENTRY VEHICLE MATERIALS  Cr. 3
Parameters involved in the selection of optimum materials for a particular satellite, reentry vehicle and rocket-nozzle design; ablation as a function of the phenomena involved, specific property variations, nozzle or vehicle size and shape; materials properties in relation to operational objectives, structural requirements, and interpretation of the physical and mechanical requirements.

ST 598 CRYOGENICS  Cr. 3
Principles of liquefaction and separation of gases; properties, storage, transfer, and handling of liquefied gases; low temperature thermometry and low temperature properties of structural materials.

SEMINAR SERIES
RECENT ADVANCES IN SPACE TECHNOLOGY
Each year, in the late fall, the Brevard Engineering College working with the Canaveral Section of the Institute of Electrical and Electronic Engineers, presents a series of lectures in Space Technology by America's most outstanding authorities in the field.

Scientists who have lectured in the Seminar series are:

PROF. HOWARD AIKEN, Harvard University
DR. LLOYD V. BERKNER, International President IEEE
PROF. DIRK BROUWER, Yale University
MR. WALTER F. BURKE, McDonnell Aircraft
DR. HANS CLAMANN, Aero Medical Space Center
PROF. CHARLES S. DRAPER, Massachusetts Institute of Technology
MR. KRAFT EHRICKE, General Dynamics Astronautics Corporation
DR. H. VON GIERKE, Wright Patterson AFB
DR. T. CHARLES HELVEY, University of South Florida
DR. J. H. HERSHEY, Bell Telephone Laboratories
PROF. JOHNPRAUS, Ohio State University
DR. GERARD KUIPER, University of Arizona
MR. VINCENT E. LALLY, National Center for Atmospheric Research
DR. KARL MORGAN, Oak Ridge National Laboratory
MR. WILLIAM MUMFORD, Bell Telephone Laboratories
DR. ROBERT OPPENHEIMER, Princeton Institute for Advanced Study
DR. HELMUTH POPPA, General Dynamics Astronautics Corporation
PROF. LARRY RAUCH, University of Michigan
DR. E. D. REED, Bell Telephone Laboratories
DR. J. B. RHINE, Duke University
DR. R. D. SHELTON, Marshall Space Flight Center, Huntsville
DR. ABE SILVERSTEIN, NASA Lewis Laboratory
DR. FRIDTJOF A. SPEER, Marshall Space Flight Center, Huntsville
DR. EDWARD TELLER, University of California
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FRANCIS X. CAREY, Associate in Science (1961)
O. JOSEF WILHELM CHRIST, M.S., Space Technology (1964)
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ROLAND LEFATE DAVIS, Associate in Engineering (1964)
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WALTER R. DESHAW, Associate in Science (1961)
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MURRAY J. DUBNER, Associate in Engineering (1962)
        B.S., Electrical Engineering (1964)
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        B.S., Electrical Engineering (1963)
THOMAS M. FARR, Associate in Engineering (1961)
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ALEXANDER A. FISCHBACK, III, Associate in Engineering (1962)
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        B.S., Electrical Engineering (1963)
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        B.S., Electrical Engineering (1964)
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PETER C. RAY, M.S., Applied Mathematics (1961)
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DAVID ALEXANDER RITCHLEY, Associate in Engineering (1963)
DANIEL EPLING RORRER, M.S., Space Technology (1963)
WILLIAM A. ROWLEY, Associate in Engineering (1962)
THOMAS G. RUTHERFORD, B.S., Electrical Engineering, M.S., Space Technology (1962)
JAMES ARTHUR SAVOR, Associate in Engineering (1964)
LEONARD WESSNER SCHOLL, M.S., Space Technology (1964)
E. RICHARD SEAMAN, M.S., Space Technology (1964)
GEORGE N. SIRBOLA, M.S., Space Technology (1962)
GEORGE HAROLD SLATON, M.S., Electrical Engineering (1964)
CHARLES LOUIS SMITH, M.S., Applied Mathematics (1964)
ELWOOD OSCAR SMITH, SR., Associate in Engineering (1964)
PHILLIP JOHN SPERLI, Associate in Engineering (1964)
F. COURTNEY STONE, Associate in Science (1961)
ROBERT L. STUBBINS, M.S., Space Technology (1963)
PHILLIS SURWILLO, M.S., Space Technology (1962)

J. NOLLEY TRAPP, Associate in Engineering (1962)
RAYMOND LEO THIBAULT, B.S., Electrical Engineering (1964)
HARRY LEON TURNER, Associate in Science (1962), B.S., Mathematics (1963)
JOHN A. VALLEE, Associate in Engineering (1961)
PAUL I. WAITE, Associate in Engineering (1962)
JAMES LUDWIG WALL, JR., M.S., Space Technology (1963)
CYRUS ELY WARDEN, JR., Associate in Science (1962)
THOMAS EDWARD WEBER, Associate in Engineering (1964)
MONROE ALDEN WELANT, JR., M.S., Electrical Engineering (1964)
CHARLES WILLIAM WELSH, M.S., Applied Mathematics (1964)
WALTER B. WHEELER, Associate in Engineering (1962)
DUKE B. WHITE, Associate in Engineering (1964)
SANFORD ADRIAN WHITE, M.S., Space Technology (1963)
THOMAS CHARLES WIRTH, Associate in Engineering (1962)
JACK H. WILLIAMS, M.S., Space Technology (1963)
RAY A. WORK, JR., M.S., Space Technology (1961)
JOHN R. WRIGHT, M.S., Applied Mathematics (1961)
RUSSELL V. ZIMMERMAN, Associate in Engineering (1962)
BUILDING DEDICATION

A complete classroom building was built and donated to the college by financial institutions and industries in the community. Honored names on this classroom building are:

ABCO Concrete Company, Inc.
Burnup & Sims, Inc.
First Federal Savings & Loan Association of Brevard County
First National Bank of Eau Gallie
First National Bank of Melbourne
Florida Power and Light Company
Southern Bell Telephone and Telegraph Company

A science and engineering laboratory was built, furnished, and donated to the college by aerospace firms in the Cape Canaveral area. Honored names on the laboratory building are:

AC Spark Plug Division of General Motors
Aerospace Corporation
Chrysler Corporation
General Electric Company
Lockheed Aircraft Corporation
Martin Company, Canaveral Division
Radiation Incorporated
Radio Corporation of America
The Boeing Company
TRW Space Technology Laboratories

A new modern library was dedicated on January 23, 1965, to William August Bartholomae.

The new men’s residence hall will be named "Brownlie Hall" in honor of Mr. V. C. Brownlie.

FRIENDS OF THE LIBRARY

Dedicated persons in the community who donate their time and talent in serving the college library are called FRIENDS OF THE COLLEGE LIBRARY. The members are:

Mrs. Mary Germond
Mrs. Joan LeMosy
Mr. Frank Lippman
Mrs. Mary McElhaney
Mrs. Oleta Underwood
Mrs. Florence Wood

RECIPIENTS OF HONORARY DEGREES

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NAME</th>
<th>DEGREE</th>
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<tr>
<td>1962</td>
<td>THE HONORABLE TOM ADAMS</td>
<td>Doctor, Space Education</td>
</tr>
<tr>
<td>1962</td>
<td>ASTRONAUT VIRGIL &quot;GUS&quot;</td>
<td>Doctor, Space Science</td>
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<td>GRISSOM</td>
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<tr>
<td>1963</td>
<td>PRESIDENT HUGH F. McKEAN</td>
<td>Doctor, Space Education</td>
</tr>
<tr>
<td></td>
<td>(Rollins College)</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>MAJ. GENERAL (Ret.) JOHN B.</td>
<td>Doctor, Space Science</td>
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<td>MEDARIS</td>
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<tr>
<td>1964</td>
<td>IMELDA NORMAN FERNANDEZ</td>
<td>Bachelor, Space Technology</td>
</tr>
<tr>
<td>1964</td>
<td>SARA LEOVA BARTHOLOMÆ</td>
<td>Doctor, Space Education</td>
</tr>
<tr>
<td>1964</td>
<td>HOMER RAINÉY DENIUS</td>
<td>Doctor, Space Science</td>
</tr>
<tr>
<td>1964</td>
<td>WERNHER VON BRAUN</td>
<td>Doctor, Space Science</td>
</tr>
</tbody>
</table>
Brevard Engineering College has not yet reached the age when it may look to its alumni for substantial financial support. Therefore, an Honorary Alumni Association has been created to provide this life-giving service to the college. Its membership is made up of citizens of the community who, as individuals, willingly and generously support the college in its formative years. They will long be remembered for their constant faith in the college.

LIFE MEMBERS

Dr. Sara Leova Bartholomae
Mr. V. C. Brownlie
Dr. Homer R. Denius
Mr. James C. Ray
Mr. Fred S. Roberts
Mr. George H. Shaw
Dr. Otto G. Sorel
Mrs. Virginia P. Wood

REGULAR MEMBERS

Dr. Jack T. Bechtel
Mr. F. George duPont
Mr. Boyce E. Jones
Dr. Jerome P. Keuper
Dr. Robert A. Lindemann
Dr. Scott D. Linn
Adm. Joseph P. Lushene
Mr. Donald J. Merritt
Dr. William C. Peters
Mr. John F. Turner

MEMBERS OF THE ALUMNI ASSOCIATION COMMITTEE

Dr. William C. Peters, Chairman
Mrs. Lima Williams, Secretary
Dr. Jack T. Bechtel
Mr. Art Herbert
Dr. Jerome P. Keuper
Mr. William Thornberg

Dr. Robert Oppenheimer, guest lecturer in the annual Space Technology Seminar.
CALENDAR OF EVENTS

WINTER 1965

Jan. 4 Mon.  Classes begin
Jan. 9 Sat.  Last day for registration and full tuition refund
Feb. 2 Tues.  Faculty meeting (No evening classes)
Feb. 6 Sat.  Last day for withdrawal
Feb. 22 Mon.  Holiday (Washington’s Birthday)
Mar. 16 Tues.  Last day of classes
Mar. 17-22  Final exams
Mar. 23-29  SPRING VACATION

SPRING 1965

Mar. 30 Tues.  Classes begin
Apr. 5 Mon.  Last day for registration and full tuition refund
May 3 Mon.  Last day for withdrawal
May 18 Tues.  Faculty meeting (No evening classes)
May 31 Mon.  Holiday (Memorial Day)
June 9 Wed.  Last day of classes
June 10-15  Final exams
June 17 Thurs.  Commencement Exercises
June 15-July 5  SUMMER VACATION

SUMMER 1965

July 6 Tues.  Classes begin
July 12 Mon.  Last day for registration and full tuition refund
July 20 Tues.  Faculty meeting (No evening classes)
Aug. 9 Mon.  Last day for withdrawal
Sept. 6 Mon.  Holiday (Labor Day)
Sept. 15 Wed.  Last day of classes
Sept. 16-21  Final exams
Sept. 22-28  FALL VACATION

FALL 1965

Sept. 27 Mon.  Aptitude test for all new undergraduates
Sept. 29 Wed.  Classes begin
Oct. 5 Tues.  Last day for registration and full tuition refund
Oct. 13 Wed.  Faculty meeting (No evening classes)
Nov. 2 Tues.  Last day for withdrawal
Nov. 25-28  Thanksgiving Recess
Dec. 11 Sat.  Last day of classes
Dec. 13-16, 18  Final exams
Dec. 19-Jan. 2  CHRISTMAS VACATION

WINTER 1966

Jan. 3 Mon.  Classes begin
### 1965

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### Supplementary Information

- **Housing**
- **Incomplete Work**
- **Language Requirements**
- **Library**
- **Location**
- **Mathematics Program**
  - Graduate
  - Undergraduate
- **Medical Services**
- **Notification of Grades**
- **Operation**
- **Operations Research Program**
- **Physics Program**
  - Graduate
  - Undergraduate
- **Point Hour Ratio**
- **Residence**
- **Scholarships and Loans**
- **Seminar Series**
- **Space Technology Program**
  - Graduate
  - Undergraduate
- **Special Courses**
- **Special Student**
- **Split Schedules**
- **Student Center**
- **Student Government**
- **Student Regulations**
- **Transportation**
- **Tuition**
- **Tuition Refund Policy**
- **Warning and Dismissal**
- **Withdrawals**

**Calendar Years:**

- **1965**: January, February, March, April, May, June
- **1966**: January, February, March, April, May, June