1961

Brevard Engineering College Announcement 1961-1962

Brevard Engineering College

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I AM AN ENGINEER. In my profession I take deep pride, but without vain glory; to it I owe solemn obligations that I am eager to fulfill.

As an Engineer, I will participate in none but honest enterprise. To him that has engaged my services, as employer or client, I will give the utmost of performance and fidelity.

When needed, my skill and knowledge shall be given without reservation for the public good. From special capacity springs the obligation to use it well in the service of humanity; and I accept the challenge that this implies.

Jealous of the high repute of my calling, I will strive to protect the interests and good name of any engineer that I know to be deserving; but I will not shrink, should duty dictate, from disclosing the truth regarding anyone that, by unscrupulous act, has shown himself unworthy of the profession.

Since the Age of Stone, human progress has been conditioned by the genius of my professional forbearers. By them have been rendered usable to mankind Nature's vast resources of material and energy. By them have been vitalized and turned to practical account the principles of science and the revelations of technology. Except for this heritage of accumulated experience, my efforts would be feeble. I dedicate myself to the dissemination of engineering knowledge, and especially to the instruction of younger members of my profession in all its arts and traditions.

To my fellows, I pledge in the same full measure I ask of them, integrity and fair dealing, tolerance and respect, and devotion to the standards and dignity of our profession; with the consciousness, always, that our special expertness carries with it the obligation to serve humanity with complete sincerity.

Courtesy, Engineers Council for Professional Development
29 West 39th Street, New York 18, New York
ORGANIZATION

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Consultant, Radiation Inc., Palm Bay

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Rector, Holy Trinity Episcopal Church, Melbourne

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Robert A. Lindemann, A.B., M.A., Ph.D. Chairman Humanities
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Ray A. Work, B.E.E., M.S. Chairman Engineering
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University of Florida
Massachusetts Institute of Technology
University of Florida

Philander H. Betts, B.S.E.E.
Rutgers

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Florida State University

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University of Florida

O. J. W. Christ, B.S.
University of Illinois

Alexander Corpacius, B.S., M.S., M.E., Ph.D., D.Sc.
University Bucharest
University LaPlata
Zurich Institute of Technology
Berlin Institute of Technology

Frank S. Coxe, B.E., M.S.
Yale University
North Carolina State College

Joseph M. Cullen, B.S.
Drexel Institute of Technology
University of West Virginia

Daniel Dahle, Ch.E., M.S., Ph.D.
Chalmers Institute of Technology
American University

Sebastian J. D’Alli, B.A.E., M.S., P.E.
Polytechnic Institute of Brooklyn
Brevard Engineering College
State of Florida

STATISTICS
Mathematician, Aerospace

ELECTRICAL ENGINEERING
Manager, The Martin Company
(Orlando)

RELIABILITY
Member of Technical Staff
Bell Telephone Laboratories

MATHEMATICS
Senior Development Physicist
Radiation, Incorporated

MATHEMATICS
Mathematician, RCA

MATHEMATICS
Mathematician, RCA

SPACE TECHNOLOGY
Engineer, RCA

SPACE TECHNOLOGY
Scientist, RCA

ELECTRICAL ENGINEERING
Member, Technical Staff
STL

MATHEMATICS
Development Engineer
Burroughs, Inc.

CHEMISTRY

SPACE TECHNOLOGY
Group Engineer
AVCO-Florida
<table>
<thead>
<tr>
<th>Name</th>
<th>Degree(s)</th>
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<th>Major</th>
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<tbody>
<tr>
<td>Lawrence D. Dibble</td>
<td>B.M.E., M.S.</td>
<td>University of Florida</td>
<td>MATHEMATICS ENGINEER, Boeing Airplane Co.</td>
</tr>
<tr>
<td>Pieter S. Dubbeldam</td>
<td>B.S., M.S., Ph.D.</td>
<td>Free University in Amsterdam</td>
<td>PHYSICS Scientist, RCA</td>
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<tr>
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<td>B.S.S.C.L., M.S., Ph.D.</td>
<td>Stetson University, Virginia Polytechnic Institute</td>
<td>MATHEMATICS Statistician STL</td>
</tr>
<tr>
<td>Eugene M. Fetner</td>
<td>B.E.E., M.S.E.</td>
<td>University of Florida</td>
<td>ELECTRICAL ENGINEERING Engineer, RCA</td>
</tr>
<tr>
<td>Thomas R. Gleason</td>
<td>B.S., M.S.</td>
<td>U.S. Military Academy</td>
<td>MATHEMATICS Major, U.S. Army</td>
</tr>
<tr>
<td>Arthur R. Harris</td>
<td>B.A., B.J.</td>
<td>Southern Methodist University</td>
<td>TECHNICAL REPORT WRITING Engineering Editor RCA</td>
</tr>
<tr>
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<td>B.S., M.S., P.E.</td>
<td>University of New Hampshire</td>
<td>SURVEYING Chief Engineer Tanner, Thompson D'Alli &amp; Heartz, Inc.</td>
</tr>
<tr>
<td>Ned W. Hill, Jr.</td>
<td>B.S., M.S.</td>
<td>Florida Southern, University of Miami, University of Florida</td>
<td>MATHEMATICS Data Reduction Analyst RCA</td>
</tr>
<tr>
<td>Fielding B. Hills</td>
<td></td>
<td>Andrew Johnson School</td>
<td>GRAPHICS Engineer, RCA</td>
</tr>
<tr>
<td>A. E. Hoffman-Heyden</td>
<td></td>
<td>Berlin Technische Hock-schule</td>
<td>SPECIAL LECTURER IN RADAR Engineer, RCA</td>
</tr>
<tr>
<td>David C. Howard, Jr.</td>
<td>B.E.E., M.S.E.</td>
<td>University of Florida</td>
<td>ELECTRICAL ENGINEERING Project Engineer, Radiation, Inc.</td>
</tr>
<tr>
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<td>B.S., M.S., Ph.D.</td>
<td>Concordia College, Purdue University, University of Chicago, University of Texas</td>
<td>ELECTRICAL ENGINEERING Staff Scientist PAA</td>
</tr>
<tr>
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<td>B.S., B.D., M.A.</td>
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<td>MATHEMATICS Head, Mathematics Department Melbourne High School</td>
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<tr>
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<td>University de LaPlata, University de Buenos Aires</td>
<td>MATHEMATICAL PHYSICS Physicist, RCA</td>
</tr>
</tbody>
</table>
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HUMANITIES
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Indialantic Elementary School

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Chemist, RCA

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University of Pittsburgh
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Manager, Data Support Planning
PAA

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University of Southern California
University of Chicago
HUMANITIES
<table>
<thead>
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<th>Name</th>
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<tr>
<td>Wilmer W. Nichols, B.S.</td>
<td>N. E. Mississippi Junior College</td>
<td>MATHEMATICS Mathematician, RCA</td>
<td>Delta State College</td>
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<td>University of Miami</td>
<td>MATHEMATICS Engineer, PAA</td>
<td>Rollins College</td>
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<td>Butler University</td>
<td>ELECTRICAL ENGINEERING Engineer, RCA</td>
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<td>Massachusetts Institute of Technology</td>
<td>CHEMISTRY Engineering Group Head, AVCO</td>
<td>Columbia University</td>
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<td>Jean A. Risher, B.S.</td>
<td>Maryville College Florida State University Georgia Institute of Technology</td>
<td>MATHEMATICS</td>
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<td>Welby T. Risler, A.B., M.S.</td>
<td>Emory University University of Florida</td>
<td>PHYSICS Physicist, USAF</td>
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<tr>
<td>James Robertson, B.S.</td>
<td>Carnegie Institute of Technology</td>
<td>QUALITY CONTROL Supervisor, Quality Analysis, Radiation, Inc.</td>
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<tr>
<td>Allen Roth, B.S.</td>
<td>University of Miami</td>
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<td>Donald C. Sheppard, B.S.</td>
<td>University of Maryland University of Florida</td>
<td>PHYSICS Aerospace Technologist, NASA</td>
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<td>William K. Silber, B.A., M.B.A.</td>
<td>Lenoir Rhyne College University of Pennsylvania</td>
<td>HUMANITIES Personnel Coordinator, RCA</td>
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<tr>
<td>Phillip W. Sumner, A.B.</td>
<td>Elon College North Carolina State</td>
<td>PHYSICS Manager, Test Equipment Repair and Calibration Laboratory, RCA</td>
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<td><strong>The Rev. Father George Swallow</strong>, S.B., L.Th.</td>
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<td>HUMANITIES</td>
<td>Massachusetts Institute of Technology</td>
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<td>John A. Vallee, B.A.</td>
<td>MATHEMATICS</td>
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<td>Laval University</td>
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<td>Eugene West, S.B.</td>
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<td>Robert E. Wilkinson, A.B.</td>
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<td>Marvin R. Whipple, A.B., L.L.B.</td>
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<td>Western Kentucky State College</td>
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<td>Bradford H. Whitacre, B.A.E., M.Ed.</td>
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<td>John R. Wright, B.S.M.E., M.S.</td>
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<td>John Young, A.B., M.A., Ph.D.</td>
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FOREWORD

The Brevard Engineering College was founded in 1958. It is located in Melbourne, Florida, a few miles south of Patrick Air Force Base, the center of engineering activities for the Atlantic Missile Range.

The college is incorporated in the State of Florida as a non-profit educational institution and chartered to confer undergraduate and graduate degrees.

It is the objective of the college to provide opportunities for higher education in the areas of engineering and science. The college has been primarily an evening school of engineering, although day classes have now been established to fit the needs of regular students, as well as those who are employed in the evenings at the Atlantic Missile Range. The day classes parallel the evening classes so that students may attend throughout the year in either class with no conflict with their regular employment schedule.

Most of those associated with the college, with the exception of the office secretaries, are regularly employed elsewhere as scientists, engineers, or administrators. Each is expert in his own particular field and it is this expertness and experience that is brought into the classroom. There are few colleges that can boast of such depth of technical experience in their teaching staff.

The Brevard Engineering College is a relatively new college, and as such, not yet regionally accredited. The college is dedicated to, and follows as closely as possible, the principles and standards of The Southern Association of Colleges and Secondary Schools.

Also, it is the policy and practice of the college to carry out curricula in conformity to criteria established by the Engineers Council for Professional Development. The individual courses of study are thus equal to those offered by most engineering colleges. Accreditation is not a requirement for granting college credits and many of the better engineering schools will accept credits from the Brevard Engineering College for courses paralleling their own. Important here is the fact that the college is neither a technical institute nor a junior college, but is in all respects a college of engineering and science. The college is an academic member of The Society for Industrial and Applied Mathematics.

The college is largely tuition supported, although grants are received from time to time. The Radio Corporation of America has each year supported the college with unrestricted grants.

Honor students at the college receive recognition in various ways. At the end of the semester, a Dean's List is published, listing the names of students who study two or more subjects and attain an average of 85% or better. Frequently, cash awards are made available to outstanding students.
The college has received widespread recognition and has created much interest through the nation-wide press and radio. Most of the contracting companies at the Atlantic Missile Range have approved the college for attendance by their employees under their individual tuition loan and refund plans. The college has attracted students from all parts of the nation.

Some have enrolled in the college and then found employment at the Missile Test Center or in local businesses.

The Brevard Engineering College campus is situated on approximately 35 acres of partially wooded land in the city of Melbourne. The present college buildings are located along Country Club Road which runs through the campus. A stream, abounding with a natural growth of palm trees, circles around the campus forming a natural tropical backdrop to the campus proper. Construction of an administration building with two modern air conditioned classroom wings is currently being completed.

A separate library building, complete with office and other facilities is located adjacent to one of the classroom wings. Approximately 3000 volumes are to be found on its shelves. In addition to the standard technical books, many volumes are devoted to the humanities and the fine arts. The collection of technical journals is one of the finest in Florida available to the general public.

The Brevard Engineering College Computing Center was established in September 1959, to provide electronic computing facilities for instruction and research.

A Royal-McBee LGP-30 with a photo-electric reader/punch and auxiliary equipment are installed in the Computer Laboratory. This facility is used in undergraduate and graduate training and is available for research projects of graduate students.

The College Computing Center also offers consulting services and high speed computations to industrial, business and governmental organizations.

**GENERAL INFORMATION**

**DEGREES** Two baccalaureate degrees are offered in the undergraduate programs. Five and one-half year evening programs lead either to the Bachelor of Science in Electrical Engineering or Bachelor of Science in Mathematics. In either program, the student is awarded the Associate Degree upon satisfactory completion of one half of the baccalaureate work.

In the graduate studies, three Master of Science programs are offered. Degrees may be earned in Space Technology, Applied Mathematics, and Electrical Engineering.

**REQUIREMENTS FOR ADMISSION** To be admitted to the college, an applicant must be a high school graduate at least 17 years
of age and must satisfy the college that he is prepared to undertake the rigorous studies of science and engineering.

ADVANCED STANDING Credit for work successfully completed 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. A minimum of 30 term hours, however, must be taken at the Brevard Engineering College in the appropriate program to satisfy any of the undergraduate degree requirements.

APTITUDE TESTING A thorough aptitude examination (ACE) is given to all entering, first year, undergraduate students. The object of the examination is to guide the faculty in assisting individual students.

ARRANGEMENT OF CLASSES The normal school year consists of four terms, extending throughout the calendar year. A calendar of events will be found on the last page in the catalogue.

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 90 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 daytime classes meet on Monday, Wednesday and Saturday mornings from 8:30 to 11:30 A.M.

Graduate classes normally meet on Tuesday and Thursday evenings.

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.

SYSTEM OF GRADING Final grades in most courses are based on the following weights: one for homework; two for tests; two for final examination. However, at the discretion of the instructor, term grades may be raised or lowered based on the student's classroom participation.

The final examination in all courses is two hours long and covers the work of the term.

Tests will be given at the times indicated in the Calendar of Events and will be equivalent for all sections of a particular subject. Students who are absent from a test are required to make up the test.
The system of grading is as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
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<tr>
<td>A</td>
<td>90 - 100</td>
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<tr>
<td>B</td>
<td>80 - 89</td>
</tr>
<tr>
<td>C</td>
<td>70 - 79</td>
</tr>
<tr>
<td>D</td>
<td>60 - 69</td>
</tr>
<tr>
<td>Inc.</td>
<td>Incomplete (not a grade)</td>
</tr>
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</table>

The lowest passing grade is 60%.

Incomplete work in homework, tests, or final examination must be made up before a student is entitled to a clear grade and is admitted to dependent subjects. An incomplete grade must be made up before the subject is next given, otherwise, it will be considered a failure.

To qualify for either of the undergraduate degrees, a student must have an average of 70%.

REPORT OF GRADES A report of grades is issued to each student at the end of each term.

ATTENDANCE The intensive nature of the courses imposes heavy demands upon the student's time and effort. Unbroken attendance is essential if the student expects to grasp successfully the various courses presented. Students are expected to make up all work missed through absence.

WITHDRAWAL Students may withdraw from the College or drop one or more subjects at any time prior to the first day of the seventh week of classes upon written application to the dean on forms provided by the college for this purpose. Students who drop out of the college without permission of the dean will be automatically credited with a failure.

Students who drop one or more subjects following the first day of the seventh week of classes will be credited with an incomplete, withdrawal, or a failure, depending upon the recommendation of the instructor(s) concerned.

The policy on tuition refund is described under the section "Tuition and Fees".

TUITION AND FEES Tuition for lecture courses is charged at the rate of $10 per credit hour for 100 and 200 series courses, $12 per credit hours for 300 and 400 series courses, and $14 per credit hour for 500 and 600 series courses.

Tuition for laboratory courses is charged as follows: P103, P203 at $36 per course; P303, EE304, EE407, M405, M406, and M407 at $42 per course.

A fee of $5 is charged for matriculation. The matriculation fee is not refundable. Fees for graduation are charged as follows:

Associate degrees $10.00; Bachelors degrees $15; and Graduate degrees $20.
The college has an arrangement with the First National Bank of Melbourne for a time-payment plan for students who prefer this method.

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

- First week of classes: 100%
- Second week of classes: 70%
- Third week of classes: 40%
- Fourth week of classes: 10%

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

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.

Special courses which have recently been conducted are Surveying; Review for the Professional Engineer's Exam; Investments; Quality Control Administration; Management; Reliability.

UNDERGRADUATE SCHOLARSHIP STANDARDS AND STUDENT RESPONSIBILITY

The student is responsible for knowing his own scholastic standing in reference to the published regulations and standards of the college.

The Marking And Point System

The grade marks given at the college are as follows:

- A — Excellent; for each credit hour, 4 credit points shall be allowed.
- B — Good; for each credit hour, 3 credit points shall be allowed.
- C — Average; for each credit hour, 2 credit points shall be allowed.
- D — Poor; for each credit hour, 1 credit point shall be allowed.
- E — Failed; for each credit hour, 0 credit points shall be allowed. Credit for a course in which “E” has been received can be obtained only by repeating and passing the work in class.
- F — Failed absent, same conditions as “E” above. This mark indicates that the student was absent from the final examination without excuse, and that his work during the Quarter does not justify the expectation that he will secure a passing grade.
- I — Incomplete — indicates (1) that the work of the student in the course is qualitatively satisfactory, but that for legitimate
reasons a small fraction of work remains to be completed; or (2) that the record of the student in the course justifies the expectation that he will obtain a passing grade, but he has been unavoidably absent from the final examination. The student is charged with the responsibility of completing the work at the earliest possible time, and not later than the end of the Quarter in residence following receipt of the Incomplete; except in laboratory courses offered but once a year, he shall have one calendar year in which to complete the work. If, at the close of the Quarter, the student has not completed the work remaining to be done, he will be given a final Quarter grade for the work which shall take into consideration the unfinished part of his requirement.

**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, unless the Executive Committee of the College authorizes a substitute course.

**Notification Of Grades**

At the close of each Quarter, the Registrar notifies each student by mail of the grades earned during the Quarter. These grades become a part of the official record of the student and are not subject to change except upon official authorization of the Chairman of the Department or director of the school and the Dean of the College.

A grade filed in the Office of the Registrar is a part of the official records of the College. It is not subject to change except upon written authorization of the Department Chairman or the Dean of the College, and then only when a clerical error has been discovered.

**The Point Hour Ratio**

A student’s academic standing for a Quarter is expressed by his “point-hour ratio.” This ratio is determined by dividing the total number of points earned by the total number of credit hours scheduled or undertaken. Course grade I is not included in the computations. The following is an example: A=4, B=3, C=2, D=1, E=0, F=0.

| Course No. 1 | 5 | A | 20 |
| Course No. 2 | 3 | C | 6 |
| Course No. 3 | (3) | I | |
| Course No. 4 | 3 | E | 0 |
| Course No. 5 | 3 | B | 9 |
| **14** | | | **35** |

Point hour ratio 2.50
When the final grade on Course No. 3 is recorded, the points and hours will be included in figuring the student’s point-hour ratio. When a student has a record for two or more Quarters, he will have a cumulative point-hour ratio determined by dividing the total points earned by the total hours undertaken.

**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 degree candidacy.

“1.7 Rule.” A 1.7 point-hour ratio accumulative or better is required for all Bachelor Degree candidates.

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

Dismissal for good and sufficient reasons may be waived by special action of the Executive Committee of the College.

“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. While point-hour ratio of such a student will be computed on the work done at Brevard Engineering College, the period of enrollment at other institutions will be included when the Quarters of residence are determined.
CURRICULA

Bachelor Of Science And Associate Degrees

Five and one-half year baccalaureate programs lead either to the Bachelor of Science in Electrical Engineering or Bachelor of Science with a major in mathematics. For either degree, the minimum number of term hours required for graduation is 192. Upon satisfactory completion of 96 hours, the student is awarded an associate degree in either engineering or science, depending upon the program he is following. For some, the associate degree will be a terminal degree representing a strong training in technical fundamentals.

Both undergraduate programs are outlined in detail in the succeeding pages. Electives are necessarily quite restricted because of the limited capacity of the college. Also, it should be recognized that while it is possible to gain the bachelor's degree in only five and one-half years of evening work, the program outlined includes summer study each year, and the total load each term is better than half a normal load for full time day students. Many students do not find it possible to follow such a rigorous program exactly as outlined, but the opportunity is open for the many who do have the time and ability.

In the Electrical Engineering program, 79 hours are devoted to engineering courses, 45 hours to other technical courses, 33 hours to mathematics courses, and 36 hours to non-technical courses.

In the Mathematics program, 66 hours are devoted to mathematics courses, 42 hours to technical courses, 51 hours to non-technical courses, and 33 hours to electives, technical or non-technical.

Mathematics program electives may be selected from the humanities courses offered, or from EE curriculum courses not already included in the mathematics program. M407, Advanced Programming, is not a necessary requirement for the degree. A substitution for this course may be made with the permission of the college.

Nine (9) term hours of foreign language are required in the mathematics program and none in the electrical engineering program.
# CURRICULUM

## Bachelor Of Science In Electrical Engineering

### First Year

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Codes</th>
<th>Courses</th>
<th>Hours</th>
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<tr>
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<td>M101</td>
<td>Algebra</td>
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<td>C101</td>
<td>Chemistry</td>
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<td></td>
<td>D101</td>
<td>Graphic Science</td>
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<td>C102</td>
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<td>D102</td>
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<td>EC101</td>
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### Second Year

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### Third Year

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<td>Circuit Theory of Electron Devices</td>
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<td>EE305</td>
<td>D.C. Machinery</td>
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<td>EE302</td>
<td>Circuit Theory of Electron Devices</td>
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<td>EE306</td>
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### Fifth Year

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<td>ME302</td>
<td>Machine Design</td>
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<td>EE401</td>
<td>Transistor Circuit Theory</td>
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<td><strong>Spring Term</strong></td>
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<td>Communication Theory</td>
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### Sixth Year

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<td>Industrial Electronics</td>
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<td>ME403</td>
<td>Engineering Thermodynamics</td>
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<td><strong>Fall Term</strong></td>
<td>G361</td>
<td>Principles of Management</td>
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<td>E203</td>
<td>English Literature</td>
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<td>Engineering Thermodynamics</td>
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<td>EE406</td>
<td>Servomechanisms</td>
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# CURRICULUM

## Bachelor Of Science In Mathematics

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<th>Hours</th>
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<td>M101 — Algebra</td>
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<td>M105 — Calculus</td>
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<td>E102 — English</td>
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<td>M102 — Algebra</td>
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<td>P201 — Physics</td>
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<td>M302 — Mathematical Analysis</td>
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<td>G222 — Foreign Language</td>
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<td>M303 — Mathematical Analysis</td>
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<td><strong>Summer Term</strong></td>
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<td>M405 — Digital Computers</td>
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<td>M403 — Introduction to Modern Mathematics</td>
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<td>H201 — History of Science</td>
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<td>M556 — Vector Analysis</td>
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<td>E202 — English Literature</td>
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<tr>
<td>G361 — Principles of Management</td>
<td>3</td>
<td>M404 — Introduction to Statistical Methods</td>
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<td>M406 — Digital Computers</td>
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<td>M545 — Statistics</td>
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Prospective candidates for the degree of Master of Science must hold a Bachelor's Degree in Science or Engineering from a recognized college or university with an undergraduate scholarship record sufficiently high to indicate probable success in graduate work. An official copy of the student's undergraduate work must be filed with the college.

The degree of Master of Science may be conferred upon satisfactory completion of a minimum of forty-two (42) term hours of graduate work. Two courses per term are considered a full load for evening students in the Master of Science programs; thus the requirements may be completed in seven terms (one and three-quarter calendar years).

Master of Science candidates are required to take three terms of Advanced Calculus the first year and three terms of Mathematical Physics the second year.

The Electrical Engineering option requires the completion of fifteen hours of graduate electrical engineering courses and nine hours of other graduate courses related to the field of electrical engineering.

The Applied Mathematics option requires the completion of eighteen hours of electives, nine hours of which must be in mathematics and six hours devoted to the thesis. The thesis must be a comprehensive and searching piece of work in applied mathematics, suitable for publishing and guided by a senior member of the faculty.

The Space Technology option requires the completion of a minimum of twelve hours of space technology courses which must include three hours of Introduction to Space Technology. The remaining number of required hours must be made up of other graduate courses.

All candidates for the Masters Degree must have their programs approved by the appropriate Department Chairman and on file in the office of the Registrar.
ARTS
G 211 INTRODUCTION TO MUSIC Cr. 3
Designed to familiarize students with the language of music. A study of harmony and the terminology of music. Appreciation for the masterworks in the history of music.

G 212 INTRODUCTION TO ART AND ARCHITECTURE Cr. 3
A comparative study of the art and architecture of the Ancient, Medieval and Baroque periods leading into the modern.

CHEMISTRY
C 101,102,103 CHEMISTRY Cr. 3, 3, 3
Study of the fundamental principles of chemistry; physical state of matter and the periodic table; molecular bonding and classification of compounds; chemical equations; solutions; oxidation-reduction; chemical equilibria; chemistry of the metals and non-metals; insight into organic and nuclear chemistry.

C 301 GEOLOGY Cr. 3
A survey of structural and historical geology including principal geological formations, rocks and minerals and a history of the earth's crust.

ELECTRICAL ENGINEERING
EE-201,202,203 A-C CIRCUIT THEORY Cr. 3, 3, 3
(Prerequisite Mathematics M-107; Concurrent Physics 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 or matching; tuned coupled circuits.

EE-204 ADVANCED A-C CIRCUIT THEORY Cr. 3
(Prerequisites EE-203, Mathematics M-202)
Transients in Linear Circuits; Transmission Line Theory; Network Theory, Filters, and Equalizers. LaPlace transformation as applied to circuit theory.

EE-301,302,303 CIRCUIT THEORY OF ELECTRON DEVICES Cr. 3, 3, 3
(Prerequisite EE-204)
Electronic circuit components (diodes, triodes, tetrodes, pentodes, gas filled tubes, photo tubes) circuit theory of triodes; circuit theory of tetrodes and pentodes; audio and video ampli-
fiers; feedback principles. Gas tube control circuits; single phase rectifiers and power supplies; polyphase rectifier circuits; radio frequency amplifiers and oscillators.

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

EE-305 D-C MACHINERY Cr. 3
(Prerequisite EE-204)
Principles and operating characteristics of D-C Machines; generated electromotive force; saturation curves; voltage regulation and efficiency of shunt, series and compound generators; motor operating equations; speed, regulation and efficiency of shunt, series and compound motors; auxiliary equipments.

EE-306 A-C MACHINERY Cr. 3
(Prerequisite EE-204)
Basic principles of A-C Machinery; transformers; alternators; synchronous motors; induction motors; single-phase motors; selsyn devices.

EE-401,402 TRANSISTOR CIRCUIT THEORY Cr. 3, 3
(Prerequisite EE-303)
Physical concepts of transistors and other related semiconductor devices; P-N Junction theory; characteristics and parameters of transistors; equivalent circuits; basic amplifier circuits; miscellaneous solid state devices.

EE-403 COMMUNICATION THEORY Cr. 3
(Prerequisite EE-303)
Theory of communication, information content, frequency spectra, noise, radio receivers and transmitters, propagation, and antennas.

EE-404 INDUSTRIAL ELECTRONICS Cr. 3
(Prerequisite EE-303)
Fundamentals of industrial electronic control using photo cells, gas tubes, and ignitrons; timing circuits, and sequence relaying; welder control; radio frequency heating.

EE-405 THEORY OF ELECTRON DEVICES Cr. 3
(Prerequisite EE-303)
Electric fields, potential distribution, space charge flow, and energy relations in electron tubes; electron theory of metals, thermionic emission; kinetic theory of gases.

EE-406 SERVOMECHANISMS Cr. 3
(Prerequisite EE-303, 305, 306, Mathematics M-202)
General background of servomechanisms. LaPlace transformation, equations of physical systems, transient analysis,
transfer functions, design, gain adjustment, compensation. Nyquist diagram, Bode plots, Root Locus.

EE-407 SERVOMECHANISMS LABORATORY Cr. 2
Laboratory experiments to illustrate the principles of EE-406.

EE-525,526,527 SYNTHESIS OF PASSIVE NETWORKS Cr. 3, 3, 3
The study of 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. The course includes studies of driving-point and transfer impedance properties; synthesis of LC, RC and RL driving-point impedances; equivalent and reciprocal networks; properties of two terminal pair networks and their synthesis, etc.

EE-535 RADAR SYSTEMS Cr. 3
Fundamental principles of radar systems; analysis of the engineering principles and the design of circuitry unique to these systems.

EE-545,546 LOGICAL DESIGN OF DIGITAL COMPUTERS Cr. 3, 3
Utilization of Mathematics as a tool in the logical design of digital systems. Boolean Algebra, switching techniques, optimization of digital systems.

EE-555,556,557 SOLID STATE ELECTRONICS Cr. 3, 3, 3
Physical concepts of transistors and other related semiconductor devices; P-N Junction theory; characteristics and parameters of transistors; equivalent circuits; basic amplifier circuits; miscellaneous solid state devices.

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
A survey of: the backgrounds of American History; the Colonial Period; the War for American Independence; the Confederation of the Constitution; and the National Period.
H 102  AMERICAN HISTORY  Cr. 3
From 1840. Political history forms the framework, with economic, social, cultural, and intellectual history interwoven. An introduction to historical literature, source material and criticism is included.

H 201  HISTORY OF SCIENCE  Cr. 3
A 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. To develop an appreciation for the heritage of modern science.

H 211  AMERICAN DIPLOMATIC HISTORY  Cr. 3
Topics covered include the foundations of American diplomacy from the Colonial period to 1823; and the diplomacy of American Continental expansion to 1865.

H 212  AMERICAN DIPLOMATIC HISTORY  Cr. 3
American Diplomatic History from the Civil War period to present day, including discussion of the United States as a world power; U. S. involvement in Far Eastern affairs after 1898; the diplomacy of World Wars I and II; and developments to the present day.

ENGLISH

E 101,102  ENGLISH  Cr. 3, 3
The basic mechanics of written communications; sentence and paragraph structure; vocabulary; punctuation; clarity of expression.

E 103  TECHNICAL REPORT WRITING  Cr. 3
(Prerequisite E 102)
The 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  Cr. 3
(Prerequisite E 102)
The course is designed specifically to develop the student's ability to deal effectively with speaking situations arising in his job. It covers the 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  ENGLISH LITERATURE  Cr. 3
(Prerequisite E 102)
Reading and discussion of selected plays and essays.
E 203 ENGLISH LITERATURE  Cr. 3
(Prerequisite E 102)
Reading and discussion of selected English classics.

E 204 SELECTED READINGS IN THE HUMANITIES  Cr. 3
Individual readings and research in various areas of the humanities. Topics will be chosen on an individual basis, and students will be required to present formal, written and/or oral reports.

LANGUAGES
G 221,222,223 FOREIGN LANGUAGES  Cr. 3, 3, 3
Foreign languages are offered in French, Spanish, German and Russian.

MANAGEMENT
G 361 PRINCIPLES OF MANAGEMENT  Cr. 3
A survey course designed 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 operations, and in industrial relations and labor relations.

G 362 MANAGEMENT PROCESSES  Cr. 3
(Prerequisite G-361)
An intermediate management course designed to present a non-technical view of the basic management processes as they operate in the job situation. Students will examine and report on the management disciplines currently in use by business.

G 363 ADVANCED MANAGEMENT  Cr. 3
(Prerequisite G 361)
A critical analysis and study of advanced management theory. Particular emphasis will be placed on the six major approaches to the management discipline.

MATHEMATICS
M 101,102,103 ALGEBRA  Cr. 3, 3, 3
The fundamental operations of algebra. 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 101)
Ordinary topics of trigonometry. 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 M103,104 or M103,104 concurrently)
Fundamental ideas of differential and integral calculus. 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; areas of surfaces of revolution center of gravity; moment 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 201,202  DIFFERENTIAL EQUATIONS  Cr. 3, 3
(Prerequisite M107)
Infinite series, and complex number, 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 M107)
Brief review of elementary calculus. Further topics include vector velocity and acceleration in plane curvilinear motion; three-dimensional analytic geometry; partial differentiation, multiple integration.

M 301  ENGINEERING ANALYSIS  Cr. 3
(Prerequisite M202,203, EE203, ME301)
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 302,303,304  MATHEMATICAL ANALYSIS  Cr. 3, 3, 3
(Prerequisite M203, M203)
A systematic discussion of the fundamental properties of real numbers and a careful development of the concepts of functions, limits, continuity, derivatives, integrals, series, etc. A general study of integration, line and surface integrals, theorems of Gauss, Stokes and Green; selected topics in the theory of functions of a real variable.
M 401,402,403 INTRODUCTION TO MODERN MATHEMATICS Cr. 3, 3, 3
(Prerequisite M304)
Supplements the usual elementary courses. Emphasizes recently developed mathematical ideas and proofs which underlie mechanical and manipulative techniques. Without the former, the student is liable to commit fundamental errors in his application of mathematics. Topics discussed include: sets, relation, measure and probability, metric and vector spaces, linear functionals, modern generalization of the concept of function.

Introduces numerical methods. Finite differentiation and integration, interpolation methods, polynomial approximations, Cheyyshev polynomials, smoothing techniques.

M 404 INTRODUCTION TO STATISTICAL METHODS Cr. 3
(Prerequisite M107)
A first course in statistics. The normal distribution statistical inference curve fittings, estimate of the variants, analysis of variants, regression and correlation.

M 405 DIGITAL COMPUTERS Cr. 3
(Prerequisite M103, M104)
An introduction to the operation of general purpose electronic digital computers. Number systems, arithmetic operations in digital machines; coding, digital computer programming.

M 406 DIGITAL COMPUTERS Cr. 3
(Prerequisite M106 & M405)

M 407 ADVANCED PROGRAMMING Cr. 3
(Prerequisite M406)
Advanced programming of digital computers.

M 505,506,507 ADVANCED CALCULUS Cr. 3, 3, 3
(Prerequisite M202, M203)
Selected advanced topics from calculus and differential equations, integration by power series; Bessel, Elliptic, and Legendre functions; numerical methods for solving ordinary differential equations. Partial differential equations; boundary value problems and orthogonal functions; introduction to LaPlace transform methods.

M 508 OPERATIONAL CALCULUS Cr. 3
(Prerequisite M507)
Detailed development of the theory of the LaPlace transform. Application to the solution of ordinary and partial differential equations. Solution of engineering problems by operational techniques.
M 525,526 COMPLEX VARIABLES Cr. 3, 3
(Prerequisite M507)
Complex numbers; analytic functions; elementary functions; geometry of elementary functions; integrals; transformations, power series, residues and poles; conformal mapping; application of conformal mapping; analytic continuation; Reimann surfaces.

M 527 REAL VARIABLES Cr. 3
(Prerequisite M526)
Set theory, real number system, measure theory, sequence of functions, implicit functions and integration theory.

M 535 MATRIX THEORY Cr. 3
(Prerequisite M202)
Introduction to algebra and theory of matrices. Applications to physical problems.

M 536,537 MODERN ALGEBRA Cr. 3, 3
(Prerequisite M107)
Introduction to theory of groups and sets, Algebra of Matrices, Boolean Algebra, linear vector spaces.

M 545,546 STATISTICS Cr. 3, 3
(Prerequisite M404)
Advanced course in statistics. Discrete and continuous distribution functions, sampling distributions, estimations, tests of hypotheses, regression.

M 555,556 VECTOR ANALYSIS Cr. 3, 3
(Prerequisite M202)
The algebra of vectors, differential and integral vector calculus; vector transformation theory; applications to electrical theory, mechanics, and hydrodynamics.

M 561 NUMBER THEORY Cr. 3
(Prerequisite M202)
General introduction to the theory of numbers; theorems on divisibility and congruences; quadratic residues and the reciprocity law; Diophantine equations and binary quadratic form.

M 605,606,607 THESIS IN MATHEMATICS Cr. 3, 3, 3
Individual work under the direction of a member or members of the graduate faculty on a selected topic in the field of mathematics.

MECHANICS
ME 201,202,203 APPLIED MECHANICS Cr. 3, 3, 3
(Prerequisite P101)
Introduction to engineering applications of static behavior of rigid and deformable systems. Stress and strain. Force systems, application to stress distributions and stability. Dynamic behavior of rigid and deformable systems. Kinetics and
Kinematics of particles and rigid bodies. Impulse-momentum and work-energy theorems and applications.

**ME 301 STRENGTH OF MATERIALS**  
(Prerequisite ME203)  
Cr. 3  

**ME 302,303 MACHINE DESIGN**  
(Prerequisite ME301)  
Cr. 3, 3  
Applications of the principles of applied mechanics strength of materials and kinematics to the design of machine parts. Creative design problems involving fits, endurance limits, fastenings, shafting, gears, springs, couplings, brakes, clutches, flexible connectors, etc.

**ME 401 ENGINEERING MATERIALS**  
(Prerequisite ME303)  
Cr. 3  
Solid State physics presented from the point of view of engineers. Thermal, electrical and physical properties of common engineering materials.

**ME 402 FLUID MECHANICS**  
(Prerequisite ME203, M202)  
Cr. 3  
A study of the properties of fluids, gas laws, viscosity, static pressure, bouyant force and equilibrium of floating and immersed bodies, dynamics of fluids, Bernoulli’s theorem, flow in pipes, Reynolds number.

**ME 403,404 ENGINEERING THERMODYNAMICS**  
(Prerequisite M202, P102)  
Cr. 3, 3  
Fundamental laws governing flow of gases, vapors. Basic concepts of thermodynamics of chemical reactions and combustion. Emphasis is placed on applications to internal combustion engines, turbines, compressors and refrigeration.

**PHILOSOPHY**

**G 131 INTRODUCTION TO PHILOSOPHY**  
Cr. 3  
A survey of classical philosophy with selected reading and discussion of the works of the great philosophers of history.

**G 331,332 LOGIC**  
Cr. 3, 3  
A study of the principles of reasoning involved in normal human thought processes. The inter-relationship of logic, philosophy, and mathematics.

**PHYSICS**

**P 101,102 PHYSICS**  
(Prerequisite M105 or M105 concurrently)  
Cr. 3, 3  
A study of mechanics including statistics, Newton’s laws,

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

**P 201,202 PHYSICS**
(Prerequisite P102)
Cr. 3, 3
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 301 PHYSICS**
(Prerequisite P202)
Cr. 3
The nature and propagation of light. The principles of optics, lenses and optical instruments. Illumination, color interference, diffraction and polarization.

**P 302 PHYSICS**
(Prerequisite P301)
Cr. 3
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.

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

**P 304, 305 ASTRONOMY**
(Prerequisite P 301, or P 301 concurrent)
Cr. 3, 3
The solar system and stellar astronomy. Distribution, structure and evolution of stars and galaxies. Introduction to astrophysics.

**P 401 ELECTROMAGNETIC THEORY**
(Prerequisite M202)
Cr. 3
A study of Maxwell’s equations; plane waves; radiation; theory of antennas and wave guides.

**P 515, 516, 517 MATHEMATICAL PHYSICS**
Cr. 3, 3, 3
Mechanics of particles; planetary motion; rigid bodies; vibrating strings and membranes. Wave equation. Use of Hamilton’s and LaGrange’s equations and generalized coordinates.

Electrostatics. Maxwell’s equations; the potentials; Poynting’s theorem. Plane waves in empty space; reflection and refraction. Spherical waves, field of oscillating dipole. Radiation;
interference; diffraction, scattering. Electron theory and introduction of quantum mechanics.

SOCIAL SCIENCES

G 151 INTRODUCTION TO SOCIOLOGY Cr. 3
A general survey of sociology to provide the essentials for understanding man in his society.

G 152 AMERICAN GOVERNMENT Cr. 3
A general study of the structure of the American Government. Powers and duties of the local, state and federal governments.

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 ECONOMICS Cr. 3
(Prerequisite EC101)
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 202 LABOR ECONOMICS Cr. 3
A survey of the field of labor economics. Major topics covered are: the economic problems of the wage earner in modern society, the structure, policies and problems of labor organizations; employer and governmental policies affecting labor relations.

G 141 PRINCIPLES OF PSYCHOLOGY Cr. 3
Study of the principles of psychology of normal behavior.

G 142 SOCIAL PSYCHOLOGY Cr. 3
(Prerequisite G141)
A study of the problems of social behavior such as prejudices, rumor, propaganda. Analysis in terms of basic principles of perception, learning and motivation.

GRADUATE COURSES IN SPACE TECHNOLOGY

ST 500 INTRODUCTION TO SPACE TECHNOLOGY Cr. 3
An introduction to the field of space technology. History of the development of ballistic missiles and satellites. An introductory study in rocket motors, gantries, launchers, guidance, trajectories. Problems in space flight and space medicine.

ST 510, 511, 512 ROCKET PROPULSION Cr. 3, 3, 3
Generation of rocket thrust; analysis of one-dimensional
fluid flow with heat addition; application of fundamental principles to rocket engine design; development of rocket propellant performance parameters; liquid propellant types and properties; heat transfer; design of a typical liquid propellant rocket thrust chamber. Types of liquid propellant rocket systems and controls; static testing; instrumentation and data; fundamentals of solid propellant rockets; solid propellant types and properties; design of a typical solid propellant rocket; principles of nuclear rocket propulsion; application of rocket propelled vehicles to extra-terrestrial flights.

ST 530 MISSILE GUIDANCE Cr. 3
Survey course in the field of Missile Guidance. Description and discussion of various types of guidance systems, including radio, radio-inertial, celestial-inertial, and pure inertial. Mathematical study of complete systems and individual components. Error analyses of systems and components.

ST 540 CELESTIAL MECHANICS I Cr. 3
(Prerequisite M202)
Basic principles of applied mechanics applied to the calculation of orbits and planets and satellites. The Solar system; the central force field, orbit determination; perturbation analysis; and introduction to celestial navigation.

ST 541 CELESTIAL MECHANICS II Cr. 3
(Prerequisite ST540)
Concerned primarily with interplanetary orbits, this course will treat transfer orbits in general, impulse change of orbital elements, hyperbolic encounters, capture and landing operations, and also error analysis of interplanetary operations.

ST 550, 551 RANGE INSTRUMENTATION Cr. 3, 3

ST 560, 561 MISSILE INSTRUMENTATION Cr. 3, 3
(Prerequisite M505, EE203)
Principles and techniques of dynamic measurements, transducers and telemetry with particular emphasis on their application in space technology problems.
CALENDAR OF EVENTS
1961 - 1962

FALL 1961
Sept. 25, Mon. Psychological Test for all new students
Sept. 30, Sat. Classes begin
Oct. 3, Tues. Assembly of all students
Oct. 6, Fri. Last day for registration and for full
tuition refund
Oct. 14, 18-20 First 40 minute test
Nov. 4-8 Second 40 minute test
Nov. 10, 11 Holiday
Nov. 13, Mon. Extra session for Friday classes
Nov. 18, Sat. Last day for withdrawal
Nov. 23-26 Thanksgiving Recess
Nov. 29-Dec. 2 Third 40 minute test
Dec. 12, Tues. Extra session for Thursday classes
Dec. 13, Wed. Extra session for Friday classes
Last day of classes
Dec. 14, 15, 16, 18 Final exams

WINTER 1962
Jan. 3, Wed. Classes begin
Jan. 9, Tues. Last day for registration and for full
tuition refund
Jan. 20-24 First 40 minute test
Feb. 10-14 Second 40 minute test
Feb. 21, Wed. Last day for withdrawal
Feb. 22, Thurs. Holiday (Washington's Birthday)
Mar. 3-7 Third 40 minute test
Mar. 15, Thurs. Last day of classes
Mar. 16-20 Final exams

SPRING 1962
Mar. 28, Wed. Classes begin
Apr. 3, Tues. Last day for registration and for full
tuition refund
Apr. 14-18 First 40 minute test
May 5-9 Second 40 minute test
May 16, Wed. Last day for withdrawal
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