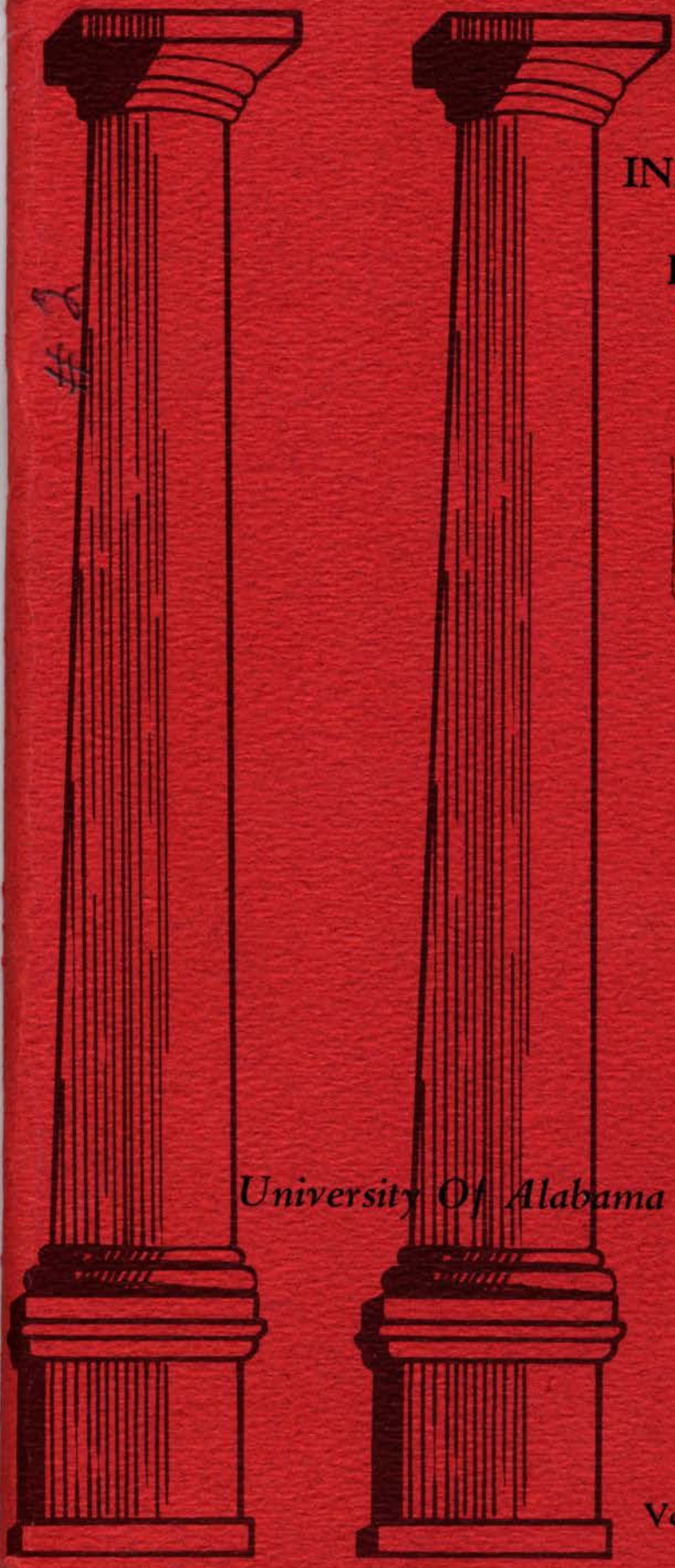

INFORMATION FOR PLANNING PURPOSES 1968 - 1969

University Of Alabama In Huntsville

Volume 2 No. 1

THE UNIVERSITY of Alabama in Huntsville (UAH) is a new branch of an institution established in 1831. Although the University of Alabama initiated academic programs in Huntsville in 1950, it was 1963 before degree opportunities at the master's level were provided, and 1964 before degree programs were initiated at the baccalaureate level. The first master's degree based on work begun and completed in Huntsville was awarded in 1964; the first UAH undergraduate degrees will be awarded in 1968.

This brief chronology indicates that the UAH program is in the process of being developed. It was brought into being, and is growing to meet the needs of a concentration of scientific and technological enterprise and a rapidly expanding community.

Because the UAH program is new, it is relatively unfettered by tradition and patterns of established practice. This should facilitate finding means for providing educational opportunity attuned to changing situations and the needs of tomorrow. This also imposes on students and faculty a greater than usual responsibility, because each step tends to create new paths which others will follow. It is our intention to be innovative, even experimental, to explore what is new, to evaluate existing programs continually, to develop and establish curricula and pedagogical techniques calculated to help students live and perform better in a complicated environment.

UAH is supported by the State, Federal, and local governments, generous individuals, and industries. The existing programs strive for superiority within limited areas and though expansion is anticipated, wide variety of specialties is not planned for the foreseeable future.

The programs at UAH are administered by three closely related academic divisions.

The Division of Engineering offers the degree, Bachelor of Science in Engineering. This is a unified engineering curriculum with options to specialize in electronics, mechanics, and systems. This degree requires a number of liberal education courses and emphasizes a strong grounding in mathematics, physics, and chemistry. Master's and post master's work is offered in several engineering disciplines.

The Division of Natural Sciences and Mathematics has baccalaureate degree programs in mathematics, physics, and chemistry and master's degree programs in mathematics and physics. Instruction is also offered in biology, earth sciences, and other natural sciences.

The Division of General Studies offers undergraduate degree programs in English and history and with instruction in art, business administration, education, psychology, French, German, political science, sociology, Spanish, and others. Graduate instruction is provided in public administration and in education.

As a branch of the University of Alabama, UAH is accredited by the Southern Association of Schools and Colleges.

The UAH Library is being developed as the center for academic and research programs. Its more than 30,000 volumes have been selected to

reflect a usefulness well above their number. These resources are supplemented by 140,000 microfilm, periodicals, technical reports and other special materials. Acquisition of library resources is given high priority in UAH development, and it is anticipated that an already good working library will soon become excellent.

The availability of the facilities of the Redstone Scientific Information Center, with its holdings in the scientific and technical areas that make it possibly the finest technical library in the Southeast, adds substantial strength to UAH programs, particularly at the graduate level.

Students admitted to UAH have achieved academic records that compare favorably with those in larger and older educational institutions. Through evaluations of previous academic records and entrance examinations, UAH attempts to insure admission to those who are well qualified for collegiate education. Students are assured that faculty members are present to help but not "oversee" them; and because of assumed maturity, students are expected to seek counseling and special assistance as needed.

The faculty at UAH has been assembled from leading universities across the United States and five foreign countries. The quality of this faculty is evident when measured by its writings, its research, and its reputation in the academic world.

The University of Alabama in Huntsville is an institution which has some distinctive features and some unusual strengths. The information contained in this publication is designed to outline in more detail the policies, purposes, and programs of the University of Alabama in Huntsville.

Academic Calendar

FALL TERM—1968

Freshman Orientation (Incl. Placement Tests)	July 25-26
Application Deadline	August 22
Fall Placement Tests	August 24
Registration	September 5-6
Deferred Examinations	September 7
Classes Begin 8:00 a.m.	September 9
Late Registration	September 9-12
Examinations	November 18-21

WINTER TERM—1968

Winter Placement Tests	November 9
Application Deadline	November 19
Registration	November 26-27
Thanksgiving Holidays Begin 5:00 p.m.	November 27
Classes Begin 8:00 a.m.	December 2
Late Registration	December 2-5
Deferred Examinations	December 7
Christmas Holidays Begin 12:00 noon	December 21
Classes Resume 8:00 a.m.	January 6
Examinations	February 24-27

SPRING TERM—1969

Spring Placement Tests	February 15
Application Deadline	February 27
Registration	March 6-7
Deferred Examinations	March 8
Classes Begin 8:00 a.m.	March 10
Late Registration	March 10-13
Examinations	May 19-22
Commencement (University of Alabama)	May 31 - June 1

SUMMER TERM—1969

Summer Placement Tests	May 10
Application Deadline	May 21
Registration	May 28-29
Classes Begin 8:00 a.m.	June 2
Late Registration	June 2-5
Deferred Examinations	June 7
Holidays Begin 10:00	July 3
Classes Resume 8:00 a.m.	July 7
Examinations	August 12-15

The UAH Term System

The UAH operates on a system in which four identical terms, each spanning 12 weeks, constitute a calendar year.

Credit for course work is granted in standard semester hour units.

University of Alabama in Huntsville
Volume 2 No. 1

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Facilities

The University of Alabama in Huntsville is located on a 332 acre campus in the northwest section of Huntsville, Alabama.

Morton Hall, on University Avenue, contains classrooms and laboratories, the library, bookstore, and student lounge, the offices of the Division of General Studies, faculty, admissions and records, and student affairs.

The Research Institute Building, on Sparkman Drive, houses the University of Alabama Research Institute, its administration offices, laboratories, and computer services.

The Graduate Studies Building, (to be named later), on Sparkman Drive, provides space for all graduate classrooms, faculty offices, the technical portion of the library, classrooms for programs of continuing education, study areas, and temporarily houses the offices of the Division of Engineering and the Division of Natural Science and Mathematics, and some other administrative units including the business office.

Two additional buildings, one to house instructional laboratories for science and engineering and the other to be the first phase of a permanent University library, will be under construction in the near future.

Other buildings are being planned to meet requirements necessitated by the rapid growth of UAH.

The Research Institute

The Research Institute of the University of Alabama in Huntsville was created with the strong support of the community, local and state governments and federal agencies. It provides research leadership, management services, facilities, and equipment for faculty, research associates and graduate students to acquire new knowledges, principally in the space-related fields. With few exceptions, the academic members of the Research Institute are actively engaged in the instructional program of undergraduate and graduate study at the University of Alabama in Huntsville.

A key feature of the Research Institute is the contiguity of the disciplines which fosters communication and encourages an interdisciplinary approach to research. Other important benefits derive from this particular and rather unique organization. It is a point for exposure of graduate students to a research environment, a place for recognition and dissemination of current research of the faculty to the scientific and technological community, and a place for pooling research instrumentation to make it optimally accessible to University personnel.

Short Course And Conference Activities

UAH offers short courses, conferences, seminars, and institutes in a variety of subjects without college credit.

The continuing education program of UAH is unique in that it, collaboratively with potential users, defines needs; develops tentative programs; and, from industry and educational institutions across the country as well as UAH faculty, recruits outstanding scholars for a day or a week to bring the most up-to-date information available to professional users. Most of the students involved are employed in the Huntsville area; but, increasingly, students come from industries and governmental agencies outside this community.

Normally, professional people have to rely on publications or more general courses to acquire the newest information in their fields. This involves a considerable time lag. By the use of this type of continuing education, UAH is significantly implementing technological and scientific progress.

UAH intends to expand non-credit offerings to upgrade professional and sub-professional workers, to fill critical gaps in adult education, and to foster cultural and utilitarian interests.

Student Life

STUDENT GOVERNMENT ASSOCIATION

The Student Government Association is the official governing body of the students of the University of Alabama in Huntsville. The SGA formulates a program of student services and activities and, through its functions, provides experiences in democratic living. The SGA has an executive branch and a legislative branch which are elected by the student body, and a judicial branch which is appointed.

The SGA attempts to provide activities that fulfill the academic, social, cultural, and sports desires of the students. The SGA operates a book exchange; it brings guest lecturers to stimulate academic debate; it offers tutorial services to the community and university, and it has involved itself in discussion of community and state issues to further the educational experiences of the students.

The SGA sponsors formal and informal dances and operates the "In," a coffee-sandwich shop with a relaxed atmosphere.

The SGA sponsors an intramural athletic program which includes football, basketball, bowling, and softball. Also, the SGA provides moral and financial support for the UAH Rowing Club which competes against other colleges and universities.

STUDENT PUBLICATIONS

The UNIVALA, the official student newspaper, is published by members of the student body. The Editor is elected by the student body.

CLUBS

GERMAN CLUB

The German Club aims to promote the German culture and to familiarize students with the language, history, and cultural aspects of Germany.

SPANISH CLUB

The Spanish Club aims to promote interest in all areas of Spanish culture, including literature, music, art, history, and drama. The club offers an opportunity for an exchange of ideas among the Spanish speaking people of the area and English speaking people who are interested in the Spanish language and culture.

HISTORY CLUB

The History Club is open to all students interested in history. In addition to holding regular program meetings, members periodically take field trips to near-by historical spots.

LITERARY CRITICISM CLUB

The Literary Criticism Club promotes the appreciation and understanding of literature through the application of practical criticism. The club is open to anyone interested in this approach to the study of literature.

PRE-LAW SOCIETY

The Pre-Law Society is open to students who are interested in exploring all aspects of the legal profession and in making a study of law schools accredited by the American Bar Association.

THE UNIVERSITY CULTURAL SERIES

The University Cultural Series, jointly sponsored by the SGA and the UAH faculty and administration, presents lecturers and performances to stimulate the cultural interests of the students.

MUSIC

UAH has three choral groups: the UAH Choir, The Premier Singers, and The Village Singers. Membership is open to all students; course credit is offered. Participation in any of the three groups may be repeated. (See course listings in General Studies section for details.)

RELIGIOUS GROUPS

The Baptist Student Union is actively functioning on the UAH Campus. Other religious groups are in the process of organization.

OTHER

Student and faculty art shows are exhibited each term. Guest lecturers are brought to the UAH campus to stimulate the thinking of students and faculty.

Administrative Procedures

ADMISSION TO THE FRESHMAN CLASS

PLAN A.

High school graduates may be admitted to the University of Alabama in Huntsville as freshmen on the basis of acceptable high school records and qualifying examinations.

All applicants must present a minimum of 16 high school units in the following categories:

4 Units English
1 Unit History or Social Studies
1 Unit Algebra
1 Unit Geometry
9 Units of Electives (At least 5 electives should be academic in nature.)

UAH urges high school students to include in their elective courses additional units in mathematics, foreign languages, natural sciences, and social studies. The Division of Engineering and the Division of Natural Sciences and Mathematics strongly recommend that the additional elective units include ½ unit of algebra and ½ unit of trigonometry. Applicants who plan to enter the Division of Engineering or major in a natural science should also include 1 unit of physics and 1 unit of chemistry.

Applicants having deficiencies in the specifically required courses may be admitted in good standing. The deficiencies must be removed during the first year of enrollment in a manner approved by the appropriate division director. Courses taken to remedy entrance deficiencies cannot be used to satisfy degree requirements.

Applicants who were graduated from high school since June, 1961, must submit scores from the American College Testing Program test (ACT), taken preferably during the senior year.

PLAN B.

Persons over 21 years of age who have not been graduated from high school may be admitted on the basis of satisfactory scores on prescribed examinations.

APPLICATION PROCEDURE

Applicant must submit:

1. Completed application forms in duplicate.
2. Non-refundable application fee of $10.00.

In addition, he must request that:

1. Two copies of his high school transcript be sent from the high school to the OFFICE OF STUDENT RECORDS and
2. ACT test scores be sent from ACT to the OFFICE OF STUDENT RECORDS.

All application materials must be in the OFFICE OF STUDENT RECORDS no later than specified dates in the UAH calendar.

ADMISSION WITH ADVANCED STANDING

Applicants with previous records from accredited colleges or universities must have a minimum overall *C* average on all work attempted and be eligible to return to the last institution attended.

Applicants presenting records that are deficient may be admitted on probation upon recommendation of the director of the division in which the student plans to major provided:

1. The quality point average is at least 0.75 (1.00=C); and
2. The quality point deficiency is less than 8.

In this case, transferred courses with a grade of *D* will not count as degree credit.

If the records show fewer than 21 semester hours of prior work attempted, the applicant may request permission to discard those credits and to be considered for admission to the freshman class. This permission will be granted only once.

If the previous record was earned at an institution not holding regional accreditation, the applicant may be admitted as outlined; but any credit granted will be provisional. Full credit for the provisional credit will be based upon performance during the first 30 semester hours attempted at UAH.

If the previous record was earned at a junior college, a maximum of 64 semester hours may be transferred and applied toward a degree.

APPLICATION PROCEDURE

Applicant must submit:

1. Completed application forms in duplicate.
2. Non-refundable application fee of $10.00.

In addition he must request that:

1. Two copies of his high school transcript be sent from the high school to the OFFICE OF STUDENT RECORDS.
2. Official transcripts from each collegiate institution attended be sent directly from the previous institutions to the OFFICE OF STUDENT RECORDS. (Credits earned in terms of quarter hours will be evaluated in terms of semester hours on the basis of ⅔ of one semester hour for each quarter hour.)

All application materials must be in the OFFICE OF STUDENT RECORDS no later than specified dates on the UAH calendar.

ADMISSION WITH IRREGULAR POST GRADUATE STANDING

Applicants already holding a bachelor's or other higher degree will be considered for admission in the status of irregular post graduate.

Students admitted in this category may take any courses if prerequisites have been satisfied.

Application procedure is the same as that for *Admission with Advanced Standing*. (High school transcripts are not required.)

ADMISSION AS A SPECIAL STUDENT

NON-MATRICULATED STUDENTS

To qualify as a non-matriculated student a person must be at least 21 years of age and interested in receiving University credit but not credit towards a degree. (A student in this category may take no more than two courses per term and may earn no more than 15 semester hours of credit.)

A person interested in this student status must complete a specified application form on which the terms for admission are identified.

TRANSIENT STUDENTS

To qualify as a transient student a person must be currently enrolled with good standing at another institution (including any other unit of the University of Alabama) and interested in attending UAH for one term only.

The transient application form and the letter of good standing form must be submitted.

AUDIT STUDENTS

A person interested in attending credit courses on an audit basis may be admitted for this purpose on the basis of information required on an appropriate application form. (Regularly admitted students may audit credit courses without separate application. An auditor will not be permitted to obtain credit in a course by retroactive action after announced deadlines for changes.)

All application materials for non-matriculated, transient, and audit students should be in the OFFICE OF STUDENT RECORDS no later than specified dates in UAH calendars.

SPECIAL NON-CREDIT STUDENTS

Persons interested in attending one of the courses developed for special interest groups may be admitted to the courses on the basis of information furnished on an appropriate form.

Application deadlines are included in course announcements.

ADMISSION OF FOREIGN STUDENTS

In addition to fulfilling the specified entrance requirements or their equivalents, foreign students (this applies to all persons whose official residence is other than the United States) must submit a satisfactory score on the Test of English as Foreign Language (TOEFL) unless his native language is English. Each foreign applicant must also give evidence of financial ability to meet the expenses of his intended stay at UAH.

Foreign students are advised to submit applications earlier (preferably 3 months) than announced deadlines for other students. All inquiries should be directed to the OFFICE OF STUDENT RECORDS.

READMISSION

Persons who have interrupted their attendance at the University of Alabama in Huntsville and wish to return should communicate with the OFFICE OF STUDENT RECORDS to determine the conditions under which a resumption of attendance may be possible.

An applicant may be requested to furnish information related to character supplemental to that required on the application forms. UAH reserves the right to refuse admission to persons when there is evidence that their presence might be deemed detrimental to the best interest of the institution or its students.

The administration reserves the right to establish rules for expulsion and penalties for failure to meet standards of scholarship, character, and health.

PLACEMENT TESTS

All students who have been admitted to the University of Alabama in Huntsville to take undergraduate credit courses and who do not have a previous college academic record which includes courses in English, Chemistry, Mathematics, French, or Spanish, must take a series of tests for proper placement in the listed subjects. Students may enroll for courses in other subjects which do not require placement tests. However, at the time such a student decides to take a course in one of the listed subjects, the series of placement tests will be required.

Arrangements to take the placement tests should be made at the Reception Desk in Morton Hall.

REGISTRATION AND COURSE CHANGES

Dates of registration and late registration are listed on the UAH calendar.

Once a student has completed registration, all changes in schedule must be made on a Change of Course Form and recorded in the OFFICE OF STUDENT RECORDS. Changes accomplished in any other manner are void.

The following kinds of changes may be accomplished ONLY during the designated hours of regular and late registration:

1. *Change from one course to another.*
2. *Change from one section to another section of the same course:* Approval of the director of the division in which the course is taught is required on the Change of Course Form.
3. *Addition of course to schedule.*
4. *Change from audit to credit.* (Only students who are otherwise eligible to take the work for credit will be permitted to make such a change.)
5. *Removal of course from schedule:* In the case of a cancelled class, submission of a Change of Course Form by the student facilitates correcting his record. Except in the case of course cancellation, removal of a course is considered a withdrawal after the first scheduled meeting of a class. In the case of a "drop before class," the Change of Course Form must be submitted prior to the first scheduled meeting of the class.

A change from credit to audit for a course is permitted only during the first three weeks of class meetings; approval of course instructor is required on the Change of Course Form.

CLASS ATTENDANCE

When a student registers for a course, he assumes the responsibility of attending all assigned class meetings. Courses are usually designed so that regular attendance is necessary for satisfactory completion of the course. A student's final grade in each course is determined on the basis of identified course requirements.

ACADEMIC COUNSELING AND ADVISING SERVICE

Counseling and guidance are provided through the Office of the Director of Student Affairs and by faculty advisors. Both services are concerned with scholastic, vocational, and social interests of the student.

A student's major area of study determines the academic division under which he will be registered and counseled. It is advisable that a student seek assistance in program planning and other matters from counselors.

WITHDRAWAL

A student may withdraw from one or more courses or from UAH by completing the appropriate forms secured from the OFFICE OF STUDENT RECORDS. Regardless of the circumstances under which withdrawal becomes necessary, a student must carry out withdrawal procedures.

The official date of withdrawal is the date on which the withdrawal forms are received in the OFFICE OF STUDENT RECORDS. The OFFICE OF STUDENT RECORDS will take action on courses involving withdrawals based on the following conditions:

1. A grade of *W* will be assigned if the withdrawal occurs during the first three weeks of class.
2. A grade of *W* or *WF* will be assigned if the withdrawal occurs between the end of the third week and the beginning of the sixth week of classes.
3. A grade of *F* will be assigned if the withdrawal occurs after the beginning of the sixth week. If, in this case, a student believes that extenuating circumstances exist, he may identify the circumstances in writing on the appropriate form and request a review.

Honors

HONOR SCHOLAR

A student earning 9 or more semester hours in a term with a quality point average of 2.50-3.00 is distinguished by being identified as an Honor Scholar. A student who takes less than 9 semester hours per term and establishes a quality point average of 2.50-3.00 will, at the end of the term in which at least 9 semester hours are completed, be designated as an Honor Scholar.

SCHOLAR

A student earning 9 or more semester hours in a term with a quality point average of 2.00-2.49 is recognized by having his name placed on the List of Scholars. A student who takes less than 9 semester hours per term and establishes a quality point average of 2.00-2.49 will, at the end of the term in which at least 9 semester hours are completed, have his named placed on the List of Scholars.

For these purposes, the student's work will be considered in blocks that do not overlap.

Scholastic Discipline

A beginning student is subject to scholastic review at the end of the term in which he has attempted a total of at least 9 semester hours of work. At the time of review, if he has not passed one-half of work attempted or attained a quality point average of 0.5, he is placed on scholastic probation.

A transfer student is subject to scholastic review at the end of the term in which he has attempted at least 8 semester hours. At the time of review, if his quality point average is less than 1.0, he is placed on scholastic probation.

After the first evaluation, a student's record is examined at the end of the term in which at least 8 semester hours have been attempted from the time of previous review.

At the specified times of review, a student will be placed on scholastic probation if his overall quality point average for work attempted at all institutions is less than 1.0 (C). He also will be placed on probation if his average for work attempted at UAH only is less than 1.0 (C).

At the time of review of the record of a student on probation, action will be taken according to the following requirements.

Overall Quality Point Average	*Quality Point Average**	*Quality Point Deficiency***	*Action Indicated*
1.0 or higher	—	0	Probation removed
less than 1.0	1.0 or higher	7 or less	Probation continued
less than 1.0	less than 1.0	more than 7	Suspension

* (On last block of work prior to review)
** (Including transferred deficiencies)

A student suspended for scholastic reasons is eligible to return on scholastic probation at the beginning of the second term following suspension.

When a student is suspended the second time for scholastic reasons, he is permanently disqualified for readmission.

A student whose academic status is indeterminate due to grades of *I* or *X* may be permitted to register conditionally. Such students should clear their status soon after registration.

Student Fees

APPLICATION FEE $10.00

PLACEMENT TEST FEE $10.00

TUITION AND ALL GENERAL FEES PER TERM

Full-Time Students—Undergraduate	Alabama Resident	Non-Resident
Course and Building Fees	$135.00	$135.00
Student Activity Fee	5.00	5.00
Out-of-State Fee		100.00
TOTAL	$140.00	$240.00

Full-Time Students—Graduate	Alabama Resident	Non-Resident
Course and Building Fees	$220.00	$220.00
Out-of-State Fee		100.00
TOTAL	$220.00	$320.00

Part-Time Students (Undergraduate-Alabama Resident) 6 Hours or less:
- Registration Fee ..... $ 5.00
- Course and Building Fees per Semester Hour 17.00
- For Non-Residents (Students Residing Out-of-State at Time of Registration), an additional charge is pro-rated on the basis of $100 for full-time students.
- Student Activity Fee (optional) 5.00

Part-Time Students (taking Graduate Education Courses)
- Registration Fee ..... $ 4.50
- Course and Building Fees per Semester Hour 25.00
- Student Activity Fee (optional) 5.00

Part-Time Students (Graduate-Alabama Resident) 4 Hours or less:
- Registration Fee 3.00
- Course and Building Fees per Semester Hour 50.00
- Student Activity Fee (optional) 5.00
- For Non-Residents (Students Residing Out-of-State at Time of Registration), an additional charge is pro-rated on the basis of $100 for Full-Time Students.

Audit Fee — Same as for Credit.

Fees for Non-Credit courses vary and are announced in individual brochures.

OTHER CHARGES

- Change of Course Fee ..... $ 5.00
- Examination Fee (Deferred or Special) 2.00
  (A student missing more than two examinations in one term is charged a maximum fee of $5.)
- Deferred Payment Fee 2.00
- Laboratory Fee (Biology, Chemistry, Physics) 15.00
- Registration for Students Writing Thesis 3.00
- Applied Music
  - ⅔ Hour Private Instruction 20.00
  - 1⅓ Hours Private Instruction 30.00
  - 2⅔ Hours Private Instruction 45.00
- Late Payment Fee 10.00
- Late Deferred Penalty 5.00
- Late Registration Fee (in addition to regular registration fee) 10.00
- Returned Check Handling Fee
  - (1st Check) 1.00
  - (2nd Check) 2.00
  - (3rd Check) 5.00
- Transcript Fee (First transcript free — charge for each additional copy) 1.00
  No transcript will be issued for a person who has a financial obligation to the University.
- Cap and Gown Rental — Handled through UAH Bookstore
- Diploma Fee
  - B.S. and B.A. Degrees 15.00
  - Master's Degree 15.00
  - Diploma Fee (If qualifications for graduation are not met and if diploma has been ordered). 5.00
  - Duplicate Diploma 7.50
- Thesis Binding Fee 9.00

Regulations concerning traffic and parking will be distributed at the time of registration.

PAYMENT OF FEES

Each student will be given a fee card to complete along with other registration materials and will be mailed a Fee Statement showing the amount due on fees and tuition. Payment should be made by check, if possible, and mailed to the Finance Office along with the Fee Statement. If a student does not receive a Fee Statement within several days after registration he should contact the Finance Office. It is the student's responsibility to see that his account is paid by the final day for payment.

WITHDRAWALS AND REFUNDS

A student who officially withdraws from the University after he has been enrolled may obtain a proportionate refund of the course fees he has paid. It is the student's responsibility to withdraw in accordance with University regulations.

The following proration of fees and tuition is made in the event of withdrawal:

	Charges
Withdrawal after registration is completed but before first class meeting of the course	Registration fee
Withdrawal during first week of classes	25% of basic fees
Withdrawal during second week of classes	50% of basic fees
Withdrawal during third week of classes	75% of basic fees
Withdrawal after third week of classes	100% of basic fees

Students suspended for disciplinary reasons shall have no right to a refund of any portion of any fees paid or due to be paid.

VETERANS

Under Public Law 89-358, which affects most veterans, the veteran receives his allowance directly from the Government. He in turn is responsible for paying his fees directly to the University. In cases of students enrolled under the Alabama GI and Dependents Educational Act, the student is given a certificate exempting him from paying tuition to the University, and the State makes an allowance directly to the University for this tuition. Students under these acts are required to pay activity fees and other charges. The Veterans Administration will make full payment only when the student's schedule includes at least ten semester hours each term. It is the student's responsibility to keep in contact with the Veterans Administration for possible changes in regulations.

Financial Aids

Students who attend UAH may receive financial assistance to meet University expenses.

Financial aid programs include part-time jobs under the Work-Study program, Educational Opportunity Grants, and National Defense Student Loans, all provided through Federal funds; part-time jobs at UAH in offices, libraries, shops, and laboratories; loans from private sources; and scholarships from foundations, individuals, and organizations.

A UAH bulletin, Financial Aids for Students, which outlines these programs in detail and describes procedures for applying for financial assistance, is available at the UAH financial aids office.

Students wishing to apply for financial aids must make application early to conform with required deadlines.

Persons with recent military service may be eligible for financial assistance while attending UAH. (See Section on *Student Fees.*)

Job Placement Bureau

The UAH Job Placement Bureau assists students in locating jobs on a full- or part-time basis with local businesses and industries.

The Bureau operates year round. Its services are available to both graduate and undergraduate students. Interested students should register with the Bureau.

Divisions, Programs, And Degrees

The University of Alabama in Huntsville is composed of three divisions:

Division of General Studies
Division of Natural Sciences and Mathematics
Division of Engineering

Programs for the undergraduate degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Science in Engineering are provided with majors in the indicated areas of specialization.

Bachelor of Arts:	English, History, Mathematics
Bachelor of Science:	Chemistry, Physics
Bachelor of Science in Engineering:	Unified Programs with Professional Specializations

Students may minor in any of the indicated major areas or psychology.

As facilities and strength of faculty permit, additional subject areas will be developed.

It is the student's responsibility to select and to register for courses which are needed for reasonable progress toward his degree and which will enable him to meet all requirements for his degree at the time when he expects to graduate.

Degree requirements are under study by UAH and are subject to change. Efforts will be made to allow students to graduate under the regulations which were effective at the time they entered the program; students are advised to adhere as closely as possible to revised programs of study. Assistance in understanding requirements may be obtained from academic counselors in order to prevent, insofar as possible, loss of credits toward graduation.

OTHER DEGREE OPPORTUNITIES

In addition to the specified majors and minors available at UAH and those that may be added as faculty and facilities permit, students will find numerous opportunities for developing other programs.

DENTAL AND MEDICAL PROGRAMS

Most students entering medical or dental schools do so after completing an undergraduate degree. Applicants interested in developing a career in medicine or dentistry, after consulting the specific requirements of the desired medical or dental school, will find that UAH offers programs that will prepare them for admission to the professional school.

The competition for admission to medical and dental schools is great, and students should know that completion of the admission requirements does not insure acceptance. Since admission to the schools is not assured,

students are advised to complete undergraduate degree requirements.

Typical of the requirements for admission to medical colleges are those which follow for the Medical College of Alabama at the University of Alabama in Birmingham:

1. Two academic years of English
2. One academic year of general biology or zoology
3. One academic year of general inorganic chemistry (including qualitative analysis and laboratory work)
4. One academic year of organic chemistry with laboratory work
5. One academic year of physics with laboratory
6. College algebra and trigonometry

In addition it is strongly recommended that students take one year of physical chemistry and mathematics through calculus. Students are encouraged to take as much chemistry and mathematics as possible. To reduce duplication in later work, electives taken in biology should be genetics and embryology. A student is advised to choose his program according to his individual interest and ability so that he may fulfill his maximum academic potential.

Typical of the requirements for admission to dental schools are those which follow for the School of Dentistry of the University of Alabama in Birmingham:

1. Eight semester hours of biology
2. Eight semester hours of inorganic chemistry (including qualitative analysis)
3. Eight semester hours of organic chemistry
4. Four semester hours of quantitative analysis
5. Eight semester hours of physics (including laboratory)
6. Six semester hours of college algebra and trigonometry
7. Thirty semester hours of non-science courses to include 6 (preferably 12) semester hours in English. It is recommended that students complete 12 semester hours in a foreign language, and include as many courses in history, political science, economics, philosophy, psychology, and sociology as possible.
8. The completion of a minimum of 90 semester hours of collegiate work.

Students should elect courses in mathematics through calculus and should not elect biology courses that constitute a part of the dental school curriculum.

NURSING

Students interested in nursing as a career can initiate a degree program at UAH and plan to transfer to the School of Nursing at the University of Alabama in Birmingham to complete the degree requirements. The curriculum for the first two years may be found in the catalog of the College of Arts and Sciences of the University of Alabama.

Students may find it advisable to transfer during the sophomore year to prevent loss of time.

LAW

Many schools of law require applicants to obtain a bachelor's degree as a prerequisite for admission. Interested students should examine the requirements of the specific law school which they wish to attend for identification of the needed curriculum.

The University of Alabama School of Law does not prescribe a curriculum but does require specific courses that must be included in the curriculum selected by the student. These courses are:

English Composition	6 Semester Hours
English or American Literature	6 Semester Hours
American History	6 Semester Hours
Political Science (including U. S. Government)	6 Semester Hours
Principles of Economics	6 Semester Hours

Additional recommended courses are philosophy, psychology, sociology, foreign languages, and accounting. Since other requirements must be met, completion of these courses does not insure admission.

COMMERCE AND BUSINESS ADMINISTRATION

Students interested in obtaining a degree in one of the concentrations of commerce and business from the University of Alabama will find it possible to complete up to 75% of the undergraduate degree program at UAH. Proper course selection is the responsibility of the student. Professional courses are validated when a student successfully completes one additional course in the sequence after transfer.

EDUCATION

In the field of education, a student may complete professional requirements for a Class B Secondary Teaching Certificate with a major in subjects identified in other portions of this catalog. Students interested in a degree in education involving programs in other major areas, or in elementary education, may complete up to 75% of the degree requirements at UAH. When preparing such programs, students should consult the requirements of the particular school to which transfer may be made.

BASIC REQUIREMENTS FOR THE DEGREE: BACHELOR OF ARTS

	Semester Hours
English	
a. Composition	6
b. Survey of English Literature	6

	Semester Hours
Social Sciences	
a. History of Western Civilization	6
b. Economics, Philosophy, Political Science, Psychology, or Sociology	6 (from one discipline)
Science-Mathematics	
Mathematics 109 or 111 and 115 or 118	6
Eight hours in one of the laboratory sciences (Biology, Physics, Chemistry, Earth Sciences)	8
(Eight hours in each of two of the laboratory sciences may be used to satisfy the science-mathematics requirement)	
Foreign Language (one language)	12
Students who have previously obtained abilities in a language will be placed at the appropriate level by the foreign language faculty and may complete this requirement with 6 hours in that language. No credit is advanced for exemption from any portion of the language requirement.	

BASIC REQUIREMENTS FOR THE DEGREE: BACHELOR OF SCIENCE

	Semester Hours
English	
a. Composition	6
b. Survey of English Literature	6
Social Sciences	
a. History of Western Civilization	6
b. Economics, Philosophy, Political Science, Psychology, or Sociology	6 (from one discipline)
Natural Science (8 hours in each of two)	
Physics, Chemistry, or Biology	16
Mathematics	
Calculus and Analytical Geometry	9
Foreign Language (one language)	12
Students who have previously obtained abilities in a language will be placed at the appropriate level by the foreign language faculty and may complete this requirement with 6 hours in that language. No credit is advanced for exemption from any portion of the language requirement.	

BASIC REQUIREMENTS FOR THE DEGREE: BACHELOR OF SCIENCE IN ENGINEERING

The requirements for this professional degree are identified in the section on the Division of Engineering.

MAJOR AND MINOR REQUIREMENTS FOR THE DEGREES: BACHELOR OF ARTS AND BACHELOR OF SCIENCE

Every student in the programs currently offered by UAH for these degrees must establish and complete the requirements for one major and one minor subject of specialization. Major and minor programs should be established no later than the term of enrollment in which 45 semester hours of work are completed, and students should recognize that courses taken beyond this point may not be acceptable for inclusion in the major and minor areas at a later date. After the term in which a student completes 45 semester hours, priority should be given to basic course requirements which have not been satisfied.

Major and minor subject specialization must be worked out with representatives of the respective subject areas at designated times during each term. A major specialization will consist of not less than 36 semester hours; a minor specialization will consist of not less than 21 semester hours.

TOTAL DEGREE REQUIREMENTS

1. Minimum requirements for the Bachelor of Arts and Bachelor of Science degrees are 128 semester hours; for the Bachelor of Science in Engineering degree, 136 semester hours. A minimum of 25% of the total requirements and 12 of the last 18 hours must be completed at UAH after September 1, 1964. Also, unless otherwise specified, a minimum of 6 semester hours of upper level courses (numbered 300 or above) must be completed at UAH in a student's major and in his minor after September 1, 1964. A minimum of 30% of the total degree requirements should be taken in courses numbered 300 or above.
2. The maximum amount of correspondence or extension credit allowed towards a bachelor's degree is 25% of the degree requirements.
3. In addition to fulfilling all other identified requirements for a degree, a student must have an overall average of at least *C* on all work attempted at all institutions as well as at UAH, and a minimum average of *C* in both the major and the minor.
4. To qualify for a second bachelor's degree, a student must complete in residence a minimum of 25% of the requirements for the second degree in addition to credits applied to the first degree. The second degree must include a new major. The student must meet all other applicable requirements for a degree.

ELECTIVES AND COURSE OFFERINGS

At the present time a student may choose as an elective any course offered at UAH unless otherwise restricted. Courses taken at other institutions in academic areas other than those offered at UAH may be transferred as elective credit. Such credit is subject to the approval of the director of the academic division in which the student is registered.

All courses listed will be offered at times which will be announced in printed schedules for each term. There is no assurance of a particular course being scheduled in any given term or year.

CHANGE OF PROGRAM

Students who are pursuing one program of study at UAH and desire to change to another program may petition to do so by making application at the OFFICE OF STUDENT RECORDS. Counseling before changing programs may help students avoid losing credits. Application of previously earned credits toward the new program will be determined after the transfer has been approved. A request for a change of program must be approved by the division to which the change is proposed before the change is effective.

GRADUATION

Candidates for graduation should file their applications by the end of the Fall Term preceding the date of anticipated graduation. Application forms may be obtained at the OFFICE OF STUDENT RECORDS.

Some students may complete degree requirements at a time that will permit them to attend August graduation ceremonies. Students completing degree requirements at other times of the year will be given certified letters of completion and may attend the next graduation ceremony.

Classification And Grades

A regular student is classified as indicated in the following table when he has completed the number of semester hours shown.

	Semester Hours Earned
Freshman	0-29
Sophomore	30-59
Junior	60-91
Senior	92 up

Special students are classified according to type of admission. *A full-time undergraduate student* is one who is enrolled in courses totaling at least 9 semester hours. The maximum number of semester hours in which a student will be permitted to enroll in one term is 13. (Equivalents will be used for non-credit and audit courses.) *A part-time undergraduate student* is one who is enrolled in courses totaling 1-8 semester hours.

Students will be given much responsibility for independent study. Careful budgeting of time will be necessary if the desired academic goals are to be reached. Accordingly, full-time students are advised to limit their employment. Experience has shown that approximately 20 hours per week constitutes an average work load that will allow needed time for adequate study.

For students who, for financial reasons, need to be employed to a greater extent, a reduction in course load is suggested. From the standpoint of allowing sufficient time for the amount and quality of work necessary to meet a student's academic goals, fully employed undergraduate students will normally find that they should take no more than two courses.

GRADES AND QUALITY POINTS

Grades			*Qual. Pts./Sem. Hr.*
A	(90-100)	Superior	3
B	(80-89)	Above Average	2
C	(70-79)	Average	1
D	(60-69)	Passing	0
F	(0-59)	Failure	0

Other grades are:

I — *Incomplete.* Assigned by the instructor when a student has failed to satisfy some minor requirements of the course. This grade becomes an *F* unless the course requirements are completed during the first four weeks of the next term of enrollment, or if it appears on the record at the time of graduation.

X — *Absent from examination.* Assigned by the instructor when a student completes all course requirements except the final examination. This grade becomes an *F* unless the examination is completed by the time of the announced deferred examination date of the term of next regular enrollment of the student. (See section on *Examination.*)

W — *Withdrawal.* Assigned by the OFFICE OF STUDENT RECORDS when a student withdraws from a course with passing work. (See section on *Withdrawal.*)

WF — *Withdrawal.* Assigned by the OFFICE OF STUDENT RECORDS when a student withdraws from a course with failing work. (See section on *Withdrawal.*)

A grade of *S* (Satisfactory) or *U* (Unsatisfactory) is assigned in some courses.

Certificates of completion, instead of grades, are awarded for successful completion of courses designed for special interest groups.

The last grade received in a course taken more than once will be the official and only grade of the course for purposes of evaluation of quality points; but a student is charged with hours attempted each time he registers for a credit course and receives a grade other than *W, S,* or *U.*

Grades submitted to the Office of Student Records can be changed by submission by the instructor of a corrected grade sheet containing a written explanation of the error. The corrected grade sheet must be approved by the director of the academic division.

QUALITY POINT AVERAGE

The quality point average is computed by dividing the total number of quality points earned by the total number of semester hours attempted. Not included are courses in which a grade of *W* is assigned.

EXAMINATIONS

During each term, one or more announced examinations of class period length may be held.

At the end of each term, a two and one-half hour examination period is scheduled for each course. Absences from a scheduled final examination without prior arrangement with the course instructor (except in extenuating circumstances) will be classified unexcused, and a failing grade in the course will be assigned.

STUDENT REPORT

At the completion of each term, a report of final grades is mailed to the home address of the student.

Courses Of Instruction

Courses are described under the sections of the various divisions.

COURSE NUMBERING SYSTEM

Range of Numbers	*Year Student Normally Takes Courses*
001-099	Refresher (non-credit)
100-199	Freshman
200-299	Sophomore
300-399	Junior (upper level)
400-499	Senior (upper level)
500-599	Advanced undergraduate credit but graduate credit awarded by permission
600-799	Graduate

Division Of General Studies

The graduate of the University of Alabama in Huntsville should take his place as a responsible citizen through having attained an understanding of man's relation to himself, fellow man, and the physical and biological world in which he lives. He should be trained in the skills of criticism so that he will be able to gather, organize, and evaluate data. He should be able to communicate his thoughts in correct and effective language. He should enter his adult life with those appreciations and tastes which will prove personally enriching to him and his community.

The Division of General Studies embraces disciplines and academic programs essential to those objectives that fall in the area of the humanities, the social sciences, and education.

UNDERGRADUATE DEGREES AND STUDY

Within the Division a student may major in English or history and complete all requirements for a Bachelor of Arts degree. A student may minor in English, history, mathematics, physics, engineering, chemistry, or psychology. In addition to the areas where majors and minors are authorized, courses are offered in art, economics, business administration, education, French, German, music, political science, sociology, and Spanish. A student planning to become a high school teacher may major in one of the available areas and complete requirements for a teacher's certificate in the State of Alabama. (See following section.)

SPECIAL CURRICULUM FOR THE CLASS B SECONDARY PROFESSIONAL TEACHING CERTIFICATE

Students in the Division of General Studies and the Division of Natural Sciences and Mathematics who wish to quality for the Class B Secondary Professional Teaching Certificate must meet the requirements listed below.

I. *Academic Area Courses:*	*Semester Hours*
English	
a. English Composition	6
b. Survey of English Literature	6
Social Sciences	
a. History of Western Civilization	6
b. Economics, Political Science, or Sociology (History majors are encouraged to choose Political Science or Economics.)	6
Natural Science	12
Biological and Physical Science (must include two courses in either a Biological or a Physical Science. The remaining credits must be in the other science).	
Mathematics	3
Speech	3
Psychology	3

In addition to the general requirements listed above, students must complete a major and a minor selected from the Division of General Studies or the Division of Natural Sciences and Mathematics and satisfactorily complete all requirements for a degree in the appropriate division.

II. *Professional Education Courses:*		*Semester Hours*
ED 261	Foundations of Education in the United States	3
ED 263	Educational Psychology	3
ED 388	Teaching Secondary School Subjects	3
ED 490	Principles of High School Teaching	3
ED 497	Secondary Student Teaching	9

ADMISSION TO AND RETENTION IN THE TEACHER EDUCATION PROGRAM

All students who indicate a definite interest in teaching as a career may submit the Declaration of Intent to Teach as early as the freshman year so that appropriate counseling opportunities may be established to identify course patterns.

During the winter or spring term of the sophomore year, students should make application for admission to the teacher education program. Applicants to the program should:

a. Have a cumulative quality-point average of 1.00 on all work attempted.
b. Have completed at least 70% of the academic areas listed above.
c. Present confidential evaluations prepared on forms provided for this purpose.

Before April 15 of the student's junior year, students admitted to the teacher education program should make application for a student teaching assignment for one term of the senior year. The following additional criteria must be met at this time.

1. The student must have acquired (a) a grade point average of 1.20 in all work attempted and a grade point average of 1.10 in all work attempted in the major field, or (b) a grade point average of 1.00 in all work attempted and a grade point average of 1.50 in all work attempted in the major field.
2. A grade point average of 1.00 in all work attempted in education courses.
3. Satisfactory completion of all *Academic Area Courses.*

In addition to fulfilling the general degree requirements, a student must earn as many quality points as hours attempted in professional psychology and education courses.

Near the end of the teacher education program, the student must complete the State Department of Education certification application at the OFFICE OF STUDENT RECORDS.

GRADUATE STUDY

The graduate offerings in the Division of General Studies are part of the graduate programs of departments and colleges on the Tuscaloosa Campus.

Admission to these programs is obtained by approval of the departments, colleges, and graduate school of the University of Alabama. Application may be made at the office of the Graduate School at UAH. In all cases only a limited amount of credit towards a master's degree may be obtained in Huntsville.

EDUCATION

A student admitted to the graduate program of the College of Education at the University of Alabama may apply a maximum of 12 semester hours earned at the Huntsville Campus toward the master's degree.

A student interested in graduate study in education should refer to the Graduate School Catalog and the College of Education Catalog of the University of Alabama for complete description of admission, requirements, and courses. Students are advised to seek counseling in establishing their program needs.

Graduate work for the degree of Master of Arts is offered by the College of Education (Tuscaloosa Campus) in: administration and supervision; art education; business education; counseling and guidance; curriculum study and research; educational psychology (including a program for the preparation of reading improvement specialists); elementary education; health, physical education, and recreation; home economics education; music education; school librarianship; secondary education; special education for exceptional children; and vocational industrial education.

PUBLIC ADMINISTRATION

A student admitted to the public administration graduate program of the College of Arts and Sciences at the University of Alabama may apply a maximum of 12 semester hours earned at the Huntsville Campus toward the master's degree.

A student interested in graduate study in public administration should refer to the Graduate School Catalog and the College of Arts and Sciences Catalog of the University of Alabama for complete description of admission, requirements, and courses. Students are advised to seek counseling in establishing their program needs.

DESCRIPTION OF COURSES

ART

100. *Comprehensive History of Art*—A survey of the principal visual art statements of our world, the means by which they are expressed, and their relationship to other civilization phenomena. Three hours.

101. *History of Modern Art*—An introduction to the forms and motivations of the visual arts since 1750. Three hours.

120. *Two-dimensional Form in Design*—An introduction to the primary fundamentals of two-dimensional design, encompassing analytical and intuitive work in dot, line, and plane on the image surface. Two hours.

121. *Color in Design*—An investigation into the physiological, psychological and physical properties of color, with experimental studio work in both the subjective and objective evaluation of color usage. Two hours.

122. *Three-dimensional Form in Design*—Studio analysis and development of forms by the use of basic principles of three-dimensional expression and manipulation. Two hours.

140. *Sculptural Use of Plastic and Organic Materials*—Introduction in clay to three-dimensional sculptural space; mold-making and casting techniques using plaster, silastic and fiberglass. Two hours.

141. *Sculptural Use of Constructive Techniques and Materials*—Constructions in various media, both molded and found: wood, plexiglass, wire, etc. Two hours.

160. *Drawing with Dark-on-Light Media*—Introduction to two-dimensional form and expression through the use of the more traditional means of line, value, texture, etc. Two hours.

161. *Drawing with Fluid Media*—Introduction to the use of inks, washes, oils, gouache, etc. in art-image making. Two hours.

162. *Drawing with Light-on-Dark Media*—Introduction to the additive use of light reflectivity in drawing, especially useful in preparation for painting about mass in space. Two hours.

163. *Drawing with Collage*—Introduction to the problems and possibilities inherent in the drawing systems that involve reorganizing preformed visual references. Two hours.

320. *Advanced Design*—Experimental manipulation of imagery in two- and three-dimensional media and in film. Research in contemporary art movements. Prerequisite: ART 100, 120, 121, or approval of instructor. Two hours.

321. *Advanced Design*—Exploration of design relationships in our physical environment, with problems, both real and hypothetical, necessitating individual response and solution. Prerequisite: ART 100, 120, 121, or approval of instructor. Two hours.

322. *Advanced Design Workshop*—Selection of individual design problems in image media, requiring individual initiative and research. Drawings, models, research reports, etc. Prerequisite: ART 100, 120, 121, or approval of instructor. Two hours.

330. *Lettering and Commercial Design*—A study in the history of contemporary letter forms, with analysis and studio practice in historical calligraphic styles. Introduction to the tools and practices of the professional graphic designer. Prerequisite: ART 120, 121, or approval of instructor. Two hours.

331. *Introduction to Typography*—Advanced practice in engrossing and calligraphy. Investigation with the development of type design and contemporary usage. Studio work in the basic techniques of typographic layout and typesetting. Prerequisite: ART 120, 121, or approval of instructor. Two hours.

332. *Survey of Illustrative Techniques*—Studio practice in contemporary illustrational concepts and commercial techniques. Investigation in the development of the art of illustration from its origin to the present. Prerequisite: ART 120, 121, or approval of instructor. Two hours.

340. *Carving Wood and Stone.* Prerequisite: ART 100, 140 or 141, or approval of instructor. Two hours.

341. *Sculpture: Assemblage Metal and Plastics*—Welded metal as sculpture — oxy-acetylene and arc welding. Manipulation of contemporary plastic materials. Prerequisite: ART 140, 141, or approval of instructor. Two hours.

342. *Casting Metal and Plastics*—Foundry work in the lost wax and sand casting of bronze and aluminum. Practice in casting of plastic foams and resins. Prerequisite: ART 100, 140 or 141, or approval of instructor. Two hours.

370. *Oil Painting*—An advanced course leading to the development of reflex and conscious acquaintanceship with the fusion and additive characteristics of oil paints. Prerequisite: ART 100; one of ART 120, 121, 122; and one of ART 160, 161, 162, 163, or approval of instructor. Two hours.

371. *Tempera Painting*—Advanced course designed to develop capability in the generally opaque and quick-curing tempera media that are so conducive to pictorial and decorative effect. Prerequisite: ART 100; one of ART 120, 121, 122; and one of ART 160, 161, 162, 163, or approval of instructor. Two hours.

372. *Mixed Media*—Advanced experience in the combination of formerly separate media and motifs: for example, two- and three-dimensional, cut-out, motion, lights, sound, literary reference, etc. Prerequisite: ART 100; one of ART 120, 121, 122; and one of ART 160, 161, 162, 163, or approval of instructor. Two hours.

382. *Graphics: Relief Printmaking*—Beginning studio practice in woodcut, wood engraving, lino-cut, and contemporary relief printing techniques. Investigation into historical backgrounds. Prerequisite: ART 100, 121; and one of ART 160, 161, 162, 163, or approval of instructor. Two hours.

BUSINESS AND PUBLIC ADMINISTRATION (EC), (PA)

BUSINESS (EC)

111. *Principles of Accounting*—Basic principles of accounting emphasizing individual proprietorships. Three hours.

112. *Principles of Accounting*—Accounting principles for partnerships and corporations. Prerequisite: EC 111. Three hours.

141. *American Economic History*—A survey of the origins of basic economic institutions in Europe followed by a detailed study of the historical development of these institutions in the United States. No degree credit for students who take HY 221, 222. Three hours.

142. *Principles of Economics*—Introduction to economic analysis and its use in dealing with business or governmental problems. Material in the first term concentrates on national income, price levels, employment, and simple demand and supply theory. Three hours.

143. *Principles of Economics*—A continuation of EC 142. Concentrates on more advanced value theories, including problems of monopoly or partial monopoly, distribution of income along functional lines, international economics, and economic growth. Prerequisite: EC 142. Three hours.

213. *Intermediate Accounting*—Intensive study of balance sheet accounts and their interrelationship to income and expense accounts. Prerequisite: EC 112. Three hours.

221. *Business Law*—Introductory course emphasizing the legal environment in business. Three hours.

231. *Business Statistics*—Collection, classification, and presentation of data; ratios, averages, and disbursements; elements of sampling; index numbers; time series; correlation. Prerequisite: MA 109 or 111. Three hours.

251. *Corporate Financial Policy*—Promotional, financial, and structural features of the basic types of business organizations. Prerequisite: EC 112, 143. Three hours.

253. *Business Fluctuations and National Income Analysis*—This course deals with the forces determining the level of income and employment in the economic system, with special reference to the United States. Causes and cures of unemployment are studied and evaluated. Particular attention is given to the role of government in maintaining a high level of employment. Prerequisite: EC 142. Three hours.

261. *Principles of Business Organization*—Basic theories and principles of organization as they are developing in modern society. Prerequisite or parallel: EC 143. Three hours.

262. *Management and Labor Economics*—Psychological and institutional factors as well as economic analysis of the major aspects of such problems as employment, wages, hours, unionism, labor-management relations, and social security. Prerequisite or parallel: EC 143. Three hours.

313. *Income Tax Procedure*—Determination of taxable income and selected aspects of tax accounting for individuals. Prerequisite: EC 112. Three hours.

314. *Cost Accounting*—Basic theory and procedures involving materials, labor, and manufacturing expenses in job order and process cost systems. Prerequisite: EC 213. Three hours.

315. *Introduction to Auditing*—Auditing theory and practice, working papers, financial statements, and professional ethics. Prerequisite: EC 213. Three hours.

322. *Government and Business*—Analysis of regulations which government may impose upon business and a survey of basic constitutional principles and legal aspects of the more recent federal legislation affecting business. Prerequisite: EC 251, 261. Three hours.

344. *European Economic History*—Industrial Revolution to current developments covering institutions, activities, economic systems, and policies. Prerequisite: EC 143. Three hours.

345. *Intermediate Economic Analysis*—More intensive examination of the economic principles underlying value and distribution with additional training in the application of these principles to problems of analysis. Prerequisite: EC 143. Three hours.

352. *Money and Banking*—Organization, operation, and economic significance of the monetary and banking systems. Prerequisite: EC 251. Three hours.

353. *Public Finance*—Principles of taxation, government expenditures, borrowing, and fiscal administration. Prerequisite: EC 143. Three hours.

371. *Introduction to Behavioral Science*—Designed to integrate behavioral science concepts (psychology, sociology, anthropology, and physiology), as applied to business and industry, into an effective working tool for the student interested in human relations. Prerequisite: Junior standing or approval of instructor. Three hours.

416. *Advanced Accounting*—Specialized aspects of accounting, such as liability, owner's equity, and reorganization. Prerequisite: EC 213. Three hours.

417. *Governmental Accounting*—Special features of budgetary and fund accounting as applied to municipalities, other governmental units, and institutions such as schools and hospitals. Prerequisite: EC 112. Three hours.

446. *International Economics and Trade*—Theoretical principles underlying international trade with an application of these principles to recent historical developments and to current national policies. Prerequisite: EC 345 or approval of instructor. Three hours.

448. *Development of Economic Theory*—Study of the historical development of economic thought from ancient times to the nineteenth century and from early modern times to the present. Prerequisite: EC 345. Three hours.

454. *International Finance*—Institutions, policies, and practices involved in financing international transactions. Prerequisite: EC 345 or approval of instructor. Three hours.

PUBLIC ADMINISTRATION (PA)

271. *Principles of Public Administration*—Administrative principles and practices in public organizations and agencies. Prerequisite: PSC 101, 212. Three hours.

•512. *Public Personnel Administration*—Purposes, functions, and processes of personnel management at the national, state, and local levels. Prerequisite: PA 271. Three hours.

•515. *Fiscal Administration*—Governmental revenue and expenditure policies with emphasis on the budget as a method of administrative and fiscal control. Prerequisite: PA 271, EC 353. Three hours.

•564. *Government Planning*—Theories, objectives, techniques, and problems of governmental planning within cities, metropolitan areas, states, regions, and at the national level. Prerequisite: PA 271. Three hours.

•568. *Administrative Law and Regulation*—Judicial influences and controls on the exercise of administrative authority together with an analysis of governmental regulatory policies. Prerequisite: PA 271. Three hours.

572. *American Constitutional Law*—Federal and state constitutional powers and limitations stressing the development of judicial review, the growth of national power, and civil liberties through judicial interpretation. Prerequisite: PA 271, PSC 101, 212. Three hours.

577. *Behavioral and Empirical Problems and Methods*—Application of quantitative methods to public administration problems. Prerequisite: EC 231, PA 271. Three hours.

•Students desiring graduate credit should refer to the section on Graduate Public Administration Courses which follows this listing of courses.

GRADUATE PUBLIC ADMINISTRATION COURSES

A maximum of 12 hours credit for work completed in Huntsville in courses in public administration may be applied in partial fulfillment of the Master of Public Administration degree offered by the University of Alabama. The following courses are approved for credit, subject to the above limitation on total hours, in Huntsville. Some of these courses are described and denoted with an • in the preceding section. The numbers on the courses listed below correspond to those in the UA catalog.

PSC 112. Public Personnel Administration. Three hours.
PSC 115. Fiscal Administration. Three hours.
PSC 164. Government Planning. Three hours.

PSC 168. Administrative Law and Regulation. Three hours.
PSC 243. Problems of Public Policy. Three hours.
PSC 283. American National and State Government. Three hours.

EDUCATION (ED)

111. *Career Exploration*—Educational and Vocational Planning. Prerequisite: Nine hours college credit and placement tests. One hour.

130. *Introduction to Child Development*—Basic principles of child growth and development with special emphasis on student self-understanding. (Not applicable to certification requirements.) Three hours.

261. *Foundations of Education in the United States*—The development of education in America and its relation to prospective teachers. Prerequisite: Sophomore standing. Three hours.

263. *Educational Psychology*—Psychological principles basic to the learning process. Prerequisite: PY 100 and sophomore standing. Three hours.

404. *Principles of Education*—Aims of education and functions of schools in a democratic society. Three hours.

411. *Guidance for Teachers*—The sociological, psychological, and philosophical bases for guidance in schools. Three hours.

467. *Tests and Measurements*—Survey of standardized and teacher-made evaluation instruments. Three hours.

ELEMENTARY EDUCATION

370. *Teaching of Reading*—Materials and methods in the teaching of reading; emphasis upon developing readiness and planning a balanced program. Prerequisite: ED 263, junior standing, and admission to the teacher education program. Three hours.

378. *Teaching the Language Arts*—Theory and practice in teaching composition, spelling, writing, and reading. Prerequisite: ED 263, junior standing, and admission to the teacher education program. Three hours.

379. *Teaching of Arithmetic*—Presentation of the subject matter of arithmetic; helping children develop understanding and functional skills. Prerequisite: ED 263, junior standing, and admission to the teacher education program. Three hours.

482. *Observation and Participation in Teaching*—Selected observation and participation in elementary schools. For students in curricula designed for both elementary and secondary schools and for experienced teachers. Prerequisite: Senior standing. Three to six hours.

SECONDARY EDUCATION

388. *Teaching Secondary School Subjects*—(Major area of teaching to be designated.) Materials and methods in the various major fields.

Prerequisite: ED 263 and admission to the teacher education program. Three hours.

490. *Principles of High School Teaching*—Prerequisite: ED 388 and senior standing. This course is taken concurrently with student teaching. Three hours.

497. *Secondary Student Teaching*—(Major area of teaching to be designated.) Observation and student teaching in secondary schools. Prerequisite: ED 388 and senior standing. Nine hours.

498. *Secondary Student Teaching*—(Major area of teaching to be designated.) Observation and student teaching in secondary schools. Prerequisite: ED 388 and senior standing. Three to six hours.

SPECIAL EDUCATION

493. *Education of Exceptional Children and Youth*—Introduction to the field of exceptional children and youth. Prerequisite: ED 263. Three hours.

495. *Psychology and Education of the Mentally Retarded I*—Social, emotional, physical, and learning characteristics of retarded children and youth. Prerequisite: ED 263. Three hours.

SCHOOL LIBRARIANSHIP

380. *Library Operation and Management*—Methods of organizing books and other library materials; includes ordering, processing, circulating, mending, binding, inventory, budgeting, business records, housing and equipment. Three hours.

571. *Function and Use of the School Library*—School libraries in educational programs; includes historical development of libraries, standards, library service to teachers and pupils, use of the library. Three hours.

573. *Selection of Materials*—Principles, policies, practices and problems in the selection of books and other materials and of techniques in the promotion of their use. Three hours.

588. *Books For Young People*—Reading and evaluating books and related materials according to the interests, needs, and abilities of high school age youth. Three hours.

GRADUATE EDUCATION COURSES

The following courses are taught in Huntsville for the graduate program of the College of Education at the University of Alabama. The numbering system is consistent with the UA College of Education Catalog. Students are advised to seek counseling in establishing their program needs.

		Semester Hours
ACD 233	Introduction to Public School Organization and Administration	3
ACD 291	Principles of Curriculum Development	3
EPY 263	Contributions of Psychology to Teaching	3
CGP 211	Principles of Guidance	3
EED 222	Modern Elementary School Programs	3
EDH 203	Sources of American Educational Thought	3
SED 230	Modern Secondary School Programs	3

ENGLISH (EH)

Requirements for a major: A minimum of 36 semester hours identified as follows, with the provision that one group (but not more than one) must be fulfilled with a course devoted exclusively to the novel (courses marked with an asterisk), and that at least 6 semester hours be taken in courses numbered 400 or above.

	Semester Hours
Basic courses (EH 101, 102 or 103, 104 and EH 205, 206)	12
Shakespeare (EH 360)	3
American Literature (EH 330, 331, 430*, 431*, 432, 530)	3
I. Middle Ages and Renaissance (EH 240, 450, 460, 471)	3
II. Restoration and 18th Century (EH 380, 381, 470, 492*)	3
III. 19th Century (EH 390, 391, 493*)	3
IV. Modern Literature (EH 241, 420, 421, 500)	3
Electives in English	6
	36

A minor in English must include a minimum of 21 semester hours of which at least 3 must be taken in courses numbered 400 or above, identified as follows:

	Semester Hours
Basic courses (EH 101, 102 or 103, 104 and EH 205, 206)	12
Shakespeare (EH 360)	3
One course chosen from Groups I, II, or III as listed in requirements for English major	3
Electives in English	3
	21

No more than 3 semester hours credit in creative writing (EH 210, 211, 212, 213) may be applied to an English major or minor.

Transfer students majoring in English must take at least 12 semester hours of advanced English courses (numbered 300 or above) at UAH. A student minoring in English must take at least 6 semester hours of advanced English courses (numbered 300 or above) at UAH.

003. *Writing Clinic*—Designed for students whose placement test score or class performance indicates the need of remedial work. No credit.

101. *Freshman Composition*—Emphasis on theme writing, including at least one documented paper related to close critical reading of

short stories and the novel. Prerequisite: Placement tests. Three hours.

102. *Freshman Composition*—Emphasis on theme writing, including at least one documented paper related to close critical reading of poetry and drama. Prerequisite: EH 101. Three hours.

103. *Advanced Freshman Composition*—Similar to, but more intensive than EH 101. Required of and open only to students whose placement test score indicates superior ability. Prerequisite: Placement tests. Three hours.

104. *Advanced Freshman Composition*—Similar to, but more intensive than EH 102. Prerequisite: EH 103. Three hours.

110. *Elementary Public Speaking*—Theory and practice in the effective preparation and delivery of representative types of speeches. Required for teacher certification. No credit toward English major or minor. Not open to seniors. Three hours.

113. *Voice and Diction*—A beginning course designed to assist the student to improve his personal use of voice. Three hours.

114. *Fundamentals of Oral Interpretation*—A beginning course to help the student gain the artistic skills needed to communicate literature to listeners. Prerequisite: EH 102 or 104. Three hours.

205. *Survey of English Literature*—Anglo-Saxon literature through Milton. Prerequisite: EH 102 or 104 and sophomore standing. Three hours.

206. *Survey of English Literature*—Restoration through 20th century. Prerequisite: EH 205. Three hours.

Courses below are open to students who have completed EH 206, with exceptions as indicated.

207. *Modern English Grammar*—Study of traditional grammar, with introduction to structural grammar and linguistics. Three hours.

208. *History of the English Language*—Survey of the morphological syntatic, and lexical development of the English language, with emphasis on the structure of the present-day English. Prerequisite: EH 205. Three hours.

210. *Fiction Writing*—Practice in the writing of fiction, from conception to revision. Approval of instructor. Three hours.

211. *Fiction Writing*—Practice in the writing of fiction, from conception to revision. Approval of instructor. Three hours.

212. *Poetry Writing*—Practice in the writing of poetry, from conception to revision. Approval of instructor. Three hours.

213. *Poetry Writing*—Practice in the writing of poetry, from conception to revision. Approval of instructor. Three hours.

240. *World Literature*—Selected major contributions to Western civilization; Homer to Dante. Three hours.

241. *World Literature*—Selected major contributions to Western civilization; Rabelais to the present. Three hours.

300. *Bibliography*—Lectures and practice in the techniques and materials of research in English and American literature. One hour.

330. *Major American Writers*—Major writers from the Colonial period to Whitman and Melville. Three hours.

331. *Major American Writers*—Dickinson to Eliot and Faulkner. Three hours.

360. *Shakespeare*—Renaissance background and at least six plays, including history, comedy, and major tragedies. Three hours.

380. *Restoration and Early 18th Century*—Poetry and non-fictional prose, 1660-1745. Three hours.

381. *Later 18th Century*—Poetry and non-fictional prose, 1745-1780. Three hours.

390. *The Romantic Period*—Poetry and non-fictional prose, 1780-1832. Three hours.

391. *The Victorian Period*—Poetry and non-fictional prose, 1832-1901. Three hours.

Courses below are open to students who have completed 18 semester hours in English.

420. *Modern Poetry*—Major movements in American and British poetry of the 20th century. Three hours.

421. *Modern Drama*—A study of the major ideas and forces which originated new movements in drama from Ibsen to the present. Three hours.

430. *The American Novel*—Theme and form of the American novel from Cooper to James. Three hours.

431. *The American Novel*—Representative works from the school of naturalism to the present. Three hours.

432. *The Southern Renaissance*—Origin and development of Southern myth with particular emphasis on major writers of the Southern renaissance. Three hours.

450. *Chaucer*—Emphasis on *Canterbury Tales* and *Troilus and Criseyde* in Middle English. Three hours.

460. *Renaissance Non-Dramatic Poetry*—Renaissance poetry exclusive of Shakespeare and Milton. Three hours.

470. *Milton and the 17th Century*—Milton, cavalier and metaphysical poetry, and selected prose. Three hours.

471. *English Drama*—From its beginnings to 1642, exclusive of Shakespeare. Three hours.

492. *The English Novel*—Critical reading of representative novels, accompanied by historical survey of major trends. Fielding to Thackeray. Three hours.

493. *The English Novel*—Critical reading of representative novels, ac-

companied by historical survey of major trends. George Eliot to present. Three hours.

Courses below are open to students who have completed 24 semester hours in English.

500. *Literary Criticism*—Major theories and methods, with applications by the student. Three hours.

530. *Special Topics in American Literature*—Intensive study of one or more writers, groups, or movements, announced in advance. Three hours.

540. *Special Topics in English Literature*—Intensive study of one or more writers, groups, or movements, announced in advance. Three hours.

HISTORY AND POLITICAL SCIENCE (HY), (PSC)

HISTORY (HY)

Requirements for a major: 36 semester hours including HY 101-102; HY 221, 222; and 15 semester hours in advanced courses including HY 501 or 502 or both. Transfers and other students who have not had HY 101-102 may substitute HY 391, 392.

Requirements for a minor: 21 semester hours, including 6 semester hours in advanced courses.

101. *History of Western Civilization*—A general survey of the major western civilizations to 1648. Not open to seniors. Three hours.

102. *History of Western Civilization*—A study of the development of modern institutions and values within the Western World from 1648 to the present, with particular attention to the rise and dominance of the West and the reaction of the non-Western world. Not open to seniors. Three hours.

Courses below are open to all students other than beginning freshmen, with exceptions as indicated.

221. *The United States to 1865*—A general survey of the history of the United States from discovery of America through the Civil War. Three hours.

222. *The United States Since 1865*—A general survey of the history of the United States from the end of the Civil War to the present. Three hours.

225. *History of Alabama*—A survey of the state's past from Colonial Times to the present with emphasis on its place in United States history. Three hours.

229. *Survey of Ancient Times*—A survey of the history of the ancient Near East, Greece, and Rome. Three hours.

237. *Introduction to Latin American History: Colonial Period*—A general survey of Latin American history from the discovery to the independence movements, 1808. Three hours.

238. *Latin American History Since 1808*—A general survey of Latin American history from the independence movements to the present. Three hours.

240. *History of France Since 1461*—A study of political, economic, social, and cultural developments from the accession of Louis XI to the present. Prerequisite: HY 101-102. Three hours.

242. *History of Germany Since 1648*—A study of the history of Germany from the close of the Thirty Years' War to the present with attention being given to the decline and disappearance of the medieval empire, the rise of Austria and Prussia, the unification of Germany, the problems of the Weimar Republic, and the emergence of the Third Reich. Prerequisite: HY 101-102. Three hours.

247. *History of England to 1660*—A general study of England from the earliest times to 1660 with attention being given to constitutional, political, economic, and social phases. Three hours.

248. *History of England Since 1660*—A general study of England with attention given to constitutional, political, economic, and social aspects. Three hours.

249. *Current World History*—A study of the present in perspective as it relates to the main themes of world history since 1914. Three hours.

Courses listed below are open to students who have completed 12 semester hours in history or have junior standing.

364. *The Westward Movement in American History Since 1803*—A study of pioneering society, Indian relations, land policies, expansion, and politics of the westward-moving frontier. Three hours.

369. *Social and Cultural History of the United States to 1865*—A general study of the social, cultural, religious, and intellectual life of the United States to the end of the Civil War. Prerequisite: HY 221 or approval of instructor. Three hours.

370. *Social and Cultural History of the United States Since 1865*—A general study of the social, cultural, religious, and intellectual life of the United States since the end of the Civil War. Prerequisite: HY 222 or approval of instructor. Three hours.

373. *Foreign Relations of the United States to 1898*—A general survey of foreign relations from 1775 to 1898 with particular attention to the evolution of policy in the nineteenth century. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

374. *Foreign Relations of the United States Since 1898*—A general survey of foreign relations with particular attention to the development of policy in areas where the United States has exercised acknowledged leadership. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

375. *History of Russia to 1894*—A survey of Russian history with emphasis on nineteenth century developments. Prerequisite: HY 101-102

or approval of instructor. Three hours.

376. *History of Russia Since 1894*—A study of Russia and the Soviet Union in the twentieth century. Prerequisite: HY 101-102 or approval of instructor. Three hours.

391. *Europe, 1500-1815*—An examination of the economic, social, political, and cultural developments in Europe from the age of the Renaissance to the close of the Napoleonic Wars. Three hours.

392. *Europe Since 1815*—A study of Europe from the end of the Napoleonic Wars to the present with equal emphasis on the nineteenth and twentieth centuries. Three hours.

393. *History of the Near East in Modern Times*—A general survey of the interrelationship of the western nations with the countries of the Near East. Prerequisite: HY 101-102 or approval of instructor. Three hours.

Courses listed below are open to students who have completed 15 semester hours in history or 12 semester hours in history with senior standing.

413. *The Old South*—The colonial South through secession including the development and operation of the plantation economy and its extension into new lands, emergence of the ante-bellum social and political patterns of the region, and relationship of the South to the United States. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

414. *The New South*—A study of the economic, social, and political readjustments of the late nineteenth century, and the vast changes in the South during the twentieth century. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

418. *Constitutional History of the United States*—A study in the growth and development of the American constitutional system with emphasis on those aspects of constitutional growth which relate closely to the fundamental structure of American government and social order. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

424. *American History to 1800*—A study of the American Colonies within the British Empire, the Revolution, the Confederation, the Constitutional Convention, and the Federalist Period. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

428. *American History, 1800-1850*—A study of Jeffersonian Democracy, Jacksonian Democracy, and the era of Manifest Destiny. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

434. *The Civil War and Reconstruction*—A study of the sectional struggle leading to secession of the South, and the political, military, economic, and social aspects of Civil War and Reconstruction. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

437. *The Foundations of Modern America, 1865-1900*—An intensive examination of the period from 1865 to 1900 with particular attention

to the origins of twentieth-century United States. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

438. *Twentieth Century American History*—A study of the United States in the twentieth century with particular attention to the period since World War II. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

445. *The Relations of the United States and Latin America*—A detailed study of the interrelationships of the United States with Latin America from 1776 to the present. Prerequisite: HY 238 or approval of instructor. Three hours.

446. *The Relations of the United States and the Far East*—A study of the interrelationships of the United States with the Far East since 1784 with particular attention to China and Japan. Prerequisite: HY 221, 222, or approval of instructor. Three hours.

447. *The Medieval World, 500-1273*—A study of the Medieval World from the disintegration of the Roman Empire to the collapse of medieval imperial power. Prerequisite: HY 391 or approval of instructor. Three hours.

448. *The Later Middle Ages and the Renaissance*—A study of the transformation of Western Europe from 1273 to 1500, stressing the decline of medieval economic, political, and cultural life and the rise of modern European civilization. Prerequisite: HY 391 or approval of instructor. Three hours.

474. *The Age of the Reformation*—A study of the religious crisis of the sixteenth century in its political, economic, and intellectual setting. Prerequisite: HY 391 or approval of instructor. Three hours.

475. *Europe in the Seventeenth Century*—A study of Europe from the Edict of Nantes to the Peace of Utrecht with major emphasis upon the Thirty Years' War and the ascendancy of France under Louis XIV. Prerequisite: HY 391 or approval of instructor. Three hours.

476. *The Age of Reason, 1713-1789*—An analysis of the intellectual, social, economic, and political developments in Europe from the Peace of Utrecht to the outbreak of the French Revolution. Prerequisite: HY 391 or approval of instructor. Three hours.

477. *Europe in the Age of Revolution, 1789-1848*—A study of revolution and reaction, nationalism, liberalism, and democracy from the French Revolutions of 1848. Prerequisite: HY 391 or approval of instructor. Three hours.

483. *Europe, 1848 to 1914*—An intensive study of Europe in the period of intensification of national power and imperialism, culminating in the outbreak of the War of 1914. Prerequisite: HY 392 or approval of instructor. Three hours.

484. *Europe Since 1914*—An intensive study of Europe in the world setting of the two great wars of the twentieth century and the decline of Europe as the center of world power. Prerequisite: HY 392 or approval of instructor. Three hours.

501. *Senior Seminar in American History*—A course in historiography, research and writing, and recent interpretations in the field of American history. Open only to seniors who are majoring or minoring in history. Three hours.

502. *Senior Seminar in European History*—A course in historiography, research and writing, and recent interpretations in the field of European history. Open only to seniors who are majoring or minoring in history. Three hours.

503. *Directed Readings in History*—A program of independent reading in one field of history, to be selected in consultation with an advisor. Open only to seniors majoring in history. Three hours.

POLITICAL SCIENCE (PSC)

101. *American Government*—A survey of the principles, political institutions, and practices of American national, state, and local government. Three hours.

103. *Problems of American National Government*—A survey of problems encountered by American governmental units in fields such as foreign affairs, agriculture and business regulation, defense, and education. Prerequisite: PSC 101. Three hours.

205. *Western European Constitutional Systems*—An examination of the political systems of Great Britain, France, and West Germany. Not open to freshmen. Three hours.

212. *State and Local Government and Politics*—A study of the institutions and functions of American state and local government and their relationship to the political process. Three hours.

215. *Introduction to International Politics*—A survey of the evolution of the modern state system and the basic forces and principles in international relations. Not open to freshmen. Three hours.

241. *American Parties and Politics*—Activities of pressure groups and parties in American politics. Attention is given to the social composition, organization, finance, and nominating processes of parties. Prerequisite: PSC 101. Not open to freshmen. Three hours.

Courses listed below are open to students who have completed 9 semester hours in Political Science, with exceptions as indicated.

357. *The American Legislative Process*—An examination of the constitutional and theoretical foundations of Congress and state legislatures emphasizing problems of structure, procedure, leadership, and legislative reform. Prerequisite: PSC 101 and 6 additional hours in political science. Three hours.

358. *The American Executive*—An examination of the role of the President, governors, and local executives in the American political system. Three hours.

362. *Introduction to Political Theory*—The fundamental issues of politics as treated by some representative thinkers of the western world. Three hours.

363. *Introduction to Political Analysis*—The application of behavioral methods in the collection, organization, and analysis of political data. Three hours.

MODERN FOREIGN LANGUAGES (ML)

COURSE NUMBERS

The course numbering system of UAH has been coded additionally for courses in modern foreign languages so that the second digit indicates each separate language.

	Middle Digit
French	0
German	1
Spanish	2
Russian	3

ML 102, 112, 123 are not open to freshmen who have had two years of the indicated language in high school. ML 203, 215, 223 are review courses for students who have had two years of high school work in a language and whose placement score indicates need for further preparation before entering the intermediate course in that language. These review courses carry no credit toward meeting the language requirement, but do apply toward elective credit.

101. *Elementary French*—(No credit without ML 102) Three hours.

102. *Elementary French*—Prerequisite: ML 101. Three hours.

111. *Elementary German*—(No credit without ML 112) Three hours.

112. *Elementary German*—Prerequisite: ML 111. Three hours.

121. *Elementary Spanish*—(No credit without ML 122) Three hours.

122. *Elementary Spanish*—Prerequisite: ML 121. Three hours.

131. *Elementary Russian*—(No credit without ML 132). Three hours.

132. *Elementary Russian*—Prerequisite: ML 131. Three hours.

201. *Intermediate French*—Prerequisite: ML 102 or placement. Three hours.

202. *Intermediate French*—Prerequisite: ML 201. Three hours.

203. *French Review*—Three hours as an elective.

211. *Intermediate German*—Prerequisite: ML 112 or placement. Three hours.

212. *Intermediate German*—Prerequisite: ML 211. Three hours.

213. *Intermediate Scientific German*—For pre-professional students and others majoring in the natural sciences. Prerequisite: ML 112. Three hours.

214. *Intermediate Scientific German*—Prerequisite: ML 211 or 213. Three hours.

215. *German Review*—Three hours as an elective.
221. *Intermediate Spanish*—Prerequisite: ML 122 or placement. Three hours.
222. *Intermediate Spanish*—Prerequisite: ML 221. Three hours.
223. *Spanish Review*—Three hours as an elective.
231. *Intermediate Russian*—Prerequisite: ML 132. Three hours.
232. *Intermediate Russian*—Prerequisite: ML 231. Three hours.
301. *Advanced French*—Rapid reading, conversation, literature. Prerequisite: ML 202. Three hours.
303. *French Conversation*—Oral drills, pronunciation exercises, simple oral reports. Prerequisite: ML 202. Three hours.
304. *Advanced French Composition and Usage*—Primarily a composition course with emphasis on idiomatic expression. Prerequisite: ML 202 or 303 and approval of instructor. Three hours.
305. *Survey of French Literature*—A study of French literature of the seventeenth and eighteenth centuries. Reading of selections from the important authors, lectures, and reports. Prerequisite: ML 301 or approval of foreign language faculty. Three hours.
306. *Survey of French Literature*—A continuation of ML 305. French literature from 1800 to the present. Prerequisite: ML 301 or 305 or approval of foreign language faculty. Three hours.
311. *German Conversation*—Prerequisite: ML 212. Three hours.
313. *Survey of German Literature*—Prerequisite: ML 212 or 214. Three hours.
314. *Survey of German Literature*—A continuation of ML 313. Prerequisite: ML 212, 214, or 313. Three hours.
411. *Nineteenth Century German Literature*—German literature of the first half of the nineteenth century. Prerequisite: ML 212. Three hours.
412. *Nineteenth Century German Literature*—A continuation of ML 411. Prerequisite: ML 212. Three hours.
501. *Nineteenth Century French Novel*—A study of the development of the French novel in the first half of the nineteenth century. Reading and discussion of complete novels, with lectures and reports. Prerequisite: ML 306 or approval of foreign language faculty. Three hours.
502. *Nineteenth Century French Novel*—Continuation of ML 501. Prerequisite: ML 306 or approval of foreign language faculty.

MUSIC (MU)

A maximum of 6 semester hours in choral organization courses (190, 191, 192, 193) may be applied as elective credit toward total degree requirements; however, students may continue to participate in these courses and receive college credit for them.

100. *Fundamentals of Music*—Basic music presented in a practical way for the student who has little or no musical training. Normally, students who expect to major in music should not expect degree credit in this course. Three hours.
101. *Theory of Music I*—Intensive training in the fundamentals of musicianship, dealing principally with the mechanical aspects of music — clefs, notation, scales, intervals, meters, rhythms, and musical terminology. Extensive practice in sight-singing, melodic, harmonic, and rhythmic dictation, and practice at the keyboard. Prerequisite: Approval of instructor. Four hours.
102. *Theory of Music II*—A continuation of the study of basic principles involved in the art of musical composition, with practice in sight-singing, keyboard work, and dictation. Prerequisite: MU 101. Four hours.
110. *Introduction to Music*—A general course designed to promote the understanding of music through better listening practices. Three hours.
190. *UAH Choir*—Mixed voices singing the serious choral repertoire. Open to all students of University. May be repeated. One hour.
191. *Premier Singers*—Mixed voices singing "pop" and folk music. Open to all students of University. May be repeated. One hour.
192. *Huntsville Village Singers*—Select, small ensemble of mixed voices. Open to all students of University by audition. May be repeated. One-half hour.
193. *Summer Chorus*—Mixed voices singing a variety of choral music. Open to all students of University. May be repeated. One hour.
203. *Analysis of Music Form*—An intensive study of representative small and large compositions of the sixteenth through the twentieth centuries for structure and form. Prerequisite: MU 102 and 110, or approval of instructor. Three hours.
211. *History of Music I*—A survey of the development of music as an art in Western civilization to 1750. Emphasis is given to an acquaintance with representative musical works and style and to the understanding of musical concepts in the light of their historical background. Prerequisite: MU 110 or approval of instructor. Three hours.
212. *History of Music II*—A survey of the development of music as an art in Western civilization from 1750 to the present. Emphasis is given to an acquaintance with formal and stylistic problems through the study of representative works and an understanding of specific musical concepts in the light of their historical and general cultural context. Prerequisite: MU 211. Three hours.
220. *Piano Pedagogy*—A presentation of the materials, techniques and practices used in the teaching of beginners and students through lower advanced grades of piano, combined with practical experience. Two hours.

227. *Conducting*—Basic techniques of choral and instrumental conducting. Prerequisite: MU 101 and 102 or approval of instructor. Two hours.

APPLIED MUSIC

All beginning and transfer students who plan to take private instruction for music credit are required to demonstrate prior to registration their level of proficiency to the instructor. To advance to the next one hundred level of instruction (i.e., from 133 to 231), each student must perform before a faculty jury. The jury may retain students at any level until proper achievement is reached for advancement. Students not intending to major in music do not require a jury and may repeat private instruction as long as the instructor agrees that progress is being made. All lessons are sixty minutes in length.

130. *Private Instruction in Piano*—For non-music credit. May be repeated. Prerequisite: MU 100 or approval of instructor. Two-thirds hour.

131, 132, 133, 231, 232, 233, 331, 332, 333, 431, 432, 433. *Private Instruction in Piano*—For music credit. One and one-third hours.

140. *Private Instruction in Voice*—For non-music credit. May be repeated. Prerequisite: MU 100 or approval of instructor. Two-thirds hour.

141, 142, 143, 241, 242, 243, 341, 342, 343, 441, 442, 443. *Private Instruction in Voice*—For music credit. One and one-third hours.

PHILOSOPHY (PHL)

101. *Introduction to the Theory of Knowledge*—To acquaint the student with methods of careful thinking and careful statement. Three hours.

102. *Introduction to Logic*—To acquaint the student with the methodology of valid reasoning. Three hours.

103. *Introduction to the Problems of Philosophy*—A consideration of the fundamental problems of experience. Three hours.

104. *Introduction to Ethics*—A search for the norms and standards of human conduct. Three hours.

201. *History of Philosophy*—A consideration of the development of philosophical ideas from Thales to Aristotle. Three hours.

202. *History of Philosophy*—A continuation of the development of philosophic ideas from Aristotle to Kant. Three hours.

203. *History of Philosophy*—A further continuation of the development of ideas from Kant to the Twentieth Century. Three hours.

204. *American Philosophy*—Prerequisite: PHL 102. Three hours.

205. *Introduction to Aesthetics*—A search for objective standards in the arts. Prerequisite: 6 hours of philosophy. Three hours.

206. *Introduction to Metaphysics*—A consideration of the nature of reality. Prerequisite: PHL 102 and 6 hours of philosophy. Three hours.

PSYCHOLOGY (PY)

Requirements for a minor in psychology: a minimum of 21 semester hours which must include PY 100, 101, 105, and at least 6 semester hours in courses numbered 300 or above.

100. *Introduction to Psychology*—The study of behavior with an emphasis on empirical findings related to major areas of psychology. Three hours.

101. *Elementary Statistical Methods*—A study of mathematical procedures useful in evaluating data obtained from a population sample. Prerequisite: MA 109. Three hours.

Courses listed below are open to students who have completed PY 100 with exceptions as noted.

105. *General Experimental Psychology*—An introduction to behavioral research techniques and descriptive statistics. Four hours.

107. *Psychology of Adjustment*—Basic principles of mental health. Three hours.

252. *Developmental Psychology*—The developmental process from infancy through adolescence. Special attention is given to the role of the environment in the developmental process. Prerequisite: 9 semester hours in psychology. Three hours.

258. *Abnormal Psychology*—An examination of major behavior disorders, with an emphasis on empirical findings. Prerequisite: 9 semester hours in psychology. Three hours.

261. *Psychology of Learning*—The study of the acquisition and modification of behavior. Both empirical and theoretical material is considered. Prerequisite: 9 semester hours in psychology. Three hours.

313. *Physiological Psychology*—A functional analysis of the neural and endocrinological systems underlying behavior. Prerequisite: PY 105 or 6 hours of biology. Three hours.

357. *Comparative Psychology*—Behavioral similarities and differences in animals. Three hours.

359. *Psychometrics*—Theory of psychological tests. Prerequisite: PY 101, and senior standing. Three hours.

471. *Supervised Undergraduate Research I*—Prerequisite: Approval of instructor. One to three hours.

472. *Supervised Undergraduate Research II*—Prerequisite: Approval of instructor. One to three hours.

481. *Readings in Psychology*—Supervised readings, in depth, in an area of particular interest to the student. Prerequisite: 15 semester hours in psychology, senior standing, and approval of instructor. One to three hours.

482. *Readings in Psychology II*—Prerequisite: 15 semester hours in psychology, senior standing, and approval of instructor. One to three hours.

491. *Seminar in Psychology I*—Student reports on psychological problems within a particular area are presented and discussed. Prerequisite: 15 semester hours in psychology, senior standing, and approval of instructor. One to three hours.

492. *Seminar in Psychology II*—Prerequisite: 15 semester hours in psychology, senior standing, and approval of instructor. One to three hours.

SOCIOLOGY (SOC)

100. *Introduction to Sociology*—An introduction to the perspective, methods, concepts, and general findings of the sociologist. Includes discussion of historical and conceptual development of sociology. Three hours.

Courses listed below are open to students who have completed SOC 100 with exceptions as noted.

102. *Analysis of Social Problems*—A sociological interpretation of contemporary social problems as they relate to significant trends in complex societies. Three hours.

106. *The Family*—Analysis of the family as a social institution, its structure and function in contemporary societies, dating, marital interaction, the life cycle, and the socialization process. Three hours.

110. *Introduction to Social Psychology: Socialization*—An analysis of the social factors related to personality development. Includes comparative child-rearing practices; process of attitude and value system development; basic learning theories; and the influence of social roles, norms, and groups. Prerequisite: SOC 100 or PY 100.

208. *Urban Sociology*—An analysis of the origin and growth of cities; demographic and spatial characteristics of communities; attitude and value systems in urban society; impact of urbanization on institutional structures. Three hours.

209. *Population and Society*—Growth and distribution of world population; population characteristics of preindustrial and industrial nations, rural and urban localities, and religious, educational, and economic sub-groups; cultural explanations of population change. Three hours.

210. *Statistics for Sociological Research*—Elementary statistical techniques applied to sociological data; tables and graphs, central tendency and dispersion, probability and sampling tests of significance, measures of association. PY 111 and MA 120 are equivalent courses for sociology credit. Three hours.

211. *Criminal Behavior*—An analysis of theories of criminal behavior and criminal control procedures. Emphasis on causation; criminal and chancery laws, and crime control by police and criminal or juvenile courts. Three hours.

215. *Minority Groups*—Nature of minorities: status differentiation and group structure; institutional trends; intergroup relations. Three hours.

259. *Social Movements*—The nature and origins of social movements, conditions precipitating their development, the functions of ideologies in social movements, the patterns of revolution, counter-movement, and their relation to social change. Prerequisite: SOC 100. Three hours.

300. *Research Methods*—Techniques and tools utilized in sociological research; emphasis upon logic of proof, theory of measurement, and allied topics. Prerequisite: SOC 210. Three hours.

375. *Social Psychology: Group Dynamics*—An analysis of the fundamental principles of group structure. Emphasis is placed upon such topics as development of group solidarity, cohesion, intergroup conflict and cooperation, and the effects of different patterns of leadership. Prerequisite: SOC 300. Three hours.

455. *Industrial Sociology*—Social interaction in the industrial setting. Historical development of production systems, industrial roles and personality; labor-management relations. Also open to students who have completed EC 112. Prerequisite: SOC 300. Three hours.

465. *Development of Sociological Theory*—A study of the development of the discipline of sociology in terms of the major trends of sociological theory, past and present, and the major theoretical problem areas of the discipline. Includes study of the nature of sociological theory in relation to other disciplines. Prerequisite: SOC 300. Three hours.

Division Of Natural Sciences And Mathematics

Programs in the Division of Natural Sciences and Mathematics are sufficiently flexible to meet various educational, vocational, and professional goals. The faculty will assist students in planning programs of study to provide the background for advanced study in mathematics, the sciences, engineering, medicine, or dentistry; to obtain a secondary teaching certificate; to prepare for immediate employment in industrial and government laboratories; or to obtain a scientific background for a future career in business, law, or management.

The course sequences in the Division are divided into three major groups:

(1) Course sequences in mathematics, physics, chemistry, biology, and earth sciences that satisfy the natural science and mathematics basic requirements.

(2) A core curriculum in natural sciences and mathematics for the student who wishes to obtain more intensive training in the classified bodies of knowledge in the natural sciences. Although the courses serve as the science core for the B. S. curricula, they may appeal to students who do not major in science but who do wish to obtain a greater understanding of the sciences and their relationships to professional objectives than provided by the sequence in group (1).

(3) Advanced courses in mathematics, physics, chemistry, and biology to provide in-depth training in these disciplines.

DEGREE PROGRAMS

UNDERGRADUATE

A student obtaining a Bachelor of Science degree with a major and minor in the Division of Natural Sciences and Mathematics is required to complete a core science curriculum consisting of 9 semester hours of calculus, and a two semester sequence in each of two of the basic sciences – chemistry, physics, and biology, preferably all three. Also, a course in modern physics and a course in electronics are recommended. The non-science core includes six semester hours each of English Composition, Survey of English Literature, History of Western Civilization, social science, and twelve semester hours of a foreign language (six semester hours if the student has previously obtained abilities). At the present time, a student may select chemistry or physics as a major and chemistry, mathematics, or physics as a minor and complete all the requirements for the B. S. degree at UAH.

Programs leading to a B. S. degree are being expanded in keeping with the growth of the University of Alabama in Huntsville.

The Division of Natural Sciences and Mathematics offers a curriculum leading to a Bachelor of Arts degree with a major in mathematics and a minor in any of the approved areas in the Division of General Studies, the Division of Natural Sciences and Mathematics, or the Division of Engineering. General requirements for the B. A. degree can be found in the *Requirements for Degrees* section of the catalog.

Specific requirements for majors and minors are found at the beginning of each section of course descriptions.

GRADUATE

The Division of Natural Sciences and Mathematics offers programs leading to the degree of Master of Arts in mathematics and Master of Science in physics. Graduate courses are also offered in chemistry. Refer to section on *Graduate Programs.* Early in the program of study, a student should review his proposed program of study with a faculty advisor. A student majoring in mathematics may select either Plan I or Plan II. Students majoring in physics must follow Plan I. Special course requirements are stated in the section of the catalog related to course descriptions.

DESCRIPTION OF COURSES

BIOLOGY (BY)

111. *Botany*—A study of the principles of plant biology which includes all major groups of the plant kingdoms. Includes laboratory. Four hours.

112. *Zoology*—A basic study of animal biology, taxonomy, and reproduction, considering all major groups of the animal kingdom. Includes laboratory. Four hours.

217. *Vertebrate Zoology*—A study of the vertebrate animals with emphasis upon the relationship of organs and systems and their phylogenetic significance. Includes laboratory. Prerequisite: BY 112. Four hours.

219. *Heredity*—(Not open to freshmen.) An introduction to the principles of inheritance and application of these principles to plants and animals, and to the human. Prerequisite: BY 111, 112. Two hours.

220. *Heredity Laboratory*—Prerequisite or parallel: BY 219. Two hours.

221. *General Microbiology*—A fundamental course in microbiology which includes the cultivation and observation of micro-organisms and their relation to foods, water, industrial processes, and disease. Includes laboratory. Prerequisite: BY 111, 112, CH 101 or 121. Four hours.

238. *Local Flora*—Identification of local flowering plants. Prerequisite: BY 111. Two hours.

Courses listed below are open to students who have completed 8 semester hours in biology.

321. *Medical Microbiology*—A study of bacteria in relation to infectious diseases. Includes laboratory. Prerequisite: BY 221. Four hours.

354. *Vertebrate Embryology*—The embryology of the vertebrates including gametogenesis, fertilization of the egg, stages of cleavage, and development of organs and organ systems. Includes laboratory. Prerequisite: BY 217. Four hours.

371. *Biology of the Lower Plants*—Field and laboratory studies of locally common and economically important non-vascular plants. Includes laboratory. Four hours.

372. *Biology of the Higher Plants*—Field and laboratory studies of ferns, "fern allies" and seed plants; their habitats, life histories, and relationships. Includes laboratory. Four hours.

424. *Immunology*—Theory and practice of immunological principles. Includes laboratory. Prerequisite: BY 321. Four hours.

469. *Animal Histology*—The microscopic study of the various tissues and organs of the mammalian body. Includes laboratory. Prerequisite: BY 217, 354. Four hours.

478. *Invertebrate Zoology*—A study of the invertebrate phyla, including structural and functional relationships leading to an understanding of progressive complexity of living organization. Includes laboratory. Four hours.

Courses listed below are open to students who have completed 14 semester hours in biology.

512. *Limnology*—A study of fresh-water environments and organisms exemplified by lakes, ponds, and streams in Northern Alabama. Includes laboratory and field trips. Prerequisite: 8 hours of chemistry, 4 hours of physics, BY 217, 221, and approval of instructor. Four hours.

515. *Genetics*—(Credit will not be allowed for both this course and BY 219.) An intensive study of genes, chromosomes and other factors relating to mechanisms of inheritance. Includes laboratory. Four hours.

531. *Plant Physiology*—An elementary study of physical and chemical processes occurring in plants and the conditions which influence them. Includes laboratory. Prerequisite: 8 semester hours of chemistry, 8 semester hours of physics. Four hours.

532. *Animal Physiology*—A fundamental study of physical and chemical processes occurring in animals and conditions which influence them. Includes laboratory. Prerequisite: 8 semester hours of chemistry and 8 semester hours of physics. Four hours.

534. *Plant Taxonomy*—Principles and practice in the identification and classification of flowering plants. Includes laboratory. Prerequisite: BY 238. Four hours.

542. *Cellular Biology*—A study of basic biological unit cells, including structure and function of cell organelles and their biochemical aspects. Includes laboratory. Prerequisite: CH 232. Four hours.

575. *General Entomology*—The study of classification, habits, and economic importance of insects, including their collection, preservation, and identification. Includes laboratory. Four hours.

579. *Parasitology*—A survey of the parasitic protozoa and helminths found in man, together with a comparison with certain forms found in other animals. Emphasis is placed upon history, geographical distribution, morphology, habitat, life-cycles and methods of reproduction, transmission, pathogenesis and symptomatology, diagnosis, and prevention. Includes laboratory. Prerequisite: CH 101 or 121. Four hours.

585. *General Ecology*—The basic principles of ecology, and a survey of major plant and animal communities. Includes laboratory. Four hours.

592. *Projects in Biology*—Individual investigations into biological problems under the direct supervision of an instructor. Designed for advanced level biology students with a biology grade point average of 2.5 or above. Prerequisite: Approval of instructor. Two to four hours.

595. *Principles of Nomenclature*—Study of the rules of animal and plant classification and the basic principles of taxonomy. Two hours.

597. *Biology Seminar*—Discussions on biological literature, careers in biology, graduate schools, and specialty schools. Pertinent discussions on current biological topics. One hour.

CHEMISTRY (CH)

Requirements for a major: 36 semester hours beyond CH 122 including CH 123, 231, 232, 233, 341, 342, 343, 401, 421, 431, and a senior project. MA 353 is required.

101. *General Chemistry*—An introduction to the properties of solids, liquids, gases and solutions, to atomic theory and bonding, and to the physical and chemical properties of the more common elements and their compounds is presented. Laboratory work is designed to complement the lecture material by illustrating basic concepts of solids, liquids, gases and solutions. Includes laboratory. Prerequisite or parallel: MA 109 or 111. Four hours.

121. *General and Analytical Chemistry*—Primary course for science majors with emphasis on the chemical and physical properties of a variety of compounds, bonding, and equilibria. Laboratory work consists of a detailed investigation of qualitative analytical chemistry. Includes laboratory. Prerequisite: CH 101 or placement tests, MA 109 or 111 or placement tests. Three hours. (Must be followed by CH 122 for credit.)

122. *General and Analytical Chemistry*—Continuation of CH 121. Includes laboratory. Prerequisite: CH 121. Three hours.

123. *Quantitative Analysis*—Provides a background in the fundamental

techniques of quantitative analytical chemistry including discussion of ionic equilibria, stoichiometry, oxidation-reduction reactions, and the theory and practice of volumetric and gravimetric procedures. Includes laboratories. Prerequisite: CH 122. Four hours.

131. *General and Organic Chemistry*—An extension of CH 101 for those students who do not plan to take additional chemistry courses. Emphasis is placed on chemical and physical properties of inorganic compounds together with an introduction to organic chemistry. Includes laboratory. Prerequisite: CH 101. Four hours.

231. *Elementary Organic Chemistry*—The chemistry of organic compounds is systematically studied. Course includes synthetic methods, modern theory and reaction mechanisms. The laboratory work introduces techniques of organic chemistry, including synthesis, separation, and identification of organic compounds. Includes laboratory. Prerequisite: CH 123. Four hours.

232. *Elementary Organic Chemistry*—Continuation of CH 231. Includes laboratories. Prerequisite: CH 231. Four hours.

233. *Elementary Organic Chemistry*—Continuation of CH 232. Includes laboratories. Prerequisite: CH 232. Two hours.

341. *Physical Chemistry*—This course sequence introduces concepts in the areas of thermodynamics, kinetics, electrochemistry, atomic and molecular theory and applies them to gases, liquids, solids and solutions. Laboratory work is designed to investigate particular aspects of the lecture material. Prerequisite: PH 206, CH 123, MA 149. Three hours.

342. *Physical Chemistry*—Continuation of CH 341. Includes laboratory. Prerequisite: CH 341. Three hours.

343. *Physical Chemistry*—Continuation of CH 342. Includes laboratory. Prerequisite: CH 342. Three hours.

401. *Intermediate Inorganic Chemistry*—A survey is conducted of certain fundamental topics in inorganic chemistry including nuclear chemistry, atomic structure, chemical bonding, periodic relationships, acid-base theories, non-aqueous solvents and reaction mechanisms. Prerequisite or parallel: CH 343. Three hours.

421. *Instrumental Analysis*—A course covering the general operating principles of the commonly used analytical instruments with emphasis on theory. Mathematical interpretations and derivations are appropriately discussed. Includes laboratories. Prerequisite or parallel: CH 342. Four hours.

431. *Qualitative Organic Analysis*—Modern chemical and instrumental methods are used in synthesis, separation, purification, and identification of organic compounds. Includes laboratories. Prerequisite: CH 233, 343. Two hours.

451. *Nuclear Chemistry*—Description and discussion of chemical phenomena which are related to nuclear properties and processes. Prerequisite: Senior standing or approval of instructor. Three hours.

452. *Nuclear Chemistry Laboratory*—Theory and use of nucleonics measuring equipment. Includes laboratories. Prerequisite or parallel: CH 451. One-three hours.

491, 492, 493. *Introduction to Research*—Prerequisite: Senior standing and approval of Division. Credit not to exceed three hours.

531. *Modern Methods in Organic Chemistry*—Modern chemical and instrumental methods are used in synthesis, separation, purification and identification of organic compounds. Includes laboratories. Prerequisite: CH 233, 343. Three hours.

540. *High Polymer Chemistry*—The theory of polymer formation and structural dependence of polymer properties are discussed. Prerequisite: CH 232, 343. Three hours.

549. *Atomic and Molecular Structure*—An introduction to quantum chemistry and spectroscopy. Prerequisite: CH 232, 345. Three hours.

601. *Advanced Inorganic Chemistry*—Three hours.

621. *Analytical Separations and Calculations*—Three hours.

623. *Spectroscopic Methods of Analysis*—Three hours.

631. *Advanced Organic Chemistry*—Three hours.

632. *Advanced Theory of Organic Chemistry*—Three hours.

636. *Physical Organic Chemistry*—Three hours.

641. *Thermodynamics*—Prerequisite: CH 343. Three hours.

642. *Statistical Mechanics*—Three hours.

643. *Kinetics*—Three hours.

701. *Structural Methods in Chemistry*—Three hours.

702. *Chemistry of Coordination Compounds*—Three hours.

742. *Kinetics*—Three hours.

744. *Statistical Mechanics*—Three hours.

790. *Selected Topics in Modern Chemistry*—Three hours.

EARTH SCIENCE (ES)

101. *Principles of Physical Geography*—Planetary relations, time factors, weather, climate, landforms, soils and vegetation. Includes laboratory. Four hours.

102. *Principles of Geology*—Minerals and rocks, earth processes, landscape development, earth history and developments of life. Includes laboratory. Four hours.

MATHEMATICS (MA)

Requirements for a major: a minimum of 36 semester hours of mathematics including MA 125, 149, 150, 251, 363, 373, 491, 498, and at least 9 additional semester hours of courses numbered 300 or above. Students who may do graduate work should include at least one of MA 492, 521, 552; 570 or 533; and MA 544.

Requirements for a minor: a minimum of 21 semester hours of mathematics including MA 125, 149, 150, 251; MA 373 or 491; and at least 3 additional semester hours of courses numbered 300 or above.

The University of Alabama in Huntsville offers programs leading to the Master of Arts degree in mathematics. The student's program for the master's degree must include MA 671, 754, a course in complex analysis, one 700 level course in algebra, and one course in either geometry or applied mathematics, and receive approval of Division.

COURSE NUMBERS

The course numbering system of UAH has been coded additionally for courses in mathematics so that the second digit indicates the mathematics area.

The graduate offerings in mathematics are divided into the following areas:

	Middle Digit
Set Theory and Logic	0
Applied Mathematics	
Numerical Analysis	1
Applied Analysis	2
Probability and Statistics	8
Geometry	3
Algebra and Number Theory	4
Analysis	5, 6
Topology	7

091. *High School Algebra*—For students with a deficiency of high school credit in algebra. No credit.

092. *High School Geometry*—For students with a deficiency of high school credit in geometry. No credit.

109. *College Algebra*—No student with three or more entrance units in mathematics who is placed in MA 111 or above by testing can receive credit for MA 109. Prerequisite: 1 unit of high school algebra and placement tests. Three hours.

111. *Introductory College Mathematics*—Prerequisite: MA 109 or placement tests. Three hours.

115. *Analytic Trigonometry*—Prerequisite: MA 109 or 111, and one unit of high school geometry. Three hours.

118. *Introduction to Finite Mathematics*—Prerequisite: MA 109 or 111. Three hours.

120. *Elementary Statistics*—Prerequisite: MA 109 or 111. Three hours.

125. *Calculus and Analytic Geometry*—Introduction to plane analytic geometry, limits, continuity, differentiation of algebraic functions, applications of derivatives, extrema, the indefinite integral and area. Prerequisite: MA 111, 115 or placement tests. Three hours.

149. *Calculus and Analytic Geometry*—Applications of integration, plane analytic geometry, differentiation of trigonometric and inverse trigonometric functions, the logarithmic and exponential functions and their derivative, differentiation and integration of hyperbolic functions, methods of integration. Prerequisite: MA 125. Three hours.

150. *Calculus and Analytic Geometry*—Vectors in the plane, indeterminate forms and improper integrals, polar coordinates, cylindrical and spherical coordinates, vectors in three space, solid analytic geometry. Prerequisite: MA 149. Three hours.

251. *Calculus and Analytic Geometry*—Sequences, infinite series and convergence, operation's with series, partial derivatives, differentials, directional derivative and gradients, extrema for functions of several variables, multiple integrals and applications. Prerequisite: MA 150. Three hours.

353. *Applied Differential Equations*—Not open to students majoring in mathematics. Prerequisite: MA 251. Three hours.

363. *Introduction to Higher Geometry*—Prerequisite: MA 251. Three hours.

364. *Introduction to Higher Geometry*—Continuation of MA 363. Prerequisite: MA 363. Three hours.

373. *Introduction to Higher Algebra*—Prerequisite: MA 111, 251. Three hours.

385. *Introduction to Probability Theory*—Prerequisite: MA 251. Three hours.

491. *Introduction to Real Analysis*—Degree credit for this course and MA 353 is not allowed. Prerequisite: MA 251. Three hours.

492. *Introduction to Real Analysis*—Continuation of MA 491. Prerequisite: MA 491. Three hours.

498. *Introduction to Theory of Differential Equations*—Prerequisite: MA 491. Three hours.

513. *Numerical Analysis*—Prerequisite: MA 251. Three hours.

514. *Numerical Analysis*—Prerequisite: MA 513. Three hours.

521. *Introduction to Complex Analysis*—Complex algebra, analytic functions, Cauchy integral theorem, Taylor and Laurent series, classification of singularities, residue theorem, evaluation of definite integrals, conformal mapping. Prerequisite: MA 491. Three hours.

523. *Series and Special Functions*—Prerequisite: MA 521. Three hours.

526. *Partial Differential Equations*—Prerequisite: MA 521. Three hours.

527. *Vector Analysis*—Prerequisite: MA 251. Three hours.

530. *Projective and Related Geometries*—Prerequisite: MA 363. Three hours.

531. *Projective and Related Geometries*—Prerequisite: MA 530. Three hours.

533. *Metric Differential Geometry*—Prerequisite: MA 491. Three hours.

543. *Elementary Number Theory*—Prerequisite: MA 373. Three hours.

544. *Linear Algebra*—Prerequisite: MA 373 or 491. Three hours.

552. *Functions of Several Variables*—Prerequisite: MA 491. Three hours.

570. *Metric Spaces*—Sequences, continuous functions, completeness, separability, Lindelof property, equivalence of compactness, countable compactness and sequential compactness. Prerequisite: MA 491. Three hours.

581. *Theory of Statistics*—Probability and combinatorial methods, discrete and continuous distributions, expected value and moments, sampling, tests of hypotheses. Prerequisite: MA 251. Normally preceded by MA 385. Three hours.

582. *Theory of Statistics*—Point and interval estimation, regression and linear hypotheses, experimental design and analysis of variance, sequential tests of hypotheses. Prerequisite: MA 581. Three hours.

601. *Introduction to Graduate Mathematics*—Prerequisite: MA 491. Three hours.

624. *Celestial Mechanics*—Prerequisite: A course in differential equations. Three hours.

642. *Abstract Algebra*—Prerequisite: MA 373. Three hours.

651. *Theory of Differential Equations*—Prerequisite: MA 491 and a course in differential equations. Three hours.

671. *Introduction to Topology*—Comparison of topologies, bases, subbases, second axiom of countability, Lindelof property, separability, subspaces, compactness, connectivity, separation axioms, product spaces. Prerequisite: MA 491. Normally preceded by MA 570. Three hours.

701. *Mathematical Logic*—Prerequisite: MA 491. Three hours.

713. *Numerical Methods in Linear Algebra*—Prerequisite: MA 513, 544, and Fortran or Algol. Three hours.

715. *Numerical Methods in Differential Equations*—Prerequisite: MA 513, 552 and differential equations. Three hours.

720. *Matrix Analysis*—Prerequisite: MA 544. Three hours.

721. *Matrix Analysis*—Prerequisite: MA 720. Three hours.

722. *Theory of Stability*—Prerequisite: MA 651. Three hours.

724. *Celestial Mechanics*—Prerequisite: MA 624. Three hours.

727. *Tensor Analysis*—Prerequisite: MA 527. Three hours.

734. *Modern Differential Geometry*—Prerequisite: MA 533. Three hours.

742. *Theory of Algebraic Numbers*—Prerequisite: MA 642. Three hours.

743. *Group Theory*—Prerequisite: MA 642. Three hours.

745. *Abstract Algebra*—Prerequisite: MA 642. Three hours.

754. *Real Analysis*—Prerequisite: MA 491 and one of MA 552, 570, 671. Three hours.

755. *Complex Analysis*—Prerequisite: MA 491. Normally preceded also by MA 521. Three hours.

756. *Complex Analysis*—Prerequisite: MA 755. Three hours.

757. *Abstract Spaces*—Prerequisite: MA 754. Normally preceded also by MA 570. Three hours.

758. *Complex Analysis*—Prerequisite: MA 756. Three hours.

759. *Advanced Theory of Differential Equations*—Prerequisite: MA 651, 754. Three hours.

761. *Theories of Integration*—Prerequisite: MA 754 and one of MA 570, 671. Three hours.

766. *Calculus of Variations*—Prerequisite: MA 552. Three hours.

770. *Introduction to Algebraic Topology*—Prerequisite: MA 642, 671. Three hours.

773. *General Topology*—Prerequisite: MA 570, 671. Three hours.

774. *General Topology*—Prerequisite: MA 773. Three hours.

792. *Seminar Topics in Applied Mathematics*—One to three hours.

793. *Seminar Topics in Geometry*—One to three hours.

794. *Seminar Topics in Algebra*—One to three hours.

795. *Seminar Topics in Analysis*—One to three hours.

797. *Seminar Topics in Topology*—One to three hours.

PHYSICS (PH)

Requirements for a major: Minimum of 30 semester hours of physics beyond PH 207 including PH 253, 255, 372, 373, 385, 386, 503, 504, and two additional laboratory courses. Students planning graduate work in physics are encouraged to take the following courses in mathematics (listed in order of preference): MA 491, 521, 373, 544, 526, 581.

Requirements for a minor: Minimum of 22 semester hours including PH 205, 206, 207, 253, 255, and either PH 372, 373 or PH 385, 386.

Requirements for M. S. degree: Students beginning graduate work leading to an M. S. with a major in physics should have the equivalent of an undergraduate major in physics including one intermediate course in each of the main fields of physics and an undergraduate minor in mathematics. Intermediate courses not included in the undergraduate program should be taken at the earliest possible time. The degree, Master of Science with a major in physics, is conferred on those students who satisfy the requirements of the Division of Natural Sciences and Mathematics and the Graduate School under *Plan I.*

101. *General Physics*—Introduction to the principles of physics. Not open to physics or engineering majors or minors. Includes laboratory. Prerequisite: Knowledge of trigonometry. Four hours.

102. *General Physics*—Continuation of PH 101. Includes laboratory. Prerequisite: PH 101. Four hours.

104. *Astronomy of the Solar System*—Includes laboratory. Prerequisite: High school algebra. Two hours.

105. *Stellar Astronomy*—Continuation of PH 104. Includes laboratory. Prerequisite: PH 104. Two hours.

205. *Technical Physics*—Mechanics. Includes laboratory. Prerequisite or parallel: MA 149. Three hours.

206. *Technical Physics*—Continuation of PH 205. Waves, heat, and optics. Includes laboratory. Prerequisite: PH 205. Prerequisite or parallel: MA 150. Three hours.

207. *Technical Physics*—Continuation of PH 206. Electricity. Includes laboratory. Prerequisite: PH 206. Prerequisite or parallel: MA 251. Three hours.

253. *Modern Physics*—An elementary study of topics in modern physics including: relativity, light and quantum physics, waves and particles, Bohr-Sommerfeld atom, and elementary nuclear physics. Prerequisite: PH 207. Three hours.

255. *Modern Physics Laboratory*—Experimental work in the topics that form the subject matter of PH 253. Prerequisite or parallel: PH 253. One hour.

357. *Electronics*—Electric circuits; thermionic emission; vacuum and solid state diodes and triodes in the linear approximation; simple amplifiers and oscillators; electronic instruments. Includes laboratory. Prerequisite: PH 207. Four hours.

359. *Methods of Theoretical Physics*—Vector analysis; physical applications of matrices and tensors; simple-harmonic, damped, and forced oscillations; applications of Fourier series; solutions of partial differential equations. Prerequisite or parallel: PH 207, MA 353 or 498. Three hours.

372. *Mechanics*—Particle dynamics; orbits in central force fields; elementary rigid-body dynamics; notions of generalized mechanics including Hamilton's principle and Lagrange's equations. Prerequisite: PH 359. Three hours. (Must be followed by PH 373 for credit.)

373. *Mechanics*—Continuation of PH 372. Prerequisite: PH 372. Three hours.

385. *Electricity and Magnetism*—Electrostatics; Ampere and Faraday laws, vector potential; displacement current and Maxwell equations; Lorentz force and particle ballistics in static fields; electromagnetic waves (plane). Prerequisite: PH 359. Three hours. (Must be followed by PH 386 for credit.)

386. *Electricity and Magnetism*—Continuation of PH 385. Prerequisite: PH 385. Three hours.

The senior laboratories will expose the undergraduate to equipment and experiments now being used in professional research. Prerequisite: Approval of Division.

412. *Senior Optics and Spectroscopy Laboratory*—One hour.

413. *Senior Nuclear Physics Laboartory*—One hour.

414. *Senior Solid State Physics Laboratory*—One hour.

415. *Senior X-Ray Laboratory*—One hour.

416. *Senior Laboratory*—Contains experiments from PH 412, 413, 414. One hour.

420. *Senior Thesis*—Semi-original work performed under the direction of a faculty member. Three hours.

503. *Introductory Quantum Mechanics and Atomic Physics*—Introduction of the quantum hypothesis; wave-particle duality and the Davisson-Germer experiment; Heisenberg uncertainty principle; Schroedinger equation; electron spin; vector model of the atom. Prerequisite: PH 253, 373, 386. Three hours. (Must be followed by PH 504 for credit.)

504. *Introductory Quantum Mechanics and Atomic Physics*—Continuation of PH 503. Prerequisite: PH 503. Three hours.

505. *Nuclear Physics*—Stable nuclei, isotopes, nuclear reactions, nuclidic masses, binding energy, scattering experiments, nuclear cross sections, spins, energy levels, nuclear models, elementary particles. Prerequisite: PH 504. Three hours.

506. *Introduction to Physics of the Solar System*—Development and discussion of the fundamentals necessary for understanding of the solar system and the major modern trends. Topics include solar phenomena, the interplanetary medium, and planetary atmospheres. Prerequisite: PH 503, MA 353 or 498. Three hours.

508. *Solid-State Physics*—Phenomenological treatment of mechanical, thermal, electrical, and magnetic properties and of flourescence, phosphorescence, photoconductivity, and work function; the free-electron model and the band approximation; structures of simple crystals. Prerequisite: PH 504. Three hours.

521. *Thermal Physics*—An introduction to thermal phenomena, both on a macroscopic and on a statistical basis, and to the principles and laws governing them. Prerequisite: PH 386. Three hours.

541. *Optics*—A course primarily for physics majors treating basic theory, optical instrumentation, the interaction of light and matter, and applications to other fields. Prerequisite: PH 253. Three hours.

607. *Selected Topics in Mathematical Physics*—Three hours.

609. *Selected Topics in Mathematical Physics*—Three hours.

701. *Classical Dynamics*—Prerequisite: PH 373. Three hours.

702. *Classical Dynamics*—Continuation of PH 701. Prerequisite: PH 701. Three hours.

705. *Relativity*—Prerequisite: PH 701. Three hours.

706. *Astrophysics*—Three hours.

722. *Kinetic Theory and Statistical Mechanics*—Three hours.

723. *Kinetic Theory and Statistical Mechanics*—Continuation of PH 722. Prerequisite: PH 722. Three hours.

725. *Solid-State Physics*—Prerequisite: PH 508. Three hours.

727. *Radiation Theory*—Three hours.

731. *Electromagnetic Theory*—Prerequisite: PH 386. Three hours.
732. *Electromagnetic Theory*—Continuation of PH 731. Prerequisite: PH 731. Three hours.
741. *Optics II*—Prerequisite: PH 541. Three hours.
750. *Microwave Spectroscopy*—Three hours.
751. *Quantum Mechanics*—Prerequisite:PH 504. Three hours.
752. *Quantum Mechanics*—Continuation of PH 751. Prerequisite: PH 751. Three hours.
754. *Selected Topics in Quantum Mechanics*—Prerequisite: PH 752. Three hours.
756. *Selected Topics in Quantum Mechanics*—Continuation of PH 754. Prerequisite: PH 754. Three hours.
758. *Seminar in Contemporary Physics*— Three hours.
791. *Masters Research.*
792. *Physics Seminar*—Required of graduate students seeking the master's degree with a major in physics.

Division Of Engineering

The engineering program of the University of Alabama in Huntsville seeks the attainment of certain broad objectives for each graduate, and it is designed to make effective a philosophy of education for careers in applied science and engineering that, even after years of practice, will let the engineer effectively interact with the state-of-the-art.

Two main principles underlie the curriculum. One is that major emphasis should be placed on the fundamental subjects in physical science, mathematics, and the engineering sciences. To an ever-increasing extent and at an accelerating rate, engineers must have thorough training in all such related basic studies, not merely in a particular branch of engineering. Thorough training is the purpose of the common core of required work. Sixty-six hours of common course work in the sophomore, junior, and senior years are required in addition to the thirty-two course hours of the freshman year. Thus, in the total requirements of 136 semester hours for the Bachelor of Science in Engineering degree program, 98 semester hours are the same for all students. It is only in the student's advanced junior and senior work that some option of specialization can be obtained by taking more advanced and basic professional courses.

The second main principle underlying the UAH engineering curriculum philosophy is that scientific and technological education, however fundamental, is not enough and that resources of the University in the general studies should be utilized by the students in engineering as fully as possible, in order that they may develop an informed sense of social responsibility. To insure that the students become acquainted with non-technical disciplines, the curriculum for the Bachelor of Science in Engineering requires eighteen hours in humanistic-social studies. In addition, the free elective credit may be taken in non-technical subject areas.

This engineering curriculum has been designed to meet both the needs of the students who wish to do graduate work and those who wish to develop a professional career where a strong unified program at the undergraduate level is of special value.

DEGREES AND PROGRAMS

The Division of Engineering offers programs leading to the degrees of Bachelor of Science in Engineering and Master of Science in Engineering.

When desirable, as evidenced from continuous studies, the Division of Engineering may modify its curricula and specific courses of instruction, alter the requirements for admission or for graduation, and change the degrees to be awarded. Such changes will be applicable to both prospective and matriculated students.

REQUIREMENTS FOR A MINOR

Students in the Division of General Studies or in the Division of Natural Sciences and Mathematics may elect an engineering minor. A

minimum of 21 semester hours of engineering courses is required. A typical selection would include: EG 200, 241, 262, 271, 303, 315, and 320. Other sequences may be developed to meet the requirements of individual needs.

COURSE NUMBERS

The course numbering system of UAH has been coded additionally for engineering courses so that the second digit indicates the engineering science to which a course is oriented.

	Middle Digit
Electrical Engineering	0, 1
Industrial Engineering	2, 3
Fluid and Thermal Sciences	4, 5
Dynamics and Vibrations	6
Solid Mechanics	7, 8
General Engineering Studies	9

UNDERGRADUATE PROGRAM

A student may be awarded the degree of Bachelor of Science in Engineering upon successful completion of all requirements, including a total of 136 semester hours of course work. Each student in the Division of Engineering must assume the responsibility for registering for all required courses in their proper sequence and for fulfilling all requirements for admission and graduation. Failure to do so may extend the time required for graduation.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE PROGRAM

Freshman Year: (32 Semester Hours)

		Semester Hours
CH 121, 122	General and Analytical Chemistry	6
EH 101, 102	English Composition	6
MA 125, 149, 150	Calculus and Analytic Geometry	9
PH 205, 206	Technical Physics	6
EG 198	Engineering Graphics	2
EC 142	Principles of Economics	3
EG 195	Freshman Seminar	0

Sophomore – Junior – Senior Years: (104 Semester Hours)

A. Core Program (66 Semester Hours)

English:

		Semester Hours
EH 205, 206, 240, or 241	Literature Survey	3

Mathematics:

		Semester Hours
MA 251	Calculus and Analytic Geometry	3
MA 353	Applied Differential Equations	3

Physics:

PH 207	Technical Physics	3
PH 253	Modern Physics	3

Electrical Engineering:

EG 200	Fields and Circuits I	5
EG 305	Electronics Lab I	1
EG 312	Network Analysis	3
EG 315	Electronics I	3

General Engineering Studies:

EG 292	Advanced Engineering Analysis I	3
EG 294	Nature and Properties of Materials	3
EG 297	Introduction to Digital Computations	3
EG 390	Introduction to Engineering Statistics	3
EG 393	Advanced Engineering Analysis II	3

Fluid and Thermal Sciences:

EG 241	Thermodynamics I	3
EG 341	Fluid Mechanics	3
EG 342	Thermodynamics II	3
EG 443	Heat Transfer	3

Solid Mechanics:

EG 271	Statics	3
EG 273	Mechanics of Solids	3

Dynamics and Vibrations:

EG 262	Dynamics	3
EG 460	Linear Systems	3

B. Professional Specialization. An Engineering Group Elective Typified by the Following: (15 Semester Hours)

Electronics Group Elective: (15 Semester Hours)

EG 303	Electric Circuits Lab I	1
EG 313	Electric Circuits II	3
EG 404	Electric Circuits Lab II	1
EG 406	Electronics Lab II	1

		Semester Hours
EG 414	Electric Circuits III	3
EG 416	Electronics II	3
EG 417	Field Theory II	3
		15

Systems Group Elective: (15 Semester Hours)

EG 320	Introduction to Industrial Engineering	3
EG 421	Engineering Statistics	3
EG 520	Operations Economy	3
EG 524	Man-machine Systems	3
EG 525	Introduction to Operations Research	3
		15

Mechanics Group Elective: (15 Semester Hours)

EG 441	Intermediate Fluid Mechanics	3
EG 470	Intermediate Mechanics of Solids and Structures	3
EG 492	Methods and Applications in Mechanics	3
EG 560	Intermediate Dynamics	3
EG 561	Vibrations of Elastic Systems	3
		15

C. Approved Technical Electives	6
D. Electives in Humanistic-Social Studies	12
E. Free Electives	5

ELECTIVES

(a) *Free Electives:*

In general, for free elective credit, the student may choose any course offered by UAH in which the subject matter does not duplicate the same or a lower level of courses in his program.

(b) *Electives in Humanistic-Social Studies:*

Engineering students are required to take 12 semester hours of electives from the following humanistic-social studies:

Art, Literature, Music, History, Political Science, Geography, Psychology, Sociology, Philosophy.

A student may choose no more than 6 semester hours of any one of the above subject areas.

(c) *Technical Electives:*

Selection of technical electives should be made with the assistance of an engineering counselor and should complement but not be in the area of the group elective chosen and should clearly support the student's aims and goals. Such elective courses must be numbered 300 or above and have the approval of the Division of Engineering.

GRADUATE STUDY

The Division of Engineering offers programs leading to the degree of Master of Science in Engineering with specializations typified by the following engineering disciplines:

Astrodynamics
Electromagnetic fields
Control Sciences
Heat Transfer-Thermodynamics
Fluid Mechanics and Aerodynamics
Solid Mechanics
Dynamics and Vibrations
Network Theory
Communications and Information Theory
Human Factors Engineering
Management Control Sciences
Operations Research
Digital and Analog Computer Sciences

These disciplines represent concentrations of study included in the two primary areas of the graduate program offered by the Division of Engineering, (1) Mechanics and (2) Systems and Communications. The two primary areas encompass a scope of work often found under traditional headings that include Aerospace Engineering, Electrical Engineering, Engineering Mechanics, Industrial Engineering, and Mechanical Engineering.

Graduate work in the Division of Engineering is administered jointly by the Graduate School and the Division of Engineering. Applicants desiring to pursue graduate work in engineering should apply for admission to the Graduate Office of UAH.

For admission to graduate study in the Division of Engineering, a student is required (1) to have earned a "B" average (2.0 out of a possible 3.0) in all undergraduate work attempted as well as in all engineering courses attempted, (2) to have scored at least 1000 on the aptitude portion of the GRE, and (3) to have received a baccalaureate degree in a curriculum which was accredited by the Engineers' Council for Professional Development at the time the degree was conferred.

Conditional admission may be granted to (1) a student with a bachelors degree from an ECPD-accredited curriculum and a quality point average of between 1.5 and 2.0 in all undergraduate work attempted as well as in all engineering courses attempted, or (2) to other students who have baccalaureate degrees and who are considered, after an individual examination of quantity and quality of their work, to be properly prepared and capable of successfully pursuing graduate work toward an acceptable graduate objective. Students admitted conditionally are required to maintain a "B" average on their first twelve semester hours of graduate course work (and to remove any other conditions imposed at

the time of initial enrollment) in order to be allowed to continue graduate study.

Applicants for admission to graduate study in engineering are required to take the Advanced Engineering portion of the GRE, the results of which will be considered in determining the qualification of the student to pursue successfully a program of graduate study.

A student who is admitted to the University as an Irregular Post Graduate but who has been denied admission to the Graduate School because of his deficiency in quality point average (QPA) and/or GRE score may be reconsidered for graduate admission provided he is otherwise eligible to pursue a particular engineering discipline. In order to be reconsidered he must successfully complete 12 hours of advanced work above the number 500 in engineering, mathematics, physics, or chemistry with a QPA exceeding 2.00 on the work undertaken.

Upon admission to graduate study by the Dean of the Graduate School, the student will be referred by the appropriate coordinator of graduate studies to a temporary adviser. In many cases, the graduate coordinator will serve as the temporary adviser. The chairman and other members of the supervisory committee, which usually is, but does not have to be, the same as the examining committee membership, are usually appointed after the student selects his thesis topic.

GENERAL REQUIREMENTS FOR THE MASTER'S DEGREE

The degree of Master of Science in Engineering is conferred on those students who satisfy the requirements of the Division of Engineering, and the Graduate School under *Plan I*.

Course requirements (in addition to those established by the Graduate School) are:

(1) Average grade on the courses numbered 600 or above cannot be less than "B".

(2) Engineering courses numbered between 500 and 599 may be taken for graduate credit with prior approval of such courses on the student's plan of study. Graduate students will be required to do extra work of appropriate nature in 500 level courses. A minimum grade of B must be attained in each engineering course designated by a number less than 600.

(3) Each graduate student, during the first 12 semester hours of his program, will be required to register for Graduate Seminar I, EG 695, and, during a term in which he is actively pursuing thesis study, to register for Graduate Seminar II, EG 795. A total credit of one semester hour in these courses may be applied toward graduation requirements.

(4) All courses are selected by the student with the approval of his adviser and/or graduate coordinator and are subject to the approval of the Division of Engineering and the Graduate School. Additional course work may be required to correct deficiencies in undergraduate subjects.

SPECIAL REQUIREMENTS FOR THE MSE DEGREE

A minimum of 12 semester hours and a thesis must be satisfactorily completed under the direction of the Graduate Engineering Faculty. Each student must satisfactorily complete the following additional minimum requirements:

(a) 6 hours of graduate level courses (600 or above) in the primary engineering discipline.

(b) 6 hours of courses in a second engineering discipline.

(c) 6 hours of approved electives. These electives will be chosen in support of the primary engineering discipline.

(d) 6 hours of mathematics beyond the level of differential equations.

(e) An acceptable thesis.

ENGINEERING COURSES (EG)

097. *Engineering Drawing*—Instruction and practice in the graphical representation of objects, using both mechanical and freehand techniques, with emphasis on the principles involved and their use in design. Topics include: isometric and oblique pictorial views; multiview projection on principal and auxiliary planes; dimensioning; fits and tolerances; detail and assembly working drawings. Prerequisite or parallel: MA 125 or evidence of previous instruction in mechanical drawing. No credit.

195. *Freshman Seminar*—Required of all Freshmen. No Credit.

196. *Selected Topics in Engineering.*

198. *Engineering Graphics*—The graphical solution of problems involving the location and relationship of points, lines, planes, and surfaces of revolution by the Mongean and direct methods. Prerequisite: EG 097 or placement test. Two hours.

200. *Fields and Circuits I*—A study of electrostatic magnetostatic fields; basic electric and magnetic circuit concepts; classical solutions of the integro-differential equations of simple circuits with lumped parameters, and introduction to sinusoidal steady-state analysis. Prerequisite: PH 207. Prerequisite or parallel: EG 292, MA 353. Five hours.

241. *Thermodynamics I*—Study of the basic laws of thermodynamics which apply in all branches of engineering. Unsteady and steady-states. Properties of matter, processes of fluids, zeroth, first and second laws, availability of energy. Irreversibility. Prerequisite: PH 206, MA 251. Three hours.

262. *Dynamics*—A study of the kinematics of particles, lines, and bodies and kinetics of particles and of rigid bodies with translation, rotation, and plane motion using the method of force-mass-acceleration,

work-energy, and impulse-momentum. Prerequisite: EG 271, MA 251. Three hours.

271. *Statics*—A study of forces and couples and the resultants of force systems, free-body-diagrams, equilibrium, problems involving friction centroids and moments of inertia. Prerequisite: PH 205. Prerequisite or parallel: MA 251. Three hours.

273. *Mechanics of Solids*—A study of the kinematics and dynamics of continuous media, and mechanical behavior of solids with applications to fundamental problems of extension, torsion, flexure and buckling of bars. Prerequisite: EG 271, MA 251. Three hours.

292. *Advanced Engineering Analysis I*—Introduction to the algebra and geometry of vectors, matrices, vector analysis, vector field theory, and complex variables. Prerequisite: MA 251. Three hours.

294. *Nature and Properties of Materials*—An introductory course covering the structure of matter; basic concepts of phase transformations; mechanical electrical, magnetic, and thermal properties; and corrosion. Prerequisite: CH 122. Three hours.

296. *Selected Topics in Engineering.*

297. *Introduction to Digital Computations*—An introduction to problem oriented languages, such as FORTRAN and ALGOL, for describing computational processes. Emphasis will be placed on scientific applications. Practice in solving elementary problems on the University's digital computers is included. Prerequisite: MA 149 or approval of instructor. Three hours.

303. *Electrical Circuits Lab. I*—Experiments and reports to acquaint the student with basic types of circuit instrumentation and to apply and verify the principles presented in EG 200 and EG 313. Prerequisite or parallel: EG 313. One hour.

305. *Electronics Lab. I*—Experiments and reports to acquaint the student with basic types of electronic instrumentation and to apply and verify the principles presented in EG 315. Prerequisite or parallel: EG 315. One hour.

312. *Network Analysis*—Transient solutions of electric networks using Laplace transforms; introduction to network theory. Prerequisite: EG 200, 292, MA 353. Three hours.

313. *Electric Circuits II*—Steady-state response of networks to sinusoidal forcing functions. Prerequisite: EG 200, 292, MA 353. Three hours.

315. *Electronics I*—A study of electronic devices and applicable analysis techniques. Descriptions of solid state and vacuum diodes, triodes, transistors, and multigrid tubes. Graphical and small signal analysis; piecewise linear models. Prerequisite: EG 200. Three hours.

320. *Introduction to Industrial Engineering*—A comprehensive introduction to the industrial organization, its structure, environment, functions and systems as well as to industrial engineering, its role and methods. Three hours.

341. *Fluid Mechanics*—A study of the principles of the mechanics of fluids at rest and in motion including hydro-statics; the principle of continuity; the derivation and application of Euler's and Bernoulli's equations to the flow of ideal fluids, viscous fluids, and compressible fluids; and the principle of impulse and momentum. These principles are applied to flow in Venturi meters, pipes, open channels, and similar devices. Prerequisite or parallel: EG 241, 262, MA 353. Three hours.

342. *Thermodynamics II*—Irreversibility, availability, chemical reactions, phase and chemical equilibrium. Basic relationships among properties. Prerequisite: EG 241. Parallel: MA 353. Three hours.

390. *Introduction to Engineering Statistics*—An introduction to probability theory and statistical methods which have applicability in the practice of engineering or in engineering research. Prerequisite or parallel: MA 251. Three hours.

393. *Advanced Engineering Analysis II*—Introduction to the application and solution of partial differential equations. Fourier Analysis, Transform Methods, and Special Function. Prerequisite: MA 353, EG 292. Three hours.

394. *Meteorology*—Factors that govern weather conditions; physical properties and dynamics of the atmosphere; weather forecasting, meteorological factors affecting the design and operation of aircraft; weather research. Prerequisite: Approval of instructor. Three hours.

396. *Selected Topics in Engineering.*

404. *Electric Circuits Lab. II*—Experiments, problems, and reports to apply and verify the principles presented in EG 312 and 414. Prerequisite or parallel: EG 414. One hour.

406. *Electronics Lab II*—Theory of operation and experiments pertaining to special purpose devices such as the thermistor, tunnel diode, unijunction transistor, photo devices, SCR and thyratron. Also experiments, problems, and reports to apply and verify the principles presented in EG 416. Prerequisite or parallel: EG 416. One hour.

411. *Electrical Machinery I*—Energy storage and transfer in linear coupled systems; introduction to elementary transducers and rotating machines. Prerequisite: EG 262. Prerequisite or parallel: EG 414. Three hours.

414. *Electric Circuits III*—Driving point and transfer functions, frequency response of networks; Bode plots; Fourier series; three-phase circuits; coupled circuits. Prerequisite: EG 303, 312, 313. Three hours.

416. *Electronics II*—Multistage active circuits; impulse and step function response; frequency response; tuned-coupled stages, feedback and oscillators, switching circuits. Prerequisite: EG 305, 315, 414. Three hours.

417. *Field Theory II*—A study of time varying fields and Maxwell's equation, boundary value problems, the high frequency circuit element, radiation and propagation of electromagnetic waves; introduction to guided waves. Prerequisite or parallel: EG 414. Three hours.

418. *Transistor Circuits*—Characteristics and equivalent circuit representations of semiconductor devices. Applications of equivalent circuits in the analysis of various transistor applications. Prerequisite: EG 315. Three hours.

421. *Engineering Statistics*—A continuation of EG 390 with emphasis on introduction to design of experiments and analysis of experimental data. Prerequisite: EG 390. Three hours.

441. *Intermediate Fluid Mechanics*—A study of one-dimensional unsteady flows; fluid amplification; dimensional analysis and similitude; thermodynamic equations; two- and three-dimensional flow equations; potential flow; cavitation; boundary layer flow and viscous flow; turbulence. Prerequisite: EG 241, 351. Three hours.

443. *Heat Transfer*—Study of methods of transfer of momentum, mass and heat including steady and non-steady state conduction, convection, and radiation; and the application of these principles to engineering problems. Prerequisite: EG 241, MA 353. Three hours.

460. *Linear Systems*—Study of free and forced vibrations both undamped and damped. Systems with many degrees of freedom formulated and analyzed with matrix methods. Laplace transforms are used to study transient vibrations. Prerequisite: EG 262, 273, 393. Three hours.

470. *Intermediate Mechanics of Solids and Structures*—Fundamentals of solid mechanics with applications to structures. Including inelastic behavior, theory of bars and plates, and stability. Prerequisite: EG 492. Three hours.

492. *Methods and Applications in Mechanics*—Application of vector analysis, tensor calculus, integral transforms, and other mathematical methods. Prerequisite: EG 262, 273, 393. Three hours.

496. *Selected Topics in Engineering.*

502. *Introduction to the Theory and Design of Switching Circuits*—Boolean algebra; minimization techniques; number systems and codes; analysis and synthesis of combinational and sequential logic circuits; electronic logic implementations and memory devices; static and dynamic hazards in logic circuits. Prerequisite: EG 416 or approval of instructor. Three hours.

505. *Automatic Control Theory*—An introduction to the theory common to all feedback control systems. Topics include transfer functions, stability criteria, and frequency response. Prerequisite: EG 414 or approval of instructor. Three hours.

506. *Communication Theory*—The transmission of information, including the effects of networks, modulation systems, noise, and the use of statistics in the analysis of information transmission. Prerequisite: EG 414 or approval of instructor. Three hours.

507. *Antennas*—Radiation from point sources. Calculation of cylindrical antenna radiation resistance, self-impedance, and radiation characteristic. Study of properties of the loop, helical, biconical, and reflector types of antennas. Prerequisite: EG 417. Three hours.

508. *Ultra High Frequency Engineering*—A study of high frequency transmission line charts, negative-grid triode oscillators and amplifiers at high frequencies, klystron oscillators, magnetron oscillators, rectangular wave-guides and radiating elements. Prerequisite: EG 416, 417. Three hours.

516. *Advanced Electronics*—Non-sinusoidal generating and wave shaping circuits, timing circuits, comparators, clipping and clamping networks, multivibrators. Prerequisite: EG 406, 416. Three hours.

517. *Physical Electronics*—Application of quantum and statistical mechanics to the development of models of electronic devices. Electromagnetic properties of materials including semiconductors. Prerequisite: MA 353, PH 253. Prerequisite or parallel: EG 416. Three hours.

518. *Fields and Transmission Lines*—Transmission of information and power by means of transmission lines, waveguides, and free space; determination of line parameters; fields in waveguides; antennas and wave propagation. Prerequisite: EG 417. Three hours.

520. *Operations Economy*—Deals with the economic evaluation of interest, depreciation, replacement analysis, manufacturing progress curves and an introduction to mathematical model building. Prerequisite: EC 142, MA 251, EG 421. Three hours.

521. *Theory of Probability and Statistics*—The elements of mathematical statistics; probability, expected values, and moment generating functions; sampling theory and tests of hypothesis. Prerequisite: MA 251, EG 421. Three hours.

523. *Statistical Quality Control*—A study of statistical theory and techniques used to control the quality of manufactured products. Prerequisite: EG 421. Three hours.

524. *Man-machine Systems*—A study of anthropological and psychophysical factors as related to the design and operation of man-machine systems. Prerequisite: PY 100, EG 421. Three hours.

525. *Introduction to Operations Research*—An introduction to the philosophy and methodology of operations research. Emphasis is placed upon the development of schematic and mathematical models and their use in the optimization of complex systems. Prerequisite: EG 421 or 621. Three hours.

526. *Introduction to Design and Analysis of Experiments*—The study of one-way and r-way classification models, for fixed, random and

mixed factors; analysis of components of variance, individual degrees of freedom, and multiple regression. Prerequisite: EG 421 or 621. Three hours.

541. *Advanced Fluid Mechanics I*—Development and use of the integral and differential forms of the equations of continuity, momentum, and energy to ideal fluids, viscous fluids, and compressible fluids. The derivations of thermodynamics equations. Applications to one-, two-, and three-dimensional problems. Prerequisite: EG 441. Three hours.

545. *Principles of Propulsion*—Basic principles of propulsion dynamics; thermodynamics of fluid flow and application to propulsion engines; and a brief treatment of the technological problems in the design of propulsion systems. Prerequisite: EG 341, 342. Three hours.

560. *Intermediate Dynamics*—Newtonian and Lagrangian methods applied to particles, rigid bodies, and other mechanical systems. Prerequisite: EG 262. Three hours.

561. *Vibrations of Elastic Systems*—Dynamic response of mechanical systems: transient, oscillatory, and wave motions, flutter, and stability. Prerequisite: EG 460. Three hours.

563. *Astrodynamics I*—An introduction to the study of the engineering application of celestial mechanics, high-speed, high-altitude, aerodynamics, and other allied fields to contemporary problems of space vehicles. Topics cover fundamentals of applied dynamics, nomenclature of space flight, space environment and solar system, two-body orbits, Kepler's laws, coordinate transformations, and related studies. Prerequisite: EG 262. Three hours.

568. *Dynamics of Flight*—Introduction to the dynamics of flight vehicles. Equations for static and dynamic equilibrium are analyzed and the criteria for stability, controllability, and maneuverability are discussed. Fundamentals of stress and mathematical models using linear differential equations are emphasized. Prerequisite: EG 262, 393. Three hours.

570. *Mechanical Behavior of Engineering Materials*—A study of the mechanics of the behavior of materials subjected to static, dynamic and thermal loading conditions. The laws governing strain rate, time to failure, and cyclic life are treated from an empirical viewpoint. Static uniaxial properties as a basis for design are related to combined stress behavior, ductile and brittle states, wave propagation, creep, cyclic stress, cyclic strain, and cyclic thermal fatigue. Effects of nuclear radiation are considered. Prerequisite: EG 273. Three hours.

571. *Advanced Mechanics of Materials*—Analysis of stresses and strains at a point, the theories of failures, stress concentration factors, thick-walled cylinders, torsion of non-circular members, curved beams, unsymetrical bending, and shear center. Prerequisite: EG 273. Three hours.

591. *Digital Computers and Machine-Language Programming*—Introduction to machine-code programming. Representation of numeric and non-numeric data. Machine arithmetic. Discussion of various ways of organizing machines. Prerequisite: EG 297 or approval of instructor. Three hours.

594. *Engineering Meteorology*—A study of the basic fundamentals of meteorology and their application to problems in aerospace engineering, including instrumentation, statistical methods, climatology reference atmospheres, thermodynamic relations, turbulence, and high altitude problems. Prerequisite: MA 353 and approval of instructor. Three hours.

596. *Selected Topics in Engineering.*

601. *Transients in Linear Systems*—Formulation and solution by transform methods of the differential equations of linear electrical and mechanical systems. Prerequisite: EG 414. Three hours.

602. *Digital Computer Design*—Digital arithmetic; design of combinational and sequential logic circuits; adders, multipliers, switching matrices, shift registers, counters, comparators. Design of a simple digital computer. Prerequisite: EG 502. Three hours.

603. *Analog Computer Techniques*—Applications of an analog computer to the solution of engineering problems involving linear and nonlinear differential equations such as are encountered in vibration analysis, flow problems, automatic control theory, electrical circuit theory, and similar topics. Includes laboratory. Prerequisite: MA 353, EG 312, or 601, and graduate standing or approval of instructor. Three hours.

604. *Instrumentation*—A study of measurement techniques and conventional and electronic instruments. The construction, theory of operation, and proper use of bridge circuits, voltmeters, ammeters, oscilloscopes, transducers, etc. Prerequisite: EG 315. Three hours.

605. *Control System Design*—Compensation of d-c and a-c control systems by means of feedback, feedforward, minor loop and cascade techniques. Study of control system components. Laboratory sessions. Prerequisite: EG 505 or equivalent. Three hours.

606. *Statistical Communication Theory*—Introduction to generalized harmonic analysis. Includes correlation, convolution, power density spectra, etc. Probability and statistics. Correlation detection. Optimum linear filtering and prediction. Prerequisite: EG 506. Three hours.

607. *Information Theory*—Introduction to self information, entropy, mutual information, and channel capacity. Noiseless encoding and error detecting and correcting codes. Sampling theorem. Continuous channels. Prerequisite: EG 606. Three hours.

608. *Electromagnetic Field Theory I*—A mathematical approach to electromagnetic phenomena. Basic field concepts. Study of radiation

and propagation. Analysis of waveguides and simple radiating and scattering systems. Perturbational and variational techniques. Prerequisite: EG 417. Three hours.

609. *Electromagnetic Field Theory II*—A continuation of EG 608. Prerequisite: EG 608. Three hours.

611. *Antenna Theory I*—The study of antennas and antenna arrays. Radiation patterns and impedance characteristics. Analysis of spheres, cylinders, horns, slots, microwave lenses, traveling-wave, and frequency independent antennas. Prerequisite: EG 609. Three hours.

612. *Antenna Theory II*—A continuation of EG 611. Prerequisite: EG 611. Three hours.

614. *Network Analysis*—The analysis of networks using matrix algebra, network topology, and transform methods. Network theorems, filters, and introduction to flow graphs. Prerequisite: EG 414. Three hours.

615. *Network Synthesis*—Methods of Bott-Duffin, Brune, Cauer, Darlington, Foster, etc. studied. Filter synthesis with Butterworth and Tschebycheff functions. Realizability of networks. Prerequisite: EG 614. Three hours.

617. *Solid State Electronics*—Introduction to solid state theory as pertaining to solid state devices, their design and application in electronic circuits. Prerequisite: EG 517. Three hours.

618. *Microwave Techniques*—Network representations and analysis of microwave devices. Discontinuities from a circuit point of view. Symmetry considerations. Scattering matrices in circuit design. Cavity resonators. Prerequisite: EG 609. Three hours.

619. *Advanced Linear Control Theory*—Modern techniques for the analysis and design of linear control systems. Matrix formulation, multivariable control systems, state variable concepts. Linear transformations, optimization, statistical design methods, sampled data theory. Prerequisite: EG 605. Three hours.

620. *Industrial Management*—Introduction to the field of Industrial and Labor Relations. Past and current trends and the critical part played by the industrial engineer in manpower management; staffing; training; wage and salary incentives. Prerequisite: Graduate standing. Three hours.

621. *Statistical Methods for Engineers*—Designed to introduce graduate students to the applications of probability and statistics useful in research work. Includes descriptive statistics, theoretical distribution functions, point and interval estimation, tests of hypotheses, linear regression, and analysis of variance. Not open to students who have taken EG 390 or 421. Prerequisite: MA 251 and graduate standing. Three hours.

624. *Principles of Human Engineering*—Deals with the analysis, design and control of man-machine systems. Included are considerations of environmental, physiological and psychological factors as related

to system performance. Prerequisite: EG 524. Three hours.

625. *Problems in Operations Research*—Considers methods and procedures for conducting effective operations research programs, recent developments and advanced methodologies. Emphasis is on variations and further development of basic methodologies covered in introductory course. Prerequisite: EG 525. Three hours.

626. *Design and Analysis of Experiments*—Covers advanced topics in statistical experiments with emphasis on the design aspects. Topics include confounding, fractional replication, factorial and nested designs. Prerequisite: EG 526. Three hours.

627. *Introduction to Systems Engineering*—The analysis and design of special purpose operational, procedural and hardware systems. General theories for the analysis of complex systems from both the Macro- and Micro-viewpoints will be considered. Prerequisite: EG 505, 506, or 525. Three hours.

628. *Management Functions*—Deals with the organizational and human relations aspects of industrial management. Formal and informal organizations, motivation of employees, social behavior in the work situation and executive management functions as they influence the design and implementation of management control systems. Prerequisite: EG 620. Three hours.

630. *Information and Data Processing*—Introduction to the design of integrated control systems necessary for effective management. Includes the methods of systems design, the basic concepts of computer processing systems, the design of management control procedures and reports, and their application to mechanized and electronic data processing equipment. Prerequisite: EG 297. Three hours.

631. *Engineering Reliability*—The methodology of reliability prediction including application of discrete and continuous distribution models; reliability estimation; reliability logic diagrams; life testing; and reliability demonstration. Prerequisite: EG 421. Three hours.

632. *Stochastic Systems*—Analysis of processes whose outputs are governed by probabalistic laws. Included are Gaussian processes, processes with correlated and uncorrelated variables, Markov processes, and others. Prerequisite: EG 421, 525. Three hours.

634. *Value and Decision Theory*—A mathematical development of the decision making process. Statistical decision theory and game theory applied to decision making under risk and uncertainty. Consideration of utility, benefit functions, opportunity loss and the value of additional information. Prerequisite: EG 525. Three hours.

635. *Linear Programming*—The application of linear programming to complex allocation problems. Methods for determining the maximum or minimum or objective functions whose variables are subject to constraints. Topics include simplex method, degeneracy, modified simplex, transportation problems, network flows, and sensitivity analysis. Prerequisite: EG 525. Three hours.

636. *Systems Simulation*—Methods and procedures for simulating large scale systems with digital computer models. Programming languages particularly designed for simulation will be discussed. Prerequisite: EG 297, 525. Three hours.

637. *Dynamic Programming*—An introduction to the theory and procedures of dynamic programming for the optimization of multistage decision processes by their characterization as a sequence of single sub-optimization decisions. Prerequisite: EG 525. Three hours.

640. *Compressible Fluid Flow*—Fundamental equations of compressible fluid mechanics. Applications to isentropic flows, friction flows, simple heating, normal and oblique shocks. Linearized two dimensional theory. Prerequisite: EG 541 or approval of Division. Three hours.

641. *Fundamentals of Thermodynamics I*—Properties of thermodynamic systems: reduced equations of state; degenerate gases, equilibrium, third law. Magnetic and electric phenomena. Prerequisite: EG 342 or approval of Division. Three hours.

642. *Fundamentals of Thermodynamics II*—A continuation of EG 641. Three hours.

643. *Convection Heat Transfer*—Analysis of convection problems; boundary layer theory; laminar and turbulent flow. Boiling, condensation. Prerequisite: EG 443, 541, or approval of Division. Three hours.

644. *Transonic and Supersonic Flow Theory*—A unifying treatment of subsonic transonic and supersonic flows. Included are fundamental equations, approximate and exact solutions, hodographs, thin airfoil and slender body applications, and interference problems. Prerequisite: EG 646. Three hours.

645. *Aerospace Propulsion Systems*—General mechanics and aerothermodynamics of rocket propulsion. Rocket propellants and analyses of selected thermal propulsion systems. Applications to recombination ramjets, nuclear heat transfer and hybrid thermo-electric systems such as the plasma jet. Heat transfer and cooling problems. Prerequisite: EG 545. Three hours.

646. *Advanced Fluid Mechanics II*—Study of potential motion in two and three dimensions, conformal mapping, application of Schwarz-Christoffel transformation, virtual mass, approximate methods. Prerequisite: EG 541, or approval of Division. Three hours.

647. *Radiation Heat Transfer*—Physical laws of thermal radiation. Methods of analysis; geometrical and spectral characteristics. Special problems in design. Prerequisite: EG 342. Three hours.

648. *Heat Conduction in Solids*—Derivation of general differential equation of heat conduction; methods of solution. Steady-state, transient, and periodic heat flow. Internal heat sources in solids. Prerequisite: EG 342, 393. Three hours.

649. *Transport Phenomena*—Mass, energy, and momentum transport in steady and transient motions in real and rheological substances. Prerequisite: EG 441 or 443 or approval of instructor. Three hours.

650. *Cryogenics*—Study of the thermodynamics of low pressure and low temperature systems: measuring devices, materials, and techniques of handling low temperature, low pressure systems. Prerequisite: EG 342 or approval of Division. Three hours.

651. *Direct Conversion of Energy*—The analysis and study of systems for the direct conversion of heat to electricity including thermionic, magneto-hydrodynamic, fuel cells, and semi-conductor devices. Prerequisite: Approval of Division. Three hours.

652. *Gaseous Radiation*—Critical analysis of luminous and non-luminous gaseous radiation with and without chemical action. Prerequisite: EG 647. Three hours.

659. *Dimensional Analysis*—Nature and use of dimensions; principles of dimensional analysis; systematic calculation of dimensionless products; algebraic theory of dimensional analysis, similarity and model testing; applications to problems of stress and strain, dynamics, fluid mechanics, theory of heat, and electrical phenomena; differential equations and similarity. Prerequisite: MA 353. Three hours.

660. *Advanced Vibrations*—Matrix treatment of systems with many degrees of freedom. Vibrations of elastic bodies. Nonlinear vibration of systems with single degree of freedom. Prerequisite: EG 561, 692. Three hours.

661. *Advanced Dynamics*—Special theory of relativity, Hamilton's equations, canonical transformations, Hamilton-Jacobi theory. Lagrangian and Hamiltonian formulation for continuous systems. Prerequisite: EG 560, 692. Three hours.

663. *Astrodynamics II*—An extension of the principles developed in Astrodynamics I (EG 563) in which more advanced topics are discussed such as: transfer orbits, orbital perturbations, multiple body problems, numerical treatments of n-body problems, propulsion and powered system dynamics. Prerequisite: EG 563. Three hours.

665. *Introduction to Aeroelasticity*—Deformation of aircraft structures under static and dynamic loads. The effects of the air loads developed by incompressible flow on static aeroelastic phenomena and flutter are analyzed. Prerequisite: Approval of Division. Three hours.

668. *Advanced Dynamics of Flight*—The dynamic motions of an aircraft are analyzed with the use of linear and nonlinear differential equations. The response of an airplane to actuation of controls, automatic stability and control, and vehicle simulation by analog computer are studied. The Laplace transform is used throughout the course as a basic mathematical tool. Prerequisite: EG 568. Three hours.

670. *Matrix Methods in Structural Mechanics*—Matrix analysis of discrete systems. Use of finite elements in the force and stiffness

methods to analyze complex linear and nonlinear problems in solid mechanics. Prerequisite: MA 353, EG 571 or 671, EG 692. Three hours.

671. *Mechanics of Deformable Solids*—The fundamentals of solid mechanics with applications to important structural problems. Topics include: the concepts and analyses of strain and stress, the constitutive equations of elastic, plastic, and viscoelastic materials, energy and stability concepts and applications to beams and plane problems. Prerequisite: EG 273, 692. Three hours.

672. *Theory of Elasticity*—Equations of linear elasticity in orthogonal curvilinear coordinates, stress functions, Papkovich-Neuber displacement potentials, axisymmetric problems for the sphere and the solid with a spherical cavity, problems for the half space, concentrated loads and higher order singular solutions. Prerequisite: EG 671. Three hours.

673. *Mechanics of Continuous Media*—A study of the mechanics of continuous media. Kinematics, dynamics and thermodynamics are developed in generality. Constitutive equations of solids and fluids are formulated and applied to specific problems. Prerequisite: EG 671. Three hours.

674. *Applications of Energy Methods*—Concept of virtual displacements, principle of minimum potential energy, Castigliano's theorem, Hamilton's principle, and Lagrange's equations. Applications in stress analysis, elastic stability, and dynamics. Prerequisites: EG 571, 673. Three hours.

675. *Photoelasticity*—Theory and laboratory application of two- and three-dimensional photoelasticity. Introduction to theory of elasticity. Study of isochromatics and isoclinics. Separation of principal stresses. Use of photoelastic coatings. Prerequisite: EG 571. Three hours.

677. *Experimental Stress Analysis*—Experimental methods (not including photoelasticity) used to determine stress distribution in machine and structural elements subjected to static and dynamic loadings. Theory and laboratory application of mechanical and electrical resistance strain gauges, brittle coatings, and analogies. Prerequisite: EG 571. Three hours.

691. *Research Problems*—Advanced work of a research nature for graduate students. Open to properly qualified students. Credit based on amount of work completed.

692. *Graduate Engineering Analysis I*—Introduction to the algebra and geometry of vectors, matrices, vector analysis, vector field theory, and tensor analysis. Not open to students who have taken EG 292 and 393. Prerequisite: MA 353. Three hours.

693. *Graduate Engineering Analysis II*—Introduction to Fourier series and Laplace transforms, solution of partial differential equations by separation of variables. Not open to students who have taken EG 292 and 393. Prerequisite: MA 353. Three hours.

695. *Graduate Seminar I*—Preparation and presentation of papers on current topics of research and general interest in engineering. To be taken no later than the term preceding registration for the 13th hour of the student's program and no earlier than the term in which the student is registered for the 7th hour of his graduate program.

696. *Selected Topics in Engineering.*

697. *Systems Programming and the Theory of Formal Languages I*—The technique of constructing systems programs: supervisory programs (monitors), input-output systems, interpreters and compilers for procedure-oriented languages. Syntactic analysis and semantic interpretation of formal languages. Prerequisite: EG 591 or approval of instructor. Three hours.

698. *Systems Programming and the Theory of Formal Languages II*—A continuation of EG 697. Three hours.

700. *Sampled Data Control Systems*—Z-transforms, transport lags, z and w plane analysis, finite sampling durations are among the topics studied. Prerequisite: EG 619. Three hours.

702. *Theory of Automata*—Unified treatment of finite-state systems. Decomposition theory, group invariance, reliability and state assignment. Other models of automata with applications to coding and programming. Probabilistic automata. Prerequisite: EG 502. Three hours.

704. *Nonlinear Control Systems*—Classical and modern methods for the analysis and design on nonlinear automatic control system. State variables, phase plane, limit cycles, stability, describing functions, relay control. Optimal and adaptive control systems. Prerequisite: EG 619. Three hours.

705. *Theory of Optimal Control*—The general theory of optimal control of dynamic processes. Calculus of variations, Hamilton-Jacobi theory, Pontryagain's maximum principle, dynamic programming. Prerequisite: EG 619 or approval of instructor. Three hours.

706. *Communication Systems*—Analysis of nonlinear communication processes using Hilbert transforms. Optimum nonlinear and time-varying systems and non-stationary signals. Phase lock demodulation. Orthogonal multiplexing. Modulation, detection and series approximation for nonlinear systems. Prerequisite: EG 606. Three hours.

715. *Microwave Filter Theory*—Microwave filter design. Synethesis of reflection. Coefficient. Tchebyscheff, Butterworth design. Theory of coupled cavity filters. Prerequisite: EG 609 or 618. Three hours.

716. *Plasma Dynamics I*—Motion of ions and electrons, Kinetic theory, collisions, ionizations and recombination. BBGKY hierarchy. Interaction of plasma with static and slowly varying fields, gas discharges, instabilities sheath and oscillations. Prerequisite: EG 608 or approval of instructor. Three hours.

717. *Plasma Dynamics II*—Macroscopic motion and transport phenomena. Basic equations for single- and multi-particle media. Magnetohydrodynamic equations. Waves in plasma, complex refractive index (Appleton). Plasma diagnostics, man-made applications and natural phenomena. Prerequisite: EG 716. Three hours.

718. *Advanced Topics in Servomechanisms*—Advanced topics in linear, non-linear, sampled data, optimal, etc. control. Prerequisite: Approval of instructor. Three hours.

719. *Advanced Electromagnetic Field Theory*—A study in depth of the classical theory of electricity and magnetism. Potential theory, time-varying fields, boundary-value problems, stresses, theory of relativity. Prerequisite: EG 609. Three hours.

744. *Hypersonic Flow Theory*—Nonlinear treatment of compressible flow; linearized theory, methods for blunt bodies, blast wave theory, numerical methods and hypersonic wind tunnels. Prerequisite: EG 640. Three hours.

752. *Mechanics of Rarefied Gases*—Energy and momentum transfer in rarefied gas and supersonic flows. Boltzmann statistical distribution unsteady gas-solid interaction; accommodation coefficients. Free molecular flow, slip flow, and transition flow. Prerequisite: EG 541, 642 or approval of Division. Three hours.

753. *Magneto-Gas Dynamics*—Equations of motion for ionized gases with critical analysis of transport properties in steady and varying electric and magnetic fields, MHD shock waves and radiation effects. Prerequisite: EG 640 or approval of instructor. Three hours.

755. *Theory of Flow of Viscous Fluids I*—Navier-Stokes equations including several exact solutions and several approximate solutions for both small and large Reynolds numbers. Application to laminar and turbulent flows. Introduction to approximate boundary layer methods. Prerequisite: EG 541 or approval of Division. Three hours.

756. *Theory of Flow of Viscous Fluids II*—Theory of convective aerodynamic heating in high speed flow, laminar, and turbulent flows: ablation, transpiration cooling, and mass transfer cooling. Also, the course includes aerodynamic heating in hypersonic flow, real gas effects, effect of pressure interactions, vorticity interactions, and heat transfer in rarefied gas flows. Prerequisite: EG 755. Three hours.

757. *Theory of Flow of Viscous Fluids III*—Study of turbulence in gasses and liquids; compressive phenomena such as interaction of shocks and boundary layers, and fluid-dynamic heating. Prerequisite: EG 756. Three hours.

758. *Statistical Thermodynamics*—Statistical ensembles: Maxwell-Boltzmann, Bose, Einstein, and Fermi-Dirac statistics. Application of statistical mechanics to thermodynamic processes. Information theory and its formalism. Prerequisite: EG 642. Three hours.

760. *Nonlinear Vibrations*—Development of theory and applications of nonlinear vibration phenomena, transient and steady state response of nonlinear systems. Prerequisite: EG 492, 561. Three hours.

762. *Wave Motion of Continuous Elastic Bodies*—A study of the dynamics of continuous elastic bodies. The properties of wave motion are considered while studying the motion of an elastic string. Propagation of elastic waves in infinite and semi-infinite bodies, cylinders, rods, and beams. Prerequisite: EG 660. Three hours.

763. *Astrodynamics III*—Advanced problems in space flight dynamics concerning powered aerospace flight, powered deep-space flight, and space recovery. Topics cover atmospheric booster flight dynamics, continuously powered low thrust flights, re-entry hypersonics, re-entry flight path, and re-entry heating. Prerequisite: EG 663. Three hours.

764. *Astrodynamics IV*—Advanced problems in space flight dynamics concerning space navigation, guidance and control. Topics cover rigid body dynamics, dynamics of inertia sensing elements, theories of optimization and automatic control, guidance schemes for space navigation and controlled rendezvous, and fundamentals of space flight error analysis. Prerequisite: EG 763. Three hours.

765. *Aeroelasticity*—Effects of compressible flow and unsteady flow on deformation of aircraft structures. Approximate methods of computing natural mode shapes and frequencies and dynamic response phenomena considered. Prerequisite: EG 665. Three hours.

768. *Dynamics of Aerospace Vehicles*—Advanced problems in aerospace vehicle rigid body dynamics and control are studied. Statistical characteristics of vehicle responses to turbulence, trajectory computations, Euler's equations of motion for spinning vehicles, and other special problems related to satellite stabilization and control are presented. Prerequisite: EG 668. Three hours.

772. *Theory of Elastic Stability*—A study of the concepts of static and dynamic stability. Development of the various methods of analysis. Applications to buckling of columns, plates and shells. Prerequisite: EG 671. Three hours.

773. *Theory of Shells*—The first approximation theory of Bernoulli, Euler, Kirchhoff and Love and the higher approximation of Reissner, et al. This course emphasizes the role of geometrical nonlinearities in current problems of shell buckling, and includes applications to plates and shells of various shapes. Prerequisite: EG 671. Three hours.

791. *Special Problems*—Independent investigations of special problems in engineering. Open to properly qualified graduate students. Credit based upon amount of work undertaken.

795. *Graduate Seminar II*—Preparation and presentation of papers on topics of research interest related to thesis study. Parallel to EG 799. One hour.

796. *Selected Topics in Engineering.*

799. *Master's Thesis*–Written dissertation for master's degree. Required of all students working on a master's thesis.

Graduate Programs

The graduate programs at the University of Alabama in Huntsville are part of the Graduate School of the University of Alabama and meet the requirements specified by the Graduate Council.

Degrees:

Master of Arts: Mathematics
Master of Science: Engineering, Physics

PLANS FOR MASTER'S DEGREE

All course work is done with the approval of the major division in which the master's degree is sought.

PLAN ONE:

Degree requirements under this plan include completion of 24 or more semester hours of course work and the writing of an acceptable thesis.

The thesis should show evidence of the student's capacity for research, independent thought, and his ability to interpret materials used and to write correct English. The subject must be in the major field and must be approved by a faculty committee of the major field, by the director of the major division, and by the Dean of the Graduate School.

A completed copy of the thesis must be submitted to the major division at least four weeks before the date on which the candidate expects to receive the degree. At least ten days before graduation three copies of the thesis, approved by the thesis committee and the director of the major division, and a receipt for the binding fee ($9), must be deposited in the office of the Graduate School in Huntsville. Theses must comply with the regulations set out in the leaflet *Instruction for the Preparation of Theses and Dissertations at the University of Alabama* which is available at the Office of the Graduate School in Huntsville. Approval by the Graduate Dean or his designated representative is necessary before graduation.

In exceptional cases, theses may be written in absentia. To obtain such permission, the student, before leaving the University, must select his thesis subject and submit to the director of his major division a satisfactory outline of his thesis, plus satisfactory evidence that adequate facilities are available where he plans to do his work.

PLAN TWO:

Degree requirements for the master's degree under this plan include the completion of 33 or more semester hours of course work. If the program contains three or more terms of full-time work, the degree requirements may be met with 30 or more semester hours of course work. A thesis is not required.

A candidate working under Plan Two may be required to participate successfully in seminar or problem courses that will give him an acquaint-

ance with the methods of research and an appreciation of the place and function of original investigation in the field.

Students majoring in mathematics may follow Plan One or Plan Two; students majoring in all other master's degree programs must follow Plan One.

REQUIREMENTS FOR ADMISSION

Applicants for admission to the Graduate School must hold a bachelor's degree from the University of Alabama or from another approved institution. The following minimum requirements are acceptable to the Graduate Council; academic units may require higher averages.

A. ADMISSION:

1. An applicant must have a minimum quality point average of at least 2.0 (A=3.0) overall, or at least 2.0 for the last 60 hours of work; and
2. An applicant must score at least 1,000 on the aptitude portion of the Graduate Record Examination (GRE). The advanced test of the GRE in the applicant's proposed graduate field is also required. Information concerning the GRE may be obtained from Educational Testing Service (ETS), Princeton, New Jersey. Applications may be obtained at the Graduate Office at UAH.

B. CONDITIONAL ADMISSION:

An applicant whose scholastic record does not fully meet the requirements for admission, may, upon recommendation of the division director and with the approval of the Dean of the Graduate School, be admitted conditionally provided:

1. His quality point average is at least 1.5 (A=3.0) overall or
2. His score on the aptitude portion of the GRE is at least 1,000 or
3. His quality point average on the last 60 hours is at least 2.0.

C. IRREGULAR POST GRADUATE STATUS:

Persons whose applications to the Graduate School have been denied on the basis of a quality point average and/or GRE score may apply to UAH for admission with irregular post graduate status. (See *Admission with IPG Standing* in the undergraduate section of this catalog.) A student admitted in this category may register in courses at UAH providing all prerequisites for the courses have been satisfactorily completed.

Upon completion of 12 or more semester hours of advanced level courses with an average of B or better in each course, a student may reapply for admission to the Graduate School. Evaluation of this application will include the demonstrated performance in the advanced level

courses. In this case, an applicant, if recommended for admission by an academic division, will be admitted conditionally.

D. FACULTY MEMBERS:

Members of the University faculty with rank above that of instructor may not pursue work toward an advanced degree at the University of Alabama.

E. UAH SENIORS:

A UAH senior may, with permission of the Assistant Dean of the Graduate School in Huntsville, pursue graduate work while completing undergraduate degree requirements if:

1. Fewer than 13 semester hours remain to be taken.
2. His undergraduate average is at least 2.0 (B).
3. His total course load is less than 12 semester hours.

APPLICATION PROCEDURE

Applicant must submit:

1. Completed graduate application form in duplicate.
2. Non-refundable application fee of $10.

In addition he must request that:

1. Two copies of previous academic records be sent from each institution attended to UAH Graduate Office.
2. Scores of The Graduate Record Examination (GRE) be sent to UAH Graduate Office from Educational Testing Service (ETS).
3. Three former professors (or other individuals qualified to judge competence for graduate study) submit to UAH Graduate Office completed "Evaluation of Fitness for Graduate Study Forms."

All application materials must be in the Graduate Office no later than dates specified in the UAH Calendar.

Applicants are urged to initiate actions for admission at least six weeks in advance of the registration date for the term to which admission is sought.

REGISTRATION

A student must be admitted to the Graduate School and must register on graduate forms in order to receive graduate credit for courses taken. Graduate students can schedule courses for other than graduate credit by so indicating on regular graduate registration forms; these courses will remain as originally designated.

The maximum course load of a graduate student is 10 semester hours per term. Students employed full time (40 or more clock hours per week)

can schedule no more than 3 semester hours of graduate work per term. Students employed part time (32 or fewer clock hours per week) can schedule no more than 6 semester hours per term. A letter certifying the employment status must be on file in the Graduate Office.

Identified undergraduate prerequisites or deficiencies must be scheduled early in the graduate program.

The same requirements and procedures of attendance, conduct, withdrawals, examinations, and assigned tasks that apply to undergraduate students must be met by graduate students.

Students working on a thesis must register for thesis and pay a fee of $3.00.

SCHOLASTIC REQUIREMENTS

The following scholastic requirements are those of the Graduate School; individual academic units may identify additional requirements.

A. DEGREE REQUIREMENTS:

1. Overall grade average must be B or better on all graduate credit hours undertaken.
2. Grade of B or better must be received on at least 75% of all credit hours undertaken.
3. Credits toward a master's degree are earned only with grades of C or better.
4. At least 50% of the hours required for a master's degree must be completed in courses numbered 600 or above.

B. TRANSFERRED CREDIT:

A maximum of six semester hours of acceptable graduate credit, earned in any approved graduate institution, may be transferred and counted toward the master's degree. Such credit may not be more than six years old at the time of graduation and is transferable only if the student was enrolled in a graduate school at the time it was taken and if the overall average at the institution was B or better. Evaluation of credit for transfer will be made on request after the student has completed 12 semester hours of graduate credit at the University of Alabama. Students who have graduate credits from other units of the University of Alabama must complete a minimum of 12 semester hours in the Huntsville Graduate Programs to receive a master's degree from UAH.

C. TIME LIMIT:

All requirements for the master's degree should be completed in not more than six years. Credit for individual courses completed at the University of Alabama more than six but less than ten years before the completion of all requirements for the degree may be validated by special examination given by the division concerned. Such an examination will be equivalent to a final examination in the course.

D. ADMISSION TO CANDIDACY:

Admission to the Graduate School and admission to candidacy for a degree are two separate acts. Application for admission to candidacy for the master's degree should be filed after completing 12 semester hours but before completing 18 semester hours of graduate credit at the University of Alabama. It must be approved at least two months before the degree is conferred. Approval will depend on (a) the quality of the applicant's graduate work prior to the time the application is made. (See *Scholastic Requirements*); (b) the removal of any special conditions; and (c) the certification of the major division that the student is well qualified to continue work toward the degree. Application forms will be supplied by the Graduate Office.

E. EXAMINATIONS:

In addition to the regular course examinations, a final comprehensive examination is required of all candidates for the master's degree. This examination may be written, oral, or both. If a thesis is submitted and a written examination is given, there will be an oral examination which may be limited to the thesis. The candidate will be examined on his major subject or subjects and his thesis if he pursues Plan One, and on his field or fields of concentration if he pursues Plan Two. The oral examination is conducted by a committee of at least 3 members, appointed by the Dean of the Graduate School. A written notice of the time and place of the examination is sent by the Dean of the Graduate School to the candidate and to each member of the committee. The examination must be given at least two weeks before the date of graduation, and the results must be reported promptly to the Dean of the Graduate School on furnished forms. A student may take the final oral or written examination only twice.

F. APPLICATION FOR DEGREE:

Each candidate for a master's degree must apply for the degree through the Graduate Office during the terms in which all remaining requirements for the degree are to be met but at least two months before it is to be conferred.

G. PROBATIONARY STATUS:

1. At any time that the overall grade average of a student drops below a B average the student will be placed on probation.
2. A student on probation cannot apply for admission to candidacy for a degree.
3. Probationary status is removed by raising the overall grade average to B or better on all work attempted in all terms up to and including the term in which 12 semester hours are completed following the term in which the student was placed on probation.
4. Failure to remove probation in the manner identified in #3 results in dismissal from the Graduate School.

H. CONDITIONAL STATUS:

1. Students admitted conditionally who have an overall grade average of B or better for all work attempted up to and including the term in which 12 semester hours are completed assume the status of an unconditionally admitted student.
2. Students admitted conditionally who fail to have an overall grade average of B or better as indicated in #1 above are dismissed from the Graduate School.

I. SPECIAL REQUIREMENTS:

The graduate programs of the University of Alabama in Huntsville are a part of the Graduate School of the University of Alabama, and reference should be made to the bulletin of the Graduate School for amplification of the general requirements. With interpretation to fit the Huntsville graduate programs, all requirements and regulations of the Graduate School of the University of Alabama apply.

Students must assume full responsibility for acquainting themselves with all requirements related to a desired program and for carrying them out.

Special requirements of the Huntsville academic divisions are indicated in the separate division sections.

Graduate programs provided in education, public administration, and chemistry are presently terminal in Tuscaloosa; and the requirements of those areas must be met as indicated in the appropriate University of Alabama bulletins.

Ph.D. PROGRAMS

All Ph.D. programs are presently terminal in Tuscaloosa. The requirements are specified in University of Alabama bulletins, and applicants are advised to counsel with the appropriate academic department of the Tuscaloosa campus. In engineering, mathematics, and physics, applications may be submitted to the Graduate Office in Huntsville. After being admitted, students intending to complete the requirements for a Ph.D. degree should develop an academic program with a representative of the department of the Tuscaloosa campus.

At least two semesters with a minimum of 18 semester hours must be taken on the Tuscaloosa campus. Research requirements for the degree may be accomplished in Huntsville in the areas of specialization where the faculties and facilities are acceptable to the departments of the Tuscaloosa campus.

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Technical Assistant to the Director, Research Institute

W. P. Watts, B.S., M.B.A.
Administrative Manager, Research Institute

Faculty

(First date refers to original appointment to the University. Second date, if any, refers to date of appointment to title listed.)

ADAMS, CURTIS H., *B.S. (Mississippi State University), M.S. Ed. (Henderson State Teachers College), Ph.D. (Mississippi State University). Associate Professor of Biology, 1965.*

ANDERSON, KATHLEEN C., *B.S., M.A. (University of Alabama). Part-time Instructor in Mathematics, 1958.*

ANDERSON, ROBERT A., *B.A. (David Lipscomb College), M.A. (Mississippi State University), Graduate Study (University of Tennessee). Part-time Instructor in History, 1965.*

ARAMBURU, JUAN CARLOS, *L.M.S. (University of Buenos Aires). Instructor in Mathematics, 1967.*

ARENDALE, WILLIAM F., *B.S. (Middle Tennessee State University), M.S., Ph.D. (University of Tennessee). Professor of Chemistry; Director, Division of Natural Sciences and Mathematics, 1964, 1966.*

ARENSTORF, RICHARD F., *Diploma (University of Gottingen Germany), Dr. rer. nat. (University of Mainz, Germany). Part-time Professor of Mathematics, 1958, 1964.*

ARMSTRONG, ROBERT C., III, *B.S.M.E. (Tennessee Polytechnic Institute), M.S.M.E. (University of Kentucky). Part-time Assistant Professor of Mechanical Engineering, 1961, 1967.*

AUDEH, NADEEM F., *B.S. (South Dakota State College), M.S., Ph.D. (Iowa State University). Associate Professor of Electrical Engineering, 1964, 1965.*

BAIRD, JAMES ADAM, JR., *B.S.M.E., M.S.M.H., Ph.D. (University of Alabama). Part-time Assistant Professor of Engineering Mechanics, 1965.*

BALDWIN, MART G., JR., *B.S. (Furman University), Ph.D. (University of North Carolina). Part-time Assistant Professor of Chemistry, 1967.*

*BARTEE, EDWIN M., *B.S., M.S.E. (University of Alabama). Associate Professor of Industrial Engineering, 1959.*

BAYER, JEFFREY J., *B.A., M.F.A. (University of North Carolina). Instructor in Art, 1967.*

BEAL, THOMAS REYNOLDS, *B.S. (Southwestern at Memphis), M.S. (Washington University), Ph.D. (Stanford University). Part-time Associate Professor of Aerospace Engineering, 1965.*

BENTLEY, MARK W., *B.S. (Mississippi State College), M.A. (University of Alabama). Part-time Instructor in Engineering Drawing, 1966.*

BESS, BARTLEY E., *A.B., M.A. (University of Missouri), Ph.D. (Texas Technical College). Part-time Professor of Psychology, 1957.*

BISHOP, RAYMOND C., *B.S. (University of Southern Mississippi), M.A. (George Washington University). Part-time Instructor in Political Science, 1967.*

BLANTON, ROY W., JR., *B.M.E., M.S., Ph.D. (Georgia Institute of Technology). Associate Professor of Mechanical Engineering, 1965, 1967.*

BLEVINS, CRAIG M., *B.S., M.S. (Kansas State Teachers College of Pittsburg). Associate Professor of Engineering Graphics, 1967.*

**On leave 1967-1968*

BOND, MARGARET S., *LL.B. (University of Poitiers), Ph.D. (University of Paris). Assistant Professor of Economics, 1964, 1966.*

BOONE, ANNE D., *B.S. (University of Alabama). Part-time Instructor in Biology, 1966.*

BOYER, D. ROYCE, *B.M. (Butler University), M.A. (Catholic University of America), Graduate Study (University of Texas). Assistant Professor of Music, 1966.*

BRADEN, ARTHUR WAYNE, *A.B. (Transylvania College), B.D. (Lexington Theological Seminary), Ph.D. (University of Southern California). Professor of Philosophy; Director, Division of General Studies, 1966.*

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