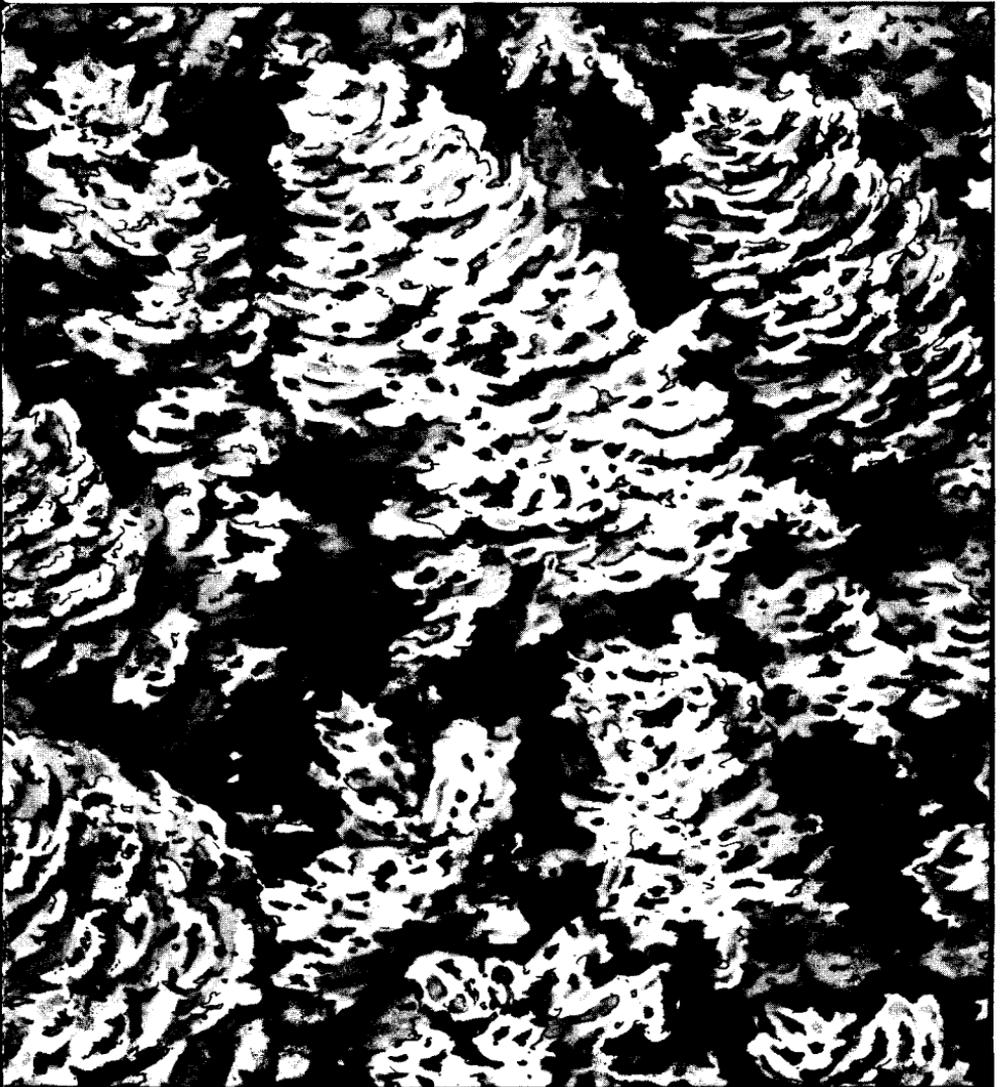


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1980-82

UNIVERSITY
OF MINNESOTA
BULLETIN

COLLEGE OF FORESTRY





UNIVERSITY OF MINNESOTA

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College of Forestry

UNIVERSITY OF MINNESOTA

Curricular Programs of the College of Forestry

Forest Resources Curriculum

with elective cores in . . .

Ecosystems and Silviculture
Forest Management
Management and Administration
Measurement and Information Systems
Urban Forestry
Wood Utilization

Forest Science Curriculum

with specializations in . . .

Natural Science
Social and Managerial Sciences

Forest Products Curriculum

with specializations in . . .

Marketing
Production Management
Pulp and Paper
Residential Housing
Wood Science and Technology

Recreation Resource Management Curriculum

An Intercollegiate Program

Equal Opportunity Statement

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, creed, color, sex, national origin, or handicap. In adhering to this policy, the University abides by the requirements of Title IX of the Education Amendments of 1972, by Section 504 of the Rehabilitation Act of 1973, and by other applicable statutes and regulations relating to equality of opportunity.

Inquiries regarding compliance may be directed to Lillian H. Williams, Director, Office of Equal Opportunity and Affirmative Action, 419 Morrill Hall, 100 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, (612) 373-7969, or to the Director of the Office of Civil Rights, Department of Health, Education, and Welfare, 330 Independence Avenue S.W., Washington, D.C. 20201.

How to Use This Bulletin

This bulletin is the official source of information about the College of Forestry. The bulletin is organized as follows:

I. Introduction

- The College
- Educational Objectives

II. General Academic Requirements

- Degree Offered
- Admission Requirements
- Preforestry and Upper Division Classification
- Itasca Forestry Session
- Registration and Class Attendance
- Grading Systems
- Access to Student Educational Records
- Academic Requirements
- Classification of Students
- Council on Liberal Education Requirements
- Use in the Graduate School of Credits Earned While an Undergraduate

III. Programs and Curricula

- Undergraduate Programs in Forestry
 - Facilities
 - Work of Foresters
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 - Curricula and Requirements
 - Fees for Field Training Sessions
 - Curricula in Forestry
- Graduate Study in Forestry

IV. Course Descriptions

- Forest Products
- Forest Resources
- Related Departmental Courses

V. Student Government, Career Opportunity Services, and Financial Assistance

VI. Faculty

All current and prospective students should also refer to the *General Information Bulletin*. Information on evening courses and summer school offerings is contained in the *Extension Classes Bulletin* and the *Summer Session Bulletin*, respectively. For information about alternative programs in related areas, consult the bulletins for the College of Agriculture, College of Biological Sciences, College of Business Administration, College of Liberal Arts, Graduate School, and Institute of Technology. Each of these bulletins is available in 130 Coffey Hall or may be obtained by writing to the Office of Admissions and Records, 130 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108.

The *Class Schedule*, published just before the registration period each quarter, gives the time and location of classes.

FACILITIES OF THE COLLEGE



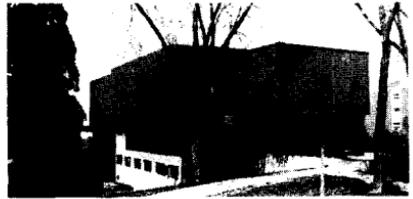
Green Hall

The College of Forestry, located on the Twin Cities campus/St. Paul of the University of Minnesota, consists of two buildings—Green Hall and the Kaufert Laboratory of Forest Products and Wood Science. Green Hall is the location of the Dean's Office, Office of Student Services, and Department of Forest Resources. The Department of Forest Products is located in the Kaufert Laboratory.

The college has established field centers for programs in education and research. Forest resources students spend the entire fall or spring quarter of their senior year completing course work at the 3,700-acre Cloquet Forestry Center located at Cloquet, Minnesota. Forest resources and forest science majors spend 3½ weeks of the summer between their sophomore and junior years at the Lake Itasca Forestry and Biological Station located in Itasca State Park. Also available for field laboratory work during the regular school year is the John H. Allison Forest, which is located within 10 miles of the Twin Cities campus/St. Paul.



John H. Allison Forest



Kaufert Laboratory of Forest Products and Wood Science



Cloquet Forestry Center



Lake Itasca Forestry and Biological Station

College of Forestry

I. INTRODUCTION

The College

The University of Minnesota College of Forestry is an educational, research, and public service institution established for the benefit of the state's citizens. It has offered programs leading to degrees in forestry since 1903 and is recognized for its contributions to national and international forestry education. The college's most important role today and for the future is its unique opportunity to contribute to the educational and research dimensions of the total renewable natural resource system. The college is concerned with producing well-educated graduates, relevant research findings and their applications, and an increasingly informed citizenry.

Educational Objectives

The products and services of forests and foresters have been vital to people throughout history. Forests are becoming increasingly important. Strongly motivated, well-educated men and women are needed to provide wise and prudent management and development of forest resources and of the forest environment to assure renewal while providing for the needs of people.

The educational objectives of the undergraduate programs of the College of Forestry are:

- to help students develop a basic understanding of the sciences, communications, mathematics, and people and society.
- to help students develop entry-level professional qualifications through specialized curricular offerings.
- to provide opportunity for training in a variety of professional areas through availability of elective cores and areas of specialization.
- to provide opportunity for advanced study to those interested in and capable of preparation for graduate study and careers in research and development, teaching, and extension work.



II. GENERAL ACADEMIC REQUIREMENTS

The College of Forestry offers professional education in the areas of forestry, forest products, recreation resource management, and related fields.

This section provides background material on the degree offered, admission requirements, registration and class attendance, grading systems, academic requirements, classification of students, and liberal education requirements for programs in the college.

For more detailed information about general academic requirements, contact the Office of Student Services, College of Forestry, 10 Green Hall, 1530 North Cleveland Avenue, University of Minnesota, St. Paul, Minnesota 55108; telephone (612) 373-0842.

Degree Offered

The bachelor of science (B.S.) degree is awarded to students completing the requirements of the undergraduate curricula offered in the College of Forestry.

Requirements for the Bachelor's Degree in Forestry—Candidates will be recommended for graduation upon completion of:

1. Required and elective courses prescribed in the curriculum to meet the 192-credit total.
2. All of the requirements with a GPA of 2.00. A student may graduate with a maximum of five credits of D in required forestry courses and five credits of D in other required courses.
3. Liberal education requirements for all students (see page 16).
4. Residence and other general University requirements for graduation (see the *General Information Bulletin*).

Graduation With Honors—Students may earn undergraduate degrees with the honors "with distinction" or "with high distinction."

The degree is granted with distinction if you attain a minimum grade point average of 3.35 for the entire curriculum. If you are a transfer student with fewer than two years of work in this college, you will not be eligible to graduate with distinction. However, if you complete in this college one-half the number of credits required for graduation in any curriculum, you will satisfy the two-year residence requirement. Recommendations to the faculty for award of the degree with distinction are made on the basis of scholarship and other evidence of satisfactory achievement and advancement in the curriculum pursued.

Your degree will be granted with high distinction if you attain a minimum grade point average of 3.85 for the entire curriculum. The same conditions for residence and recommendation apply as for the degree granted with distinction.

If you should fail to meet in full the requirements stated above, your case will be referred to the Office of Student Services in 10 Green Hall for individual consideration.

Admission Requirements

To be admitted to the College of Forestry you must first apply through the Office of Admissions and Records, 130 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108. Listed below are requirements for admission to the College of Forestry. Other requirements and procedures having to do with nonresident status, admission with advanced standing, adult special admission, and admission by examination are explained in the *General Information Bulletin*.

General Academic Requirements

High School Graduates—Applicants seeking admission as freshmen must submit scores from either the Preliminary Scholastic Aptitude Test/National Merit Scholarship Qualifying Test (PSAT/NMSQT) or the American College Testing Program (ACT). The PSAT, administered through the Minnesota Statewide Testing Program, is taken in the junior year of high school; the ACT in the junior or senior year. Test scores should be reported to the Office of Admissions and Records, 130 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108. High school rank plus either the PSAT or ACT score are used to determine admissibility. Patterns of high school work and educational objectives are also considered, and exceptions to the basic standard are considered if a careful study of the applicant's record suggests the likelihood of successful college work.

High school courses required for admission to the College of Forestry are as follows:

- three units in English
- one unit in elementary algebra
- one unit in plane geometry
- one unit in higher algebra or equivalent course
- one unit in natural science

Non-High-School Graduates—Write the Office of Admissions and Records, 130 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108, for information about entering the University by examination. Also, consult the *General Information Bulletin*.

Adult Special Students—You may be admitted as an adult special student if you wish to register for particular courses to meet special needs rather than to pursue a degree. Normally adult special students already hold a bachelor's degree.

Students who enter the College of Forestry as adult specials with the intention of transferring later to the Graduate School should be aware that there is a limit on the number and type of adult special credits they may transfer to their graduate records. Contact the Graduate School for information.

Admission With Advanced Standing—Credits earned at other accredited colleges and universities and in other colleges of the University of Minnesota that are appropriate for a student's course of study may be transferred to the College of Forestry. Transfer credits are evaluated by the Office of Admissions and Records and are designated as either required or elective credit. A transfer course that is applied toward required credit is considered the equivalent of a specific course required in a curriculum here. Experience has shown that lower division forestry courses transferred from community colleges are not comparable to professional courses offered in the junior and senior years, i.e., courses numbered 3000 or higher. You will be expected to complete in residence all required courses and all area requirements regardless of the number of excess elective credits you may have. If you have any questions about the use of transfer credits, inquire at the Office of Student Services, 10 Green Hall. If necessary, you will be referred to your departmental Student Scholastic Standing Committee, which makes final decisions on evaluating transfer credits in terms of requirements of this college and its various curricula.

If you are beginning your academic work at another institution and plan to transfer to the College of Forestry at a later date, it is important to have planned your earlier course work carefully so that the greatest number of credits possible may apply to the particular curriculum you desire to enter. See the program descriptions and curricular requirements in section III of this bulletin. Pay special attention to the requirements for the freshman and sophomore years. Your college adviser will help you select courses that will meet specific curricular requirements. For further help contact the Office of Student Services.

College Level Entrance Placement (CLEP) Examinations—The College of Forestry accepts CLEP examination scores for exemption from course requirements in

category IV, Literary and Artistic Expression; a student may receive a maximum of eight credits by scoring at the 75th percentile level or higher. In special situations, students may be allowed to petition for credits in category III, The Individual and Society.

Transfer of Credit From Continuing Education and Extension—Transfer to your permanent record of credits and grades earned for courses taken through the programs of Continuing Education and Extension at the University of Minnesota may be accomplished by submitting a petition requesting such action to the appropriate departmental Student Scholastic Standing Committee through the Office of Student Services, 10 Green Hall.

Preforestry and Upper Division Classification

Students in lower division are classified as preforestry students. They attain upper division status in the various curricula of the College of Forestry upon fulfillment of the following requirements.

Forest Resources Curriculum—Completion of the Itasca Forestry Session (see below).

Forest Science Curriculum—Completion of the Itasca Forestry Session (see below).

Forest Products Curriculum—Completion of 90 credits with a grade point average of at least 2.00 and the rhetoric communication requirement.

Recreation Resource Management Curriculum—Completion of all course requirements for the freshman and sophomore years.

Itasca Forestry Session

The Lake Itasca Forestry and Biological Station 3½-week summer session for foresters is required of all forest resources and forest science majors. This session must be completed between the sophomore and junior years. Students will be eligible to attend the Itasca Forestry Session if they have a minimum grade point average of 2.00 and have completed 80 credits, including the following preforestry courses:

- AgEc 1020—Principles of Macroeconomics (5)
- AgEc 1030—Principles of Microeconomics (4)
- AgEn 1030—Introduction to Computer Programming (3)
- Biol 1011—General Biology (5)
- Biol 1103—General Botany (5)
- Chem 1004—General Principles of Chemistry (5)
- Chem 1005—General Principles of Chemistry (5)
- Geo 1001—Physical Geology (5)¹
- Math 1111—College Algebra and Analytical Geometry (5)
 - (or) Math 1201—Pre-Calculus (5)
- Math 1142—Introduction to Calculus (5)
 - (or) Math 1211—Analysis I (5)
- Phys 1031—Introductory Physics: Measurement and Applications (4)
- Phys 1035—Introductory Physics Laboratory (1)
- Rhet 1101—Communication I (4)
 - (or) pass English proficiency examination

¹Students transferring from colleges not offering a course equivalent to Geo 1001 may attend the Itasca Forestry Session but must complete this course as a requirement for graduation.

General Academic Requirements

- Rhet 1102—Communication II (4)
 - (or) pass English proficiency examination
- Rhet 1222—Public Speaking (4)
- Soc 1001—Introduction to Sociology (4)
 - (or) Psy 1001—General Psychology (5)
 - (or) Anth 1102—Introduction to Social and Cultural Anthropology (5)
 - (or) Geog 1301—Human Geography (5)
- Stat 3081—Experimental Techniques and Statistical Inference (5)

Students are not qualified to attend the Itasca Forestry Session if they have earned more than five credits of D grades in required lower division courses.

It will be the *responsibility of the student* to supply the College of Forestry with a complete transcript of all academic work completed. All applications must be received by July 15 of the year in which you plan to attend Itasca.

Registration and Class Attendance

Fees—For information about fees, see the *General Information Bulletin*.

Working With Your Faculty Adviser—Upon entry into the college, you are assigned a faculty adviser on the basis of the curriculum you have chosen. Your adviser can explain the curriculum, will offer guidance in planning your program each quarter, and will counsel you about your general progress. However, since the consequences of program planning are borne by the student and not the adviser, program planning is the responsibility of the student. Before registration time, you should study curriculum requirements and course listings and descriptions, and develop a tentative program with the aid of the *Class Schedule*.

It is your responsibility to know and meet all requirements prescribed for graduation in the curriculum you select and, where applicable, for the elective core or specialization.

Credit Load—The normal load of work for each quarter is 14 to 18 credits. A credit requires an average of three hours of work per week. These hours may be distributed as follows: one hour of lecture or recitation requiring two hours of preparation; two laboratory periods requiring one hour of preparation; or three laboratory periods requiring no outside preparation. The quarterly credit load of students in the College of Forestry may vary according to the individual's ability or circumstances. To carry more than 21 hours of credit, you must have a B average in work of the previous quarter and must secure permission from your departmental Student Scholastic Standing Committee.

Electives—Consult your adviser if you are uncertain about choosing elective courses.

Limitations on Use of Elective Credit—No more than nine credits in physical education may be applied toward a degree.

A maximum of nine credits in music may be applied as elective credits toward a degree, with not more than six of these in Mus 1430 or in Concert Band.

Quality Credits—The number of free elective credits required for graduation may be decreased by one for every five grade points in excess of those required to reach a grade point average of 3.00. Free electives are those you may choose without regard to curricular or all-college requirements. No more than one-twelfth of the total number of credits required for graduation may be gained through excess grade points.

Mathematics Placement—Initial registration for courses in mathematics is based on courses taken in high school, the quality of this work, and the results on the mathematics sections of the American College Testing Program (ACT) Examination and the Preliminary Scholastic Aptitude Test (PSAT). A refresher course at extra cost is required of students

Registration and Class Attendance

whose background in elementary and higher algebra is insufficient for them to take advanced courses.

In those programs requiring trigonometry, students with acceptable performance in high school trigonometry need not take Math 1008, Trigonometry, at the college level.

Junior-Senior Advising Procedure—Eligible junior and senior students in the forest products curriculum may sign their own registration materials. To be eligible, students must be in the upper division (completed 90 credits and freshman communication, and have a 2.00 GPA). Forest resources, forest science, and recreation resource management students, *regardless of class standing*, must have their advisers sign their registration materials.

Auditors—The approval of your adviser and the instructor is necessary if you wish to register for a course as an auditor. An auditor must enroll officially in a course and must pay the same fees charged for regular membership in the class, but does not take the examinations and does not earn a grade or credit for the course.

Changes in Registration—To change your registration you must obtain a change of registration form from the Office of Student Services, 10 Green Hall. Changes should be made only when necessary or highly desirable and should be made as early in a quarter as possible.

During the first six weeks of a quarter you may cancel a course without grade with only your adviser's approval. After the sixth calendar week you must have the approval of your adviser, the instructor, and your departmental Student Scholastic Standing Committee. However, withdrawal from a course after the sixth week is strongly discouraged unless extenuating circumstances exist. If you are doing passing work at the time, you may be permitted to cancel a course after the sixth week with a W (withdrawal) on your grade report, or without grade; if you are doing failing work an N (no credit) will be recorded.

During the first three days of the quarter you may add a course with the approval of your adviser only. After the first three days you must have the approval of your adviser and the instructor.

Cancellation of Entire Registration—If you leave college before the end of the quarter, you should cancel your registration at the time you discontinue attending classes. Cancellation within the first six weeks entitles you to a refund prorated according to the amount of time you attended classes. If you do not attend classes at all, you are entitled to a full refund.

Credit by Special Examination—If you wish to secure full credit for a course for which you have adequate training and preparation, you may apply for permission to take a special examination. Such examinations may be taken during the first quarter in residence without fee; after that time a fee of \$20 is required for each test attempted. Special examinations in which a grade of C or better is earned are recorded with credit and grade as part of the student's college record.

Extra Credit and Independent Study Registration—Often students prefer to study some courses on their own rather than through the usual means of class participation and directed instruction. Opportunity to study in this way has long been available to College of Forestry students through the credit by examination procedure (or by other methods of evaluation) in almost any course in the college. Students may study material in whatever way they wish.

Extra Credit Registration—Students may register for one to three extra credits in conjunction with a course they are taking with approval of their instructor. Students work independently, meeting such evaluative standards as the instructor sets. Extra credit registration provides the opportunity for more intensive study of a topic. Such registrations

General Academic Requirements

should not be used when the department offers a regular course that has the same objective. The usual regulations concerning fees, grades, and cancellations apply to extra credit registration.

Students should bring an Extra Credit Special Permission Slip, approved by their instructor, to the Office of Admissions and Records, 130 Coffey Hall. The registration card should show the course number followed by a capital X (example: ForP 1301X). Such registrations are not reserved.

Independent Study Registration—Under independent study students may take a course without attending class.

Registration for independent study work counts as part of the regular credit load, and regular fees are charged. Students must take the final examination at the regular time (or at a time directed by the instructor) and must meet prescribed deadlines for any other work required. The usual regulations about grades, incompletes, and cancellations apply.

Permission to register for independent study must be obtained from the instructor. Students should bring an Independent Study Special Permission Slip to the Office of Admissions and Records, 130 Coffey Hall, so that their registration can be checked. The registration card should show the course number followed by a capital Y (example: ForP 1301Y).

Repeating Courses—College of Forestry students may repeat courses in which they have received passing grades. Students who have grade point deficiencies may find repeating courses in which they received a D grade advantageous because the grade and credit received upon completion of a course the second time become the permanent record for the course and the grade and credit for the previous experience are not calculated into the overall grade point average.

Class Attendance—On the Twin Cities campus/St. Paul, attendance is compulsory for certain classes (depending upon the instructor) because of the nature of such classes. If you cannot attend class for good reasons beyond your control, you may request the instructor's assistance in making up the classwork you miss. The instructor is under no obligation, however, to give assistance if you willfully or deliberately miss class, although there are situations in which the instructor may properly wish to do so.

The following reasons will be accepted by instructors to justify absence from class and a request for assistance in making up work: (a) illness certified by the Boynton Health Service or by the family physician; (b) emergencies caused by a death or serious illness in the immediate family; (c) absences approved by the departmental Student Scholastic Standing Committee; and (d) participation in University-approved, cocurricular activities (certification that a student was absent from class because of such participation is made by the Office of Student Affairs).

If you wish to make up work, you should confer directly with the instructor about the reasons for your absence and the possibility and ways of making up the classwork. The departmental Student Scholastic Standing Committee will enter into the situation only when special emergencies (items b and c above) are involved and as an appeal agency.

Grading Systems

Academic progress in the College of Forestry may be evaluated by one of two grading systems, the letter grade (A-N) system or the satisfactory-no credit (S-N) system. Required courses must be taken under the A-N system. Nonrequired courses, unless specifically prohibited, may be taken under the A-N or S-N system.

Grades

- A—Achievement that is outstanding relative to the level necessary to meet course requirements.
- B—Achievement significantly above the level necessary to meet course requirements.
- C—Achievement that meets the basic course requirements in every respect.
- D—Achievement worthy of credit even though it does not fully meet the basic course requirements in every respect.
- S—Achievement satisfactory to the instructor, for the program in which the student is registered. This definition is intended to imply that the standards for S may vary from one program to another.
- N—Assigned when the student does not earn an S or a D or higher and is not assigned an I. It stands for no credit.

Supplementary Symbols

- V—Registration as an auditor or visitor, a noncredit, nongraded registration.
- T—Indicates credits transferred from another institution or from one college or campus to another within the University. The symbol appears immediately preceding the transferred grade on the transcript.
- W—Indicates official cancellation from a course without grade. This is assigned in all cases of official cancellation during the first six weeks of classes, irrespective of the student's standing. After six weeks, a W is posted only if the student is passing at the time of cancellation. The student's adviser and departmental Student Scholastic Standing Committee determine whether or not cancellation is permitted.
- I—Indicates an incomplete. It is assigned when, in the instructor's opinion, there is a reasonable expectation that the student can complete successfully the work of the course. An I that is not made up by the end of the student's next quarter in residence becomes an N; instructors may set dates within the quarter for makeup examinations. When an I is changed to a grade, the I is removed from the record.
- X—Reported in a continuation course for which a grade cannot be determined until the full sequence of quarters is completed. The instructor submits a grade for each X when the student has completed the sequence.

S-N System

The S-N system is designed to reduce to some extent the pressure associated with the traditional grading system and to encourage students to seek greater breadth in the educational experience.

Under the S-N system the grade S stands for "satisfactory" and N for "no credit." S represents achievement that is satisfactory to the instructor for the program in which the student is registered. This definition is intended to imply that the standards for S may vary from one program to another. The instructor is obligated to define to a class in its early meetings, as explicitly as possible, the performance that will be necessary to earn the S. The symbol N is assigned when the student does not earn an S.

The following principles have been adopted as a guide for use of the S-N grading system by College of Forestry students:

1. All courses available to undergraduate students (those numbered under 8000) are available on the S-N and the A-N basis except where specifically restricted by the department offering the course (consult course listings in this bulletin).

General Academic Requirements

2. A baccalaureate candidate from the college may present a maximum of 25 percent of the residence credits offered for the degree in courses in which he or she received a grade of S.
3. Required courses must be taken under the A-N system. Prerequisites for required courses and courses in the major must also be taken under the A-N system, unless exceptions are made.

A student's adviser or the Office of Student Services, 10 Green Hall, will answer questions about use of the S-N system.

Choice of Grading System—Choice of grading system for each course is made at the time of registration by entering the credits under the appropriate heading on the registration card. Subsequent changes from one option to another require a regular cancel-add form and may be made only through the second week of classes.

Instructors' Definition of Standards—Instructors may set different requirements and methods of appraisal for the different grading options. The circumstances under which incompletes may be assigned are also at the option of the instructor.

In connection with all achievement symbols, but especially in connection with S, Twin Cities Campus Assembly legislation directs that instructors define to a class in its early meetings, as explicitly as possible, the performance that will be necessary to earn each grade.

You should ask for this information if it is not given.

Access to Student Educational Records

In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, telephone number, dates of attendance, college and class, major, adviser, and degrees earned—is considered public or directory information. To prevent release of such information outside the University while in attendance at the University, a student must notify the records office on his or her campus.

Students are notified annually of their right to review their educational records. The regents' policy, including a directory of student records, is available for review at the information booth in Williamson Hall, Twin Cities campus/Minneapolis, and at the records offices on other campuses of the University. Questions may be directed to the Office of the Coordinator of Student Support Services, 260E Williamson Hall, (612) 373-2106.

Academic Requirements

Student Scholastic Standing Committees

A forestry student on occasion may find it necessary to make use of a departmental Student Scholastic Standing Committee of the college. This is a faculty committee that interprets and enforces faculty regulations. It also may make exceptions to regulations when they work to the educational advantage of a particular student, provided the basic spirit of the regulations is maintained. If you have any questions concerning the interpretation of faculty regulations, you should consult with your adviser or inquire at the Office of Student Services. By means of a petition (forms are available in the Office of Student Services), you may request a departure from normal procedure when such action appears to be justified. These requests, after they have been approved by your adviser, must be

returned to the Office of Student Services, 10 Green Hall, which then routes it to your departmental Student Scholastic Standing Committee for approval.

Satisfactory Progress

Students in the College of Forestry are expected to meet certain minimum academic standards. Students not meeting these standards are subject to probation and suspension actions by their departmental Student Scholastic Standing Committees. The following chart details conditions under which these actions will be taken.

CONDITIONS FOR PROBATION AND SUSPENSION

Student Classification	Probation	Suspension
Freshman Sophomore Upper Division	Cumulative GPA is below 1.90 2.00 2.00	Cumulative GPA after first two quarters in college is below 1.60 1.90 1.90
	(or)	(or)
	Any combination of three D and N grades in any one quarter	Two consecutive quarters of probation
		(or)
		Any combination of four D and N grades in three consecutive quarters

A probation action puts a student on notice that repeated low academic performance will lead to a suspension. A suspension action lasts for two academic quarters, and reinstatement in the program requires a petition to the departmental Student Scholastic Standing Committee. Students placed on probation or suspension may appeal the action.

It is understood that a student may retake a course to remove either a D or an N grade.

The Itasca session for forest resources and forest science students is not counted as a separate quarter. Itasca grades are included with the fall quarter grades.

Students who are performing poorly academically should contact their advisers as soon as possible to take corrective action. Probation and suspension actions are rarely waived.

To appeal a suspension or probation action, the student must submit a written statement to the chair of the departmental Student Scholastic Standing Committee explaining the reasons for the appeal and including any supporting documents. The final decision rests with the department head, who will explain the decision on the appeal in a letter to the student.

Classification of Students

Sophomore—If you are within 18 credits of the number usually earned in your curriculum for the first year and have completed three quarters of college work, you are classified as a sophomore. The three quarters may include time spent at another collegiate institution. A sophomore who lacks no more than 12 credits from the total required for junior classification and who has a B average may be permitted to register for courses at the 5000

General Academic Requirements

level. Students who have not attained junior classification and who have lower than a C average are not permitted to register for courses numbered 5000 or above for which graduate credit is given.

Junior—You must have completed a total of 90 credits with a grade point average of at least 2.00 and the rhetoric communication requirement for junior classification.

Senior—To be classified as a senior, you must be no more than nine credits short of the number required for the first three years in your curriculum (refer to section III).

Transfer Students—If you transfer from a college outside the University and enter this college, you must have a grade point average of at least 2.00.

Council on Liberal Education (CLE) Requirements

In addition to the specific requirements for each curriculum, the University of Minnesota believes that all of its students, whatever their areas of specialization or vocational goals, should have a broad liberal education. A liberal education can help students improve their communication skills and knowledge; give them a better understanding of the ways in which scientists contribute to their knowledge of themselves and their environment; allow them a greater historical and philosophic perspective on the nature of their own lives and the world in which they live; and permit them to better appreciate the cultural benefits derived from the study of literature and the arts.

Rapid and dynamic changes and innovations are occurring in all professions. Only those persons with wide horizons and with sensitivity will be able to make the wise value judgments and adjustments required by these changes. The college believes that liberal education goals can be encouraged and pursued concurrently with the development of technical professional competence in the student's speciality.

To help students achieve the goals of liberal education, the College of Forestry expects all students to distribute a part of their course work in each of the four categories listed below.

I. Communication, Language, Symbolic Systems (26 credits)

- A. English and Foreign Language Communication Skills
- B. Linguistics, Logic, and Philosophic Analysis
- C. Mathematics

II. Physical and Biological Sciences (25 credits)

- A. The Physical Universe
- B. The Biological Universe

III. The Individual and Society (8 credits)

- A. Analysis of Human Behavior and Institutions
- B. Development of Civilization: Historical and Philosophical Studies

IV. Literary and Artistic Expression (8 credits)

- A. Literature
- B. The Arts

In category I, students will be expected to take a minimum of eight credits of freshman communication. Transfer students from other colleges with fewer than eight credits in freshman communication or the equivalent will be placed in Communication I or II, depending upon their needs as revealed by the diagnostic testing program.

No more than six credits in any one discipline (e.g., economics, psychology) may be counted toward the category III requirements.

Suggested Courses to Meet CLE Requirements

This is but a partial list of courses that may be used to fulfill distribution requirements. It is intended merely as a guide. If you are in doubt about the use of a specific course, call the Office of Student Services, 373-0842.

I. Communication, Language, Symbolic Systems—26 credits

- A. English and Foreign Language Communication Skills
Comm 1001-1002
Comp 1001-1002, 1027
Rhet 1101-1102, 1222, 1506, 3254, 3257, 3266, 3551, 3562
Spch 1101, 3605
- B. Linguistics, Logic, and Philosophic Analysis
Clas 1048, 3048
Ling 1001, 3001
Phil 1001-1002, 5201
- C. Mathematics
Math—all courses through 1511
Stat 1051, 3081, 3091, 5021

II. Physical and Biological Sciences—25 credits

- A. The Physical Universe
Ast 1011, 3051
BioC 1301-1302
Chem 1001-1002, 1004-1005, 1006
Geo 1001, 1002, 1111
NSci 1004, 1005, 1006
Phys 1031, 1032, 1035, 1036
Soil 1122, 1262
- B. The Biological Universe
Biol 1011, 1103, 1104, 1106
Bot 1009, 1012
EBB 3004
Ent 1005
GCB 3022
MicB 3102 or VB 3103
Phsl 1002
Zool 1013

III. The Individual and Society—8 credits

- A. Analysis of Human Behavior and Institutions
Afro 1025, 3055, 3061-3062, 3072, 3075-3076, 3091-3092, 3098, 5401
AgEc 1020, 1030
AmIn 3061, 5121
Anth 1002
Econ 1001-1002, 1004-1005, 3001-3002
FR 1201
FSoS 1001, 1025
Geog 1301, 1311, 1401
Jour 1003, 3021
Pol 1001, 1025, 1026, 1027, 1031, 1051
Psy 1001, 1004-1005, 3031
Rhet 3250, 5165

General Academic Requirements

Soc 1001, 1002, 3101
Spch 1103, 3401
SSci 1111, 3111, 3205, 3304, 3402, 3507, 3601, 3981

- B. Development of Civilization: Historical and Philosophical Studies
Afro 1015, 1025, 1036, 1441, 1442, 3081-3082
Amln 1101, 1102
Clas 1001, 1002, 1003, 1004, 1005, 1006, 1042, 3071, 3072, 3073
Foreign languages (civilization and culture)—Fren 3501-3502, Ital 3501-3502,
Span 3501-3502, Russ 3501-3502-3503
Hist—all courses through 1954
Indc 1504, 1506
Jour 5601
Phil 1002, 3001, 3002, 3003, 3004
Pol 1041

IV. Literary and Artistic Expression—8 credits

- A. Literature
AmSt 1101, 1102, 1103
Engl—all literature courses
Foreign languages—all literature courses
Hum—all courses
Rhet—all literature and humanities courses
- B. The Arts
Afro 1301, 3105, 3301
Amln 5211, 5212
Arch 1001, 1002, 1003
ArtH 1001, 1008, 1015, 1016, 3009, 3011
ArtS 1101, 1102, 1301, 1701, 1801
Dsgn 1501, 1521, 5505
Mus 1021—all courses above 1024
Th 1101, 1321, 1326, 1504

Rhetoric Communication Requirement—Before you graduate from the College of Forestry, you must demonstrate proficiency in public speaking and in written composition. Rhet 1222, Public Speaking, and Rhet 3551, Professional Writing, or Rhet 3562, Scientific and Technical Writing, must be taken by all students. Each course is offered for four credits. Most students register for Rhet 1222 as sophomores and complete Rhet 3551 or Rhet 3562 in their junior or senior years. Students with above average competence in communication skills may take exemption examinations for Rhet 3551 and Rhet 3562. These examinations are given once each quarter at a time specified by the Department of Rhetoric. A course in advanced composition taken at another college cannot be used to satisfy the Rhet 3551 or Rhet 3562 requirement.

Reserve Officers' Training Corps—The ROTC—through the Army, Navy, Marines, and Air Force services—gives college students an opportunity to combine military or naval training with their academic work. Students are eligible for ROTC enrollment if they are registered in academic programs leading toward degrees, are United States citizens, and meet certain physical and other qualifications. The general requirements of the ROTC programs and their special characteristics are described in the *Army-Navy-Air Force ROTC Bulletin*. You may make inquiries personally or by letter at the following offices in the University Armory: Military Science, room 108; Naval Science, room 203; Aerospace Studies, room 3.

Use in the Graduate School of Credits Earned While an Undergraduate

Credits for advanced courses completed while you are an undergraduate, when in excess of those required for the baccalaureate degree, can be transferred to the Graduate School under the following conditions:

If you lack no more than nine credits of undergraduate work, taking into account required and sequence courses, you may carry a limited amount of graduate course work (approved courses numbered 5000 or above) for graduate credit, with the prohibition that such courses may not be applied toward an undergraduate degree. The conditions as stated apply to the beginning of the quarter in which you are taking the courses for graduate credit. In order to hold these credits available for use at the graduate level, you must submit a petition to your departmental Student Scholastic Standing Committee at the time of registration for the last quarter, requesting that these specified credits be withheld from your undergraduate transcript. Transfer of credit must be arranged by petition to the Graduate School.

If you lack no more than nine credits from the total required for graduation, you may register in the Graduate School.





III. PROGRAMS AND CURRICULA

UNDERGRADUATE PROGRAMS IN FORESTRY

Forestry courses were offered by the University of Minnesota as early as 1886, but professional work leading to the bachelor of science degree was not offered until 1903, when the College of Forestry was established. Since that time more than 3,600 foresters have earned undergraduate and graduate degrees.

The bachelor of science degree is granted upon completion of 192 credits of required and elective courses in the following curricula or majors:

1. Forest Resources Curriculum

with elective cores in . . .

- Ecosystems and Silviculture
- Forest Management
- Management and Administration
- Measurement and Information Systems
- Urban Forestry
- Wood Utilization

2. Forest Science Curriculum

with specializations in . . .

- Natural Science
- Social and Managerial Sciences

3. Forest Products Curriculum

with specializations in . . .

- Marketing
- Production Management
- Pulp and Paper
- Residential Housing
- Wood Science and Technology

4. Recreation Resource Management

The College of Forestry is fully accredited by the Society of American Foresters, the national accrediting agency for U.S. forestry schools.

Facilities

The College of Forestry's facilities for training in the fields of forest resources and forest products are located in St. Paul. They consist of two modern buildings, Green Hall and the Kaufert Laboratory of Forest Products and Wood Science. The college draws on many Twin Cities campus departments for instruction in courses basic to the training of foresters, forest products specialists, and recreation resource managers. Located next to Green Hall and the Kaufert Laboratory is the regional headquarters building of the North Central Forest Experiment Station of the U.S. Forest Service.

The following field laboratories are also available for use:

The *John H. Allison Forest* of more than 300 acres, located within 10 miles of the Twin Cities campus/St. Paul, is available for field laboratory work.

The *Lake Itasca Forestry and Biological Station* is located at Lake Itasca, the source of the Mississippi River in Itasca State Park. It provides varied field laboratory experiences for

Programs and Curricula

forest resources and forest science majors. Here, during a 3½-week summer term starting the last week in August, students have an opportunity to study forest botany, forest ecology, and field measurements on a 30,000-acre tract of virgin and second-growth forest, including practically all forest types found in Minnesota. Good housing, a dining hall, and laboratory facilities are available at the station.

The *Cloquet Forestry Center* is located near the forest products manufacturing center of Cloquet in northeastern Minnesota. This center, comprising a tract of more than 3,700 acres of virgin and second-growth timber, serves as a site for undergraduate, graduate, and continuing education. Forest resources and forest science (natural science specialization) students complete 18 credits of field-oriented instruction during fall or spring quarter of their senior year. Emphasis is placed on application of concepts and knowledge acquired in previous course work to contemporary forestry management decisions and systems. Instruction in forest resource inventory and analysis, silviculture, engineering and harvesting, soil site productivity, and wildlife management is provided. Students visit local industries and interact with nearby state and federal forestry agency personnel. The center has housing, dining hall, classroom, laboratory, and library facilities.

For students interested in work in the forest products industries or in public research organizations, the *Kaufert Laboratory of Forest Products and Wood Science* has available many well-equipped laboratories in such areas as paper and fiber products, particleboard, wood chemistry, mechanical testing, biodeterioration, drying, and wood preservation. Local millwork and furniture plants, pulp and paper mills, building products marketing and sales groups, and wood preservation companies provide added opportunities for training in the major areas of utilization of wood fiber.

Work of Foresters

The work of foresters is diverse. Forest resources graduates are concerned primarily with the scientific management of the forest, wildlife, recreation, range, and water resources on approximately one-third of the land area of the United States that is classified as forest land. Forest science majors are particularly well qualified for graduate study in preparation for research careers with industrial, governmental, or educational organizations or for technical and professional teaching careers at the college level. Graduates trained in the several specialized utilization fields of the forest products curriculum—marketing, production management, pulp and paper, residential housing, and wood science and technology—may find employment in the development, production, and marketing of forest products.

Brochures describing employment opportunities for graduates of College of Forestry curricula are available in the Career Opportunities Coordinator's Office, 8F Green Hall.

General Information

The first two years of work in all forestry curricula are devoted primarily to basic courses such as physics, chemistry, biology, mathematics, rhetoric, economics, computer science, statistics, and public speaking. Students also take elective courses as well as courses to satisfy category III (The Individual and Society) and category IV (Literary and Artistic Expression) of the Council on Liberal Education (CLE) requirements (see page 16). The growing complexity of the duties performed by foresters in the management of natural resources, which affect practically every phase of our society, demands that they have knowledge and training in the humanities and social sciences. This need is met through the CLE requirements. Because the first year of basic work is somewhat similar in all curricula, students may transfer between curricula at the completion of their freshman year with little loss of credit.

The 3½-week summer term at the Lake Itasca Forestry and Biological Station at Itasca State Park is required of all forest resources and forest science majors, including transfer students. This requirement must be completed just prior to the junior year.

Forest resources and forest science (natural science specialization) students spend the fall or spring quarter of their senior year at the Cloquet Forestry Center.

Students registered in preforestry curricula at state universities, state community colleges, and private colleges should complete courses equivalent to the basic requirements included in the College of Forestry curricula if they are to receive full credit for transfer of work completed. In addition, students registered in preforestry curricula should plan to transfer by the end of their second year if they expect to complete the professional course requirements of the College of Forestry in two years.

Students are encouraged to obtain practical work experience in forestry or forest products industries during summer vacations. Although work experience is not required for graduation, such experience is an excellent recommendation when seeking employment. The College of Forestry assists students in obtaining summer employment with federal agencies such as the U.S. Forest Service, various state agencies, and private companies. The college operates a career opportunities program for graduates of its several curricula.

Curricula and Requirements

The bachelor of science degree is offered upon completion of four years of satisfactory work in the following curricula:

Forest Resources—This curriculum is designed to prepare students for professional management of forest lands. Forests occupy approximately one-third of the land area of the United States and provide wood fiber, wildlife, recreation, water, and grazing for the use and enjoyment of its citizens. Forest resources majors must select one of six elective cores: ecosystems and silviculture, forest management, management and administration, measurement and information systems, urban forestry, and wood utilization. These elective cores provide students with an opportunity to strengthen their understanding of forestry in a specific area of interest, i.e., quantitative analysis, biology, administration and management, or a variety of forest uses. Further information about the elective cores is available in the Office of Student Services, 10 Green Hall.

Forest Science—This curriculum provides an opportunity for preparation for graduate training directed toward research with a public or private organization, an academic position with a college or university, or other positions requiring advanced professional training. Forest science students may elect either a natural science or social and managerial sciences specialization.

Forest Products—This curriculum is designed to prepare students for a broad range of careers in the forest products industries. Forest products students may select a specialized program in marketing, production management, pulp and paper, residential housing, or wood science and technology.

Recreation Resource Management—This curriculum is designed to train recreation specialists for the broad area of recreation resource planning and management involving land and water areas in the expanding county, regional, state, and federal recreation programs. Students who complete this program may elect graduate study in more specialized training areas.

A detailed listing of requirements for these four curricula is found on the following pages.

Fees for Field Training Sessions¹

The following fees and expenses are charged for the field training sessions at Cloquet and Itasca. These fees are subject to change.

Cloquet Session (fall or spring quarter):

Tuition

Minnesota residents and those from states with reciprocity agreements	\$320.00
Nonresidents	880.00
Health fee	31.65

In addition, a nominal fee is charged to each student for use of the dormitories.

Itasca Forestry Session (to be completed between the sophomore and junior year; starts in August and runs for 3½ weeks):

Tuition

Minnesota residents and those from states with reciprocity agreements	\$109.50
Nonresidents	109.50
Students Services Fee	11.90

In addition, a nominal fee is charged to each student for cabin rental. The Forestry Student Cooperative also pays 5 percent of its gross commissary operating expenses for use of dining hall facilities, breakage, and other miscellaneous items.

Curricula in Forestry

Forest Resources

This curriculum provides a sequence of courses designed to prepare individuals for the scientific management of forest lands. Majors in this curriculum must elect one of six elective cores: ecosystems and silviculture, forest management, management and administration, measurement and information systems, urban forestry, or wood utilization. Courses included in the elective cores allow the student to gain additional knowledge and proficiency in a specialized area of study.

Preforestry Core

FRESHMAN YEAR

- Biol 1011—General Biology (5)
- Biol 1103—General Botany (5)
- Chem 1004—General Principles of Chemistry (5)
- Chem 1005—General Principles of Chemistry (5)
- Geo 1001—Physical Geology (5)
- Math 1111—College Algebra and Analytical Geometry (5)
(or) Math 1201—Pre-Calculus (5)
- Math 1142—Introduction to Calculus (5)
(or) Math 1211—Analysis I (5)

¹The fees stated below were charged for the 1979 sessions. Final determination of fees for the 1980 sessions had not been made at the time this bulletin was printed.

Phys 1031—Introductory Physics: Measurement and Applications (4)
Phys 1035—Introductory Physics Laboratory (1)
Rhet 1101—Communication I (4) (or pass English proficiency examination)
Rhet 1102—Communication II (4) (or pass English proficiency examination)
Students with a grade of C or better in high school mechanical drawing are exempt from
AgEn 1010, Technical Drawing; others must take AgEn 1010.
Students with a grade of C or better in high school trigonometry are exempt from Math
1008, Trigonometry; others must take Math 1008.
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (48)

SOPHOMORE YEAR

AgEc 1020—Principles of Macroeconomics (5)
AgEc 1030—Principles of Microeconomics (4)
AgEn 1030—Introduction to Computer Programming (3)
ForP 1301—Wood as a Raw Material (4)
Rhet 1222—Public Speaking (4)
Soc 1001—Introduction to Sociology (4)
(or) Psy 1001—General Psychology (5)
(or) Anth 1102—Introduction to Social and Cultural Anthropology (5)
(or) Geog 1301—Human Geography (5)
Stat 3081—Experimental Techniques and Statistical Inference (5)
FR 1100, Dendrology, and AgEn 1400, Surveying, should be taken in the sophomore year if
recommended by the adviser.
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (30)

ITASCA FORESTRY SESSION

The Lake Itasca Forestry and Biological Station summer term for foresters (3½ weeks)
is required of all forest resources and forest science majors. The term must be completed
between the sophomore and junior years. To attend, a student must have completed 80
credits, including all required lower division courses (see page 9), and must have a
minimum grade point average of 2.00.

FR 3100—Important Forest Plants (2)
FR 3101—Field Forest Ecology (3)
FR 3201—Field Forest Measurements (1)
Total Required Credits (6)

Professional Core

JUNIOR YEAR

AgEn 1400—Surveying (3)
FR 1100—Dendrology (4)
FR 3220—Beginning Forest Soils (2)
FR 5100—Silviculture (3)
FR 5114—Forest Hydrology (3)
FR 5200—Aerial Photo Interpretation (3)
FR 5212—Natural Resources Inventory (3)
FR 5222—Forest Policy and Economics (5)
FR 5223—Timber Management Planning (3)
FR 5232—Management of Recreational Lands (3)
FR 5240—Meteorology and Forest Fire Management (4)

Programs and Curricula

FW 3052—Principles of Fisheries and Wildlife Biology (4)

Electives and CLE requirements to fulfill the overall requirements for graduation.

Total Required Credits (40)

CLOQUET FORESTRY SESSION

Students in the forest resources curriculum are required to attend the fall or spring (senior year) Cloquet Forestry Session. To attend, students must meet the following requirements:

1. Achieve a minimum grade point average of 2.00 at the end of the quarter preceding the Cloquet session.
2. Have no more than five credits of D grades in required forestry courses.
3. Complete the Itasca Forestry Session and AgEn 1400, FR 1100, 3220, 5100, 5114, 5200, 5212, 5222, 5223, 5232, 5240, and FW 3052.
4. Submit a certificate of physical fitness (obtained from the Boynton Health Service) prior to the end of the quarter before you plan to attend the Cloquet session. This certificate must be turned in at the Office of Admissions and Records when you register.

FR 5101—Field Silviculture (3)

FR 5126—Field Forest Soils (1)

FR 5220—Remote Sensing, Forest Resources Inventory (3)

FR 5225—Forest Resources Analysis (7)

FR 5248—Harvesting and Engineering (3)

FW 3167—Techniques of Forest Wildlife Management (1)

Total Required Credits (18)

SENIOR YEAR

Rhet 3562—Scientific and Technical Writing (4)

Electives and CLE requirements to fulfill the overall requirements for graduation.

Total Required Credits (4)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (146 credits), credits to satisfy CLE requirements, plus electives sufficient to total 192 credits must be completed for the bachelor of science degree. Twenty to 27 elective credits are required, as a minimum, to complete requirements for the degree. Majors in the forest resources curriculum must use their elective credits to complete an elective core.

Elective Cores

Ecosystems and Silviculture

This elective core is designed for students interested in the biological and physical aspects of forest ecosystems, which are important to forest land use and management decisions. Focus is on subjects such as silvics, silviculture, water quality, soil-site relationships, and forest land use potentials.

REQUIRED COURSES

Ent 5050—Forest Entomology (4)

FR 5105—Intensive Silviculture (3)

PIPa 5050—Forest Pathology (4)
Soil 5710—Advanced Forest Soils (3)

ELECTIVE COURSES

Bot 3131—Survey of Plant Physiology (4)
EBB 3004—Fundamentals of Ecology (4)
EBB 5014—Ecology of Plant Communities (5)
FR 3104—Forest Ecology (3)
FR 3114—Forest and Shade Tree Biology (3)
FR 3115—Forest and Shade Tree Biology (1)
FR 5102—Regional Silviculture (3)
FR 5150—Forest Ecology Seminar (3)
FR 5151—Multiple-Use Silviculture (3)
Total Required Credits (22)

Forest Management

This elective core is designed for students interested in the wide range of forest uses and opportunities for and techniques of coordinating these uses. Focus is on subjects such as water, timber, forage, wildlife, and recreation.

REQUIRED COURSES

Ent 5050—Forest Entomology (4)
FR 5231—Range Management (3)
PIPa 5050—Forest Pathology (4)
Soil 5710—Advanced Forest Soils (3)

ELECTIVE COURSES

ForP 5306—Manufacturing Processes (3)
FR 5102—Regional Silviculture (3)
FR 5105—Intensive Silviculture (3)
FR 5153—Advanced Forest Hydrology (4)
FR 5233—Principles of Outdoor Recreation Design and Planning (4)
FR 5261—Advanced Forest Policy and Economics (3)
FR 5262—Remote Sensing of Natural Resources (4)
FR 5264—Quantitative Techniques in Forest Management (3)
Total Required Credits (20)

Management and Administration

This elective core is designed for students interested in the administration of public or private organizations charged with the management of forest lands. Focus is on subjects such as economics, sociology, policy, political science, law, and administration.

REQUIRED COURSES

FR 5260—Forest Administration (3)
FR 5261—Advanced Forest Policy and Economics (3)
FR 5264—Quantitative Techniques in Forest Management (3)

ELECTIVE COURSES

AgEc 5600—Land Economics (4)
Ent 5050—Forest Entomology (4)
FR 5257—Recreation Land Policy (3)
Mgmt 3001—Fundamentals of Management (4)
PIPa 5050—Forest Pathology (4)
Total Required Credits (20)

Measurement and Information Systems

This elective core is designed for the mathematically skilled student who is interested in the measurement and information systems that support forest land use and management decisions. Focus is on subjects such as biometrics, sampling, mensuration, remote sensing, computer sciences, and management information systems.

REQUIRED COURSES

FR 5253—Forest Biometry (3)
FR 5264—Quantitative Techniques in Forest Management (3)
Stat 5021—Statistical Analysis I (5)
Stat 5022—Statistical Analysis II (5)

ELECTIVE COURSES

CE 5104—Photogrammetry (4)
CSci 5101—Structure and Programming of Software Systems I (4)
FR 5262—Remote Sensing of Natural Resources (4)
Math 1221—Analysis II (5)
Stat 5301—Designing Experiments (4)
Total Required Credits (21)

Urban Forestry

This elective core is designed for students interested in an urban forestry career. Courses focus on major problems encountered in the practice of urban forestry. Upon completion of this core, the student can seek employment in either urban forestry or professional forestry. If a student chooses a career in professional forestry, this core will have strengthened his or her background in entomology, pathology, tree physiology, and political science.

REQUIRED COURSES

Ent 5050—Forest Entomology (4)
FR 3114—Forest and Shade Tree Biology (3)
FR 3115—Forest and Shade Tree Biology (1)
Hort 3076—Arboriculture (3)
Mgmt 3001—Management Fundamentals (4)
PIPa 5050—Forest Pathology (4)

ELECTIVE COURSES

FR 5233—Principles of Outdoor Recreation Design and Planning (4)
Hort 1021—Plant Materials (4)
(or) Hort 5021—Ornamental Plant Materials (5)

LA 1024—Landscape Theory (4)
LA 1031—Introduction to Landscape Architecture (4)
PA 5502—Local Administration (4)
Pol 5315—State Government and Politics (4)
Pol 5327—Local Government and Politics (4)
Pol 5328—Metropolitan Government and Politics (4)
Total Required Credits (27)

Wood Utilization

This elective core is designed for students who wish to gain a more complete understanding of forest products and to work in close association with the forest products industries. The core stresses technical and marketing aspects of the utilization of wood.

REQUIRED COURSES

ForP 3303—Forest Products Marketing (3)
ForP 5300—Wood-Fluid Relationships (3)
ForP 5304—Wood Drying and Preservation Processes (4)
ForP 5306—Manufacturing Processes (3)
PIPa 5050—Forest Pathology (4)

ELECTIVE COURSES

ForP 1303—Wood Structure and Identification (2)
ForP 3310—Housing Systems (4)
ForP 5301—Mechanical Properties (3)
ForP 5303—Wood Deterioration (3)
ForP 5305—Pulp and Paper Technology (3)
ForP 5356—Advanced Forest Products Marketing (3)
FR 5260—Forest Administration (3)
FR 5261—Advanced Forest Policy and Economics (3)
FR 5264—Quantitative Techniques in Forest Management (3)
Total Required Credits (22)

TOTAL GRADUATION REQUIREMENTS INCLUDING ELECTIVE CORES

Required courses listed above (166-173 credits), additional credits to satisfy the CLE requirements, plus electives sufficient to total 192 credits must be completed for the degree.

Forest Science

This curriculum is designed for students intending to pursue graduate work. Typical career objectives of students are research or teaching, although the curriculum also offers preparation for students who want to enter the field of forest management. Students pursuing this curriculum may not be prepared for or qualified for some professional positions.

At the end of the freshman year, the student must select one of two specializations, natural science or social and managerial sciences. The natural science specialization is intended for students interested in the biological and earth science aspects of forestry, such as genetics, ecology, and hydrology. The social and managerial sciences specialization is intended for students who wish to emphasize the social, economic, measurement, or managerial aspects of forestry.

Programs and Curricula

Only students with a demonstrated potential for academic excellence should consider enrolling in the forest science curriculum. Entering freshmen should have graduated in the top one-quarter of their high school class. To enter the curriculum in the junior year, students must have a grade point average of 3.00 in all required courses.

The curriculum encourages individuality in course selection and includes the opportunity for completion of a senior research topic. An adviser will work to help each student plan the learning experience and select elective courses that are appropriate.

Natural Science Specialization

FRESHMAN YEAR

Biol 1011—General Biology (5)
Biol 1103—General Botany (5)
Chem 1004—General Principles of Chemistry (5)
Chem 1005—General Principles of Chemistry (5)
Geo 1001—Physical Geology (5)
Math 1211—Analysis I (5)
Math 1221—Analysis II (5)
Math 1231—Analysis III (5)
Rhet 1101—Communication I (4) (or pass English proficiency examination)
Rhet 1102—Communication II (4) (or pass English proficiency examination)
Students with a grade of C or better in high school trigonometry are exempt from Math 1008, Trigonometry; others must take Math 1008.
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (48)

SOPHOMORE YEAR

AgEc 1020—Principles of Macroeconomics (5)
Chem 3301—Elementary Organic Chemistry I (4)
Chem 3302—Elementary Organic Chemistry II (4)
Chem 3305—Elementary Organic Chemistry Lab I (2)
Chem 3306—Elementary Organic Chemistry Lab II (2)
CSci 3101—A FORTRAN Introduction to Computer Programming (4)
ForP 1301—Wood as a Raw Material (4)
Phys 1031—Introductory Physics: Measurement and Applications (4)
Phys 1032—Introductory Physics: Measurement and Applications (4)
Phys 1035—Introductory Physics Laboratory (1)
Phys 1036—Introductory Physics Laboratory (1)
Rhet 1222—Public Speaking (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (39)

ITASCA FORESTRY SESSION

The Lake Itasca Forestry and Biological Station summer term for foresters (3½ weeks) is required of all forest resources and forest science majors. This term must be completed between the sophomore and junior years. To attend, a student must have completed 80 credits, including all required lower division courses (see page 9), and must have a minimum grade point average of 3.00.

FR 3100—Important Forest Plants (2)
FR 3101—Field Forest Ecology (3)

FR 3201—Field Forest Measurements (1)

Total Required Credits (6)

JUNIOR YEAR

FR 1100—Dendrology (4)

FR 3220—Beginning Forest Soils (2)

FR 5100—Silviculture (3)

FR 5114—Forest Hydrology (3)

FR 5200—Aerial Photo Interpretation (3)

FR 5212—Natural Resources Inventory (3)

FR 5222—Forest Policy and Economics (5)

FR 5223—Timber Management Planning (3)

Rhet 3562—Scientific and Technical Writing (4)

Stat 5021—Statistical Analysis I (5)

Electives and CLE requirements to fulfill the overall requirements for graduation.

Total Required Credits (35)

SENIOR YEAR

Select three of the following five courses

Ent 5050—Forest Entomology (4)

(or) PIPa 5050—Forest Pathology (4)

(or) FR 5240—Meteorology and Forest Fire Management (4)

(or) FW 3052—Principles of Fisheries and Wildlife Management (4)

(or) FR 5232—Management of Recreational Lands (3)

Select one course from two of the following three groups

1. FR 5401—Senior Topics (4)

2. PIPh 3131—Survey of Plant Physiology (4)

(or) FR 3114—Forest and Shade Tree Biology (3)

(and) FR 3115—Forest and Shade Tree Biology (1)

(or) GCB 3022—Genetics (4)

3. Soil 5232—Soil Physics (4)

(or) Soil 5520—Soil Development (3)

(or) Soil 5710—Advanced Forest Soils (3)

Electives and CLE requirements to fulfill the overall requirements for graduation.

Total Required Credits (18-20)

CLOQUET FORESTRY SESSION

Students enrolled in the natural science specialization of the forest science curriculum are required to attend the Cloquet Forestry Session. To attend, students must meet the following requirements:

1. Achieve a minimum grade point average of 2.00 at the end of the quarter preceding the Cloquet session.
2. Have no more than five credits of D grades in required forestry courses.
3. Complete the Itasca Forestry Session and FR 1100, 3220, 5100, 5114, 5200, 5212, 5222, and 5223.
4. Submit a certificate of physical fitness (obtained from the Boynton Health Service) prior to the end of the quarter before you plan to attend the Cloquet session. This certificate must be turned in at the Office of Admissions and Records when you register.

Programs and Curricula

- FR 5101—Field Silviculture (3)
- FR 5216—Field Forest Soils (1)
- FR 5220—Remote Sensing, Forest Resources Inventory (3)
- FR 5225—Forest Resources Analysis (7)
- FR 5248—Harvesting and Engineering (3)
- FW 3167—Techniques of Wildlife Management (1)
- Total Required Credits (18)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (164-166 credits), additional credits to satisfy the CLE requirements, plus electives sufficient to total 192 credits must be completed for the bachelor of science degree.

Social and Managerial Sciences Specialization

FRESHMAN YEAR

- Biol 1011—General Biology (5)
- Biol 1103—General Botany (5)
- Chem 1004—General Principles of Chemistry (5)
- Chem 1005—General Principles of Chemistry (5)
- Math 1211—Analysis I (5)
- Math 1221—Analysis II (5)
- Math 1231—Analysis III (5)
- Rhet 1101—Communication I (4) (or pass English proficiency examination)
- Rhet 1102—Communication II (4) (or pass English proficiency examination)
- Students with a grade of C or better in high school trigonometry are exempt from Math 1008, Trigonometry; others must take Math 1008.
- Electives and CLE requirements to fulfill the overall requirements for graduation.
- Total Required Credits (43)

SOPHOMORE YEAR

- AgEc 1020—Principles of Macroeconomics (5)
- AgEc 1030—Principles of Microeconomics (4)
- CSci 3101—A FORTRAN Introduction to Computer Programming (4)
- ForP 1301—Wood as a Raw Material (4)
- FR 1100—Dendrology (4)
- FW 3052—Principles of Fisheries and Wildlife Management (4)
- Phys 1031—Introductory Physics: Measurement and Applications (4)
- Phys 1035—Introductory Physics Laboratory (1)
(or) Math 3142—Introduction to Linear Algebra (4)
- Rhet 1222—Public Speaking (4)
- Electives and CLE requirements to fulfill the overall requirements for graduation.
- Total Required Credits (33 or 34)

ITASCA FORESTRY SESSION

The Lake Itasca Forestry and Biological Station summer term for foresters (3½ weeks) is required of all forest resources and forest science majors. This term must be completed between the sophomore and junior years. To attend, a student must have completed 80 credits, including all required lower division courses (see page 9), and must have a minimum grade point average of 3.00.

- FR 3100—Important Forest Plants (2)
- FR 3101—Field Forest Ecology (3)
- FR 3201—Field Forest Measurements (1)
- Total Required Credits (6)

JUNIOR YEAR

- FR 3220—Beginning Forest Soils (2)
- FR 5100—Silviculture (3)
- FR 5114—Forest Hydrology (3)
- FR 5200—Aerial Photo Interpretation (3)
- FR 5212—Natural Resources Inventory (3)
- FR 5223—Timber Management Planning (3)
- Stat 5021—Statistical Analysis I (5)
- Stat 5022—Statistical Analysis II (5)
- Stat 5302—Applied Regression Analysis (4)
(or) FR 5253—Forest Biometry (3)
- Electives and CLE requirements to fulfill the overall requirements for graduation.
- Total Required Credits (30 or 31)

SENIOR YEAR

- FR 5222—Forest Policy and Economics (5)
- FR 5232—Management of Recreational Lands (3)
- FR 5264—Quantitative Techniques in Forest Management (3)
- FR 5401—Senior Topics (4)
- PIPa 5050—Forest Pathology (4)
(or) Ent 5050—Forest Entomology (4)
- Rhet 3562—Scientific and Technical Writing (4)
- Electives and CLE requirements to fulfill the overall requirements for graduation.
- Total Required Credits (23)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (135-137 credits), additional credits to satisfy the CLE requirements, plus electives sufficient to total 192 credits must be completed for the bachelor of science degree.

Forest Products

This curriculum is designed for students interested in careers involving the manufacture, marketing, utilization, and research development of wood-based materials ranging from laminated timbers to paper. Courses emphasize the chemical, physical, and mechanical properties of wood and the newest technologies for converting this raw material to its many final forms. By selecting one of the five specializations, students direct their study toward the type of activity they wish to enter upon graduation—marketing, production management, pulp and paper, residential housing, or wood science and technology. The specializations are similar enough that students completing one specialization can seek employment in one of the other areas. Beyond its professional employment goals, the curriculum is intended to provide business or engineering oriented students with a sound background in the economic or engineering sciences critical to the future development of wood as a renewable resource.

Marketing Specialization

This specialization is designed for students interested in careers involving the sales, distribution, and market development of forest products. The technical emphasis is on the physical-mechanical nature of wood-based building materials including lumber, plywood, fiberboard, particleboard, and newer composite products. In addition, course work emphasizes marketing principles and analysis, management science, computer applications, and economics. Career opportunities in this field include purchasing and selling all types of forest products at the wholesale and retail levels, work in urban renewal programs, technical sales, product promotion, and specialized marketing research.

FRESHMAN YEAR

Acct 1050—Principles of Accounting I (4)

Acct 1051—Principles of Accounting II (4)

AgEn 3010—Architectural Drafting (4)

Biol 1011—General Biology (5)

Chem 1001—General Principles of Chemistry (5)

Chem 1002—General Principles of Chemistry (5)

Econ 1001—Principles of Macroeconomics (4)

Econ 1002—Principles of Microeconomics (4)

Rhet 1101—Communication I (4) (or pass English proficiency examination)

Rhet 1102—Communication II (4) (or pass English proficiency examination)

Students with a grade of B or better in high school trigonometry are exempt from Math 1008.

Trigonometry; others must take Math 1008.

Electives and CLE requirements to fulfill the overall requirements for graduation.

Total Required Credits (43)

SOPHOMORE YEAR

ForP 1301—Wood as a Raw Material (4)

ForP 1303—Wood Structure and Identification (2)

FR 1100—Dendrology (4)

Math 1142—Introduction to Calculus (5)

Mktg 3000—Principles of Marketing (4)

Phys 1121—Physics for Architects (4)

Phys 1122—Physics for Architects (4)

Phys 1123—Physics for Architects Lab (1)

Phys 1124—Physics for Architects Lab (1)

Psy 1001—General Psychology (5)
Rhet 1222—Public Speaking (4)
Stat 3091—Introduction to Probability and Statistics (4)
Total Required Credits (42)

JUNIOR YEAR

BLaw 3058—Introduction to Law, and the Law of Contracts and Agency (4)
ForP 3300—Wood Industry Tours (2)
ForP 3303—Forest Products Marketing (3)
ForP 5300—Wood-Fluid Relationships (3)
ForP 5301—Mechanical Properties (3)
ForP 5303—Wood Deterioration (3)
MIS 3099—Elementary FORTRAN (1)
MIS 5100—Introduction to Computers and Computer Data Processing (4)
Psy 5751—Psychology of Advertising (4)
QA 3055—Introduction to Management Sciences (4)
Rhet 3551—Professional Writing (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (35)

SENIOR YEAR

ForP 5304—Wood Drying and Preservation Processes (4)
ForP 5306—Manufacturing Processes (3)
ForP 5307—Wood-Base Panel Technology (4)
ForP 5331—Senior Seminar (1)
ForP 5355—Mechanics and Structural Design With Wood Products (4)
ForP 5356—Advanced Forest Products Marketing (3)
FR 5265—Forest Policy Issues (3)
Mktg 3010—Buyer Behavior and Marketing Analysis (4)
Mktg 3020—Marketing Operations Management (4)
QA 5000—Basic Methods of Management Science (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (34)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (154 credits), CLE requirements in category IV (8 credits), plus electives (30 credits) for a total of 192 credits required for graduation.

Production Management Specialization

This specialization is designed for students interested in pursuing a career in the production of forest products. Opportunities in this field include production management jobs associated with the manufacture of hardwood and softwood lumber, plywood, particle-board, and various secondary wood products.

FRESHMAN YEAR

AgEc 1020—Principles of Macroeconomics (5)
AgEc 1030—Principles of Microeconomics (4)
Biol 1011—General Biology (5)
Chem 1004—General Principles of Chemistry (5)

Programs and Curricula

Chem 1005—General Principles of Chemistry (5)
Math 1142—Introduction to Calculus (5)
Rhet 1101—Communication I (4) (or pass English proficiency examination)
Rhet 1102—Communication II (4) (or pass English proficiency examination)
Students with a grade of B or better in high school trigonometry are exempt from Math 1008, Trigonometry; others must take Math 1008.
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (37)

SOPHOMORE YEAR

ForP 1301—Wood as a Raw Material (4)
ForP 1303—Wood Structure and Identification (2)
FR 1100—Dendrology (4)
Phys 1121—Physics for Architects (4)
Phys 1122—Physics for Architects (4)
Phys 1123—Physics for Architects Lab (1)
Phys 1124—Physics for Architects Lab (1)
Psy 1001—General Psychology (5)
Rhet 1222—Public Speaking (4)
Stat 3091—Introduction to Probability and Statistics (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (33)

JUNIOR YEAR

CSci 3101—A FORTRAN Introduction to Computer Programming (4)
ForP 3300—Wood Industry Tours (2)
ForP 3303—Forest Products Marketing (3)
ForP 5300—Wood-Fluid Relationships (3)
ForP 5301—Mechanical Properties (3)
ForP 5303—Wood Deterioration (3)
ForP 5355—Mechanics and Structural Design with Wood Products (4)
FR 5265—Forest Policy Issues (3)
IEOR 5000—Introduction to Industrial Engineering Analysis (4)
IEOR 5030—Quality Control and Reliability (4)
IR 3007—Collective Bargaining Negotiations and Modern Labor Relations (4)
Rhet 3562—Scientific and Technical Writing (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (41)

SENIOR YEAR

ForP 5304—Wood Drying and Preservation Processes (4)
ForP 5305—Pulp and Paper Technology (4)
ForP 5306—Manufacturing Processes (3)
ForP 5307—Wood-Base Panel Technology (4)
ForP 5331—Senior Seminar (1)
IEOR 5010—Introduction to Work Analysis (4)
IEOR 5020—Engineering Cost Accounting Analysis and Control (4)
IEOR 5040—Introduction to Operations Research (4)
IEOR 5311—Management for Engineers (3)
IEOR 5351—Analysis of Production Processes (3)
IEOR 5361—Inventory and Production Control (4)

IR 3002—Industrial Relations Systems: Labor Markets and the Management of Human Resources (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (42)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (153 credits), CLE requirements in category IV (8 credits), plus electives (31 credits) for a total of 192 credits required for graduation.

Pulp and Paper Specialization

This specialization is intended primarily for students interested in pursuing a career in the pulp and paper industry. It provides in-depth training in mathematics, physics, chemistry, and the science and technology of wood and fiber products. In addition, a special group of pulp and paper and related engineering courses are included that deal with the technology of wood pulp production and the manufacture of paper and other fiber products.

FRESHMAN YEAR

Chem 1004—General Principles of Chemistry (5)
Chem 1005—General Principles of Chemistry (5)
Chem 1006—Principles of Solution Chemistry (4)
Econ 1001—Principles of Macroeconomics (4)
Math 1211—Analysis I (5)
Math 1221—Analysis II (5)
Math 1231—Analysis III (5)
Rhet 1101—Communication I (4) (or pass English proficiency examination)
Rhet 1102—Communication II (4) (or pass English proficiency examination)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (41)

SOPHOMORE YEAR

Chem 3301—Elementary Organic Chemistry (4)
Chem 3302—Elementary Organic Chemistry (4)
Chem 3305—Elementary Organic Chemistry Lab (2)
Chem 3306—Elementary Organic Chemistry Lab (2)
ForP 1301—Wood as a Raw Material (4)
ForP 1303—Wood Structure and Identification (2)
Math 3221—Introduction to Linear Algebra and Linear Differential Equations (5)
Phys 1271—General Physics (4)
Phys 1275—General Physics Lab (1)
Phys 1281—General Physics (4)
Phys 1285—General Physics Lab (1)
Phys 1291—General Physics (4)
Phys 1295—General Physics Lab (1)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (38)

JUNIOR YEAR

CE 3400—Fluid Mechanics (4)
CSci 3101—A FORTRAN Introduction to Computer Programming (4)
ForP 3300—Wood Industry Tours (2)

Programs and Curricula

ForP 5300—Wood-Fluid Relationships (3)
ForP 5301—Mechanical Properties (3)
ForP 5302—Wood Chemistry (3)
ForP 5305—Pulp and Paper Technology (4)
ForP 5310—Pulp and Paper Process Laboratory (3)
ME 3301—Thermodynamics (4)
Rhet 1222—Public Speaking (4)
Rhet 3562—Scientific and Technical Writing (4)
Stat 5021—Statistical Analysis I (5)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (43)

SENIOR YEAR

AgEn 5070—Automatic Control Instrumentation (4)
Chem 5520—Elementary Physical Chemistry (3)
ForP 5306—Manufacturing Processes (3)
ForP 5312—Pulp and Paper Process Calculations (4)
ForP 5313—Pulp and Paper Process Operations (5)
ForP 5315—Paper Engineering Laboratory (2)
ForP 5316—Coated Product Developments (2)
ForP 5331—Senior Seminar (1)
ForP 5359—Surface and Colloid Chemistry of Papermaking (3)
FR 5265—Forest Policy Issues (3)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (30)

SUGGESTED ELECTIVES

CE 3500—Introduction to Environmental Engineering Problems and Analysis (4)
CE 5500—Analysis and Design of Water Supply Systems (4)
CE 5501—Analysis and Design of Wastewater Systems (4)
Chem 5521—Elementary Physical Chemistry (3)
IEOR 5020—Engineering Cost Accounting Analysis and Control (4)
ME 3201—Mechanical Engineering Systems Analysis (4)
ME 3303—Applied Thermodynamics (4)
ME 3701—Basic Measurements Lab I (2)
ME 3702—Basic Measurements Lab II (2)
ME 5283—Industrial Instrumentation and Automatic Control (4)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (152 credits), CLE requirements for categories III and IV (12 credits), plus electives (28 credits) for a total of 192 credits required for graduation.

Residential Housing Specialization

This specialization is designed to prepare graduates for careers in the manufacture and merchandising of residential housing. It includes course work in forest products, architecture, mechanics, industrial engineering, and economics. Career opportunities are available in the light-frame construction industries specifically and forest products industries in general.

FRESHMAN YEAR

AgEc 1020—Principles of Macroeconomics (5)
AgEc 1030—Principles of Microeconomics (4)
AgEn 3010—Architectural Drafting (4)
Biol 1011—General Biology (5)
Chem 1004—General Principles of Chemistry (5)
Chem 1005—General Principles of Chemistry (5)
Math 1211—Analysis I (5)
Rhet 1101—Communication I (4) (or pass English proficiency examination)
Rhet 1102—Communication II (4) (or pass English proficiency examination)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (41)

SOPHOMORE YEAR

ForP 1301—Wood as a Raw Material (4)
ForP 1303—Wood Structure and Identification (2)
ForP 3310—Manufactured Housing Systems (4)
Math 1221—Analysis II (5)
Math 1231—Analysis III (5)
Mktg 3000—Principles of Marketing (4)
Phys 1121—Physics for Architects (4)
Phys 1122—Physics for Architects (4)
Phys 1123—Physics for Architects Lab (1)
Phys 1124—Physics for Architects Lab (1)
Rhet 1222—Public Speaking (4)
Stat 3091—Introduction to Probability and Statistics (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (42)

JUNIOR YEAR

AEM 3092—Statics and Mechanics of Materials (4)
ForP 3300—Wood Industry Tours (2)
ForP 5300—Wood-Fluid Relationships (3)
ForP 5303—Wood Deterioration (3)
FR 1100—Dendrology (4)
IEOR 5000—Introduction to Industrial Engineering Analysis (4)
IEOR 5020—Engineering Cost Accounting, Analysis and Control (4)
MIS 3099—Elementary FORTRAN (1)
Mktg 3010—Buyer Behavior Marketing Analysis (4)
QA 3055—Introduction to Management Sciences (4)
Rhet 3562—Scientific and Technical Writing (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (37)

Programs and Curricula

SENIOR YEAR

AEM 3093—Mechanical Properties of Construction Materials (4)
ForP 5304—Wood Drying and Preservation Processes (4)
ForP 5306—Manufacturing Processes (3)
ForP 5307—Wood-Base Panel Technology (4)
ForP 5331—Senior Seminar (1)
ForP 5355—Mechanics and Structural Design With Wood Products (4)
FR 5265—Forest Policy Issues (3)
IEOR 5030—Quality Control and Reliability (4)
IR 3007—Collective Bargaining Negotiations and Modern Labor Relations (4)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (31)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (151 credits), CLE requirements in categories III and IV (10 credits), plus electives (31 credits) for a total of 192 credits required for graduation.

Wood Science and Technology Specialization

This specialization is designed for those desiring broad and general training in the field. It allows latitude in the selection of elective subjects to complement the basic training in the physical sciences, the fundamental properties of wood, and the technology of wood products manufacturing.

FRESHMAN YEAR

Biol 1011—General Biology (5)
Biol 1103—General Botany (5)
Chem 1004—General Principles of Chemistry (5)
Chem 1005—General Principles of Chemistry (5)
Chem 1006—Principles of Solution Chemistry (4)
Math 1211—Analysis I (5)
Math 1221—Analysis II (5)
Math 1231—Analysis III (5)
Rhet 1101—Communication I (4) (or pass English proficiency examination)
Rhet 1102—Communication II (4) (or pass English proficiency examination)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (47)

SOPHOMORE YEAR

Chem 3301—Elementary Organic Chemistry (4)
Chem 3302—Elementary Organic Chemistry (4)
Chem 3305—Elementary Organic Chemistry Lab (2)
Chem 3306—Elementary Organic Chemistry Lab (2)
ForP 1301—Wood as a Raw Material (4)
ForP 1303—Wood Structure and Identification (2)
FR 1100—Dendrology (4)
Math 3211—Analysis IV (5)
Phys 1271—General Physics (4)
Phys 1275—General Physics Lab (1)
Phys 1281—General Physics (4)
Phys 1285—General Physics Lab (1)

Phys 1291—General Physics (4)
Phys 1295—General Physics Lab (1)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (42)

JUNIOR YEAR

AgEc 1020—Principles of Macroeconomics (5)
AgEc 1030—Principles of Microeconomics (4)
Chem 3100—Quantitative Analysis (3)
Chem 3101—Quantitative Analysis Lab (2)
Chem 5520—Elementary Physical Chemistry (3)
ForP 3300—Wood Industry Tours (2)
ForP 5300—Wood-Fluid Relationships (3)
ForP 5301—Mechanical Properties (3)
ForP 5302—Wood Chemistry (3)
ForP 5303—Wood Deterioration (3)
Rhet 1222—Public Speaking (4)
Rhet 3562—Scientific and Technical Writing (4)
Stat 5021—Statistical Analysis I (5)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (44)

SENIOR YEAR

ForP 5304—Wood Drying and Preservation Processes (4)
ForP 5305—Pulp and Paper Technology (4)
ForP 5306—Manufacturing Processes (3)
ForP 5307—Wood-Base Panel Technology (4)
ForP 5331—Senior Seminar (1)
ForP 5355—Mechanics and Structural Design With Wood Products (4)
FR 5265—Forest Policy Issues (3)
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (23)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (156 credits), CLE requirements in categories III and IV (10 credits), plus electives (26 credits) for a total of 192 credits required for graduation.

Recreation Resource Management

Students in this curriculum examine various conceptual approaches to recreation, to provide a systematic means of organizing information about and to develop an understanding of recreation planning and management. Emphasis is placed on natural nonurban lands. The program does not contain the traditional core of forestry courses usually required for federal forester positions. General objectives of the program are:

1. To prepare recreation resource specialists for comprehensive planning and management of land and water for recreation.
2. To provide the background for participation in expanding community, county, regional, state, and federal resource-oriented recreation programs as well as for private planning consultant employment.

Programs and Curricula

3. To prepare students for graduate work in resource planning and management through forestry, agricultural economics, and other fields of study.

The recreation resource management program is administered by the College of Forestry with the aid of an interdisciplinary committee representing concerned departments.

FRESHMAN YEAR

- Biol 1011—General Biology (5)
Biol 1103—General Botany (5)
Chem 1004—General Principles of Chemistry (5)
Chem 1005—General Principles of Chemistry (5)
FR 1201—Conservation of Natural Resources (3)
Geo 1001—Physical Geology (5)
Geog 1401—Physical Geography (5)
(or) Geog 1301—Human Geography (5)
Math 1111—College Algebra and Analytic Geometry (5)
(or) Math 1131—Finite Mathematics (5)
(or) Math 1201—Pre-Calculus (5)
Rhet 1101—Communication I (4) (or pass English proficiency examination)
Rhet 1102—Communication II (4) (or pass English proficiency examination)
SOI 1122—Introductory Soil Science (4)
Students with a grade of C or better in high school mechanical drawing are exempt from AgEn 1010. Technical Drawing; others must take AgEn 1010.
Students with a grade of C or better in high school trigonometry are exempt from Math 1008. Trigonometry; others must take Math 1008.
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (50)

SOPHOMORE YEAR

- AgEc 1020—Principles of Macroeconomics (5)
AgEc 1030—Principles of Microeconomics (4)
EBB 3004—Fundamentals of Ecology (4)
FR 1100—Dendrology (4)
LA 1024—Landscape Theory (4)
(or) LA 1001—Environmental Design: Man and Environment (4)
Math 1142—Introduction to Calculus (5)
(or) Math 1211—Analysis I (5)
Phys 1031—Introductory Physics: Measurement and Applications (4)
Phys 1035—Introductory Physics Laboratory (1)
Pol 1041—Contemporary Political Ideologies (4)
(or) Pol 1027—Urban Politics (4)
(or) Pol 1031—Selected Problems in American Public Policy (4)
Psy 1001—General Psychology (5)
Rhet 1222—Public Speaking (4)
Soc 1001—Introduction to Sociology (4)
Students who have completed high school physics are exempt from Phys 1031, Introductory Physics: Measurement and Applications, and Phys 1035, Introductory Physics Laboratory. Students who have not completed high school physics must take Phys 1031 and 1035. If exempt, they must see their advisers.
Electives and CLE requirements to fulfill the overall requirements for graduation.
Total Required Credits (48)

JUNIOR YEAR

- AgEc 3610—Community Resource Development (4)
(or) AgEc 5620—Regional Economic Analysis (4)
- AgEn 3410—Hydrology, Water Control (4)
- FR 5232—Management of Recreational Lands (3)
- FW 3052—Principles of Fisheries and Wildlife Management (4)
- Geog 3511—Cartography (4)
- Rec 3550—Park and Recreation Administration (5)
(or) Rec 3530—Recreation, Park Areas, and Facilities (5)
- Rhet 3254—Advanced Public Speaking (4)
(or) Rhet 3266—Discussion Methods (4)
- Rhet 3551—Professional Writing (4)
(or) Rhet 3562—Scientific and Technical Writing (4)
- Stat 3081—Experimental Techniques and Statistical Inference (5)
(or) Soc 3801—Sociological Methods I: Descriptive Statistics (5)
- Electives and CLE requirements to fulfill the overall requirements for graduation.
- Total Required Credits (37)

SENIOR YEAR

- EBB 5014—Ecology of Plant Communities (5)
(or) EBB 5016—Ecological Plant Geography (5)
- FR 5200—Aerial Photo Interpretation (3)
- FR 5233—Principles of Outdoor Recreation Design and Planning (4)
- FR 5259—Analysis of Outdoor Recreation Behavior (3)
(or) FR 5257—Recreation Land Policy (3)
- RCD 5099—Interdisciplinary Seminar I (2)
- RCD 5100—Interdisciplinary Seminar II (4)
- RCD 5101—Interdisciplinary Seminar III (4)
- Soc 5401—Social Organizations (5)
(or) Soc 5651—Rural Social Institutions (4)
(or) Jour 5501—Communication and Public Opinion I (4)
- Electives and CLE requirements to fulfill the overall requirements for graduation.
- Total Required Credits (30)

TOTAL GRADUATION REQUIREMENTS

Required courses listed above (165 credits), additional courses to satisfy CLE requirements (8 credits), plus electives (19 credits) to total 192 credits must be completed for the degree.

GRADUATE STUDY IN FORESTRY

Graduate study leading to the master of science (M.S.), the doctor of philosophy (Ph.D.), and the professional degree master of forestry (M.F.) is offered through the Graduate School in cooperation with the College of Forestry.

Master of Science and Doctor of Philosophy Programs—Graduate study leading to these degrees is intended for qualified students preparing for careers in research, extension work, administration, and teaching in the several recognized areas of specialization in forestry: ecology and silviculture; forest economics, policy, and administration; genetics and forest tree improvement; hydrology; measurements and biometrics; tree physiology; recreation land management; remote sensing; wood and wood fiber science; forest products production and technology; and forest products marketing.

Master of Forestry Program—This program is designed to prepare students for careers in forest land management or related renewable resources management. The general requirements for the M.S. degree under Plan B apply to the M.F. degree; additional requirements are designed to insure a broad professional background. Each M.F. student must complete basic science prerequisites (biology, chemistry, ecology, economics, mathematics, and statistics) and selected introductory forestry courses if these or their equivalents were not included in the undergraduate program. For specific information about prerequisites and required courses, contact the director of graduate studies, 110J Green Hall.

Students interested in graduate programs should consult the *Graduate School Bulletin* for details about requirements, and should apply for admission to the Graduate School, 306 Johnston Hall, 101 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.



IV. COURSE DESCRIPTIONS

Course Numbering and Symbols—Courses primarily for freshmen and sophomores are numbered 1000 through 1998; for juniors and seniors, 3000 through 3998; for juniors, seniors, and graduate students, 5000 through 5998. Courses numbered 8000 and above are restricted to students registered in the Graduate School.

The following symbols are used throughout the course descriptions in lieu of page footnotes:

§ Credit will not be granted if the equivalent course listed after the section mark has been taken for credit.

* Concurrent registration is required in the course listed after the paragraph mark.

Consent of the instructor is required prior to registration.

When no abbreviated departmental prefix precedes the course number listed as a prerequisite, that prerequisite is in the same department as the course being described.

Forest Products (ForP)

1301. WOOD AS A RAW MATERIAL. (4 cr)

The physical and chemical nature of solid wood and wood fibers as it relates to the requirements of major wood-based industries. World supply and consumption. Weekly demonstration laboratories dealing with structure and properties of wood and with manufacture of solid, particle, and fiber products.

1303. WOOD STRUCTURE AND IDENTIFICATION. (2 cr, prereq 1301)

Features of wood structure vital to the identification of various tree species and to understanding the physical properties of wood. Lecture and laboratory.

3300. WOOD INDUSTRY TOURS. (2 cr; prereq 1301, jr or sr standing)

Visits to a number of firms involved with various facets of the forest products industry.

3303. FOREST PRODUCTS MARKETING. (3 cr, prereq Mktg 3000)

Historical and current considerations of forest products marketing at the manufacturing, wholesale, and retail levels. Lectures, guest speakers, and field trips.

3310. MANUFACTURED HOUSING SYSTEMS. (4 cr)

Development and principles of manufactured housing systems. Wood-frame construction technology. Strength and other properties of wood and wood-based materials as related to design. Material and design optimization. Insulation materials and heat loss.

3325. DIRECTED STUDY EXPERIENCE. (1-5 cr; prereq #)

Opportunity to pursue experiences not available under independent study or extra credit registration. The student develops, in consultation with the adviser for the project, a prospectus, and completes progress reports and a final report on his or her project.

5300. WOOD-FLUID RELATIONSHIPS. (3 cr; prereq 1301)

Moisture in wood and its relationship to density and specific gravity, shrinking and swelling, electrical properties, strength properties, thermoconductivity, sorption isotherms, dimensional stabilization, permeability and diffusion. Lectures only.

5301. MECHANICAL PROPERTIES. (3 cr, prereq 1301 or #)

Basic mechanics and strength of materials as applied to wood products.

5302. WOOD CHEMISTRY. (3 cr; prereq Chem 3302)

Chemical composition, reactions, and analyses of wood, wood components, and derivatives.

5303. WOOD DETERIORATION. (3 cr; prereq 1301 or #)

Deterioration of wood and wood products by bacteria, fungi, insects, marine organisms, fire, and weathering; methods of preservation and preservatives used. Lecture and laboratory.

5304. WOOD DRYING AND PRESERVATION PROCESSES. (4 cr; prereq 5300, 5303)

The materials, equipment, processes, and technical considerations involved in the industrial drying and preservative treatment of wood products. Lectures, laboratory exercises, and plant visits.

5305. PULP AND PAPER TECHNOLOGY. (4 cr; prereq 5300, 5302 or #)

Pulping processes; fiber refining and processing; manufacture of paper, fiber and paper properties; recycling of paper; and water requirements and effluent treatment. Lecture and laboratory. Field trip optional.

5306. MANUFACTURING PROCESSES. (3 cr; prereq 1301 or #)

Manufacture of wood-based products from a systems point of view. Input requirements, machinery selection, methods of economic comparison. Technology related to lumber manufacture. Field trip required.

Course Descriptions

- 5307. WOOD-BASE PANEL TECHNOLOGY.** (4 cr; prereq 5300, 5301 or #)
Design, manufacture, properties, and applications of plywood, particleboard, fiberboard, and composite panels. Adhesives and their application in the panel industry. Lecture, laboratory, and research project.
- 5310. PULP AND PAPER PROCESS LABORATORY.** (3 cr; prereq 5305 or 15305)
Chemical and mechanical pulping, pulp preparation, secondary fiber, de-inking, wet end additives. Laboratory problems and exercises supplemented by lectures.
- 5312. PULP AND PAPER PROCESS CALCULATIONS.** (4 cr; prereq ME 3301 or #: 4 lect and 3 rec hrs per wk)
Chemical and physical process calculations: steady and unsteady state material and energy balances applied to pulping and papermaking processes.
- 5313. PULP AND PAPER PROCESS OPERATIONS.** (5 cr; prereq CE 3400 or #: 5 lect and 2 rec hrs per wk)
Application of the principles of momentum, heat, and mass transfer to unit operations in the pulp and paper industry: fluid transport, filtration, sheet forming, sedimentation, heat exchange, evaporation, gas absorption and stripping, distillation, leaching, extraction, crystallization, humidification, and drying.
- 5315. PAPER ENGINEERING LABORATORY.** (2 cr; prereq 5312 or #: 2 lect and 1 lab hrs per wk)
Experiments designed to illustrate and apply the principles of momentum, heat, and mass transfer using the pilot-plant paper machine and coater.
- 5316. COATED PRODUCT DEVELOPMENT.** (2 cr; prereq 5310 or #)
Coating process and products (primarily paper); theory, techniques, and procedures for formulating and applying coatings; properties and uses of coated products.
- 5317. INSTRUMENTATION AND PROCESS CONTROL.** (2 cr; prereq 5312)
Measurements, analog and digital control systems, instrumentation, computers, computer control, system maintenance, fluidics, special applications.
- 5331. SENIOR SEMINAR.** (1 cr; prereq sr: S-N grading only)
Current developments in forest products.
- 5350. WOODY TISSUE MICROTÉCHNIQUE.** (2 cr)
Use of sliding and rotary microtomes, maceration, differential staining, and special techniques in preparation of woody tissue for microscopic study. Laboratory.
- 5353. ADVANCED WOOD CHEMISTRY.** (2 cr; prereq 5302, Chem 3100, 3101 or equiv; offered when feasible)
Laboratory problems in the analysis of wood constituents and in the techniques of their isolation and purification.
- 5355. MECHANICS AND STRUCTURAL DESIGN WITH WOOD PRODUCTS.** (4 cr; prereq 5301)
Mechanical behavior of lumber, plywood, and particleboard as applied to structural considerations in building construction. Lecture and laboratory.
- 5356. ADVANCED FOREST PRODUCTS MARKETING.** (3 cr; prereq 3303 or #)
Lectures and case studies on retail, wholesale, manufacturer, and market analysis research concerning the forest products business.
- 5359. SURFACE AND COLLOID CHEMISTRY OF PAPERMAKING.** (3 cr; prereq Chem 5520 or #)
Principles of surface and colloid chemistry applied to basic problems in pulp and paper manufacturing operations and product uses.
- 5360. STRUCTURE AND PROPERTIES OF IMPORTANT TROPICAL WOODS.** (2 cr; prereq 1303)
Structure and methods of identification of commercially important tropical woods. Properties of these woods; relation of these properties to favored uses for the woods.
- 5401. SENIOR TOPICS.** (Cr ar; prereq sr)
Independent study in a field of interest to a forestry major planned with the student's adviser.

FOR GRADUATE STUDENTS ONLY

(For course descriptions, see the *Graduate School Bulletin*)

8300. RESEARCH PROBLEMS

8301. RESEARCH PROBLEMS

8302. RESEARCH PROBLEMS

8303. ADVANCED TOPICS IN PANEL PRODUCTS TECHNOLOGY

8304. ADVANCED TOPICS IN WOOD DRYING

8305. INFLUENCE OF CULTURAL/GENETIC PRACTICES ON THE STRUCTURE AND UTILIZATION OF WOODY FIBROUS MATERIALS

Forest Resources (FR)

- 1100. DENDROLOGY.** (4 cr; prereq Biol 1103)
Identification, nomenclature, classification, and distribution of about 200 important forest trees. Preparation and use of keys, systems of natural classification, and field and laboratory methods of identification.
- 1101. INTRODUCTION TO AIR AND WATER QUALITY.** (4 cr)
Air and water quality problems. Basic processes that govern the accretion, depletion, and cycles of specific types and sources of pollution. Methods of pollution abatement and influence of political, social, and economic pressures on the maintenance of a "quality environment."
- 1201. CONSERVATION OF NATURAL RESOURCES.** (3 cr)
Renewable natural resources of the United States and the world; their utilization, interrelationship, and management treated from an economic standpoint; their importance to society and our responsibility for their conservation. Lectures and reports.
- 1202. FARM AND SMALL WOODLANDS FORESTRY.** (3 cr for non-forestry majors, 2 cr for majors [3 cr with paper]; prereq 1100 or *1100 for majors)
Status and problems of the small woodland owner. Factors influencing tree growth. Cutting practices for and marketing products of small woodlands. Establishment and care of plantations, shelterbelts, and windbreaks. Field trips.
- 1203. INTRODUCTION TO MINNESOTA'S NATURAL RESOURCES.** (3 cr. §1201, for non-forestry students)
Ecological, social, and economic implications of Minnesota's soil, water, forest, wildlife, and other resources are studied in field exercise and group discussions at nature centers and natural areas. Environmental teaching techniques for the elementary indoor classroom.
- 3100. IMPORTANT FOREST PLANTS.** (2 cr; prereq Biol 1103; given at Itasca)
Identification of forest plants as related to forest types.
- 3101. FIELD FOREST ECOLOGY.** (3 cr; prereq college physics; given at Itasca)
Field examination of succession, soils, silvical characteristics, tree classification, stand structure, and the ecology of regeneration.
- 3104. FOREST ECOLOGY.** (3 cr; prereq Itasca session)
Ecological concepts and principles as a basis for silvicultural practice. The forest as an ecosystem.
- 3114. FOREST AND SHADE TREE BIOLOGY.** (3 cr; prereq Chem 1004, 10 cr of biology)
The growth, development, and functions of forest and shade trees. Lecture only.
- 3115. FOREST AND SHADE TREE BIOLOGY.** (1 cr; prereq 3114 or *3114)
Laboratory study of aspects of tree biology. Emphasis on the design and conduct of experiments.
- 3201. FIELD FOREST MEASUREMENTS.** (1 cr; prereq Math 1008; given at Itasca)
Introduction to and use of instruments in forest mensuration.
- 3220. BEGINNING FOREST SOILS.** (2 cr; prereq Itasca session, Geo 1001)
Basic soil properties and relationships to tree growth; soil development and classification.
- 3225. DIRECTED STUDY EXPERIENCE.** (1-5 cr; prereq #)
Opportunity to pursue experiences not available under independent study or extra credit registration. The student develops, in consultation with the adviser for the project, a prospectus, and completes progress reports and a final report on his or her project.
- 5100. SILVICULTURE.** (3 cr; prereq Itasca session, 1100, 3101)
Introduction to silvics, silvicultural systems, intermediate cuttings, and related practices. Forest regeneration problems and techniques.
- 5101. FIELD SILVICULTURE.** (3 cr; prereq 5100; given at Cloquet)
Timber stand improvement projects, stand examinations and prescriptions, seeding and planting, and related silvicultural practices. Lectures and fieldwork.
- 5102. REGIONAL SILVICULTURE.** (3 cr; prereq 5100 or #)
Forest regions of North America emphasizing silvical, historical, geographic, economic, and other determinants of forest management. Topics and field trips on special problems of current concern.
- 5103. ADVANCED FOREST TREE BIOLOGY.** (3 cr; prereq #)
Current applications and research in forest tree biology.
- 5105. INTENSIVE SILVICULTURE.** (3 cr; prereq sr in forestry)
Principles and techniques underlying silvicultural systems aimed at high productivity. Current practices in various forest regions of the United States and the world. Lectures and guest speakers.
- 5114. FOREST HYDROLOGY.** (3 cr; prereq Itasca session, Geo 1001 or #)
Introduction to the hydrologic cycle and hydrologic processes. Effects of forest management activities on water yield, storm flow, and water quality.

Course Descriptions

- 5126. FIELD FOREST SOILS.** (1 cr; prereq 3220, 5114; given at Cloquet)
Field examination of forest soils and their relationship to site productivity and forest management.
- 5150. FOREST ECOLOGY SEMINAR.** (3 cr; prereq sr, 3101, 5100 or #)
Survey of classical concepts and contemporary developments in ecology as related to forestry. Discussion group format.
- 5151. MULTIPLE-USE SILVICULTURE.** (3 cr; prereq sr, 5100 or #)
Wildlife production, aesthetics, wilderness and management, minor forest products, noise and air pollution, and other non-timber-production forest uses. Classical and recent contributions.
- 5152. FOREST GENETICS.** (3 cr; prereq #)
Genetic variation of forest-tree species and underlying principles; application of plant breeding principles to forestry.
- 5153. ADVANCED FOREST HYDROLOGY.** (4 cr; prereq 3220, 5114 or #)
Current hydrologic problems in the management of forested watersheds. Analytical methods to evaluate effects of vegetation management on the quantity and quality of runoff. Lecture and laboratory.
- 5200. AERIAL PHOTO INTERPRETATION.** (3 cr; prereq WM major or #)
Types, characteristics, procurement, preparation, viewing, and interpretation of aerial photographs; introduction to mapping; applications to resource surveys and management.
- 5212. NATURAL RESOURCES INVENTORY.** (3 cr; prereq Itasca session, 3201, Stat 3081)
Measurement of stand variables, forest products, forest growth and yield. Elementary statistics. Sampling methods for estimating characteristics of natural resources and resource use for management decision making. Lecture and laboratory.
- 5220. REMOTE SENSING, FOREST RESOURCES INVENTORY.** (3 cr; prereq 3220, 5200, 5212; given at Cloquet)
Use of aerial photographs in property boundary location; interpretation and classification of forest vegetation types. Application of sampling methods for estimating natural resources and resource use for management decision making.
- 5222. FOREST POLICY AND ECONOMICS.** (5 cr or cr ar. \$5265; prereq AgEc 1030 or #)
Forest resource supply and consumption relationships. United States and world; legal and political factors; basic economic analysis of forestry activities (production, consumption, and investments).
- 5223. TIMBER MANAGEMENT PLANNING.** (3 cr; prereq 5212, 5222 or #)
Introduction to the fundamentals of planning, finance, forest regulation models, sustained yield of timber, and development of timber management plans.
- 5225. FOREST RESOURCES ANALYSIS.** (7 cr; prereq 5100, 5114, 5222, 5223; given at Cloquet)
Compartment examination, analysis, planning and evaluation exercises. Prescription and presentation of development plans.
- 5231. RANGE MANAGEMENT.** (3 cr; prereq Biol 1103 or #)
Grazing animal production methods and their influence on forest and open range lands; public grazing land administration; relationship of grazing to other land uses.
- 5232. MANAGEMENT OF RECREATIONAL LANDS.** (3 cr; prereq jr in forestry or #)
Recreational use of the forest and associated land and water. Policy problems arising from recreational demands.
- 5233. PRINCIPLES OF OUTDOOR RECREATION DESIGN AND PLANNING.** (4 cr; prereq 5232 or #)
(Same as LA 5010) For advanced students associated with design, management, and planning of recreational facilities. Planning and design principles related to recreational land use and development; parks, campsites, water areas, highways, summer and winter recreational facilities.
- 5240. METEOROLOGY AND FOREST FIRE MANAGEMENT.** (4 cr; prereq t 1100, Itasca session, WM major or #)
Fundamentals of meteorology and climatology and applications to forestry. Forest fire behavior, administration of forest fire control, and applications of prescribed burning.
- 5244. FOREST RESOURCES MANAGEMENT.** (3 cr; prereq 5222, sr)
Analysis of forest resources management systems in the United States. Interpretation and evaluation of resource information, alternative management strategies, and conflicting forest use and management decisions. Case studies.
- 5248. HARVESTING AND ENGINEERING.** (3 cr; prereq AgEn 1400; given at Cloquet)
An introduction to harvesting systems and their relationship to forest management, preparation for and administration of timber sales, and location, construction, and maintenance of forest roads.
- 5253. FOREST BIOMETRY.** (3 cr; prereq 5212, Stat 5022 or #)
Topics in forest measurements, sampling, inventory, and the modeling and analysis of forest growth and change.
- 5257. RECREATION LAND POLICY.** (3 cr; prereq 5232 or #)
Policy issues affecting the use and management of lands devoted entirely or in part to recreational objectives.

- 5259. ANALYSIS OF OUTDOOR RECREATION BEHAVIOR.** (3 cr; prereq 5232, RRM major or grad student or #)
Principles of management of parks, forests, and other areas for recreation visitors. The role of interpretive education. User preference in relation to administrative objectives. Individual and group influences. Lectures, discussions, reports, readings.
- 5260. FOREST ADMINISTRATION.** (3 cr; prereq Cloquet session or #)
Patterns and processes of administrative organization in forestry and related resource institutions. Personnel supervision, direction, and control. Planning and budgeting processes and problems.
- 5261. ADVANCED FOREST POLICY AND ECONOMICS.** (3 cr; prereq 5222 or #)
Advanced topics concerning the quantitative techniques for analyzing forestry policy and economic activities; economic analysis of forestry projects; analyses of political and legal processes in forestry; review of literature on forest policy and economics; case studies.
- 5262. REMOTE SENSING OF NATURAL RESOURCES.** (4 cr; prereq 5200 or #)
Introduction to remote sensing for natural resource inventories, land use analyses, and environmental monitoring activities; photographic, thermal, multispectral, and radar sensing procedures; airborne and satellite systems; visual and computer-assisted analysis techniques; oriented toward an interdisciplinary audience.
- 5264. QUANTITATIVE TECHNIQUES IN FOREST MANAGEMENT.** (3 cr; prereq 5212, 5222, 5223 or #)
Forestry applications of quantitative techniques in allocation and other decision-making problems. Mathematical programming, simulation.
- 5265. FOREST POLICY ISSUES.** (3 cr, §5222)
Processes by which forestry issues evolve and are resolved; systematic analysis of issues (defining issues, assessing special interest group concerns, defining objectives and alternatives); analysis of selected forestry issues such as sustained yield, clear-cutting, forest practice regulation, multiple and dominant use, and energy conservation.
- 5401. SENIOR TOPICS.** (Cr ar; prereq sr in forestry)
Independent study in a field of interest to the student. Work must be planned with a forestry faculty member.
- 5406. FORESTRY WORKSHOP FOR TEACHERS.** (5 cr)
Forest ecosystems and forest management studied in lecture and laboratory sessions conducted in a forest environment. In field exercises, techniques and materials are developed for teaching principles of forestry in indoor and outdoor classrooms. Tours to forest and wildlife research and management units and utilization locations, and discussions of contemporary forestry issues by guest lecturers.
- 5408. FORESTRY IN THE URBAN ENVIRONMENT.** (3 cr; prereq student teacher, teacher or #)
Study of forest ecosystems and forest management in lecture and laboratory sessions. Field exercises emphasize techniques and materials useful for teaching principles of forestry in indoor and outdoor classrooms; forest areas in the Twin Cities used for field exercises. Special uses and problems of the urban forest. Discussions and presentations by guest lecturers on contemporary forestry issues.

FOR GRADUATE STUDENTS ONLY

(For course descriptions, see the *Graduate School Bulletin*)

- 8100. RESEARCH PROBLEMS: SILVICULTURE**
- 8101. RESEARCH PROBLEMS: FOREST-TREE PHYSIOLOGY**
- 8102. RESEARCH PROBLEMS: FOREST-TREE GENETICS**
- 8103. RESEARCH PROBLEMS: FOREST HYDROLOGY**
- 8104. FOUNDATIONS OF FOREST ECOSYSTEMS**
- 8105. ADVANCED FIELD SILVICULTURE**
- 8106. TOPICS IN SILVICULTURE-FOREST SOILS**
- 8200. RESEARCH PROBLEMS: FOREST MANAGEMENT**
- 8201. RESEARCH PROBLEMS: FOREST ECONOMICS**
- 8202. RESEARCH PROBLEMS: FOREST BIOMETRY**
- 8203. RESEARCH PROBLEMS: FOREST RECREATION**
- 8204. RESEARCH PROBLEMS: FOREST POLICY**
- 8205. RESEARCH PROBLEMS: REMOTE SENSING**
- 8206. ADVANCED MANAGEMENT OF RECREATIONAL LANDS**
- 8207. ECONOMIC ANALYSIS OF FORESTRY PROJECTS**
- 8208. LEGAL AND POLITICAL PROCESSES IN FORESTRY**

Course Descriptions

8209. SEMINAR: FORESTRY AND ECONOMIC DEVELOPMENT

8210. RESEARCH METHODS IN FORESTRY

8211. SEMINAR: FOREST RESOURCES ISSUES

Related Departmental Courses

Listed below are courses that are either required or recommended for the various curricula in the College of Forestry.

Entomology (Ent)

5050. FOREST ENTOMOLOGY. (4 cr; prereq forestry major or #)

Lectures and laboratory concerning ecology and population management of forest insects with heavy emphasis on tree factors and biological control.

Fisheries and Wildlife (FW)

3052. INTRODUCTION TO FISHERIES AND WILDLIFE BIOLOGY AND MANAGEMENT. (4 cr; prereq EBB 3004; 3 lect. 1 demonstration-discussion session per wk)

Introduction to fishery and wildlife population ecology; environmental relationships of fish and wildlife populations and habitats; management and research methods; fishery and wildlife agency administration.

3167. TECHNIQUES OF FOREST WILDLIFE MANAGEMENT. (1 cr; offered at Cloquet)

Biology and management of important forest wildlife species; methods of evaluating forest wildlife populations and habitats.

Plant Pathology (PIPa)

5050. FOREST PATHOLOGY. (4 cr; prereq Biol 1103 or equiv)

Diseases of forest and shade trees: wood decay. Symptoms, etiology, and control. Lectures, laboratory, and fieldwork.

5051. ADVANCED FOREST PATHOLOGY. (3 cr; prereq 5050 or equiv; offered 1980 and alt yrs)

Basic concepts in the etiology, epidemiology, and pathogenesis of tree diseases and wood deterioration.

Rhetoric (Rhet)

All students in the College of Forestry are required to take the following rhetoric courses: Rhet 1101 and 1102, Communication I and II; Rhet 1222, Public Speaking; and Rhet 3551, Professional Writing, or Rhet 3562, Scientific and Technical Writing. Additional requirements depend upon the particular curriculum for which the student is registered.

The Department of Rhetoric also offers courses in humanities, literature, original writing, speech, and dramatics. A number of these courses may be used to fulfill the distribution requirements in categories I, III, and IV. See the *College of Agriculture Bulletin* for course descriptions.

1101. COMMUNICATION I. (4 cr)

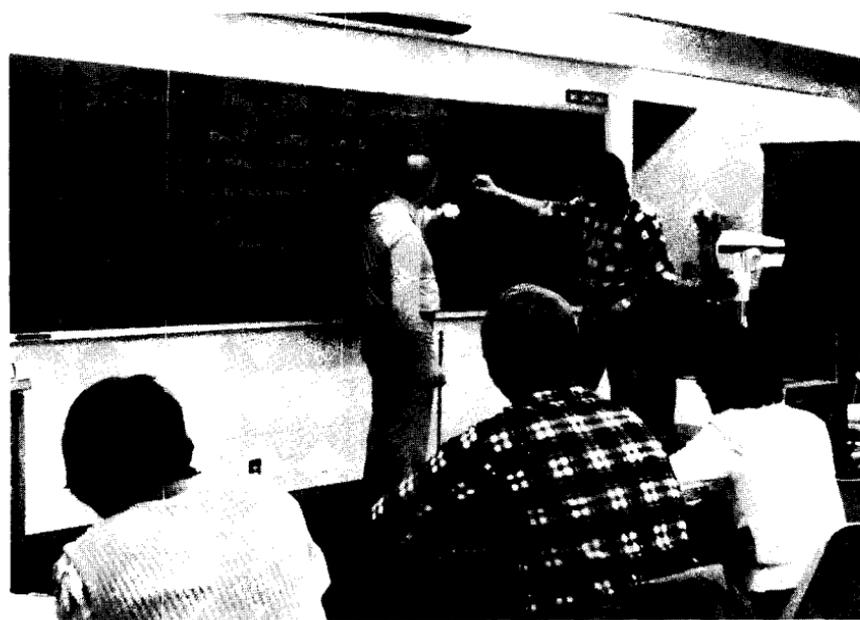
Writing from observation and personal experience. Emphasis on expository and descriptive prose that is clear, vigorous, honest, and economical. Attention to effectively written sentences and sound paragraph construction.

1102. COMMUNICATION II. (4 cr)

Writing from research and personal observation. Emphasis on the research paper including techniques of drawing hypotheses; examining indexes and guides; selecting, evaluating, and organizing evidence; constructing paragraphs; and assembling footnotes and bibliography. Attention to effective sentences and forceful style.

- 1147. EFFICIENT READING.** (3 cr)
Designed to increase reading rate, comprehension, and vocabulary. For persons of average or above-average reading ability who wish to achieve or maintain superior scholastic status. Not a remedial course.
- 1222. PUBLIC SPEAKING.** (4 cr; prereq soph. completion of freshman communication requirement)
Practical course in fundamentals of speechmaking. Emphasis on organizing the speech and projecting it to the audience.
- 1251. EFFECTIVE LISTENING.** (3 cr)
Designed to increase listening comprehension by developing four central abilities: Reading, research, theory, and practice.
- 3551. PROFESSIONAL WRITING.** (4 cr; 3551 or 3562 is required of all students unless exempted through deptl exam; prereq jr. completion of freshman communication requirement)
Projects and reports in professional communication: the resume, application letter, interview, professional journals; the review of literature; specialized bibliographic tools; the feature article.
- 3562. SCIENTIFIC AND TECHNICAL WRITING.** (4 cr; 3562 or 3551 is required of all students unless exempted through deptl exam; prereq jr. completion of freshman communication requirement)
Methods of exposition in scientific and technical writing; types of reports; audience analysis; continuous practice in report writing.





V. STUDENT GOVERNMENT, CAREER OPPORTUNITY SERVICES, AND FINANCIAL ASSISTANCE

Student Government

Student-Faculty Board—The Student-Faculty Board was created to establish and maintain open and meaningful communication among the faculty, student body, and administration of the College of Forestry. Its responsibility is to consider problems and to make recommendations to the dean concerning their resolution. Students on the board are chosen according to regulations designated in the constitution of the college.

Honor System—Under the provisions of a self-governing honor system, the students in the College of Forestry, rather than faculty members, conduct examinations and quizzes. The honor system is operated on the assumption that honesty prevails among a large majority of students. Students place themselves on their honor not to give or receive aid during examinations. *The responsibility for honesty is between student and student; the faculty does not place students on their honor.*

A student who observes an act of dishonesty during an examination period may take some appropriate step at the time to halt the act, or may report the incident later to the instructor or to a member of the college Honor Case Commission. A faculty member has the same rights as a student under the honor system.

The Honor Case Commission, composed of student representatives from the various curricula, considers confidentially the cases reported. If it is clear that an act of scholastic dishonesty has occurred, the commission recommends to the departmental Student Scholastic Standing Committee an appropriate action to be taken concerning the offending student. The membership of the Honor Case Commission is posted in 10 Green Hall together with a notice explaining how members may be contacted for information or assistance.

The honor system is essentially a preventive rather than a punitive system. New students are urged to discuss the honor system with other students registered in the college.

St. Paul Campus Board of Colleges—The St. Paul Campus Board of Colleges directs and coordinates student activities and encourages student leadership throughout the Twin Cities campus/St. Paul. Its membership is drawn from the Colleges of Agriculture, Biological Sciences, Forestry, Home Economics, and Veterinary Medicine. The board brings questions from the student body to the administration of the colleges and discusses and reaches decisions on matters of general interest.

The board cooperates with the Twin Cities Student Assembly and the Senate Committee on Student Affairs.

Student Center Board of Governors—The Student Center on the Twin Cities campus/St. Paul provides a varied program of social, cultural, and recreational activities and contributes in many ways to the educational objectives of the campus. Student participation in the activities of the Student Center is encouraged. The Board of Governors, whose members are students elected from the various academic units on the Twin Cities campus/St. Paul, formulates policy for operation of the Student Center and establishes its budget. Students wishing information about the Student Center, its operation, and opportunities to serve on its various planning and programming committees should inquire at the information desk, first floor of the Student Center.

Career Opportunity Services

The College of Forestry assists students in locating summer forestry work and permanent positions following graduation. The career opportunities coordinators are located in 8F Green Hall and in the Kaufert Laboratory. They bring job opportunities to the attention of students, advise students on individual job placement efforts, and assist in arranging interviews with employer representatives. Meetings and information seminars are held periodically throughout the academic year to assist students seeking employment.

Financial Assistance

Financial aid available to students includes: various scholarships supported by gifts from alumni, foundations, industry, and friends of the University and the College of Forestry; grants such as those of the Educational Opportunity and Regents' Student Aid Fund programs; loans from the National Defense Student Loan and the University Trust Fund Loan programs; and the College Work-Study program. One application to the Office of Student Financial Aid, 210 Fraser Hall, 106 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, ensures consideration for all of these types of financial assistance. Application for scholarships available only to College of Forestry students should be made directly to the Scholarship Committee of the College of Forestry. Applications for these scholarships are distributed to all registered students each year.

Incoming freshmen should submit all applications for financial aid to the Office of Student Financial Aid. Application forms are available at the office of the principal or counselor of your high school or at the Office of Student Financial Aid. Financial aid information is sent to all Minnesota high schools in early October of each year; prospective students should consult with their high school principals or counselors at that time.

Applications from entering freshmen for aid for the fall quarter should be submitted by February 15 prior to the fall quarter they desire to enroll; applicants are notified of the action taken by April 1. Students presently enrolled in the College of Forestry and transfer students should submit applications by March 1 for notification by August 1. Applications for Forest Products and Pulp and Paper Scholarships should be submitted to the Forest Products Scholarship Committee, College of Forestry, 203 Kaufert Laboratory, 2004 Folwell Avenue, University of Minnesota, St. Paul, Minnesota 55108.

Unless otherwise specified, selection of recipients for scholarships is based upon academic aptitude, vocational promise, personal attributes, leadership, and financial need.

Institute of Agriculture, Forestry, and Home Economics Scholarships and Awards

Alpha Gamma Rho (Lambda Chapter) Scholarship—To assist active members of Alpha Gamma Rho, Lambda Chapter.

Alpha Zeta Traveling Scholarships—To assist junior and senior students with high scholarship and strong professional interests to attend a meeting of an appropriate professional, scientific, or technical society or association.

University of Minnesota Memorial Fund Scholarship—Preference given to children of deceased staff members of the University of Minnesota.

College of Forestry Scholarships and Awards

Mary Dwight Akers Loan

Sponsor: Anonymous

Basis of Award: Limited loans as needed and approved by the dean.

John H. Allison Scholarship

Sponsor: Former members, Beta Chapter, Tau Phi Delta

Basis of Award: For students with special interests in forest economics, forest management, and related areas.

Andersen Corporation Scholarships

Sponsor: Andersen Corporation, Bayport, Minnesota

Basis of Award: Awarded to juniors and seniors enrolled in the residential housing, marketing, and production management specializations of the forest products curriculum on the basis of academic achievement and professional promise.

R. M. Brown Scholarship

Sponsor: College of Forestry Service Fund

Basis of Award: Awarded to a senior in the forest resources or forest science curriculum with a special interest in mensuration or statistics.

Carolind Scholarship

Sponsor: The late Dr. Ralph M. Lindgren

Basis of Award: Established to provide financial assistance to deserving and outstanding undergraduate students in the College of Forestry.

E. G. Cheyney Memorial Scholarships

Sponsor: The Minnesota Forestry Alumni Association

Basis of Award: Scholarships open to junior or senior students who have demonstrated outstanding ability and improvement in creative writing and speaking skills.

Caleb Dorr Scholarships

Sponsor: Caleb D. Dorr Fund

Basis of Award: Awarded annually to the forestry student in each class with the highest grade point average.

Edward A. Everett Memorial Scholarship

Sponsor: The late Edward A. Everett

Basis of Award: Awarded to upper division forestry students on the basis of financial need, acceptable scholarship, and professional promise.

Federated Garden Clubs of Minnesota Scholarships

Sponsor: Federated Garden Clubs of Minnesota

Basis of Award: Awarded to students in forestry on the basis of special interest in urban forestry, academic aptitude, and personal attributes.

Forest Products Marketing Scholarship

Sponsor: Forest Industry Fraternity of Minneapolis and St. Paul

Basis of Award: Awarded to a deserving and promising junior or senior entering the marketing specialization of the forest products curriculum.

*Student Government, Career Opportunity Services,
and Financial Assistance*

College of Forestry Scholarship

Sponsor: Gifts from alumni of the College of Forestry

Basis of Award: For occasional small grants to especially needy and worthy students.

Robert L. Goudy Memorial Scholarship

Sponsor: Mr. and Mrs. F. X. Corbett, Georgetown, Colorado

Basis of Award: Awarded to outstanding transfer students on the basis of academic ability, vocational promise, extracurricular activities, personality, and financial need.

Samuel B. Green Scholarship Medal

Sponsor: The late Mrs. Samuel B. Green in memory of her husband, who established the College of Forestry in 1903 and directed it until 1910.

Basis of Award: Awarded to the senior in forestry having the highest scholastic average at the end of fall quarter.

Oscar L. Mather Scholarship

Sponsor: Minnesota Federation of Women's Clubs and Mrs. Oscar L. Mather, Madison Lakes, Minnesota, in memory of her husband, a lumberman deeply interested in conservation.

Basis of Award: Book awarded to a student in forestry displaying outstanding scholarship, leadership, and character.

William R. Miles Scholarship

Sponsor: William R. Miles Scholarship Fund

Basis of Award: Awarded to a forest resources senior on the basis of professional promise, character and integrity, academic aptitude, and leadership.

Charles Lathrop Pack Awards in Forestry

Sponsor: Charles Lathrop Pack Foundation

Basis of Award: Awarded to regularly enrolled undergraduate students writing the best essays of a popular nature on forestry or conservation subjects.

Pulp and Paper Scholarships

Sponsors: Sunds Defibrator, Incorporated, Scholarship; Beloit Corporation Scholarship; Charles K. Blandin Foundation Scholarships; Boise Cascade Corporation Scholarship; Champion Packaging Scholarship; H. B. Fuller Company Scholarship; Minnesota Section, Technical Association of the Pulp and Paper Industry Scholarship; North Central Division, Paper Industry Management Association Scholarship; Potlatch Foundation for Higher Education Scholarship; St. Regis Paper Company Scholarship; and Nalco Chemical Company Scholarship.

Basis of Award: Awarded to juniors and seniors in the pulp and paper specialization of the forest products curriculum on the basis of academic performance and professional promise.

Henry Schmitz Forest Products Engineering Scholarship

Sponsor: Dr. Stanley J. and Mertie W. Buckman, Memphis, Tennessee

Basis of Award: Awarded to a junior or senior in the forest products curriculum on the basis of academic achievement and professional promise.

Henry Schmitz Memorial Scholarship

Sponsor: Gifts from alumni of the College of Forestry

Basis of Award: For occasional small grants to take care of special emergency needs.

Henry Schmitz Student Leadership Award

Sponsor: Dr. Stanley J. and Mertie W. Buckman, Memphis, Tennessee

Basis of Award: One or more awards to juniors or seniors on the basis of demonstrated leadership and acceptable scholarship.

Augustus L. Searle Scholarship

Sponsor: Augustus L. Searle

Basis of Award: To women in the College of Forestry, with preference to Minnesota residents.

Sonford Products Corporation Scholarship

Sponsor: Sonford Products Corporation, St. Paul Park, Minnesota

Basis of Award: Awarded to junior or senior in the forest products curriculum on the basis of academic achievement and professional promise.

Helen A. Young Memorial Scholarship

Sponsor: John Young, Rochester, Minnesota

Basis of Award: To assist qualified, competent, and needy students to initiate and complete their forestry education.



VI. FACULTY

Dean Emeritus

Frank H. Kaufert, Ph.D.

Professor Emeritus

R. M. Brown, M.F.

Professor

Richard A. Skok, Ph.D., *dean*
Egoffs V. Bakuzis, Ph.D.
Bruce A. Brown, Ph.D.
Gregory N. Brown, Ph.D.
Robert W. Erickson, Ph.D.
David W. French, Ph.D.¹
Roland O. Gertjens, Ph.D.
Hans M. Gregersen, Ph.D.
Alvin R. Hallgren, Ph.D.
Henry L. Hansen, Ph.D.
John G. Haygreen, Ph.D.
Lewis T. Hendricks, Ph.D.
Ralph L. Hossfeld, Ph.D.
Frank D. Irving, Ph.D.
Herbert M. Kulman, Ph.D.²
Lawrence C. Merriam, Jr., Ph.D.
Merle P. Meyer, Ph.D.
Carl A. Mohn, Ph.D.
Marvin E. Smith, B.S.
Edward I. Sucof, Ph.D.
Edwin H. White, Ph.D.
Kenneth E. Winsness, M.F.

Adjunct Professor

John Crist, Ph.D.³
Rolf Leary, Ph.D.³
David W. Lime, Ph.D.³
Allen L. Lundgren, Ph.D.³
Elon S. Verry, Ph.D.³

Associate Professor

Alvin A. Alm, Ph.D.
James L. Bowyer, Ph.D.
Kenneth N. Brooks, Ph.D.
Alan R. Ek, Ph.D.
Paul V. Ellefson, Ph.D.
David F. Grigal, Ph.D.⁴
Timothy B. Knopp, Ph.D.
Vilis Kurmis, Ph.D.
Thomas M. Lillesand, Ph.D.
Ronald D. Neuman, Ph.D.
Dietmar W. Rose, Ph.D.
Harold Scholter, Ph.D.

Assistant Professor

Erwin R. Bergland, Ph.D.
William Cromell, B.S.⁵
Steven A. Sinclair, Ph.D.

Instructor

Karl Ketter, M.S.
Scott Reed, M.S.
Philip J. Splett, M.S.
Alan White, M.S.

Research Associate

Clifford E. Ahlgren, M.S.
Albert Dudek, Ph.D.
Sverker Hard, Ph.D.

Adjunct Research Associate

John C. Clausen, M.S.⁶

Research Fellow

Harlan Petersen, M.S.
Frank Schoolmaster, Ph.D.

Research Specialist

Isabel F. Ahlgren, Ph.D.
William Johnson, M.S.
Mary Lyverse, B.S.
Douglas Meisner, M.S.
Dennis Murphy, M.S.
Marsha Samways, M.S.

Associate Scientist

Henry Hall, M.S.
Raymond A. Jensen, B.S.

Assistant Extension Specialist

Carl E. Vogt, B.S.

Degree Program Adviser

Michael Kuether

¹Associate member from Department of Plant Pathology

²Associate member from Department of Entomology, Fisheries, and Wildlife

³Associate member from North Central Forest Experiment Station

⁴Associate member from Department of Soil Science

⁵Associate member from North Central Agricultural Experiment Station

⁶Associate member from Department of Natural Resources

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