FNR 41800
PROPERTIES OF WOOD
RELATED TO MANUFACTURING

Instructor:

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Objective of Course:

The course objective is to familiarize the student with the basic physical, mechanical and working properties of wood and wood composites. These properties include orthotropic nature of wood, grain, texture, moisture content, shrinking, swelling, specific gravity, machining, thermal properties, electrical properties, elastic properties, strength properties, vibration properties, bending, natural characteristics affecting mechanical properties, effect of manufacturing and service environment on mechanical properties, changing quality of available resources and implications of wood quality changes for manufacturing.

Textbooks:

Wood Handbook: Wood as an Engineering Material. 1987, Forest Products Laboratory, Forest Service, U.S. Department of Agriculture.

One copy is on reserve in instructor's office.

Grading:

	Undergraduate Students % of grade	**Graduate Students % of grade**
Laboratory Reports	30	20
Research Paper		10
Class Participation		10
Three one-hour exams	30	30
Weekly quizzes	10	10
Final Exam	30	30

Student grades, status and progress can be discussed at any time upon request of either the student or the instructor. Grade appeal procedures are available by university policy.

WARNING: No laboratory assignments will be accepted late and no make-up exams will be given unless arrangements are made with the instructor prior to the due date of the assignment or exam.

Class attendance:

It is the student's responsibility to know what was covered (including notes, handouts and homework) in class during any absence. Contact instructor if you anticipate extended absence.

Cheating:

Cheating on quizzes and exams and plagiarism will not be tolerated and will be dealt with according to the university policy. The student is obligated to solve home problems on his own; however, assistance (working together) is legal and sometimes necessary for learning efficiency. But sloppy repeat of another person's errors will not be overlooked.

Research Paper and Classroom Presentation (graduate students only):

A list of research topics will be provided from which each graduate student will select one for a research paper. Students may also suggest a topic in which they are personally interested. This paper must be type written and is expected to be of very high quality. The research paper will provide the basis for a 20-minute classroom presentation. Audiovisual aids are expected to be used to assist audience understanding.

Tentative Course Outline

A. **Physical properties of wood**
   - Orthotropic nature of wood
   - Appearance
     - Grain and Texture
     - Plainsawed and quartersawed lumber
     - Decorative Features of Common Woods
   - Moisture Content
     - Green Wood and the Fiber Saturation Point
     - Equilibrium Moisture Content
   - Shrinkage
     - Transverse and Volumetric Shrinkage
     - Longitudinal Shrinkage
     - Moisture-Shrinkage Relationship
   - Weight-Density-Specific Gravity
   - Working Qualities

- Weathering
- Decay Resistance
- Chemical Resistance
- Thermal Properties
  - Thermal Conductivity
  - Specific Heat
  - Thermal Diffusivity
  - Coefficient of Thermal Expansion
- Electrical Properties
  - Electrical Conductivity
  - Dielectric Constant
  - Dielectric Power Factor
- Acoustic Properties
- Coefficient of Friction
- Nuclear Radiation

B. **Mechanical Properties**
- Elastic properties
  - Modulus of Elasticity
  - Modulus of Rigidity
- Strength properties
  - Compression
  - Tension
  - Shear
  - Bending
- Vibration properties
  - Speed of Sound
  - Internal Friction
- Natural characteristics affecting mechanical properties
  - Specific Gravity
  - Knots
  - Grain
  - Reaction Wood
  - Extractives
- Effect of manufacturing and service environment on mechanical properties
  - Moisture Content
  - Temperature
  - Age
  - Chemicals
  - Stains and Decay

C. **Machining Properties**
- Changing quality of available resources
- Implications of wood quality changes for manufacturing