GRANDE PRAIRIE REGIONAL COLLEGE
DEPARTMENT OF SCIENCE AND TECHNOLOGY

Bachelor of Applied Forest Resources Management

WOOD TECHNOLOGY AND UTILIZATION: FO4200 (Fall 1998)

Pre-requisites: FO1200-DENDROLOGY

Calendar description: Chemical and physical properties of wood and species identification; primary, secondary and other uses of wood: lumber, plywood, chip and particle board, pulp and paper, panel products, wood fibre products, and reconstituted wood products. Introduction to integrated wood products

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Lectures: Tuesday, Thursday	11:00 – 12:20	Room: D213
Lab: Tuesday	15:00 – 17:50	Room: D213

Course objectives: Upon successful completion of the course, the student will have developed the following:

1. an understanding of the influence of cell structure variation on wood properties, and the degree to which this variability can be controlled by growing conditions,
2. the ability to identify 40 Canadian tree species based on gross physical features and structural features visible with a 10X hand lens;
3. an understanding of the factors influencing the interaction of wood with moisture, wood weight, and strength of wood and wood products;
4. an understanding of the manufacturing processes for major forest products, and the relationships between raw material quality and final product quality;
5. an appreciation of the utilization and marketing of these forest products, and an outlook for the future for new and existing products

Text:
Haygreen, John G. and Bowyer, Jim L. (1996). Forest products and wood science-An introduction, 3rd edition. Iowa State University Press. Ames, Iowa. 484 pp.

Evaluation:

Mid-term	30%
Assignments and quizzes	20%
Labs	15%
Final	35%

Assignments are to be handed in on time. Late assignments/labs will be accepted, but will be subjected to an automatic deduction of 25% per day that the assignment is late. Completion of all assignments/labs and the mid-term is necessary in order to pass the course. The final exam must be completed with a grade of at least 50% in order to be eligible for credit for this course.

Course Outline:

I. STRUCTURE OF WOOD AND BARK

A. **Course objectives/requirements & introduction**

B. i. Importance of wood as a material **HB Introduction & Ch. 18**

C. ii. Classification and naming of tree species **HB Ch. 1: pp. 3-7**

D.

B. Macroscopic character of wood **HB Ch. 2**

i. three orientation planes
ii. growth rings
iii. heartwood and sapwood
iv. rays
v. spiral and interlocking grain
vi. branches and knots

C. Basic process of tree growth and wood formation **HB Ch. 1: pp. 8-19**

i. a tree's design needs
ii. apical meristems, cambium, and cork cambium
iii. Cambial division and wood cell development

D. Composition and structure of wood cells **HB Ch. 3**

i. Photosynthisus and chemical composition
ii. cell wall structure: types & sizes of cell wall layers & relation to wood density
iii. cell wall sculpturing: pits & other features & relation to wood permeability
iv. microfibrils, microfibril angle & relation to strength and & shrinkage & swelling of wood

E. Comparative softwood and hardwood anatomy **HB Ch. 4, 5**

i. different cell types and proportions
ii. Patterns of variation of cell characteristics

F. Unusual wood types & bark **HB Ch. 6, 7**

i. "juvenile" and "mature" wood
ii. growth stresses and reaction wood ("compression" wood & "tension" wood)
iii. wood of branches and roots
iv bark

II. WOOD PROPERTIES

A. Wood and water **HB Ch. 8**

i. moisture content definitions
ii. homework project: measuring moisture content and shrinkage of a wood sample
iii shrinkage and swelling
iv. drying and drying defects

B. Density and specific gravity **HB Ch. 9**

i. definitions
ii. homework project: measuring the specific gravity of a wood sample
iii. patterns of variation

C. Mechanical properties of wood **HB 10**

i. basic stress/strain concepts
ii. clear wood strength variations (species, direction plane specific gravity, moisture content, etc.)
iii. determination of allowable stresses in lumber (visual versus machine stress grades)
vi. other wood properties
  i. thermal properties
  ii. energy content for fuels
  iii. electrical properties

III. PRODUCTION OF MAJOR FOREST PRODUCTS

A. Biomass of tree & relation to utilization

B. Roundwood products **HB Ch. 13**
i. logs

B. Poles & piling

C. Lumber-based products **HB Ch. 14**
i. structural lumber
ii. lumber for remanufacturing industries
iii glue-lam beams & other engineering products

D. Veneer based products **HB Ch. 14**
i. plywood
ii. laminated veneer lumber
iii. decorative veneer products

E. Flake and particle-board based products **HB Ch. 15**
i. particleboard & OSB/waferboard

F. Fiber based products **HB Ch. 16**
i. paper
ii. hardboard & medium density fibreboard
iii. insulation board

G. Wood & energy **HB Ch. 17**

H. Deterioration of wood & wood products **HB Ch. 11**

I. Wood preservatives & finishes

IV. THE CONNECTION BETWEEN GROWTH, SILVICULTURE, & WOOD QUALITY

A. Review of biology of tree growth and wood formation **HB Ch. 1: pp. 8-19**

B. Effects on silviculture & genetics of wood quality **HB Ch. 12**

V. FOREST PRODUCTS MARKETING

A. A primer in marketing **TBA**

B. Differences among the products **TBA**

SCHEDULE (Subject to change)

	Classroom	Laboratory
Week 1:	I-A	NO LAB
Week 2:	I-B, I-C, I-D	Project description, wood as a material
Week 3:	I-E (softwoods), I-E (hardwoods)	Softwoods
Week 4:	I-F	Hardwood
Week 5:	II-A	Quiz A
Week 6:	II-B, II-C (part)	Mechanical properties I
Week 7:	II-C (cont'd.), II-D, Mid-term	NO LAB
Week 8:	III-A, III-B, III-C	Mechanical properties II
Week 9:	III-D, III-E	Sawmill
Week 10:	III-F, III-G	OSB mill
Week 11:	III-H, III-I	Pulp & paper mill
Week 12:	IV-A, IV-B, IV-C	Bagass mill
Week 13:	V-A, V-B	Presentation
Week 14:	Review	Presentation