**Course Outline, 2013 (Term 1)**

**Wood 474: Wood Properties and Products Manufacturing**

**Instructor:**

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**Teaching Assistant:**

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**Course website:** <http://courses.forestry.ubc.ca/wood474>

**Class Schedule and Venue:**

**Class: Monday, 11.00 to 13.00, Forest Sciences Centre 2964: CAWP classroom**

**Course Objectives:**

To provide forestry students with an understanding of:

1. the physical and strength properties of wood; and
2. the characteristics and manufacturing technologies for the major wood products.

**Topics to be covered**

**Physical properties of wood**

*Wood characteristics*

·         Review of wood structure

·         Origin of wood properties

·         Wood properties related to industrial utilization

o   Positive attributes

o   Negative attributes

*Wood moisture relationships*

* How moisture is measured
* How wood dries and shrinks
* Stress during drying and resultant defects

**Strength Properties of Wood**

*Mechanical Properties*

* Strength
* Deformation
* Elasticity and effects of structure, environment and time

*Stresses in wood beams, reactions and moments*

* Deflection in simple beams
* Principles of mechanical stress grading
* Derivation of working stresses

**Wood Products and the Industry**

*Primary Processing and Drying*

* Sawmilling technology
* Wood drying

*Wood preservation*

* Natural durability - decay
* Discolouration (chemical and microbial)
* Wood Preservation

*Wood Panels*

* Structural and Non-structural panels: plywood, OSB, particleboard, MDF

*Engineered wood products (EWPs)*

* Glulam, Parallam, strand based EWPs, I-joists, finger jointed products

*Pulp and Paper*

* Pulping processes
* Production of paper

*Value Chain operation*

* Operation of the forestry value chain from forest to market – with an emphasis on the British Columbian value chain.

**Learning Outcomes**

When the course has been completed the students will be able to:

* Discuss wood moisture relationships and calculate wood weight using specific gravity data, and shrinkage using volumetric shrinkage tables.
* Understand the relationship between humidity and e.m.c.
* Measure S.G. for wood samples
* Explain stress and strain, and describe the forces which are present in a beam under bending load.
* Identify the factors impacting on the strength of a timber
* Describe the characteristics of lumber that impact on grade, and explain how the various grades are defined.
* Explain the various grades of softwood lumber and how they may be determined visually and by machine
* Understand the relationship between Load and deflection, and MOR and MOE
* Discuss how the log is broken down in a sawmill
* Review the main aspects impacting on kiln drying and identify the common methods used in B.C. with an awareness of alternative methods. Explain defects caused by drying wood
* Understand the role of durability in wood performance; identify the durable woods in Canada and how they can be used in buildings to provide a suitable service life.
* Identify the main preservatives used in North America and explain how wood is pressure treated, including the use of preconditioning and post treatment processes to ensure the environmental acceptance of the treated products.
* Identify the main composite materials available in North America and explain the differences in their composition.
* Understand the range of engineered wood products available and explain the advantages of such materials in construction
* Explain how wood chips are converted into paper using chemical and mechanical pulping
* Understand how the integrated forest sector value chain operates

**Grading Policy**

Quizzes, problems and participation 10%

Report on industrial plant visit 15%

Mid-term exam 30%

Final Exam 45%

**Reference Texts:**

There is no required course text. Students may find the following source useful:

R. Shmulsky and P.D. Jones (2011): Forest Products and Wood Science: An Introduction (Sixth Edition). Wiley Blackwell. ISBN 081382074X. 477 pp.

**Schedule**

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| --- | --- | --- | --- |
| **Week** | **Date** | **Topic** |  |
| **Tutor** |
| **1** | 02-Sep | No class (Labour Day) |  |
| **2** | 09-Sep | Properties of wood (wood structure) | Ellis |
| **3** | 16-Sep | Properties of wood (mc, density, shrinkage) | Avramidis |
| **4** | 23-Sep | Properties of wood (mechanics, strength) | Lam |
| **5** | 30-Sep | Sawmilling and Drying | Avramidis |
| **6** | 07-Oct | Biodeterioration and preservation | Morris/Stirling, FPInnov |
| **7** | 14-Oct | No class (Thanksgiving) |  |
| **8** | 21-Oct | Midterm exam | McFarlane |
| **9** | 28-Oct | Panels | Smith |
| **10** | 04-Nov | Engineered wood products | McFarlane |
| **11** | 11-Nov | No class (Remembrance Day) |  |
| **12** | 18-Nov | Industry tour (sawmilling, drying, shake and shingles) | McFarlane |
| **13** | 25-Nov | Pulp and paper/Value Chain operation | McFarlane |