

# Wood, Pulping & Bleaching Chemistry

**Instructor:**

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**General Description of Course:** This is an Internet based course that uses the web for material dissemination and continuous communication. Students receive the material in the form of CD with the lecture taped in a video format with the instructor speaking as well as the slides animated. The students receive a series of ten quizzes and they are in constant communication with the instructor via e mail. A mid term and a final are also used as part of the continuous assessment tools

**Course Outline:** The fundamental chemistry of the various wood components will be described together with pertinent information that relates to their industrial processing. Emphasis will be given to the underlying scientific issues that determine the chemistry of the various pulping and bleaching operations. Aspects of environmental accountability as it relates to the pulp and paper industry will also be discussed.

**TEXT:** Extensive notes & papers will be provided prior to each class as well as summary handouts. No formal textbook required, Course pack to be supplied

<b>GRADING:</b> Class Tests (X10)	50%
Best 8 will be selected	
Homework Assignments	20%
Final exam	30%
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	100%

## Course Objectives

- To create an appreciation for the fundamental science that is behind our industry
- To create connections for our industry's choices
- To create connections that pertain to environmental accountability
- To stimulate the student's interest in our science upon which our technology rests

## Course Deliverables

Upon completion of the course the student will be able to:

- λ Describe fundamental aspects of the chemistry of the major wood components; Carbohydrates, Cellulose, Hemicelluloses and Lignin
- λ Understand the underlying Structural, Polymer and Organic Chemical principles that define their reactivity.
- λ Describe the chemistry of the main wood components during processing; Pulping & Bleaching
- λ Become aware of modern developments in wood chemistry & technology
- λ Be aware of the factors that affect our decisions toward implementing the various technologies and chemicals
- λ Identify the underlying fundamental scientific principles that ultimately define the engineering decisions toward designing our processes.

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## Course Outline

**Week 1**, Introduction, Outline & Crash Course In Organic Chemistry, Definitions, Nomenclature

**Week 1** , Ultrastructure of Wood

**Week 2** Chemistry of Carbohydrates, Definitions

**Week 2** Isomerism, Chirality, Conformations

Quiz 1

**Week 3** Carbohydrate Reactivity; Glucosides, Ethers,

**Week 3** Carbohydrate Oxidations, Reductions, Hydrolyses

Quiz 2

**Week 4** Oligosaccharides; Disaccharides,

**Week 4** Polysaccharides

Quiz 3

**Week 5** Polymer Chemistry, Fundamentals,

**Week 5** Structure, Morphology of Cellulose, Hemicelluloses

**Week 6** Lignin Biosynthesis and Structure

**Week 6** Lignin Structure continued, New Lignin Structures,

Quiz 4

**Week 7** Principles of Pulping Chemistry,

**Week 7** Pulping Chemistry, Reactions of Cellulose, Peeling, Stopping,

**Week 8** Reactions of Lignin; Sulfite;

**Week 8** Reactions of Lignin; Soda,

Quiz 5

**Week 9** Reactions of Lignin under Kraft Conditions

**Week 9** Condensation Reactions in Lignin

Quiz 6

**Week 10** Structure of Kraft Lignin,

**Week 10** Bleaching Chemistry Definitions

Quiz 7

**Week 11** Chlorine Dioxide Bleaching, Process Details,

**Week 11** Chlorine Bleaching Chemistry

Quiz 8

**Week 12** Oxygen Delignification,

**Week 12** Details of Process Limitations

Quiz 9

**Week 13** Peroxide, Delignification,

**Week 13** Ozone Delignification

Quiz 10

Final exam      Date to be Decided