



THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Department of Forestry and Wood Technology

FWT 510 – Wood Adhesives and Fasteners

Course Code: FWT 510

Course Title: Wood Adhesives and Fasteners

No of Units: 2

Course Duration: One hour of theory and three hours of practical per week for 15 weeks

Status: Compulsory

Course Email: fwt510@gmail.com

Course web page:

Prerequisites: First year University course in physics particularly engineering and chemistry are essential for a good understanding of this course. The student with some knowledge of polymer science and wood anatomy will no doubt fully grasp the principles and process that will be discussed in this course.

COURSE INSTRUCTORS

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COURSE DESCRIPTION

This course is intended to provide basic and applied information on the adhesive bonding of wood and on wood jointing using mechanical devices. In order to enhance the understanding of the more applied aspects of wood jointing the course will covers the fundamental of adhesion, general principles of glue joint design, the characteristics of the different types of materials used as adhesives and mechanical fasteners; chain analogy of adhesively bonded joint, load-slip characteristics of mechanically fastened joint, basic bonding process and the criteria for selecting adhesives for bonding

COURSE OBJECTIVES

The objectives of the course are:

1. to bring students to understand many of the technical aspects of wood bonding and jointing
2. to make students appreciate that the material science-engineering approach which is applicable to other engineered products can be applied to the design and construction of mechanically fastened wood products.

COURSE LEARNING OUTCOMES / COMPETENCIES

Following successful completion of this course, the students will be able to:

1. Identify some of the materials that are used as adhesives and mechanical fasteners
2. Understand the basic concepts of adhesion the structure of a typically bonded joint the rationale for selection of adhesives for specific bonding applications, basic bonding process, composition of typical adhesive system and evaluation techniques, the general methods of tailoring adhesives systems through the appropriate selection of basic polymers and additives and control of adhesives systems to individual requirement of different applications

GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Class Attendance	5%
Assignments	10%
Test(s)	15%
Practical	20%
<u>Final Examination</u>	<u>50%</u>
<u>TOTAL</u>	<u>100%</u>

GENERAL INSTRUCTIONS

Attendance: It is expected that every student will be in class for lectures and also participate in all practical exercises. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with any of the instructors, indicating the reason for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in

accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

Assignments and Group Work: Students are expected to submit assignments as scheduled. Failure to submit an assignment as at when due will earn you zero for that assignment. Only under extenuating circumstances, for which a student has notified any of the instructors in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, etc.) during lectures. Food and drinks are not permitted in the laboratories.

READING LIST

COURSE OUTLINE

WEEK	TOPIC	Laboratory Work
1&2	Introduction: Definition of adhesives and fasteners; needs for efficient forms of wood jointing and bonding. History of adhesives development and utilization in the wood industry	No lab work
3	Typical applications of adhesives and fasteners in the wood industry advantages and limitations of adhesives/fasteners in wood jointing	No lab work
4&5	Theory and principles of adhesion (nature of adhesion). <ul style="list-style-type: none"> ➤ Definitions of adhesion ➤ Theories of adhesion <ul style="list-style-type: none"> • Mechanical adhesion • Specifics adhesion • Inter-diffusion theory ➤ Basic requirement for adhesion ➤ Thermodynamics of adhesion <ul style="list-style-type: none"> • Adherent surface properties • Spreading, wetting and setting • Contact angle • Work of adhesion 	No lab work
6-9	Adhesives Systems <ul style="list-style-type: none"> ➤ Adhesives composition ➤ Classes of adhesives <ul style="list-style-type: none"> ✓ Natural adhesives <ul style="list-style-type: none"> • Polysaccharides (starch),dextrin, cellulose acetate and cellulose nitrates • Protein adhesives (caseins, soya 	Preparation of adhesives from Natural origin (vegetable, Soy bean, Milk

	<p>beans, albumen (blood) and animal glue</p> <ul style="list-style-type: none"> • Tannin glue <p>➤ Synthetic (plastics) glues</p> <ul style="list-style-type: none"> • Definitions- thermosetting and thermoplastics resins <p>✓ Thermosetting resins</p> <ul style="list-style-type: none"> • Phenol formaldehyde(resole) • Resorcinol formaldehyde <p>✓ Thermoplastics resins</p> <ul style="list-style-type: none"> • Phenol formaldehyde (novolaks) • Polyamides • Polyniacetate • Polyethylene <p>➤ Elastomers</p> <p>➤ Inorganic binders</p>	
10	<p>Basic bonding process</p> <ul style="list-style-type: none"> ➤ Selection of adhesives ➤ Preparation of adherend ➤ Adhesive formation and preparation ➤ Glue application ➤ Pressure application ➤ Conditioning 	Preparation of adhesives from Natural origin (vegetable, Soy bean, Milk)
11	<p>Glued joint</p> <ul style="list-style-type: none"> ➤ General principles of good adhesives joint design ➤ Chain analogy and adherently bonded joints ➤ Types of glues joints: <ul style="list-style-type: none"> • Butt joint • Scarf joint and finger joint 	Preparation of adhesives from petrochemical products
12	<p>Mechanical fasteners</p> <ul style="list-style-type: none"> ➤ Nails ➤ Bolts ➤ Screws ➤ Split rings connectors ➤ Tooth plate connectors 	Application of Prepared Adhesives.
13	<p>Testing and evaluation :</p> <ul style="list-style-type: none"> ➤ Adhesives ➤ Bonded joints and assemblies. <p>Load slip characteristics of mechanically fastened joints</p>	Assessment of adhesives properties: viscosity, Gel time.
14	Wood based panel production and specifications on / the uses of connectors in wood structure	
15	Revision	