TEACHING PLAN

1) SUBJECT IDENTIFICATION

Subject	WOOD MODIFICATION: THERMAL AND OTHER PROCESSES
Code	PGCF-2551
Hours per semester	60 hours (Theoretical: 60 h)
Credits:	4
Entry Requirement(s)	-----
Lecturer(s)	Prof. Djeison Cesar Batista, PhD.

2) CONTENTS

Modifying the properties of wood; thermal modification of wood: processes and their variables; chemical changes; physical changes; biological properties of thermally modified wood; impact of thermal modification on other wood properties; other processes of wood modification.

3) OBJECTIVES

- To teach the importance of wood modification.
- To understand the effect of thermal modification on the main properties of wood.
- To know other current industrial processes for wood modification.

4) DETAILED CONTENTS

DESCRIPTION	HOURS
The current use of wood and the need for its modification	6
Modifying the properties of wood	8
Thermal modification of wood: processes and variables	8
Chemistry of thermally modified wood	8
Physical properties of thermally modified wood	8
Biological properties of thermally modified wood	8
Other properties and performance of thermally modified wood	6
Other processes of wood modification	8

5) METHODOLOGY

- Students will be instructed to study and annotate specific material from the recommended bibliography. The annotations will be taken to the classes for discussion with the lecturer and other students.

6) EVALUATION (subject to change in agreement with students)

TYPE	NUMBER	PERCENTAGE (%)
Annotations and participation	X	30
Bibliographic review	1	30
Presentation of scientific articles (individual or group work)	2	40

7) BIBLIOGRAPHY

BASIC

HILL, C. **Wood modification**: chemical, thermal and other processes. West Sussex: John Wiley & Sons, 2006.

JONES, D.; SANDBERG, D.; GOLI, G.; TODARO, L. (Ed.). **Wood modification in Europe**: a state-of-the-art about processes, products, and applications. In: COST Action 1407. Proceedings… Florença, Itália: 123 p., 2019. https://doi.org/10.36253/978-88-6453-970-6

ZELINKA, S.L.; ALTGEN, M.; EMMERICH, L.; GUIGO, N.; KEPLINGER, N.; KYMÄLÄINEN, M.; THYBRING, E.E.; THYGESEN, L.G. Review of wood mofiication and wood functionalization technologies. **Forests**, Basel, v. 13, n. 7, 1004, 2022. https://doi.org/10.3390/f13071004

COMPLEMENTARY

ESTEVES, B. M.; PEREIRA, H. M. Wood modification by heat treatment: a review. **BioResources**, Raleigh, v. 1, n. 4, p. 370-404, 2009. http://dx.doi.org/10.15376/biores.4.1.370-404

INTERNATIONAL THERMOWOOD ASSOCIATION. **ThermoWood® handbook**. Helsinki: International ThermoWood Association, 2003. 55 p. Available at: https://asiakas.kotisivukone.com/files/en.thermowood.palvelee.fi/tiedostot/web_thermowood_handbook.pdf.

GÉRARDIN, P. New alternatives for wood preservation based on thermal and chemical modification of wood – a review. **Annals of Forest Science**, [S.l.], v. 73, p. 559-570, 2016. http://doi.org/10.1007/s13595-015-0531-4

JONES, D.; SANDBERG, D. A review of wood modification globally: updated findings from COST FP1407. **Interdisciplinary Perspectives on the Building Environment**, [S.l.], v.1, 2020. https://doi.org/10.37947/ipbe.2020.vol1.1

MILITZ, H.; ALTGEN, M. Process and properties of thermally modified wood manufactured in Europe. In: SCHULTZ, T. P.; GOODELL, B.; NICHOLAS, D.D. (Org.). **Deterioration and Protection of Sustainable Biomaterials**. Washington, D.C.: American Chemical Society, cap. 16, p. 269-285, 2014.

ORMONDROYD, G.; SPEAR, M.; CURLING, S. Modified wood: review of efficacy and service life testing. **Proceedings of the Institution of Civil Engineers - Construction Materials**, [S.l.], v. CM4, p.187-203, 2015. http://dx.doi.org/10.1680/coma.14.00072

SANDBERG, D.; KUTNAR, A. Thermally modified timber: recent developments in Europe and North America. **Wood and Fiber Science**, [S.l.], n. 48 (2015 Convention of the SWST, Special Issue), p. 28-39, 2016. Available at: < https://wfs.swst.org/index.php/wfs/article/view/2296>.