Modulehandbook

Master of Science

Wood Science

(2022-02-18)

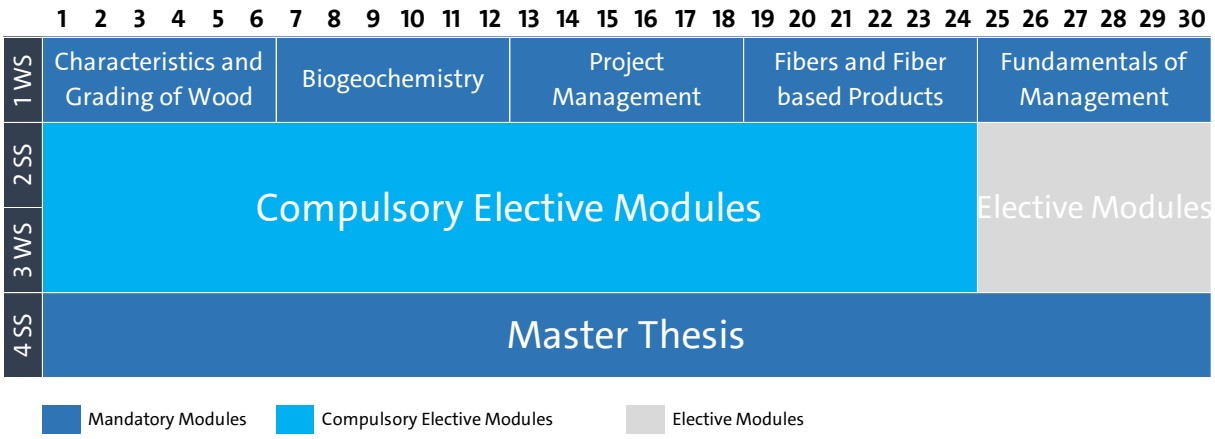
Objectives

The English-speaking MSc course of studies in *Wood Science* is a consecutive, research-oriented course, based upon fundamental knowledge of lignocellulose based bioresources and their ranges of application. It deepens the abilities of the students

- to the independent use of expertise, specifically for wood,
- to the independent research according scientific principles and in compliance with scientific methods,
- to the responsible classification of their knowledge in social contexts.

The MSc course of studies in *Wood Science* provides for the students textual, methodical and personal qualifications, which enable them to work in most different occupational fields independently and autonomously to develop approaches by using appropriate methods and tools. The course of studies also imparts a successful development concerning cooperation, delegation and guidance to the students, including sufficient qualifications in structuring and decision-making.

Thereby the graduates are able to take over a management role in economy and research, as well as to develop themselves and the respective field of application.



Inhalt

Mandatory Modules

Title	**Characteristics and Grading of Wood**				
Symbol	MWS01				
Semester	Winter				
Module type	Compulsory module				
Formal requirements for participation	none				
Module coordinator	Prof. Dr. M. Köhl, Phone: +49 4073269 100, E-Mail: Weltforst@uni-hamburg.de				
Lecturer	Prof. Dr. M. Köhl, Prof. Dr. E. Magel				
Language	English				
Educational objective	Students are familiar with the relationship of wood characteristics and grading (round wood / logs and sawn wood / timber). Moreover, they gain knowledge of common systems of wood grading				
Contents	Round Wood / Logs (MK) • Timber scaling: measurement of standing trees, stacked wood and logs, cubic volume, and weight measure • Timber grading by dimension, quality, and utilization • Common European and tropical timber grading rules • Wood sorting procedures -Retail prices of selected timber grades - Sawn Wood / Timber (JR) • Grading of sawn wood for different applications: o decorative use of timber for furniture, interior applications, flooring, framework by means of visual grading systems o load-bearing use / structural use – wall, ceiling, roof etc. – by means of visual and/or mechanical / machine grading systems and non-destructive testing methods, o both according to given standards and regulations demonstration of NDT-methods and practical application in the lecture room and lab				
Courses	• L: Wood characteristics, grading and implications for use • S: Case studies and excursions on grading of wood • L: Grading of sawn wood • S: Laboratory visual & mechanical grading methods				1 sem. hrs. 1 sem. hrs. 1 sem. hrs. 1 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Wood characteristics ...		14	20	12
	S: Case studies		14	30	
	L: Grading of sawn wood		14	25	12
	S: Laboratory visual & mechanical grading methods		14	25	
	Total workload	6	180		
Exam framework	Requirements for registration: Active participation in the exercises Type of examination: Oral or written exam (will be announced at the beginning of the course) Language: English				

Course type and usability	Compulsory for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.
Duration	one semester
Frequency of occurrence	annual
Literature	Richter, C., 2015: Wood Characteristics: Description, Causes, Prevention, Impact on Use and Technological Adaptation, Springer, Heidelberg Desch, H. E., & Dinwoodie, J. M. (1996). Timber structure, properties, conversion and use (No. Ed. 7). MacMillan Press Ltd..

Title	**Usage of Timber - Environmental and Economic Impacts**				
Symbol	MWS02				
Semester	Winter				
Module type	Compulsory module				
Formal requirements for participation	None				
Module coordinator	Prof. Dr. Michael Köhl, +4973962100, weltforst@uni-hamburg.de				
Lecturer	Prof. Dr. M. Köhl, Prof. Dr. A. Krause, Dr. S. Rüter (TI / HF)				
Language	English				
Educational concept	Students gain basic understanding of the key concepts of the sustainable use of bio resources and the interactions between ecological, economic and social aspects. They get familiar with technology impact assessment aspects.				
Contents	Part I Forest Resources: Sustainable forest management and legality; management methods to improve forest growth; environmental impacts of timber production; forest management certification; criteria and indicators for sustainable forest management; local, national and international legal regulations affecting forest management; Part II Circular economy and value-chains, calculation methods of material flow, resource efficiency, cascading use and CO2 in material flows (macro approach), political market framework and instruments for circular economy. Part III Environmental impact of wood products: Understanding environmental impact of wood products; life cycle assessment (LCA); environmental products declaration (EPD); possibility and limitation of influencing the environmental impact with process optimization and product property optimization.				
Courses	L: Basics about the usage of bio-resources L: Life cycle assessment Pr: Project work on potential impacts				2 sem. hrs. 1 sem. hrs. 1 sem. hrs
Workload (hrs)		ETCS	P (hrs)	S (hrs)	EP (hrs)
	L: Basics about the usage of bio-resources		28	42	20
	L: Life cycle assessment		14	21	10
	Pr: Project work on pot. impacts		14	21	10
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Will be announced at the beginning of the course				

Title	**Project Management**				
Symbol	MWS03				
Semester	Winter				
Module type	Compulsory module				
Formal requirements for participation	none				
Module coordinator	N.N.				
Lecturer	all lecturers of the Center for Wood Science				
Language	English				
Educational objective	The students gain skills in project management, planning of processes and productions with respect to ethic and social aspects. They get knowledge on internal management structures and organizational aspects, as well as internal logistics (material flow, internal supply structures etc.). Furthermore the students apply their theoretical knowledge in small projects, such as organizing and managing an excursion, the participation in an exhibition (e.g. LIGNA-fair), a symposium and conference contribution, a special event (e.g. Science Night, *Tag der Holzwirtschaft*), and a feasibility study.				
Contents	• Introduction (project types, project phases and execution, objectives, management, economic viability) • Structure / content of feasibility studies • Project studies - examples from forest product industry • Project implementation (planning of project realization, additional aspects, project follow up and control) • Aspects of business management (selected examples) Exercises and project implementation (e.g. LIGNA fair organization, excursion management, grading field on campus, marketing of wood center, inquiries of actors)				
Courses	L: Theory of project management S: Seminar project exercises E: Excursion				1 sem. hrs. 2 sem. hrs. 1 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Theory of project management S: Seminar project exercises E: Excursion		14 28 14	24 48 24	28
	Total workload	6	180		
Exam framework	Requirements for registration: active participation in excursion (5 to 10 working days) and project planning Type of examination: project report Language: English				
Course type and usability	Compulsory for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	annual				

Literature	Brockhouse, J.W. Jr., Wadsworth, J. J. 2010 - Feasibility study. Vital Steps. A cooperative feasibility study guide. U.S. Department of Agriculture. Rural Business-Cooperative Service. Service Report 58 Kuster J, Huber E, Lippmann R, Schmid A, Schneider E, Witschi U, Wüst R 2015 – Project management handbook. Springer Management for Professionals. ISBN 978-3-662-45372-8

Title	**Fibers and Fiber based Products**
Symbol	MWS04
Semester	Winter
Module type	Compulsory module
Formal requirements for participation	none
Module coordinator	Prof. Dr. B. Saake, Tel.: 040-73962-510, bodo.saake@uni-hamburg.de
Lecturer	Prof. Dr. A. Krause, Prof. Dr. B. Saake
Language	English
Educational objective	Students are familiar with the morphological, chemical and physical characteristics of hardwood, softwood and annual plant fibers derived from different production processes. Moreover, they gain knowledge about the application potential of the fibers for composite products, such as paper, board, fiber board and wood plastic composites.
Contents	The lecture will first focus on the different production processes and modifications of fibers from various resources. The morphological and chemical differences are discussed for fibers from various natural origins and production processes. The interaction of the different raw materials and production processes will be described, demonstrating as well which process route is advantageous for which raw material. Based on this knowledge the structure property relationship of the different fibers will be discussed for important products from the paper, board, wood product and composite industry. This includes a discussion of bulk products as well as high value products such as special papers, fiber-reinforced composite or nanofibrils. The effect and importance of beating and milling treatments are as well discussed for various product groups. Methods for the characterization of fiber properties and origin by chemical analysis, microscopy, and image analysis are presented.
Courses	L: Fibers and fiber based products — 3 sem. hrs. S: Seminar Fibers and fiber based products — 1 sem. hrs.

Workload (hrs)

	ECTS	P (hrs)	S (hrs)	EP (hrs)
L: Fibers & fiber based products		42	70	30
S: Seminar Fibers and fiber based products		14	24	
Total workload	6	180		

Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.
Duration	One Semester
Frequency of occurrence	Annual
Literature	Will be announced at the beginning of the course

Title	**Fundamentals of Management**
Symbol	FUND
Semester	Winter term
Module type	Compulsory module
Formal requirements for participation	none
Recommended prerequisites	none
Module coordinator	Prof. Dr. Michael Köhl, +4973962100, weltforst@uni-hamburg.de
Lecturer	N.N.
Language	English
Educational objective	The aim of the module is to make students familiar with management and sustainability issues in an entrepreneurial context. Students should be able to deal with central questions of management theoretically and practically, to work on them independently and to reflect critically. Furthermore, students should be familiar with the challenges and problems of sustainable management in order to enable them to understand the social and economic relationships in detail and to work on and critically reflect on the resulting conflicting objectives of organisations.
Contents	Within the framework of the module, various compulsory elective events on selected aspects of management are offered. As a rule, the module comprises the following courses, which are offered on a regular basis: - Introduction to CSR - International Strategic Management - international organization - Management Accounting and Control - International Market Strategies - finance and investment - Sustainability and Management The range of courses can be supplemented. A selection of courses that can be taken as part of the module will be announced at the beginning of course registration. Students must successfully complete a total of 1 elective courses in the module.
Courses	L: Selected lecture — 2 sem. hrs. S: Selected seminar — 1 sem. hrs.

Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Selected lecture		28	72	30
	S: Selected seminar		14	36	
	Total workload	6	180		

Exam framework	Requirements for registration: none Type of examination: The courses offered in the module usually end with a written examination of at least 60 minutes. Language: English
Course type and usability	Compulsory module for M.Sc. Wood Science
Duration	One semester
Frequency of occurrence	Annual
Literature	Will be announced at the course beginning

Title	**Master´s Thesis**				
Symbol	MWS-AB				
Semester	Summer				
Module type	Compulsory module				
Formal requirements for participation	72 ECTS from compulsory or compulsory elective modules. All compulsory modules have to be successfully passed				
Module coordinator	Lecturer of the programme				
Lecturer	All lecturers				
Language	English				
Educational concept	Students are able to think and work self-constrainedly in the scientific fields of the Master of Wood Science. They have gained experience in presentation and evaluation of their own experimental work in the context of the current scientific state of the art and they are able to solve scientific problems				
Contents	Students have to organize their scientific work, write structured thesis and discuss the results of their work				
Courses	Planning research work, writing thesis Preparation of defense				....
Workload (h)		ECTS	S (hrs)	EP (hrs)	total
	Total workload	30	900		
Exam framework	Type of examination: written thesis (90%) and oral presentation of thesis (10%) Language: English				
Course type and usability	Compulsory final module				
Frequency of occurrence	Each semester				
Duration	One semester				
Literature	Literature announced at the beginning of the master thesis				

Elective Compulsory Modules

Title	**Wood Molecular Biology and Biotechnology**				
Symbol	MWS05				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	Successful completion of courses (BSc level) in wood biology is strictly recommended				
Module coordinator	Prof. Dr. E. Magel, +494073962403, elisabeth.magel@uni-hamburg.de				
Lecturer	Prof. Dr. E. Magel, PD Dr. M. Fladung (TI / Forstgenetik)				
Language	English				
Educational concept	The students achieve a detailed knowledge of the importance of molecular and biotechnological approaches in wood science, such as a tool for proofing the legality of wood (wood identification, origin of wood) as well as for producing man-tailored wood (genetic manipulation of trees, somatic embryogenesis).				
Contents	• The course will focus on different methods for the identification of wood species and the origin of wood (macro-, microscopic, chemical and molecular methods). The strengths, weaknesses and limits of the methods are presented. • Biotechnological methods to generate (genetic transformation, somatic embryogenesis,...) produce (tissue culture, sterile culture, ...) and also identify man-tailored transgenic trees and thus wood are presented and discussed. • Application of micro and nanotechnologies				
Educational Concept	L: Wood molecularbiology and biotechnology Pr: Wood molecularbiology and biotechnology				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Wood molecularbiology and biotechnology		28	64	10
	Pr: Wood molecularbiology and biotechnology		28	40	10
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Literature being announced at the beginning of the module				

Title	**Wood Degradation and Protection**				
Symbol	MWS06				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	Successful completion of courses (BSc level) in wood biology is strictly recommended				
Module coordinator	Prof. Dr. J. Fromm, +494073962427, joerg.fromm@uni-hamburg.de				
Lecturer	Prof. Dr. J. Fromm, Prof. Dr. E. Magel				
Language	English				
Educational concept	The students use modern wood biological methods to work on current topics. They achieve profound skills in the field of wood protection and wood damage and degradation.				
Contents	• Macroscopic and microscopic methods to detect wood decay • Molecular methods for the identification of wood damaging and destroying organisms (fungi, bacteria) • Quantification of wood decay caused by fungi, bacteria and insects • Investigation of the efficiency of wood impregnating agents and wood modifications • Testing and classification of natural durability of wood • Excursions to various objects of interest				
Educational Concept	L: Wood degradation and protection Pr: Wood degradation and protection				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Wood degradation and protection		28	64	10
	Pr: Wood degradation and protection		28	40	10
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Schmidt, O: Wood and tree fungi, Springer (2006) Literature being announced at the beginning of the module				

Title	**Wood Physiology and Biochemistry**				
Symbol	MWS07				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	Successful completion of courses (BSc level) in wood biology is strictly recommended				
Module coordinator	Prof. Dr. E. Magel, +494073962403, elisabeth.magel@uni-hamburg.de				
Lecturer	Prof. Dr. E. Magel, Prof. Dr. J. Fromm				
Language	English				
Educational concept	The students achieve a deep understanding of wood physiology as well as wood biochemistry with focus on the regulation of the formation of wood and heartwood. They get insights into modern wood biological research methods such as gene expression studies, analyses of metabolites, proteomics and quantitative histochemistry				
Contents	• Regulation of wood formation by endogenous (phytohormones, carbohydrates, protein, etc.) and exogenous factors (climate, CO2, soil, water, minerals, anthropogenic conditions, plantation, etc.) • Modern methodological approaches to study wood formation (dendroecology, -climatology, biomechanics, biochemistry, molecularbiology, microscopy, cytology, bioassays, mutants and transgenes as model systems) • Basic knowledge on wood physiology as well as tree physiology • Lap experiments on biochemistry				
Educational Concept	L: Wood physiology and biochemistry Pr: Wood physiology and biochemistry				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Wood physiology and biochemistry		28	64	10
	Pr: Wood physiology and biochemistry		28	40	10
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Fromm J, Cellular aspects of wood formation (2014) Rennenberg, H., Eschrich W., Ziegler H. (eds.) Trees - Contribution to modern tree physiology (1997) Literature being announced.				

Title	**Paper and Board Technology**				
Symbol	MWS08				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	Successful completion of courses (BSc-level) in wood chemistry and chemical wood technology is strictly recommended				
Module coordinator	Prof. Dr. B. Saake, Tel.: +494073962510, bodo.saake@uni-hamburg.de				
Lecturer	Prof. Dr. B. Saake				
Language	English				
Educational objective	Students have profound knowledge of the different production processes and products of the paper and cardboard industry. They have acquired in depth knowledge of the various paper making technologies for various products like graphic paper, tissue, specialty paper, cardboard and corrugated card board. The importance of waste paper as a fiber source and the different recycling technologies adapted to the various end products will be understood.				
Contents	The lecture will first focus on the different paper production processes. As a basic scenario the production of graphic paper will be presented including strategies for influencing sheet formation and process control by online measurements. Further on the fundamentals of sheet formation and retention will be discussed introducing the most relevant strength additives and retentions aides. Based on these fundamentals the technological specifics of various product groups like tissue paper or specialty grades (e.g. filter paper, security paper, thermopaper) will be presented. The specific needs for production will be one focus explaining the different concepts for the headbox, wire and drying section. The production of card board, corrugated card board and packaging materials will be a further focus of the module. The recycling of waste paper will be presented for the three major end product groups: board, tissue and graphic paper. Analytical techniques for the characterization of paper and paper components and possibilities for process control will be presented.				
Courses	L: Paper and board technology Pr: Development on paper and board production				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Paper and board technology Pr: Development of paper and board production		28 28	54 40	30
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				

Frequency of occurrence	Annual
Literature	Will be announced at the beginning of the course

Title	**Lignocellulose Biorefinery**				
Symbol	MWS09				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	none				
Module coordinator	Prof. Dr. B. Saake, Tel.: +494073962510, bodo.saake@uni-hamburg.de				
Lecturer	Dr. J. Appelt (TI / HF), Prof. Dr. B. Saake				
Language	English				
Educational objective	Students have in depth knowledge of processes for the conversion of lignocellulosic feedstock such as wood, straw and bagasse into liquid energy sources and platform chemicals. The knowledge includes thermochemical conversion processes, and technologies based on pretreatment and enzymatic saccharification for the production of fermentable sugars and lignin. The students have acquired also knowledge on economic and environmental aspects of biorefinery processes.				
Contents	In terms of thermochemical conversion processes the generation of oil and other valuable products by pyrolysis, the production of fuel by gasification followed by Fischer-Tropsch synthesis and the implementation of biomass using the hydrothermal carbonisation (HTC) are considered. Another focus is on processes for provision of fermentable sugars and lignin. Here, the steam explosion and organosolv technologies with subsequent enzymatic hydrolysis will be discussed as well as hydrolysis with concentrated mineral acid. The comparison and evaluation of the process of economic and ecological point of view is also part of this lecture. The aspects are deepened in seminar presentations and group work.				
Courses	L: Lignocellulose biorefineries Pr: Lignocellulose biorefineries				3 sem. hrs. 1 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Lignocellulose biorefineries Pr: Lignocellulose biorefineries		42 14	70 24	30
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Will be announced at the beginning of the course,				

Title	**Biopolymers**
Symbol	MWS10
Semester	Winter or summer
Module type	Compulsory elective module
Formal requirements for participation	None
Recommended prerequisites	None
Module coordinator	Prof. Dr. B. Saake, Tel.: +494073962510, bodo.saake@uni-hamburg.de
Lecturer	Prof. Dr. B. Saake
Language	English
Educational objective	Students have in depth knowledge about the processing of wood components into valuable products as polymers or in modified forms. Based on knowledge about the chemical properties of the wood components they will acquire further know how about the processes for the separation and transformation the components into products. A further aspect will be the problems arising from the specificities of the biobased raw materials.
Contents	The production of dissolving pulps will be discussed as a basis for cellulose derivatives and regenerated fibers. The most important cellulose ethers, esters and regenerated fibers, as well as nanofibrils and aerogels will be presented in terms of their production, properties and application potential. For hemicelluloses and lignins different separation options and their influence on the structure and properties will be highlighted. Selected applications for technical lignins and hemicelluloses will be presented Selected processes and products based on the so called accessory components of lignocellulosics will be presented. Special focus will be laid upon technical problems related to accessory components and their effects on over all characteristics of different species. Analytical methods for the characterization of wood components will be presented.
Courses	L: Biopolymers from lignocellulosics — 3 sem. hrs. Pr: Biopolymers from lignocellulosics — 1 sem. hrs.

Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Biopolymers from lignocellulosics		42	70	30
	Pr: Biopolymers from lignocellulosics		14	24	
	Total workload	6	180		

Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.
Duration	One semester
Frequency of occurrence	Annual
Literature	Will be announced at the beginning of the course

Title	**Solid Wood Technology**
Symbol	MWS11
Semester	Winter or summer
Module type	Compulsory elective module
Formal requirements for participation	none
Recommended prerequisites	Successful completion of courses (BSc-level) in primary wood processing, mathematics, statistics, economy is strictly recommended
Module coordinator	Prof. Dr. A. Krause, +494073962623, andreas.krause@uni-hamburg.de
Lecturer	N.N.
Language	English
Educational objective	Students are familiar with secondary wood processing; based on timber as typical sawmill output manifold solid wood products are known. Following an initial timber grading procedure (visual vs. machine grading) the products are still showing typical wood attributes. The students master specific knowledge in wood processing (milling/cutting, routing etc.) and non-cutting processes) of solid wood products (timber drying, laminating, cross laminating ... bending) and structural solid wood components as well as surface treatment methods (staining, oiling, lacquering, powder coating). Also involved are required pre-products and additives, including appropriate timber grading and testing methods (regulations and standards). Complete process chains – starting with timber drying – and processing or operating sequences, plant layouts, alternative production methods and manufacturing costs are included as well.

Contents	• Secondary wood processing (regulations, standards, processing steps, production costs) ...
	• Timber drying
	• KVO®, Duo-®, Triolam®, glulam
	• Cross laminated timber (CLT, XLam, Microllam)
	• Solid wood components (→ window frames, doors, parquet etc.)
	• Wood modification (→ heat treatment, wax treatment etc.)
	• Surface treatment of solid wood products
	  • Liquid systems (wood stain, glaze, oil, lacquer)
	  • Solid surface coatings (films, laminates, powder ...)
	  • Quality assurance for surface treatment processes
	• Ecological assessment of processes and products
	• Product testing procedures, evaluation of regulations and standards
	• Excursion to manufacturers of typical solid wood products

Courses	L: Solid wood technology — 2 sem. hrs. Pr: Solid wood technology — 2 sem. hrs.

Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Solid wood technology		28	44	30
	Pr: Solid wood technology		28	50	
	Total workload	6	180		

Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English

Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.
Duration	One semester
Frequency of occurrence	Annual
Literature	Forest Products Laboratory 2010 - Wood handbook—Wood as an engineering material. General Technical Report FPL-GTR-190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 508 p. Navi, P., Sandberg, D. 2011 - Thermo-Hydro-Mechanical Wood Processing (Engineering Sciences). CRC Press - Taylor & Francis Group. ISBN-13: 978-1-4398-6043-4 (eBook - PDF) Walker, J. C. F. 2006 - Primary Wood Processing: Principles and Practice. Springer, 2nd ed. 2006. ISBN-10: 1402043929, ISBN-13: 978-1402043925

Title	**Composite Technology**				
Symbol	MWS12				
Semester	Winter or summer				
Module type	Compulsory module				
Formal requirements for participation	none				
Recommended prerequisites	none				
Module coordinator	Prof. Dr. A. Krause, +494073962623, andreas.krause@uni-hamburg.de				
Lecturer	Prof. Dr. A. Krause, Dr. Jan Lüdtke (TI / HF)				
Language	English				
Educational concept	Students are familiar with basic and advanced principles of composite technology. They have specific knowledge on wood-based composites and natural fiber based composites using various matrix systems.				
Contents	• General fiber based composite technology • Duroplastic wood composites • Thermoplastic wood composites • Developing, manufacturing and testing of composites				
Courses	L: Composite technology Pr: Composite technology				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Composite technology Pr: Composite technology		28 28	21 63	40
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Literature being announced at the beginning of the module				

Title	**Structural Applications of Wood**
Symbol	MWS13
Semester	Winter or summer
Module type	Compulsory elective module
Formal requirements for participation	none
Recommended prerequisites	Successful completion of courses (BSc-level) in primary wood processing, mathematics, statistics, economy is strictly recommended
Module coordinator	Prof. Dr. A. Krause, +494073962623, andreas.krause@uni-hamburg.de
Lecturer	N.N.
Language	English
Educational objective	Students are familiar with essential aspects of timber construction using solid wood and engineered wood products (EWP). They have comprehensive knowledge on structural timber as well as on EWP for structural use (static / dynamic load, building physics – heat, moisture, sound and fire). Required regulations and standards are discussed. Students gain fundamental skills of timber constructions, thus gaining a deeper understanding on internal relationships between material and structure.
Contents	• Fundamentals of wood construction methods and types (building systems: log construction, stud construction, frame construction, panel / solid timber construction...) • Fundamentals of timber construction of walls, roofs, ceilings, etc.; framework and panel constructions (basic calculations, stability proof, appropriate use of the material in construction and design) • Properties of wood species and EWP used for structural applications including standards, regulations and rules • Heat-, moisture, sound- and fire-protection and related standards (physical fundamentals and basic calculations, performance and typical examples) • Timber utilization in residential housing • Timber engineering • Ecological and economical aspects of structural timber utilization.
Courses	L: Structural application of wood — 2 sem. hrs. Pr: Structural application of wood — 2 sem. hrs.

Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Structural application of wood		28	52	20
	Pr: Structural application of wood		28	52	
	Total workload	6	180		

Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.
Frequency of occurrence	Annual
Duration	One semester

Literature	Kolb, J. 2008 - Systems in Timber Engineering. Loadbearing Structures and Component Layers. Basel, Boston, Berlin: Birkhaeuser. ISBN: 978-3-7643-8689-4 Forest Products Laboratory 2010 - Wood handbook—Wood as an engineering material. General Technical Report FPL-GTR-190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 508 p.

Title	**Timber Production**				
Symbol	MWS14				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	Successful completion of courses in timber production (BSc level), mathematics, statistics, economy is strictly recommended				
Module coordinator	Prof. Dr. M. Köhl, +494073962100, weltforst@uni-hamburg.de				
Lecturer	Prof. Dr. M. Köhl, Dr. P. Mundhenk, NN				
Language	English				
Educational concept	Students are familiar with the most fundamental decisions forest managers make in managing forests for timber production.				
Contents	The class covers stand and forest-level decisions. The most fundamental stand-level decision for even-aged stands is deciding when the stand should be harvested. Regeneration and thinning decisions also are important. Uneven-aged management decisions include identifying a target diameter class distribution and selecting a cutting cycle. Forest-level decisions include determining the harvest level, specific areas to be harvested over time, and how much and what areas to allocate to special management areas such as extended rotation areas, aesthetic buffers, streamside management zones, and wildlife areas. The course emphasises basic tools used in making these decisions, including financial analysis at the stand level and linear programming at the forest level.				
Courses	L: Principles of timber production S: Seminar about decisions for sustainable forest management				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Principles of timber production S: Seminar about decisions for sustainable forest management		28 28	40 40	44
	Total workload	6	180		
Exam framework	Requirements for registration: Active participation and presentation in the seminar Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Kangas,A., Kangas, J., Kurttila, M., 2008: Decision Support for Forest Management, Springer; Nyland, R.D., 2007: Silviculture: Concepts and Applications, Waveland Pr Inc				

	Köhl, M., Magnussen, S., Marchetti, M., 2006: Sampling methods, remote sensing and GIS, Springer

Title	**International Forestry and Timber Industries**				
Symbol	MWS15				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	Successful completion of courses in timber production (BSc level) is strictly recommended				
Module coordinator	Prof. Dr. M. Köhl, +494073962100, weltforst@uni-hamburg.de				
Lecturer	Prof. Dr. M. Köhl, Dr. P. Mundhenk, NN				
Language	English				
Educational concept	Students understand regional characteristics of forestry and timber industries in a global context and are familiar with international policy instruments, initiatives and conventions that have an impact on forestry and timber industries				
Contents	• Global forest resources, incl. forest types, site quality, increment, standing volume • Global deforestation and drivers of deforestation • Sustainability and legality, incl. legal frameworks, prevention of illegal logging (FLEGT/VPA); public procurement policy • International initiatives and conventions (e.g. UN-CBD, UN-FCCC, UN-CCD, UNCED, C&I, Bonn Challange) • Policy instruments (e.g. Coase Theorem, Pigouvian taxes, tradable certificates) • REDD+ - Reducing Emissions from Deforestation and Forest Degradation • Certification (sustainable forest management & CoC) • Timber production, demand and trade • Forest management in the tropics, incl. rehabilitation, reduced impact logging • Forests and climatic change • Land-use conflicts				
Courses	L: International forestry S: Seminar forest zones (regional focus)				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: International forestry S: Seminar forest zones (regional focus)		28 28	30 50	44
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				

Literature	Pancel L., Köhl, M., 2016, Tropical Forestry Handbook, Springer

Title	**Data Sources and Modelling Timber-related Industries**				
Symbol	MWS16				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Recommended prerequisites	Successful completion of courses in timber production (BSc level), basic knowledge of computing in R is strictly recommended				
Module coordinator	Prof. Dr. M. Köhl, +494073962100, weltforst@uni-hamburg.de				
Lecturer	Prof. Dr. M. Köhl, PD Dr. M. Knauf, Dr. Philip Mundhenk, N.N.				
Language	English				
Educational concept	Students are familiar with available national and international data collections/ data sources on wood resources, timber supply and demand, and timber products. They know different approaches for the evaluation of material flows and are able to apply them				
Contents	• National and international data sources: access, concepts, nomenclature, and reliability • Basic structures of wood resource balance • Terminology / taxonomy and statistical classification • Evaluation, e.g. lifecycle analysis, material flow analysis, stress and risk analysis, GHG-budgets • Economic ethics • Timber supply and demand modelling • Modelling supply chains und added-value chains				
Courses	L: Statistical terminology, classification and data sources S: Seminar modelling resource markets				2 sem. hrs. 2 sem. hrs.
Workload (hrs)		ECTS	P (hrs)	S (hrs)	EP (hrs)
	L: Statistical terminology, classification and data sources		28	30	44
	S: Seminar modelling resource markets		28	50	
	Total workload	6	180		
Exam framework	Requirements for registration: none Type of examination: Oral or written exam (will be announced at the beginning of course) Language: English				
Course type and usability	Compulsory elective for MSc of Wood Science, open for students of related MSc programs, dependent on capacities and schedule.				
Duration	One semester				
Frequency of occurrence	Annual				
Literature	Hamill L., Gilbert, N., Agent-based modelling in economics, Wiley, 2016 https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf				

Title	**Project Study**				
Symbol	MWS17				
Semester	Winter or summer				
Module type	Compulsory elective module				
Formal requirements for participation	none				
Module coordinator	Lecturer of the programme				
Lecturer	All lecturers				
Language	English				
Educational concept	Students learn to think and work self-constrainedly in the scientific fields of the Wood Science. They gain experience in designing and carrying out scientific experiments in order to solve scientific problems.				
Contents	Students have to organize their scientific work, write a report and discuss the results of their work				
Courses	Research work: Laboratory work or literature study				....
Workload (hrs)		ECTS	S (hrs)	EP (hrs)	total
	Total workload	6	180		
Exam framework	Type of examination: project report Language: English				
Course type and usability	Compulsory elective module				
Frequency of occurrence	Each semester				
Duration	One semester				
Literature	Literature announced at the beginning of the project study				

Elective Modules

Title	**Functional Forest Ecology**				
Symbol	MWS-FW04				
Semester	Winter semester				
Module type and assignment to the curriculum	Elective module (M.Sc. Wood Science)				
Formal requirements for participation	None				
Module coordinator	Prof. Dr. Ina Meier, Phone: 040 822459 203, E-Mail: ina.meier@uni-hamburg.de				
Lecturer	Prof. Dr. Ina Meier				
Language	English				
Educational objective	In this course the students learn the basic principles of functional forest ecology and biodiversity research and gain a deep insight into different biodiversity facets in relation to important forest ecosystem functions and services.				
Contents	The lecture conveys patterns, scales, and management conflicts of forest diversity as illustrated for specific case studies. The power of trait-based functional ecology to better understand the consequences of some current major environmental problems is addressed.				
Courses	• L: Functional Forest Ecology				2 hrs per week
Workload (hrs)	• L: Functional Forest Ecology	P (hrs) 28	S (hrs) 47	PV (hrs) 15	Total
	Total workload	28	47	15	90
Credit points (ECTS)	3 ECTS				
Exam framework	The lecture is examined with a written examination (graded).				
Duration	One semester				
Frequency of occurrence	Yearly				
Literature	Will be announced at the beginning of the course				

Title	**Project Course Forest Ecology**				
Symbol	MWS-FW05				
Semester	Summer semester				
Module type and assignment to the curriculum	Elective module (M.Sc. Wood Science)				
Formal requirements for participation	None				
Module coordinator	Prof. Dr. Ina Meier, Phone: 040 822459 203, E-Mail: ina.meier@uni-hamburg.de				
Lecturer	Dr. Anis Khokon, Dr. Daniela Yaffar, Annalena Ritter				
Language	English				
Educational objective	This course addresses students who are planning to write a master's thesis in a biological or forest ecological topic before long. The aim of the course is to teach the basics of scientific work and the presentation and publication of the research results. Students acquire competencies for scientific research projects in the field.				
Contents	In a combination of lectures, trainings, and exercises, the course introduces important aspects of the experimental design, statistical data analysis, and graphical presentation of research results (based on available data sets), as well as their oral and written presentation.				
Courses	• L: Planning and performing ecological research projects • E: Data analysis and presentation techniques				1 hrs per week 3 hrs per week
Workload (hrs)		P (hrs)	S (hrs)	EP (hrs)	Total
	• L: Planning and performing ecological research projects • E: Data analysis and presentation techniques	14 42	7 109	 8	
	Total workload	56	126	8	180
Credit points (ECTS)	6 ECTS				
Exam framework	Oral presentation of research results and written elaboration in the form of a scientific article (15 pages max; graded).				
Duration	One semester				
Frequency of occurrence	Yearly				
Literature	Will be announced at the beginning of the course				

Title	**Tree species of South America**				
Symbol	MWS-FW03				
Semester	Winter				
Module type	Elective module				
Formal requirements for participation	Basic knowledge of plant biology is recommended				
Module coordinator	Layssa da Silva Costa, Tel. 73962466, layssa.da.silva.costa(at)uni-hamburg.de				
Lecturer	Layssa da Silva Costa				
Language	English				
Educational concept	Students acquire knowledge of the basics of tree species in South America. They have an overview of the morphology, anatomy and usage of the most important South American tree species.				
Contents	The seminar is mainly based on student presentations on South American tree species, which are discussed afterwards.				
Courses	Seminar Tree species of South America				2 sem. h.
Workload (hrs)	Seminar Tree species of South America	ECTS	S (hrs)	EP (hrs)	total
	Total workload	3	90		
Exam framework	Requirements for the module examination: Active participation in the seminar Type of examination/module examination: Presentation (graded; 100%)				
Course type and usability	Elective module				
Frequency of occurrence	Annual				
Duration	One semester				
Literature	Literature announced at the beginning of the project study				