

Ministry of Education and Sports

Savannakhet University

Faculty of Agriculture and Environment

No \_\_\_\_\_/.....

Savannakhet, Date \_\_\_\_/\_\_\_\_/\_\_\_\_

## Course Syllabus

### 1 Program

Title of the study programme: Master of Science in Forest Resource Management  
(MSc in FRM)

### 2 Course details

Course name: Wood-Industrial Machines

Course code: FOA04WIM12105

Number of credits (hours/week): 3(2-2-5)

Course type (tick the appropriate box):  Required,  Elective,  Other, if other please explain:

Prerequisites courses: Forest Harvesting and Raw Timber Production

Semester, in which the course is taught: *tick the appropriate box below*

Year 1		Year 2	
Semester 1	Semester 2	Semester 1	Semester 2
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 3 Responsible unit:

**3.1 Department:** Department of Forestry Resource

Names and affiliations of lecturer(s): Dr. Somphong Chanthavong, Department of Forestry Resource, Agriculture and Environment Faculty, Savannakhet University, Lao PDR. Tel: +856 20 56789143, Email: somphongsku@gmail.com

### 4 Course description

Wood-Industrial Machines is a course designed to introduce students to machinery used in timber production and wood processing. It generates knowledge and skills through various lessons, practices and field trips. Graduates will learn about the machinery itself and the safe and efficient application of heavy and powered machines, and wood-working tools. The practices and field trips are designed to provide as much experience as possible to the students through seminar topics, student assignments, as well as field trips. The practices will also cover entry-level complexity aspects of the wood-working projects.

## **Course objectives**

The Master course in Wood-Industrial Machines aims to provide opportunities to the graduates who wish to pursue their professional careers in the field of forest and wood processing mechanization. Upon graduation, students will be able to understand, apply, analyze, and evaluate the technology to forestry machinery as basic materials to manufacture various useful forestry products. The course objectives include:

- Forestry logging by using of hand tools;
- Heavy machinery for the wood processing industry.
- Safety of logging by using of hand tools and heavy machines; and
- Wood-working tool and it's safety.

### **Knowledge:**

Graduates shall have a solid knowledge of the machinery and powered tools used in forestry and wood processing. They will obtain knowledge on the principles of functioning and operation of hand tools, power tools, as well as mobile machines in plantations and natural forests. Graduates shall understand the occupational safety and health guidelines connected to operating the machinery described within the course, and learn of the most efficient working techniques with these devices. They shall learn how to maintain and take care of said devices.

### **Skills:**

Graduates must be able to apply the acquired knowledge of forestry and wood processing machines such as mobile machinery, hand tools, and power tools in logging operations both in plantation and natural forests. Graduates must also be able to apply knowledge of woodworking tools and machines used in wood processing operations and manufacture of wood products. They can read machinery blueprints and identify functional parts of the machines and diagnose their basic defects.

### **Application of theories to practice:**

Graduates are able to apply the theoretical knowledge on the functioning of machinery and devices used in forestry and wood processing, gained throughout the course in practical tasks carried out in

forest and wood processing operations. They can analyze a given topic within the scope of the course into more depth to become experts in the field. Graduates can also apply theories to research institutes to do research, or teach in universities that offer forestry or wood science study programs. They will be able to create their ideas and concepts to both workers who carry out the operations and to higher management of forest enterprises and wood processing technology.

### **Social knowledge and skills:**

Graduates become specialists/experts on forestry and wood processing machines and devices, including knowledge and skills on utilization of hand tools, power tools for logging processes both in plantations and natural forests. They can become managers and consultants in the field of forestry and wood processing machinery. The graduates are able to analyze different approaches to the management of machinery from the point of view of their characteristic uses and to evaluate the types of tools and powered machines used in the forest and wood processing operations. They are competent to evaluate the industrial machines for solution of economic, environmental and basic societal problems. Graduates will be able to continuously create a new knowledge in wood-industrial machines in the wood processing manufactories.

### **4.1 Learning objectives of particular modules**

The course is divided into four modules: (1) hand tools; (2) power tools; (3) wood processing machinery, materials and methods. (4) occupational health and safety of machine operation;

(1) Hand tools for felling the trees both in plantations and natural forests. Students will learn the theoretical principles and construction of hand tools used in forest operations, and apply knowledge and skills in practice with the use of various kinds of hand tools for harvesting operations, such as felling, delimiting, bucking and various others in the timber production process;

(2) Power tools for logging operation both in plantations and natural forests. Graduates will understand the principles and construction of power tools used in forest operations (e.g. chain saws, mobile machinery), and apply their knowledge and skills in practice with the use of various kinds of power tools (e.g. chainsaws), and heavy forestry machinery (e.g. skidders, trucks) worked for logging preparation and operation.

(3) Woodworking tools in wood manufacture processing. This module is to provide graduates to understand, and apply various kinds of woodworking tools, materials and their methods for operations in wood manufacture processing.

(4) Safety of logging and wood processing operations (safe working techniques with a chain saw, mobile machinery, and other heavy machinery). This module is to provide graduates to understand, apply, and evaluate the safety of using machines in forest and wood processing operations, including methods of cutting trees, safe zone delineation, maintenance of hand tools and machines).

In order to gain more understanding and deep knowledge and skills in wood-industrial machines, graduates are required to participate in the seminars, group working projects, and field visits to forest logging operations, sawmills and/or wood manufactory companies.

## 5 Course teaching methods

The course consists of lectures, seminars, group projects, assignments, and field trips. Graduates are required to develop projects or essays to show the dimensions of forestry and wood processing machinery (individual and group working projects). Attendance of the course lectures, seminars, and field trips is mandatory, except in cases of sickness or other health problems documented by a physician. In case of excused unattendance, students will elaborate an extra assignment on the topic of the lecture/seminar/ field trip they failed to attend.

## 6 Teaching plan

Week	Content	Method/activity	Hour
1	<p><b>Welcome and introduction to the wood-industrial machine course</b></p> <ul style="list-style-type: none"> <li>- Hand tools for felling the trees both in plantations and natural forests;</li> <li>- Power tools for logging operations both in plantations and natural forests;</li> <li>- Safety of logging operation by using of hand and power tools; and</li> <li>- Woodworking machinery in wood manufacture processing.</li> </ul>	Lecturer provides instruction on lesson plan, course description, expected learning outcomes. Students' assignment.	2
2	<b>Theories</b>		2
	<b>Module 1: Hand tools for felling the trees both in plantations and natural forests</b>		
	History and principles of Forest Harvesting and Raw Timber Production	Lecturer provides the use of hand tools for felling trees in Laos	
	<b>Practice</b>		2
	<b>Module 1: Hand tools for felling the trees both in plantations and natural forests</b>		
Seminar topic: review of the development of hand tools (axe and saw) used in forest harvesting and the technologies connected to their use	Presentation of the various hand tools used in forest harvesting throughout history, discussion on the pros and cons of particular tools, tools evolution, the		

		purpose of improving harvesting technologies. Group working projects.	
3	<b>Theories</b>		<b>2</b>
	<b>Module 1: Hand tools for felling the trees both in plantations and natural forests</b>		
	Implement used in felling and conversion of timber -Axes: Parts (axe head, axe handle) -Saws: hand saws (cross cut saws-tooth shape); bow sawl maintenance of saws -Miscellaneous tools	Presentation on the implement used in felling and conversion of hand tools and their miscellaneous tools in Laos. Students' reports on previous assignment.	
	<b>Practice</b>		<b>2</b>
	<b>Module 1: Hand tools for felling the trees both in plantations and natural forests</b>		
Seminar topic: practical implications of hand tools in Laos	Group discussions, panel discussions		
4	<b>Theories</b>		<b>2</b>
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		
	Introduction to power tools -Power chain saw – construction and functional parts -Maintenance of chain saw -Advantage and disadvantage of chain saw	Presentation on the used and maintenance of power chain saws in forest operations	
	<b>Practice</b>		<b>2</b>
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		
Seminar topic: overview, rules and regulations and future trends of logging situation in Laos	Assignment of student work, group working projects on the policy of timber harvesting in Laos		
5	<b>Theories</b>		<b>2</b>
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		
	-Chain saw construction: functional parts, maintenance, and the consideration of pros and cons of chain saw usage.	Lecture, discussion, video demonstration of correct chainsaw operation	



	-Chainsaw timber logging - felling techniques for normal, leaning, decayed trees, stem processing through limbing and bucking		
	<b>Practice</b>		
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		<b>2</b>
	Seminar topic: Chainsaw operation and maintenance	Demonstration of correct chainsaw operation, maintenance and care, demonstration of chainsaw mechanisms and devices on a chainsaw model	
6	<b>Theories</b>		
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		<b>2</b>
	Mechanized forest road construction – heavy machines/motor trucks	Lecture, discussion, video demonstration of machine operation	
	<b>Practice</b>		
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		<b>2</b>
	Seminar topic: Heavy machinery used for forest road construction	Student group presentation of previous projects. Assignment of student work, group work on the used of heavy machines/motor trucks on logging road construction	
7	<b>Theories</b>		
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		<b>2</b>
	Mechanized timber skidding and primary timber transportation – heavy ground-based machine operation	Lecture, discussion, demonstration video on machine operation and technological process	
	<b>Practice</b>		
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		<b>2</b>



	Seminar topic: Forest operations: construction of axles, engines, propulsion systems, functional parts – cranes, clam-bunks, winches.	-Presenting real-life harvesting projects (video-presentation) -Group discussion	
8	<b>Theories</b>		<b>2</b>
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		
	Mechanized timber transportation – water transportation	Lecture, discussion, demonstration video on devices and technological process	
	<b>Practice</b>		<b>2</b>
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		
Seminar topic: Forest operations: water transportation.	Presenting real-life harvesting projects (video-presentation) -Group discussion		
9	<b>Theories</b>		<b>2</b>
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		
	Mechanized timber transportation –	Lecture, discussion, demonstration video on devices and technological process	
	<b>Practice</b>		<b>2</b>
	<b>Module 2: Power tools for logging operation both in plantations and natural forests</b>		
Mechanized timber transportation – cable yarders – main components and their functions, designing cable yarder operations	Group discussions, Individual consultations of students with tutors regarding the elaboration of the assignment		
10	<b>Theories</b>		<b>2</b>
	<b>Midterm-Examination</b>		



	<b>Practice</b>		<b>2</b>
	<b>Midterm-examination</b>		
<b>11</b>	<b>Theories</b>		<b>2</b>
	<b>Module 3: Wood processing machinery, materials, and methods</b>		
	Introduction to woodworking tools, materials and methods: typology of machines, their division and possibilities of use (from sawmill processing to woodworking).	Presentation on woodworking tools for various uses, watch video on sawmilling and wood processing technology. Students' assignments.	
	<b>Practice</b>		<b>2</b>
	<b>Module 3: Wood processing machinery, materials, and methods</b>		
Seminar topic: Typology of woodworking machines. from hand tools to CNC woodworking.	Project assignment of student works (group working) on wood processing technology		
<b>12</b>	<b>Theories</b>		<b>2</b>
	<b>Module 3: Wood processing machinery, materials, and methods</b>		
	Introduction to woodworking tools, materials and methods: Tools and materials for tools and machinery desing.	Presentation on woodworking tools and materials for tools and machinery	
	<b>Practice</b>		<b>2</b>
	<b>Module 3: Wood processing machinery, materials, and methods</b>		
Seminar topic: Materials and tools (types, source, uses, and characteristics of common used on various machinery.	Continous project assignment of student works (group working) on wood processing technology		
<b>13</b>	<b>Theories</b>		<b>2</b>
	<b>Module 3: Wood processing machinery, materials, and methods</b>		
	Introduction to woodworking tools, materials and methods Cutting and milling of wood: possibilities of use, types of machines and machining.	Presentation on types of cutting and milling of wood.	





	<b>Practice</b>		
	<b>Module 3: Wood processing machinery, materials, and methods</b>		<b>2</b>
	Seminar topic: Furniture products in Laos	Continous project assignment of student works (group working) on wood processing technology	
14	<b>Theories</b>		<b>2</b>
	<b>Module 3: Wood processing machinery, materials, and methods</b>		
	Introduction to veneer/plywood production, particle board production, machining for wood modification, pulp, and paper production, etc.	Lecture, presentation of the various kinds of woodworking machines.	
	<b>Practice</b>		<b>2</b>
	<b>Module 3: Wood processing machinery, materials, and methods</b>		
	Presentation of group working projects	Goup report on project assignment of student works (group working) on wood processing technology	
15	<b>Theories</b>		<b>2</b>
	<b>Module 4. Occupational health and safety of machine operation</b>		
	Safe working techniques for hand tools -Felling safety using hand tools; -Felling safety using chain saw; -Safety devices for hand and power tools -The primary care	Lecture, discussion, demonstration video on safety devices and technological process. Students' asignments.	
	<b>Practice</b>		<b>2</b>
	<b>Module 4. Occupational health and safety of machine operation</b>		
	Seminar topic: logging operation by using of hand and chain saw and their emergency accidents	Assignment of student work, and group discussion	



16	<b>Theories</b>		<b>2</b>
	<b>Module 4.Occupational health and safety of machine operation</b>		
	Safe working techniques for of heavy machinery -Heavy machine safety in logging road construction; -Heavy machine safety in timber skidding and transportation ; -Heavy machine safety devices water and overhead transportation -The primary care	Lecture, discussion, demonstration video on heavy machine safety in forest operation and technological process	
	<b>Practice</b>		<b>2</b>
	<b>Module 4. Occupational health and safety of machine operation</b>		
	Presentation of group working projects	Group discussion; comments on group working projects	
17	<b>Theories</b>		<b>8</b>
	Field trip		
	<b>Practice</b>		
18	Field trip		<b>8</b>
	<b>Theories</b>		
	Field trip		<b>8</b>
	<b>Practice</b>		
19	Pre-final exam		<b>4</b>
	Theories		
	Practice		
20	Final exam		<b>4</b>
	Theories		
	Practice		

## 7 Material needs

### 7.1 Equipment purchased under FRAME PROJECT

-Wood analyses

-Wood-working tools

### 8.2 Equipment purchased under FORHEAL PROJECT

**-Teaching equipment: Note books, and computers, LCD and projectors.**

- Laboratory and class-room equipment: printers, microscopes, soil analysis, etc.

-Field work equipment: Chainsaw and its safety equipment, GPS, high and diameter of tree measurements, etc.

## 8 References

### 8.1 Compulsory reading list

Dobelmann, J.K., D.-I. A. Klaus-Vorreiter et al. 2006. Study on solar and biomass energy potential and feasibility in Lao PDR. Asia Pro Eco project TH/Asia Pro Eco/05(101302). Funded by European Commission.

Foppes, J. and S. Ketphanh. 2000. Forest extraction or cultivation? Local solutions from Lao PDR. Paper presented at Workshop on the Evolution and Sustainability of “Immediate System” of Forest Management, FOREASIA, 28 June to 1 July, Norway.

Foppes, J. and S. Phommasane. 2005. Experiences with market development of non-timber forest products in Lao PDR. Paper presented at the international workshop on market development for improving upland poor’s livelihood security, 30 August to 2 September, Kunming China.

Ian, L.Th., 2015. Driver of Deforestation in the Greater Mekong Subregion Laos Country Report. [https://www.uncclearn.org/wp-content/uploads/library/fao13102015\\_4.pdf](https://www.uncclearn.org/wp-content/uploads/library/fao13102015_4.pdf).

ICEM (International Center for Environmental Management). 2003. Lao PDR national report on protected areas and development. Review of protected areas and development in the Lower Mekong River Region. Indooroopilly, Queensland, Australia.

Nanthavong, K. 2005. Access to energy: assessment of policies, capacities and knowledge repositories at the national level. UNDP Lao PDR, Regional Energy Program for Poverty Reduction (REP-PoR), Vientiane.

National Statistics Center. 2005. Population census 2005. National Statistics Center of the Lao PDR.

Sylavong, L. 2007. Environmental impacts of trade liberalization in Laos for biofuels. Alumni Newsletter Fall 2007. Beahrs Environmental Leadership Program, University of California.

Theuambounmy, H. 2007. Status of renewable energy development in the Lao People’s Democratic Republic. Paper presented at Greening the Business and Making Environment a Business Opportunity, 5 to 7 June, Bangkok Thailand.

World Bank et al. 2001. Lao PDR production forestry policy: status and issues for dialogue. Vol. 1. Main report; Vol. Annexes. World, Washington D.C.

### 8.2 Suggested reading list

-Brian Porter. 1984. Carpentry and Joinery. Formerly of Leeds College of Building.

-Carpentry I, Headquarters, EN5155, U.S. Army Engineering School, Fort Belvoir, Va., 1988.

-Carpentry III, Headquarters, EN0533, U.S. Army Engineering School, Fort Belvoir, Va., 1987.

-The Taunton Press. 2018. Woodworking with hand tools.

## 9 Assessment of students

### 9.1 Description of assessment

- Attendance 10 %
- Reporting 35 %
- Midterm examination 20 %
- Final examination 35 %

### 9.2 Grade distribution and student assessment

#### Grading scale

Score level	Meaning		Total score	Scale
Symbol	(Lao)	(English)		
A	ດີເລີດ	(Excellent)	80-100	4,00
B+	ດີຫຼາຍ	(Very Good)	75-79	3,50
B	ດີ	(Good)	70-74	3,00
C+	ດີພໍໃຊ້	(Fairly Good)	65-69	2,50
C	ພໍໃຊ້	(Fair)	60-64	2,00
D+	ອ່ອນ	(Poor)	55-59	1,50
D	ອ່ອນຫຼາຍ	(Very Poor)	50-54	1,00
F	ຕົກ	(Fail)	0-49	0,00
I	ບໍ່ສົບບຸນ (ຮຽນບໍ່ຄົບ)	(Incomplete)		



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Head of Department.....

Course Instructor

Dean of Faculty.....