

STRUKTUR KURIKULUM K2020

PROGRAM MASTER (S2) & DOKTOR (S3)

Program Studi

ILMU DAN TEKNOLOGI HASIL HUTAN

**DEPARTEMEN HASIL HUTAN
FAKULTAS KEHUTANAN
IPB UNIVERSITY**

Juli 2020

I. PROGRAM MASTER (S2)

- A. NAMA PRODI** : **ILMU DAN TEKNOLOGI HASIL HUTAN**
- B. CAPAIAN PEMBELAJARAN PRODI** :
- 1 Menguasai pengetahuan dan kemampuan riset dalam mengembangkan ilmu dan teknologi pemanfaatan biomasa hutan berdasarkan ilmu biomaterial, rekayasa proses, manajemen, dan bisnis
 - 2 Mampu mengelola dan mengembangkan riset yang berkaitan dengan biomaterial secara inter atau multi-disipliner
 - 3 Mampu mengelola dan mengembangkan riset berkaitan dengan ilmu dan teknologi pemanfaatan biomasa hutan serta mengomunikasikan hasilnya ke komunitas ilmiah dan umum baik pada tataran nasional maupun internasional
 - 4 Mampu membangun komitmen, integritas profesional dan nilai-nilai etika

C. STRUKTUR MATA KULIAH PROGRAM REGULER

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
Mata Kuliah Kompetensi Umum (<i>Common Core Courses</i>)						
1	THH501	Metode Penelitian	3(2-1)		1	2
2	PPS500	Bahasa Inggris	LH		1	2
Sub Total SKS			3			
Mata Kuliah Kompetensi Dasar Program Studi (<i>Foundational Courses</i>)						
1	THH502	Analisis Statistik	3(2-1)		1	2
2	THH50R	Ilmu Kayu	2(2-0)		1	2
Sub Total SKS			3-5			
Mata Kuliah Kompetensi Program Studi (<i>Academic Core Courses</i>)						
1	THH511	Fisika Biomaterial	2(2-0)		1	2
2	THH531	Mekanika Biomaterial	3(2-1)		1	2
3	THH541	Kimia Biomaterial	2(2-0)		1	2
Sub Total SKS			7			
Mata Kuliah Minat Program Studi (<i>In-Depth Courses</i>)						
1	THH512	Deteriorasi Kayu	3(2-1)		Ganjil	Genap
2	THH521	Teknologi Perekatan Biomaterial	3(2-1)		Ganjil	Genap
3	THH613	Ultrastruktur Dinding Sel Kayu	3(2-1)		Ganjil	Genap
4	THH614	Finishing Kayu	3(2-1)		Ganjil	Genap
5	THH615	Biologi Rayap	3(2-1)		Ganjil	Genap
6	THH622	Teknologi Biokomposit	3(2-1)		Ganjil	Genap
7	THH623	Komposit Serat Bukan Kayu	3(2-1)		Ganjil	Genap
8	THH624	Komposit Biomaterial Maju	3(2-1)		Ganjil	Genap
9	THH632	Nondestruktif Hasil Hutan	3(2-1)		Ganjil	Genap
10	THH633	Material Terbarukan pada Konstruksi Berkelanjutan	3(2-1)		Ganjil	Genap
11	THH642	Ilmu Pulp dan Serat Alami	2(2-0)		Ganjil	Genap
12	THH643	Biorefineri Lignoselulosa	3(2-1)		Ganjil	Genap
13	THH644	Ekstraktif Hasil Hutan	3(2-1)		Ganjil	Genap
14	THH651	Optimasi dalam Industri Hasil Hutan	3(2-1)		Ganjil	Genap
15	THH652	Model Ekonometrika untuk Hasil Hutan	3(2-1)		Ganjil	Genap
Sub Total SKS			8-11			
Mata Kuliah Pengayaan (<i>Enrichment Courses</i>)						
1		Mata kuliah pilihan dari luar program studi	1-M			
Sub Total SKS			1-M			

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
Tugas Akhir						
1	THH591	Kolokium	1 (0-1)		3	2
2	THH592	Proposal	2 (0-2)		3	2
3	THH593	Ujian Tesis	2 (0-2)			4
4	THH594	Tesis	6 (0-6)			4
5	PPS590	Seminar Tesis	1 (0-1)		3	4
6	PPS591	Publikasi Ilmiah	2 (0-2)		3	4
			Sub Total SKS	14		
			Total SKS	36-39		

D. MATA KULIAH PROGRAM STUDI MASTER PROGRAM BY RESEARCH

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
Mata Kuliah Kompetensi Umum (Common Core Courses)						
1	THH501	Metode Penelitian	3(2-1)		1	2
2	PPS500	Bahasa Inggris	LH		1	2
			Sub Total SKS	3		
Mata Kuliah Kompetensi Dasar Program Studi (Foundational Courses)						
1	THH502	Analisis Statistik	3(2-1)		1	2
			Sub Total SKS	3		
Mata Kuliah Kompetensi Program Studi (Academic Core Courses)						
1	THH511	Fisika Biomaterial	2(2-0)		1	2
2	THH531	Mekanika Biomaterial	3(2-1)		1	2
3	THH541	Kimia Biomaterial	2(2-0)		1	2
			Sub Total SKS	4-5		
Mata Kuliah Minat Program Studi (In-Depth Courses)						
1	THH512	Deteriorasi Kayu	3(2-1)		Ganjil	Genap
2	THH521	Teknologi Perekatan Biomaterial	3(2-1)		Ganjil	Genap
3	THH613	Ultrastruktur Dinding Sel Kayu	3(2-1)		Ganjil	Genap
4	THH614	Finishing Kayu	3(2-1)		Ganjil	Genap
5	THH615	Biologi Rayap	3(2-1)		Ganjil	Genap
6	THH622	Teknologi Biokomposit	3(2-1)		Ganjil	Genap
7	THH623	Komposit Serat Bukan Kayu	3(2-1)		Ganjil	Genap
8	THH624	Komposit Biomaterial Maju	3(2-1)		Ganjil	Genap
9	THH632	Nondestruktif Hasil Hutan	3(2-1)		Ganjil	Genap
10	THH633	Material Terbarukan pada Konstruksi Berkelanjutan	3(2-1)		Ganjil	Genap
11	THH642	Ilmu Pulp dan Serat Alami	2(2-0)		Ganjil	Genap
12	THH643	Biorefineri Lignoselulosa	3(2-1)		Ganjil	Genap
13	THH644	Ekstraktif Hasil Hutan	3(2-1)		Ganjil	Genap
14	THH651	Optimasi dalam Industri Hasil Hutan	3(2-1)		Ganjil	Genap
15	THH652	Model Ekonometrika untuk Hasil Hutan	3(2-1)		Ganjil	Genap
			Sub Total SKS	9-11		
Mata Kuliah Pengayaan (Enrichment Courses)						
1		Mata kuliah pilihan dari luar program studi	1-M			
			Sub Total SKS	1-M		
Tugas Akhir						
1	THH591	Kolokium	1 (0-1)		3	2
2	THH592	Proposal	2 (0-2)		3	2
3	THH593	Ujian Tesis	2 (0-2)			4

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
4	THH594	Tesis	6 (0-6)			4
5	PPS590	Seminar Tesis	1 (0-1)		3	4
6	PPS591	Publikasi Ilmiah 1	2 (0-2)		3	2
7	PPS592	Publikasi Ilmiah 2	2 (0-2)		3	4
		Sub Total SKS	16			
		Total SKS	36-39			

II. PROGRAM DOKTOR (S3)

- A. NAMA PRODI : ILMU DAN TEKNOLOGI HASIL HUTAN
- B. CAPAIAN : 1 Mampu merencanakan, melaksanakan, dan mengevaluasi riset untuk pengembangan IPTEK di bidang ilmu pengetahuan dan teknologi pemanfaatan biomasa hutan secara komprehensif mengenai ilmu biomaterial, rekayasa proses, manajemen, dan bisnis untuk menghasilkan bioproduct yang memiliki kebaruan, inovatif, dan teruji
- 2 Mampu mengintegrasikan, menganalisis, mensintesis, menerapkan konsep, fakta, dan teknik dalam memecahkan problem-problem baru dan kompleks yang berkaitan dengan biomaterial melalui pendekatan inter, multi atau transdisipliner
- 3 Mampu mengelola, memimpin dalam perencanaan dan pelaksanaan riset serta mengembangkan peta jalan riset dalam bidang pemanfaatan biomasa hutan, serta mampu mengkomunikasikan hasilnya ke komunitas ilmiah dan umum baik pada tataran nasional dan internasional
- 4 Mampu membangun komitmen, integritas profesional dan nilai-nilai etika

C. STRUKTUR MATA KULIAH PROGRAM STUDI DOKTOR PROGRAM REGULER

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
Mata Kuliah Kompetensi Umum (Common Core Courses)						
1	PPS702	Falsafah Sains	2(2-0)		1	2
2	PPS703	Bahasa Inggris	LH		1	2
Sub Total SKS			2			
Mata Kuliah Kompetensi Dasar Program Studi (Foundational Courses)						
1	THH701	Biopolimer	2(2-0)		1	2
Sub Total SKS			2			
Mata Kuliah Kompetensi Program Studi (Academic Core Courses/In-Depth Courses)						
1	THH613	Ultrastruktur Dinding Sel Kayu	3(2-1)		Ganjil	Genap
2	THH614	Finishing Kayu	3(2-1)		Ganjil	Genap
3	THH615	Biologi Rayap	3(2-1)		Ganjil	Genap
4	THH622	Teknologi Biokomposit	3(2-1)		Ganjil	Genap
5	THH623	Komposit Serat Bukan Kayu	3(2-1)		Ganjil	Genap
6	THH624	Komposit Biomaterial Maju	3(2-1)		Ganjil	Genap
7	THH632	Nondestruktif Hasil Hutan	3(2-1)		Ganjil	Genap
8	THH633	Material Terbarukan pada Konstruksi Berkelanjutan	3(2-1)		Ganjil	Genap
9	THH642	Ilmu Pulp dan Serat Alami	2(2-0)		Ganjil	Genap
10	THH643	Biorefineri Lignoselulosa	3(2-1)		Ganjil	Genap
11	THH644	Ekstraktif Hasil Hutan	3(2-1)		Ganjil	Genap
12	THH651	Optimasi dalam Industri Hasil Hutan	3(2-1)		Ganjil	Genap
13	THH652	Model Ekonometrika untuk Hasil Hutan	3(2-1)		Ganjil	Genap
14	THH716	Analisis Pemesinan	3(2-1)		Ganjil	Genap
15	THH734	Akustik Kayu	3(2-1)		Ganjil	Genap
16	THH735	Material Visko-elastis	3(2-1)		Ganjil	Genap
17	THH753	Ekonomi Industri Hasil Hutan	3(2-1)		Ganjil	Genap
18	THH754	Analisis Kebijakan Hasil Hutan	3(2-1)		Ganjil	Genap
Sub Total SKS			8-11			

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
Mata Kuliah Pengayaan (<i>Enrichment Courses</i>)						
1		Mata kuliah pilihan dari luar program studi	1-M		Ganjil	Genap
		Sub Total SKS	1-M			
Tugas Akhir						
1	THH791	Prelim Tertulis	2		3	4
2	THH792	Prelim Lisan	2		3	4
3	THH793	Kolokium	1		3	4
5	THH794	Proposal	2		3	4
6	THH794	Ujian Tertutup	3			6
7	THH796	Disertasi	12			6
8	PPS790	Seminar Disertasi	1		5	6
9	PPS791	Publikasi Ilmiah Nasional	2		5	4
10	PPS792	Publikasi Ilmiah Internasional	3		5	6
		Sub Total SKS	28			
		Total SKS	42-45			

G. MATA KULIAH PROGRAM STUDI DOKTOR PROGRAM BY RESEARCH

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
Mata Kuliah Kompetensi Umum (<i>Common Core Courses</i>)						
1	PPS702	Falsafah Sains	2(2-0)		1	2
2	PPS703	Bahasa Inggris	LH		1	2
		Sub Total SKS	2			
Mata Kuliah Kompetensi Dasar Program Studi (<i>Foundational Courses</i>)						
1	THH701	Biopolimer	2(2-0)		Ganjil	Genap
		Sub Total SKS	2			
Mata Kuliah Kompetensi Program Studi (<i>Academic Core Courses/In-Depth Courses</i>)						
1	THH613	Ultrastruktur Dinding Sel Kayu	3(2-1)		Ganjil	Genap
2	THH614	Finishing Kayu	3(2-1)		Ganjil	Genap
3	THH615	Biologi Rayap	3(2-1)		Ganjil	Genap
4	THH622	Teknologi Biokomposit	3(2-1)		Ganjil	Genap
5	THH623	Komposit Serat Bukan Kayu	3(2-1)		Ganjil	Genap
6	THH624	Komposit Biomaterial Maju	3(2-1)		Ganjil	Genap
7	THH632	Nondestruktif Hasil Hutan	3(2-1)		Ganjil	Genap
8	THH633	Material Terbarukan pada Konstruksi Berkelanjutan	3(2-1)		Ganjil	Genap
9	THH642	Ilmu Pulp dan Serat Alami	2(2-0)		Ganjil	Genap
10	THH643	Biorefineri Lignoselulosa	3(2-1)		Ganjil	Genap
11	THH644	Ekstraktif Hasil Hutan	3(2-1)		Ganjil	Genap
12	THH651	Optimasi dalam Industri Hasil Hutan	3(2-1)		Ganjil	Genap
13	THH652	Model Ekonometrika untuk Hasil Hutan	3(2-1)		Ganjil	Genap
14	THH716	Analisis Pemesinan	3(2-1)		Ganjil	Genap
15	THH734	Akustik Kayu	3(2-1)		Ganjil	Genap
16	THH735	Material Visko-elastis	3(2-1)		Ganjil	Genap
17	THH753	Ekonomi Industri Hasil Hutan	3(2-1)		Ganjil	Genap
18	THH754	Analisis Kebijakan Hasil Hutan	3(2-1)		Ganjil	Genap
		Sub Total SKS	5-8			

No	Kode	Mata Kuliah	Bobot SKS	Prasyarat	Semester	
					Ganjil	Genap
Mata Kuliah Pengayaan (<i>Enrichment Courses</i>)						
1		Mata kuliah pilihan dari luar program studi	1-M		Ganjil	Genap
		Sub Total SKS	1-M			
Tugas Akhir						
1	THH791	Prelim Tertulis	2		3	4
2	THH792	Prelim Lisan	2		3	4
3	THH793	Kolokium	1		3	4
5	THH794	Proposal	2		3	4
6	THH794	Ujian Tertutup	3			6
7	THH796	Disertasi	12			6
8	PPS790	Seminar Disertasi	1		5	6
9	PPS791	Publikasi Ilmiah Nasional	2		5	4
10	PPS792	Publikasi Ilmiah Internasional 1	3		5	6
11	PPS793	Publikasi ilmiah Internasional 2	3		5	6
		Sub Total SKS	31			
		Total SKS	42-45			

III. SILABUS MATA KULIAH

1. THH50R Ilmu Kayu 2(2-0)

Mata kuliah ini membahas tentang struktur anatomi, sifat fisis, sifat mekanis dan sifat kimia biomaterial hutan dalam kaitannya sebagai bahan baku industri termasuk keragaman dan faktor-faktor yang mempengaruhinya dalam rangka menentukan tujuan penggunaan, rekayasa, dan proses pengolahan yang paling tepat.

**Deded Sarip Nawawi
Imam Wahyudi
Istie Sekartining Rahayu
Naresworo Nugroho**

2. THH501 Metode Penelitian 3(2-1)

Mata kuliah ini memberikan pemahaman tentang konsep dan pengertian etika akademik dan etika penelitian ilmiah berikut perkembangannya, prosedur penelitian yang dimulai dari pengembangan ide, pertimbangan-pertimbangan dalam memilih rancangan penelitian, penerapan teori, strategi menulis dan pertimbangan etis, serta merancang penelitian yg dimulai dari pendahuluan, tinjauan pustaka, rumusan masalah dan hipotesa, metode kuantitatif, kualitatif, dan campuran, prosedur pengumpulan data, serta analisis datanya. Mata kuliah ini dilegkapi dengan responsi dengan materi: etika pendidikan dan penulisan ilmiah, teknik penyusunan proposal penelitian, karya ilmiah tugas akhir mahasiswa baik tesis, artikel ilmiah, dan presentasi karya ilmiahnya.

**Fauzi Febrianto
Rita Kartika Sari**

3. THH502 Analisis Statistik 3(2-1)

Mata ajaran ini membahas statistika dasar (jenis-jenis peubah, penyajian data, peringkasan data, konsep peubah acak, sebaran peluang peubah acak, pendugaan parameter dan pengujian hipotesis). Analisis korelasi dan regresi linier (formulasi model, pendugaan parameter model, pengujian model, ukuran kebaikan model, penerapan model). Prinsip Perancangan Percobaan, Analisis Varian Rancangan Teracak Lengkap, Analisis Varian Rancangan Teracak dalam Blok, Analisis Varian Percobaan Factorial Acak Lengkap, Analisis Varian Percobaan Factorial Acak dalam Blok, Analisis Varian Percobaan Factorial Acak Lengkap, Analisis Varian Rancangan *Split Plot*, Analisis Covarian, Analisis Non-Parametrik.

**I Wayan Darmawan
Effendi Tri Bahtiar**

4. THH511 Fisika Biomaterial 2(2-0)

Mata kuliah ini memberikan pengetahuan tentang ilmu dasar yang berkaitan dengan fisika biomaterial meliputi fisika air, berat jenis, kerapatan, kembang susut, permeabilitas, kapiler, karakteristik permukaan serta fisika biomaterial lain yang berhubungan dengan panas, bunyi, listrik serta faktor-faktor yang mempengaruhinya.

**Istie Sekartining Rahayu
Trisna Priadi**

5. THH531 Mekanika Biomaterial 3(2-1)

Mata kuliah ini membahas keunikan kayu dan komposit kayu yang meliputi sifat-sifat multi-komponen sel penyusunnya, hygroskopis, anisotropis, ketidakhomogenan, diskontinuitas, inelastisitas, fibrous, porous, dan keterbaharuan. Sifat mekanika bahan yang meliputi tegangan, regangan, dan perubahan bentuk pada benda anisotropi juga dibahas dan diaplikasikan pada system sederhana seperti batang tekan dan tarik uniaxial, balok lentur sederhana, dan tekuk. Perilaku biomaterial dalam menahan beban jangka panjang dan beban dinamis dijelaskan dalam model matematika. Kayu dan komposit kayu dijelaskan melalui pendekatan sebagai system lapisan yang dianalisis dengan *transformed cross section*. Mata kuliah ini diikuti dengan praktek pengujian sifat mekanis kayu dan komposit kayu mengikuti beberapa standar yang berlaku.

**Effendi Tri Bahtiar
Naresworo Nugroho
Lina Karlinasari**

6. THH541 Kimia Biomaterial 3(2-1)

Mata ajaran ini membahas aspek kimia biomaterial; selulosa, hemiselulosa, lignin dan zat ekstraktif; yang mencakup materi struktur kimia dan polimerisasi, karakteristik fisik dan kimia, reaksi-reaksi dasar, dan modifikasi kimia sebagai dasar pengembangan teknologi penggunaan biomaterial hutan.

**Deded Sarip Nawawi
Nyoman Jaya Wistara**

7. THH701 Biopolimer 2(2-0)

Mata kuliah ini ditujukan untuk memberikan dasar yang memadai tentang biopolimer terutama polimer berbasis polisakarida (selulosa dan chitosan) dan lignin bagi mahasiswa yang tidak memiliki dasar ilmu polimer secara memadai, namun memerlukan pemahaman yang memadai dalam rangka melaksanakan penelitian tugas akhirnya. Bahasan akan meliputi *chain molecules*, sifat biopolimer, polisakarida (selulosa dan chitin), lignin, teknik blending antar beragam jenis polimer untuk menghasilkan produk unggul. Karakterisasi, modifikasi kimia.

**Nyoman Jaya Wistara
Fauzi Febrianto**

8. THH512 Deteriorasi Kayu 3(2-1)

Mata kuliah ini membahas proses fisis, kimiawi, dan biologis terjadinya deteriorasi kayu serta dampaknya secara teknis, sosial ekonomis, dan ekologis; disamping itu juga dibahas teori dan teknik perlindungan kayu dari kemungkinan terjadinya deteriorasi, termasuk aplikasi coating agents (*water repellent*, varnish, lacquer, dan cat) serta bahan pengawet kayu (*wood preservative*).

**Dodi Nandika
Arinana
Trisna Priadi
Istie Sekartining Rahayu**

9. THH521 Teknologi Perekatan Biomaterial 3(2-1)

Mata kuliah ini menjelaskan arti dan ruang lingkup perekatan kayu, peran perekat pada produk biokomposit, peran perekat, sirekat dan mekanisme terjadinya perekatan, ikatan antar molekul pada perekatan, sifat sirekat yang berperan pada perekatan, perekat alami, perekat sintesis thermosetting dan thermoplastic, formula perekat, mekanisme terbentuknya perekatan pada biomaterial, emisi formaldehida, optimasi sifat perekat dan sirekat, serta evaluasi perekat dan perekatan.

**Dede Hermawan
Yusuf Sudo Hadi**

10. THH613 Ultrastruktur Dinding Sel Kayu 3(2-1)

Mata kuliah ini menjelaskan tentang ultrastruktur dinding sel penyusun kayu daun lebar (*hardwoods*), kayu daun jarum (*softwoods/conifer*), dan *palmwood* termasuk ultrastruktur di bagian kayu reaksi dan kayu juvenil serta kaitannya dengan fungsi, sifat/karakter biomaterial, dan proses pengolahan. Ultrastruktur dinding sel yang akan diamati adalah tanda-tanda khusus di dinding dan di dalam sel pembuluh (pori-pori kayu); *fibers* (serabut di *hardwoods*, sel trakeida aksial di *softwood*, dan *fiber bundles* di *palmwoods*), parenkim aksial di *hardwoods*, *softwoods*, dan *palmwoods*); parenkim jari-jari (jari-jari kayu) di *hardwoods* dan *softwoods*; serta inklusi mineral termasuk kristal dan silika.

**Imam Wahyudi
Trisna Priadi**

11. THH614 Finishing Kayu 3(2-1)

Mata kuliah *wood surface coating* ini adalah mata kuliah pilihan bagi mahasiswa S2 Departemen Hasil Hutan, Fakultas Kehutanan IPB. Mata kuliah ini diberikan sebagai pengetahuan lanjut dalam meningkatkan mutu kayu melalui teknologi pelapisan permukaan (*surface coating*). Mata kuliah ini akan membahas : 1) *Ultrastructure and degradation of wood surfaces*, 2) *Surface defects and roughness of woods*, 3) *Surface tension and surface free energy*, 4) *Polymeric coating materials* 5) *Wettability of liquid coatings*, 6) *Adhesion and bonding quality of the coating*, 7) *Innovation on paint additives for improving paint block resistance*, 8) *Nano coating technology*.

**I Wayan Darmawan
Istie Sekartining Rahayu**

12. THH615 Biologi Rayap 3(2-1)

Mata kuliah ini membahas mempelajari dan menerangkan perkembangan terbaru tentang taksonomi, klasifikasi, morfologi, anatomi, filogeni, dan perilaku rayap baik sebagai individu maupun koloni. Selain itu, mata kuliah ini juga mempelajari peranan rayap dalam ekosistem serta perilaku rayap dan kaitannya dengan deteriorasi kayu, dampak serangan rayap pada kayu dan bangunan, baik secara fisik, mekanis, ekonomis maupun ekologis. Teknik-teknik pengendalian rayap, baik secara fisik mekanis, kimiawi, maupun biologis.

**Dodi Nandika
Arinana**

13. THH622 Teknologi Biokomposit 3(2-1)

Mata kuliah ini diberikan sebagai pengetahuan fundamental dalam pengolahan biomaterial menjadi produk-produk biokomposit. Mata kuliah ini akan membahas: 1) Definisi/pengertian umum biokomposit, 2) Kayu lapis, LVL, Glulam, 3) Papan partikel, *Oriented Strand Board (OSB)*, Papan serat, dan *Inorganic-Bonded Composites*.

**Dede Hermawan
Yusuf Sudo Hadi**

14. THH623 Komposit Serat Bukan Kayu 3(2-1)

Mata kuliah ini membahas tentang potensi serat bukan kayu sebagai bahan baku produk komposit, sifat-sifat serat bukan kayu (fisis, mekanis dan kimia), proses produksi produk komposit dari serat bukan kayu, analisis sifat-sifat produk komposit, komposit struktural ringan, pengujian dan pengendalian kualitas, peningkatan kualitas produk komposit dari serat bukan kayu serta pengembangan komposit unggulan dimasa mendatang.

**Dede Hermawan
Yusuf Sudo Hadi**

15. THH624 Komposit Biomaterial Maju 3(2-1)

Mata ajaran ini menyajikan materi tentang komposit polimer kayu (*wood polymer composite*) dan bionanokomposit dari kayu dan bahan berlignoselulosa lainnya yang akan menjelaskan tentang berbagai matrix, filler, coupling agent dan bahan aditif lainnya dalam proses pembuatan baik itu wood polymer composite maupun bionanokomposit. Selain itu, proses isolasi dan modifikasi nanoselulosa turut dibahas dalam rangka pembuatan dan aplikasi bionanokomposit.

**Fauzi Febrianto
Yusuf Sudo Hadi**

16. THH632 Nondestruktif Hasil Hutan 3(2-1)

Cakupan materi yang dibahas dalam mata kuliah ini meliputi hirarki struktur kayu, hipotesa dasar NDT/E dan kaitannya dengan karakteristik kayu, produk kayu dan hasil hutan lainnya, serta mampu menjelaskan prinsip kerja dan aplikasi untuk berbagai metode NDT/E yaitu berbasis elastisitas dan defleksi, akustik, NIR spektroskopi, termal dan microwave, dan nuclear magnetic resonance pada suatu produk dan pengujian in-situ bangunan serta pohon berdiri. Diskusi interaktif dan tugas terstruktur diberikan untuk beberap topik terkini terkait aplikasi NDT/E di berbagai produk

**Lina Karlinasari
Naresworo Nugroho**

17. THH633 Material Terbarukan pada Konstruksi Berkelanjutan 3(2-1)

Mata kuliah ini memberikan pengetahuan kepada mahasiswa untuk mampu menganalisis bangunan hijau yang berwawasan lingkungan yang ditinjau dari berbagai aspek termasuk dari desain, proses maupun ekologi bangunannya. Penilaian bangunan menggunakan berbagai standard nasional & internasional serta pendekatan domestik pada bangunan berwawasan lingkungan; analisis siklus material (*life cycle analysis*) pada bangunan hijau, kualitas lingkungan serta lingkungan terbangun (*built environment*) yang mempengaruhi bangunan hijau.

**Naresworo Nugroho
Lina Karlinasari**

18. THH642 Ilmu Pulp dan Serat Alami 2(2-0)

Mata kuliah ini secara mendetail menjelaskan tentang beragam pulping proses, anatomi serpih kayu sehubungan dengan penetrasi larutan, prinsip dasar mekanisme reaksi ekstraksi serat, kinetika reaksi dan transfer massa dalam proses pulping, bleaching dan pencucian pulp, preparasi material maju berbasis nanofiber dari serat selulosa, dan aspek ilmu pengetahuan dan teknologi dalam pengendalian dampak lingkungan dari fiber processing (pulping dan bleaching).

Nyoman Jaya Wistara

19. THH643 Biorefineri Lignoselulosa 3(2-1)

Mata kuliah ini membahas konversi biomasa lignoselulosa dengan pendekatan biorefineri meliputi materi konsep biorefineri, bahan baku, fraksinasi komponen lignoselulosa, karakteristik kimia lignoselulosa, jenis konversi biomasa lignoselulosa, produk biorefineri lignoselulosa, integrasi industri biorefineri, prospek dan aspek lingkungan untuk meningkatkan efisiensi biomaterial hutan

**Wasrin Syafii
Deded Sarip Nawawi**

20. THH644 Ekstraktif Hasil Hutan 3(2-1)

Mata kuliah ini membahas tentang struktur kimia dan sifat fisika-kimia zat ekstraktif hasil hutan dari kelompok fenolik, terpenoid, alkaloid, minyak dan lemak; distribusi dan fungsi dalam tanaman, serta pemanfaatannya, berbagai metode ekstraksi, prinsip-prinsip dasar mekanisme ekstraksi, fraksinasi, isolasi, dan faktor-faktor yang mempengaruhi proses dan hasil, karakterisasi zat ekstraktif dengan metode spektroskopi; dan diskusi interaktif serta penugasan terstruktur untuk topik terkini terkait dengan produk hutan ekstraktif.

**Rita Kartika Sari
Wasrin Syafii**

21. THH651 Optimasi dalam Industri Hasil Hutan 3(2-1)

Mata kuliah ini membahas: Pengantar Optimasi (Introduction to Optimization), Program Linear (Linear programming), Program Jejaring (Network models), Program Integer (Integer programming), Program non-linear (Non-linear programming), dan Simulasi (Simulation).

**Bintang CH Simangunsong
Elisa Ganda Togu Manurung**

22. THH652 Model Ekonometrika untuk Hasil Hutan 3(2-1)

Mata kuliah ini membahas : Model persamaan tunggal (Single Equation Models), Model persamaan pilihan kualitatif (Model of Qualitative Choice), Model persamaan simultan (Simultaneous-Equation Models), dan Model deret waktu (Time Series Models).

**Bintang CH Simangunsong
Elisa Ganda Togu Manurung**

23. THH716 Analisis Pemesinan 3(2-1)

Mata kuliah Analisis Pemesinan Kayu ini adalah mata kuliah pilihan bagi mahasiswa S3 Departemen Hasil Hutan, Fakultas Kehutanan IPB. Mata kuliah ini diberikan sebagai pengetahuan lanjut dalam meningkatkan mutu kayu melalui analisis pemesinan kayu. Mata kuliah ini akan membahas: 1) Orthogonal Cutting dan Peripheral Milling; 2) Otomatisasi Proses pemesinan kayu; 3) *Friction and Forces analysis*; 4) *Chips formation analysis*; 5) *Cutting Temperature analysis*; 6) *Surface Roughness analysis*; 7) *Cutting tool Wear analysis*; 8) *Cutting Tool life Improvement*; 9) Monitoring and control process in wood machining; 10) *Modeling and Optimization of Wood Machining*.

**I Wayan Darmawan
Istie Sekartining Rahayu**

24. THH734 Akustik Kayu 3(2-1)

Cakupan materi yang dibahas dalam mata kuliah ini meliputi teori akustik kayu kaitannya dengan kayu sebagai bahan baik untuk keperluan pengujian nondestruktif (NDT), alat musik, akustika bangunan, akustik ruangan, serta adanya pengaruh lingkungan terhadap akustik kayu

**Lina Karlinasari
Naresworo Nugroho
Effendi Tri Bahtiar**

25. THH735 Material Visko-elastis 3(2-1)

Mata kuliah ini mempelajari material viscoelastis yaitu material yang memiliki gabungan sifat viscous dan elastis ketika berdeformasi akibat menerima beban. Material yang viscous menahan aliran geser dan regangan secara linier terhadap waktu ketika tegangan terjadi. Material elastis mengalami regangan ketika diberi beban dan segera kembali ke bentuk semula ketika dibebaskan dari tegangan. Eksperimen untuk mempelajari perilaku material viscoelastis yang meliputi creep, relaksasi, respons dinamis, serta hubungan konstitutifnya terhadap waktu dan temperatur, diuraikan dan dianalisis melalui model-model matematis yang relevan

**Effendi Tri Bahtiar
Naresworo Nugroho
Lina Karlinasari**

26. THH753 Ekonomi Industri Hasil Hutan 3(2-1)

Mata kuliah ini membahas : 1) Konsekuensi kekuatan pasar terhadap kesejahteraan (The welfare consequences of market power), 2) Perusahaan dominan (The dominant firm), 3) Oligopoli-pengakuan kesalingtergantungan (Oligopoly – The recognition of interdependence), 4) Oligopoli-Kolusi (Oligopoly – Collusion), 5) Struktur-Prilaku-Kekuatan Pasar – Bukti (Structure, Conduct, Market Power – The Evidence), 6) Faktor-faktor penentu struktur pasar (The Determinants of Market Structure), 7) Faktor-faktor penentu struktur perusahaan (The Determinants of Firm Structure), 8) Kebijakan Publik berkenaan penggabungan perusahaan (Public Policy towards Mergers), 9) Berbagai upaya penjualan (Sales Efforts), 10) Riset dan Pengembangan (Research and Development), 11) Ekonomi industri dan perdagangan internasional (Industrial Economics and International Trade), 12) Ekonomi industri dan Ekonomi makro (Industrial Economics and Macroeconomics), 13) Price Discrimination /Exclusionary Practices, and 14) Predation

**Bintang CH Simangunsong
Elisa Ganda Togu Manurung**

27. THH754 Analisis Kebijakan Hasil Hutan 3(2-1)

Mata kuliah ini membahas : Analisis kuantitatif dalam pengembangan kebijakan (the quantitative analysis of development policy); analisis permintaan (demand analysis); pendekatan fungsi keuntungan terhadap penawaran dan permintaan inputs (the profit function approach to supply and factor demand); distorsi harga: indikator dan analisis keseimbangan parsial (price distortions: indicators and partial equilibrium analysis); model input-output (Input-output tables), social accounting matrices (SAM), and multipliers; dan multi-market models.

**Bintang CH Simangunsong
Elisa Ganda Togu Manurung**

English Version

The Curriculum Structure of K2020

Master (S2) & Doctor (S3) Program

Study Program :

**FOREST PRODUCTS SCIENCE AND
TECHNOLOGY**

**Faculty of Forestry
IPB University**

2020

I. Master Program (S2)

A. Mame of Study Program : FOREST PRODUCTS SCIENCE AND TECHNOLOGY

- B. Learning Outcome :**
- 1 Mastering knowledge and research capability in developing science and technology of the forest biomass utilization based on biomaterial science, process engineering, management, and business.
 - 2 Capable of managing and developing research related to biomaterial through inter or multidisciplinary approaches.
 - 3 Capable of managing and developing research in the science and technology of forest biomass utilization and able to communicate the research results to the scientific community and the public both at national and international levels.
 - 4 Capable of building commitment, professional integrity, and ethical values.

C. Course Structure of Regular Program

No	Code	Courses	Credit Hour	Prerequisite	Semester	
					Odd	Even
Common Core Courses						
1	THH501	Research Methodology	3(2-1)		1	2
2	PPS500	English	LH		1	2
		Subtotal	3			
Foundational Courses						
1	THH502	Statistical Analysis	3(2-1)		1	2
2	THH50R	Wood Science	2(2-0)		1	2
		Subtotal	3-5			
Academic Core Courses						
1	THH511	Biomaterial Physics	2(2-0)		1	2
2	THH531	Biomaterial Mechanics	3(2-1)		1	2
3	THH541	Biomaterial Chemistry	2(2-0)		1	2
		Subtotal	7			
In-Depth Courses						
1	THH512	Wood Deterioration	3(2-1)		√	√
2	THH521	Biomaterial Adhesion Technology	3(2-1)		√	√
3	THH613	Ultrastructure of Wood Cell Walls	3(2-1)		√	√
4	THH614	Wood Surface Coating	3(2-1)		√	√
5	THH615	Biology of Termite	3(2-1)		√	√
6	THH622	Biocomposites Technology	3(2-1)		√	√
7	THH623	Non-Wood Fiber Composite	3(2-1)		√	√
8	THH624	Advanced Biomaterial Composite	3(2-1)		√	√
9	THH632	Non-destructive Forest Products	3(2-1)		√	√
10	THH633	Renewable Materials and Sustainable Construction	3(2-1)		√	√
11	THH642	Pulp and Natural Fiber Science	2(2-0)		√	√
12	THH643	Lignocellulosic Biorefinery	3(2-1)		√	√
13	THH644	Forest Products Extractives	3(2-1)		√	√
14	THH651	Optimization in Forest Products Industry	3(2-1)		√	√

No	Code	Courses	Credit Hour	Prerequisite	Semester	
					Odd	Even
15	THH652	Econometrics Model for Forest Products	3(2-1)		√	√
Subtotal			8-11			
Enrichment Course						
1		Elective courses from other study programs	1-M			
Subtotal			1-M			
Final Year's Thesis						
1	THH591	Colloquium	1 (0-1)		3	2
2	THH592	Research Proposal	2 (0-2)		3	2
3	THH593	Thesis Exam	2 (0-2)			4
4	THH594	Thesis	6 (0-6)			4
5	PPS590	Thesis Seminar	1 (0-1)		3	4
6	PPS591	Scientific publication	2 (0-2)		3	4
Subtotal			14			
Total			36-39			

D. Course Structure of By Research Program

No	Code	Course	Credit Hour	Prerequisite	Semester	
					Odd	Even
Common Core Courses						
1	THH501	Research Methodology	3(2-1)		1	2
2	PPS500	English	LH		1	2
Subtotal			3			
Foundational Courses						
1	THH502	Statistical Analysis	3(2-1)		1	2
2	THH50R	Wood Sciences	2(2-0)		1	2
Subtotal			3-5			
Academic Core Courses						
1	THH511	Biomaterial Physics	2 (2-0)		1	2
2	THH531	Biomaterial Mechanics	3(2-1)		1	2
3	THH541	Biomaterial Chemistry	2(2-0)		1	2
Subtotal			4-5			
In-Depth Courses						
1	THH512	Wood Deterioration	3(2-1)		√	√
2	THH521	Biomaterial Adhesion Technology	3(2-1)		√	√
3	THH613	Ultrastructure of Wood Cell Walls	3(2-1)		√	√
4	THH614	Wood Surface Coating	3(2-1)		√	√
5	THH615	Biology of Termite	3(2-1)		√	√
6	THH622	Biocomposites Technology	3(2-1)		√	√
7	THH623	Non-Wood Fiber Composite	3(2-1)		√	√
8	THH624	Advanced Biomaterial Composite	3(2-1)		√	√
9	THH632	Non-destructive Forest Products	3(2-1)		√	√
10	THH633	Renewable Materials and Sustainable Construction	3(2-1)		√	√
11	THH642	Pulp and Natural Fiber Science	2(2-0)		√	√
12	THH643	Lignocellulosic Biorefinery	3(2-1)		√	√
13	THH644	Forest Products Extractives	3(2-1)		√	√
14	THH651	Optimization in Forest Products Industry	3(2-1)		√	√
15	THH652	Econometrics Model for	3(2-1)		√	√

No	Code	Course	Credit Hour	Prerequisite	Semester	
					Odd	Even
		Forest Products				
		Subtotal	8-11			
Enrichment Courses						
1		Elective courses from other study programs	1-M		√	√
		Subtotal	1-M			
Final Year's Thesis						
1	THH591	Colloquium	1 (0-1)		3	2
2	THH592	Research Proposal	2 (0-2)		3	2
3	THH593	Thesis Exam	2 (0-2)			4
4	THH594	Thesis	6 (0-6)			4
5	PPS590	Thesis Seminar	1 (0-1)		3	4
6	PPS591	Scientific publication 1	2 (0-2)		3	2
7	PPS592	Scientific publication 2	2 (0-2)		3	4
		Subtotal	16			
		Total	36-39			

II. Doctoral Program (S3)

A. Name of Study Program : **FOREST PRODUCTS SCIENCE AND TECHNOLOGY**

- B. Learning Outcome** :
- 1 Capable of planning, conducting, and evaluating the research for the development of science and technology of forest biomass utilization in a comprehensive manner regarding biomaterial science, process engineering, management, and business to produce bioproduct that have newness, innovation, and reliability.
 - 2 Capable of integrating, analyzing, synthesizing, applying the concepts, facts, and techniques in solving new and complex problems related to biomaterials through inter, multi or transdisciplinary approaches.
 - 3 Capable of managing, leading in the planning and implementation of research, developing a research road map in the field of forest biomass utilization, and able to communicate the research results to the scientific community and the public both at the national and international levels
 - 4 Capable of building commitment, professional integrity, and ethical values.

C. Course Structure of Regular Program

No	Code	Courses	Credit Hour	Prerequisite	Semester	
					Odd	Even
Common Core Courses						
1	PPS702	Philosophy of Science	2(2-0)		1	2
2	PPS703	English	LH		1	2
		Subtotal	2			
Foundational Courses						
1	THH701	Biopolimer	2(2-0)		1	2
		Subtotal	2			
Academic Core Courses/ In-Depth Courses						
1	THH613	Ultrastructure of Wood Cell Walls	3(2-1)		√	√
2	THH614	Wood Surface Coating	3(2-1)		√	√
3	THH615	Biology of Termite	3(2-1)		√	√
4	THH622	Biocomposites Technology	3(2-1)		√	√
5	THH623	Non-Wood Fiber Composite	3(2-1)		√	√
6	THH624	Advanced Biomaterial Composite	3(2-1)		√	√
7	THH632	Non-destructive Forest Products	3(2-1)		√	√
8	THH633	Renewable Materials and Sustainable Construction	3(2-1)		√	√
9	THH642	Pulp and Natural Fiber Science	2(2-0)		√	√
10	THH643	Lignocellulosic Biorefinery	3(2-1)		√	√
11	THH644	Forest Products Extractives	3(2-1)		√	√
12	THH651	Optimization in Forest Products Industry	3(2-1)		√	√
13	THH652	Econometrics Model for Forest Products	3(2-1)		√	√
14	THH716	Wood Machining Analysis	3(2-1)		√	√
15	THH734	Wood Acoustics	3(2-1)		√	√
16	THH735	Viscolastic Materials	3(2-1)		√	√
17	THH753	Forest Products Industrial	3(2-1)		√	√

No	Code	Courses	Credit Hour	Prerequisite	Semester	
					Odd	Even
		Economics				
18	THH754	Forest Products Policy Analysis	3(2-1)		√	√
		Subtotal	8-11			
Enrichment Courses						
1		Elective courses from other study programs	1-M		√	√
		Subtotal	1-M			
Final Year's Dissertation						
1	THH791	Written Preliminary Examination	2		3	4
2	THH792	Oral Preliminary Examination	2		3	4
3	THH793	Colloquium	1		3	4
4	THH794	Research Proposal	2		3	4
5	THH794	Dissertation Exam	3			6
6	THH796	Dissertation	12			6
7	PPS790	Seminar	1		5	6
8	PPS791	Nasional Scientific Publication	2		5	4
9	PPS792	International Scientific Publication	3		5	6
		Subtotal	28			
		Total	42-45			

D. Course Structure of By Research Program

No	Code	Course	Credit Hour	prerequisite	Semester	
					Odd	Even
Common Core Courses						
1	PPS702	Philosophy of Science	2(2-0)		1	2
2	PPS703	English	LH		1	2
		Subtotal	2			
Foundational Courses						
1	THH701	Biopolimer	2(2-0)		1	2
		Subtotal	2			
Academic Core Courses/ In-Depth Courses						
1	THH613	Ultrastructure of Wood Cell Walls	3(2-1)		√	√
2	THH614	Wood Surface Coating	3(2-1)		√	√
3	THH615	Biology of Termite	3(2-1)		√	√
4	THH622	Biocomposites Technology	3(2-1)		√	√
5	THH623	Non-Wood Fiber Composite	3(2-1)		√	√
6	THH624	Advanced Biomaterial Composite	3(2-1)		√	√
7	THH632	Non-destructive Forest Products	3(2-1)		√	√
8	THH633	Renewable Materials and Sustainable Construction	3(2-1)		√	√
9	THH642	Pulp and Natural Fiber Science	2(2-0)		√	√
10	THH643	Lignocellulosic Biorefinery	3(2-1)		√	√
11	THH644	Forest Products Extractives	3(2-1)		√	√
12	THH651	Optimization in Forest Products Industry	3(2-1)		√	√

No	Code	Course	Credit Hour	prerequisite	Semester	
					Odd	Even
13	THH652	Econometrics Model for Forest Products	3(2-1)		√	√
14	THH716	Wood Machining Analysis	3(2-1)		√	√
15	THH734	Wood Acoustics	3(2-1)		√	√
16	THH735	Viscolastic Materials	3(2-1)		√	√
17	THH753	Forest Products Industrial Economics	3(2-1)		√	√
18	THH754	Forest Products Policy Analysis	3(2-1)		√	√
		Subtotal	5-8			
Enrichment Courses						
1		Elective courses from other study programs	1-M		Ganji I	Genap
		Subtotal	1-M			
Final Year's Dissertation						
1	THH791	Written Preliminary Examination	2		3	4
2	THH792	Oral Preliminary Examination	2		3	4
3	THH793	Colloquium	1		3	4
4	THH794	Research Proposal	2		3	4
5	THH794	Dissertation Exam	3			6
6	THH796	Dissertation	12			6
7	PPS790	Seminar	1		5	6
8	PPS791	Nasional Scientific Publication	2		5	4
9	PPS792	International Scientific Publication 1	3		5	6
10	PPS793	International Scientific Publication 2	3		5	6
		Subtotal	31			
		Total	42-45			

III. Courses Syllabi

1. THH50R Wood Science 2(2-0)

This course discusses the anatomical structure, physical properties, mechanical properties and chemical properties of forest biomaterials in relation to biomaterials as an industrial raw material including the characteristics diversity and the factors that influence the characteristics as a basis for developing of the utilization, engineering, and appropriate processing of forest biomaterials.

**Deded Sarip Nawawi
Imam Wahyudi
Istie Sekartining Rahayu
Naresworo Nugroho**

2. THH501 Research Methodology 3(2-1)

This course provides an understanding of academic and research ethics, scientific development, research procedures which include developing ideas, considerations in the selection of research designs, applying theory, and research design consisting of an introduction, literature review, problem formulation and hypothesis, the quantitative, qualitative, and mixed methods, data collection procedures, and data analysis. This course is equipped with ethical practices in education and research as well as scientific writing techniques such as research proposals, theses, scientific articles, and presentations of scientific papers.

**Fauzi Febrianto
Rita Kartika Sari**

3. THH502 Statistical Analysis 3(2-1)

This course discusses basic statistics (types of variables, data presentation, data summarization, the concept of random variables, probability distribution of random variable, estimation of parameters and testing of hypotheses). Correlation analysis and linear regression (model formulation, estimation of model parameter, model testing, model goodness measure, model application). Principles of Experimental Design, Variance Analysis of Completely Randomized Design, Variance Analysis of Randomized Complete Block Design, Variance Analysis of Completely Randomized Factorial Experiment, Variance Analysis of Randomized Factorial Experiments in Blocks, Variance Analysis of Split Plot Design, Covariance analysis, Non-Parametric Analysis .

**I Wayan Darmawan
Effendi Tri Bahtiar**

4. THH511 Biomaterial Physics 2(2-0)

This course provides basic science knowledge regarding biomaterial physics which covers water physics, specific gravity, density, shrinkage-swelling, permeability, capillarity, surface characteristics and other biomaterial physics properties which relates to thermal, sound, electricity and other influenced factors.

**Istie Sekartining Rahayu
Trisna Priadi**

5. THH531 Biomaterial Mechanics 3(2-1)

This course discusses the uniqueness of wood and wood composites which includes the properties of the multi-component constituent cells, hygroscopic, anisotropic, homogeneous, discontinuity, inelasticity, fibrous, porous, and renewal. The mechanical properties of materials which include stress, strain, and deformation in anisotropic objects are also discussed and applied to simple systems such as uniaxial compressive and tensile rods, simple bending beams, and buckling. The behavior of biomaterials in holding long-term loads and dynamic loads is explained in mathematical models. Wood and wood composites are explained through the approach as a layer system that is analyzed by the transformed cross section. This course is followed by the practice of testing the mechanical properties of wood and wood composites following several applicable standards.

**Effendi Tri Bahtiar
Naresworo Nugroho
Lina Karlinasari**

6. THH541 Biomaterial Chemistry 3(2-1)

The biomaterial chemistry course discusses the chemical aspects of biomaterials; cellulose, hemicellulose, lignin and extractive substances; which includes chemical structure and polymerization, chemical characteristics, basic reactions, and chemical modification as a basis for developing technology of forest biomaterials utilizations.

**Deded Sarip Nawawi
Nyoman Jaya Wistara**

7. THH701 Biopolimer 2(2-0)

This course is intended to provide a sufficient background on polysaccharide and lignin based biopolymers for students with no polymer science background, but requiring knowledge of biopolymer in her/his final assignment (thesis or dissertation). The course will discuss about chain molecules, biopolymer properties, polymeric characteristic of polysaccharide and lignin, and polymers blending techniques.

**Nyoman Jaya Wistara
Fauzi Febrianto**

8. THH512 Wood Deterioration 3(2-1)

This course will discuss the physical, chemical and biological processes of wood deterioration and their technical, socio-economic and ecological impacts; natural durability of wood, methods of wood protection for improvement its durability, including the application of wood preservatives and coating agents (water repellent, varnish, lacquer, and paint).

**Dodi Nandika
Arinana
Trisna Priadi
Istie Sekartining Rahayu**

9. THH521 Biomaterial Adhesion Technology 3(2-1)

This course provides students' knowledge to be able to explain the meaning and scope of wood gluing, with the subject being the role of adhesives in biocomposite products; The role of adhesives, adherends, and mechanisms for adhesion; bonding between molecules in gluing; the nature of adherends, which plays a role in gluing; Natural adhesives; Synthetic Thermosetting and Thermoplastic Adhesives; Adhesive formula; The mechanism of the formation of adhesions on biomaterials; Formaldehyde emission; Optimization of adhesive and adherends properties; and Evaluation of adhesives and adhesives process.

**Dede Hermawan
Yusuf Sudo Hadi**

10. THH613 Ultrastructure of Wood Cell Walls 3(2-1)

This course explains the ultra-structure of hardwoods, softwoods (conifers), and palmwood including ultra-structure in the reaction and juvenile woods, and their relation to the function, characteristic of biomaterial, and processing. The cell wall ultra-structures to be observed are specific structures on vessel elements (wood pores); fibers in hardwoods, axial tracheids in softwoods, and fiber bundles in palmwood; axial parenchyma in hardwoods, softwoods, and palmwood; ray parenchyma (rays) in hardwoods and softwoods; and also mineral inclusions including crystals and silica.

**Imam Wahyudi
Trisna Priadi**

11. THH614 Wood Surface Coating 3(2-1)

This course is given as further knowledge in improving the quality of wood through surface coating technology. This course will discuss: 1) Ultrastructure and Degradation of Wood Surfaces, 2) Surface Defects and Roughness of Woods, 3) Surface Tension and Surface Free Energy, 4) Polymeric Coating Materials 5) Wettability of Liquid Coatings, 6) Adhesion and Bonding quality of the Coating, 7) Innovation on paint additives for improving paint block resistance, 8) Nano coating technology.

**Wayan Darmawan
Istie Sekartining Rahayu**

12. THH615 Biology of Termite 3(2-1)

This course will discuss the latest development of taxonomy, classification, morphology, anatomy, and phylogeny of termite; the role of termite in ecosystems; ecology and behavior of termite; termite infestation on wood and other ligno-cellulose based products, including its infestation on housing as well as other building construction; and termite control techniques (physical, mechanical, chemical, and biological).

**Dodi Nandika
Arinana**

13. THH622 Biocomposites Technology 3(2-1)

This course is given as fundamental knowledge in processing biomaterials into biocomposite products. This course will discuss: 1) Definition/general understanding of biocomposites, 2) Plywood, LVL, Glulam, 3) Particleboard, Oriented Strand Board (OSB), Fiberboard, and Inorganic-Bonded Composites.

**Dede Hermawan
Yusuf Sudo Hadi**

14. THH623 Non-Wood Fiber Composite 3(2-1)

This course discusses the potential of non-wood fiber as a raw material for composite products, the properties of non-wood fiber (physical, mechanical and chemical), the process of producing composite products from non-wood fiber, analysis of the properties of composite products, lightweight structural composites, testing and quality control, improvement of the quality of composite products from non-wood fiber and the development of superior composites in the future.

**Dede Hermawan
Yusuf Sudo Hadi**

15. THH624 Advanced Biomaterial Composite 3(2-1)

This course presents material about biomaterial polymer composites and bio-nanocomposites from wood and other lignocellulosic materials that will explain various matrices, fillers, coupling agents, and other additives in the process of making both wood polymer composites and bio-nanocomposites. In addition, the process of isolation and modification of nano-cellulose was also discussed in the framework of the manufacture and application of bio-nanocomposites.

**Fauzi Febrianto
Yusuf Sudo Hadi**

16. THH632 Non-destructive Forest Products 3(2-1)

The scope of the material discussed in this course includes a hierarchy of wood structures, basic NDT / E hypotheses and discussed with the characteristics of wood, wood products, and other forest products, and can explain the working principles and applications for various NDT / E methods based on elasticity and deflection, acoustics, NIR, thermal and microwave spectroscopy, and nuclear magnetic resonance in product and in-situ testing of buildings and standing trees. Interactive discussions and structured assignments are given for some of the latest topics related to NDT / E applications in various products

**Lina Karlinasari
Naresworo Nugroho**

17. THH633 Renewable Materials and Sustainable Construction 3(2-1)

This course provides knowledge to students to be able to analyze green buildings that are environmentally sound in terms of various aspects including the design, process, and ecology of the building. Building appraisals use various national & international standards and domestic approaches to environmentally sound buildings; material cycle analysis (life cycle analysis) in green buildings, environmental quality, and the built environment that affects green buildings.

**Naresworo Nugroho
Lina Karlinasari**

18. THH642 Pulp and Natural Fiber Science 2(2-0)

The Pulp and Natural Fiber Science course will thoroughly discuss about various pulping processes, chip anatomy related to liquor penetration, the reaction mechanism of the basic principles of fiber extraction, reaction kinetic and mass transfer in pulping, pulp washing and bleaching, cellulose nanofiber based advance materials, and environmental aspect of fiber processing.

Nyoman Jaya Wistara

19. THH643 Lignocellulosic Biorefinery 3(2-1)

This course discusses the conversion of lignocellulosic biomass with a biorefinery approach covering biorefinery concept, raw materials, fractionation of lignocellulosic components, chemical characteristics of lignocellulose, types of conversion of lignocellulosic biomass, lignocellulosic biorefineries products, integrated industry of biorefinery, prospects and environmental aspects of biorefinery in order to improve the efficiency of forest biomass utilization.

**Wasrin Syafii
Deded Sarip Nawawi**

20. THH644 Forest Products Extractives 3(2-1)

This course discusses the chemical structure, physico-chemical properties, distribution and function in plants, and utilization of the forest product extractives (phenolic, terpene and terpenoids, alkaloids, and oils and fats groups); various of extraction method, mechanism of the basic principles of the extraction, fractionation, isolation, and factors that influence the process and the results, characterization of extractive substances by spectroscopic methods; and interactive discussions and structured assignments for the current topics related to extractive forest products.

**Rita Kartika Sari
Wasrin Syafii**

21. THH651 Optimization in Forest Products Industry 3(2-1)

This course discusses the Introduction to Optimization, Linear programming, Network models, Integer programming, Non-linear programming, and Simulation.

**Bintang CH Simangunsong
Elisa Ganda Togu Manurung**

22. THH652 Econometrics Model for Forest Products 3(2-1)

This course discusses the Single Equation Models, Model of Qualitative Choice, Simultaneous-Equation Models, and Time Series Models.

**Bintang CH Simangunsong
Elisa GandaTogu Manurung**

23. THH716 Wood Machining Analysis 3(2-1)

This course is given as further knowledge in improving wood quality through wood machining analysis. This course will discuss: 1) Orthogonal Cutting dan Peripheral Milling; 2) Automation in wood cutting processes; 3) Friction and Forces analysis; 4) Chips formation analysis; 5) Cutting Temperature analysis; 6) Surface Roughness analysis; 7) Cutting tool Wear analysis; 8) Cutting Tool life Improvement; 9) Monitoring and control process in wood machining; 10) Modeling and Optimization of Wood Machining.

**Wayan Darmawan
Istie Sekartining Rahayu**

24. THH734 Wood Acoustics 3(2-1)

The scope of the material discussed in this course covers the acoustic theory of wood in relation to wood as a material both for the purposes of non-destructive testing (NDT), musical instruments, building acoustics, room acoustics, and the presence of environmental influences on wood acoustics.

**Lina Karlinasari
Naresworo Nugroho
Effendi Tri Bahtiar**

25. THH735 Viscolastic Materials 3(2-1)

This course studies viscoelastic material that is a material that has a combination of viscous and elastic properties when deforming due to receiving loads. Viscous material holds the shear flow and strain linearly to the time when stress occurs. The elastic material is stretched when it is loaded and immediately returns to its original shape when released from stress. Experiments to study the behavior of viscoelastic materials which include creeps, relaxation, dynamic responses, and their constitutive relationship to time and temperature, are described and analyzed through relevant mathematical models.

**Effendi Tri Bahtiar
Naresworo Nugroho
Lina Karlinasari**

26. THH753 Forest Products Industrial Economics 3(2-1)

This course discusses the welfare consequences of market power, the dominant firm, Oligopoly—the recognition of interdependence, Oligopoly –Collusion, Structure, Conduct, Market Power – The Evidence, the Determinants of Market Structure, the Determinants of Firm Structure, Public Policy towards Mergers, Sales Efforts, Research and Development, Industrial Economics and International Trade, Industrial Economics and Macroeconomics, 1Price Discrimination /Exclusionary Practices, and Predation

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Elisa Ganda Togu Manurung**

27. THH754 Forest Products Policy Analysis 3(2-1)

This course discusses the Quantitative Analysis of Development Policy; Demand Analysis; the Profit Function Approach to Supply and Factor Demand; Price distortions: Indicators and Partial Equilibrium Analysis; Input-Output Tables, Social Accounting Matrices (SAM), Multipliers; and Multi-market models.

**Bintang CH Simangunsong
Elisa Ganda Togu Manurung**

