Course Module

Wood Quality Improvement

Faculty of Forestry

Mulawarman University

Module name	Wood Quality Improvement
Modul level, if applicable	Graduates Programme
Code, if applicable	190401802P021
Subtitle, if applicable	
Courses, if applicable	Regular
Semester(s) in which the module is taught	IV (four)
Person responsible for the module	Dr. Isna Yuniar Wardhani
Lecturer	Dr. Isna Yuniar Wardhani Prof. Dr. Edy Budiarso Dr. Enih Rosamah
Language	Indonesia
Relation to curriculum	Programme, mandatory
Type of teaching, contact hours	Lecture, 3 lecture contact hours
Workload	Number of meetings per semester: 16 meetings (14 meetings for learning activity, 1 meeting for mid semester, 1 meeting for final examination) 2 x 50 minutes lectures, 2 x 60 minutes structured assignment, 2 x 60 minutes individual activity, with a total time of 4760 minutes or equivalent to a total of 79.3 hours in 14 weeks per semester
Credit points	2 SKS (3.2 ECTS) Details: 1 Credit = 170 min/week 1 Credit = 170 min x 14 week = 2,380 min/semester 1 ECTS = 25 h / semester 1 Credit = 2,380 / 60 / 25 = 1.6 ECTS 2 Credit = 1.6 x 2 = 3.2 ECTS
Requirements according to the examination regulations	Have attended not less than 80% class meetings
Recommended prerequisites	
Module objectives/intended learning outcomes	**Intended Learning Outcome** **Knowledge and Understanding** **ILO-1** : Applying scientific ethics, norms, and values of professionalism

	Engineering Analysis **ILO-2** : Mastering specialized knowledge, skills and techniques in the field of forestry and tropical environment and being able to develop innovative theories, models and methods in their field. **Investigation** **ILO-3** : Able to analyze current problems and issues, and assess the ecological, social, and economic impacts of implementing programs in the forestry and tropical environmental sectors. **Engineering Design and Practice** **ILO-4** : Develop research schemes based on inter or multidisciplinary approaches to tropical forestry and the environment, and communicate the results to the public. **Course Learning Outcome** **Knowledge and Understanding** **CLO-1** : Students are able to understand the importance of internalizing scientific ethics, norms, and professional values in responsibly improving wood quality. **Engineering Analysis** **CLO-2** : Students are able to analyze opportunities for enhancing wood quality for various purposes. **Investigation** **CLO-3** : Students are able to develop methods for improving wood properties through chemical, biological, and physical treatments. **Engineering Design and Practice** **CLO-4** : Students are able to collaborate in efforts to enhance wood quality.
Content	This course discusses the uniqueness and weaknesses of wood, efforts to improve wood quality, and the development of methods for enhancing wood quality for various applications. The course is delivered through classroom meetings, project-based learning, case studies, presentations, and practical sessions. Achievement evaluation is conducted by observing the learning process throughout the semester, as well as through assignments and exams After attending this course, students have the ability to: 1. analyze the strengths and weaknesses of wood. **(CLO-1)** 2. relate wood's anatomical and chemical factors to its weaknesses. **(CLO-2)** 3. analyze various methods for improving wood's dimensional stability. **(CLO-2)** 4. evaluate chemical and biological treatments for enhancing wood's dimensional stability. **(CLO-1)**

<table>
<tr><td></td><td>5. analyze wood quality improvement through densification and heat treatment. (CLO-3)
6. synthesize wood strength enhancement using densification and nanotechnology. (CLO-3)
7. analyze bioactive materials for improving wood quality. (CLO-4)
8. assess lamination technology for enhancing wood strength. (CLO-4)</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>Evaluation and assessment of the learning process are following scheme 5 in the Academic Regulations of Mulawarman University:
<table>
<tr><th>No.</th><th>Objects of Assessment</th><th>Forms of Assessment</th><th>Quantity (%)</th></tr>
<tr><td>1</td><td>Affective</td><td>Participation</td><td>10</td></tr>
<tr><td>2</td><td>Assignment/Case study</td><td>Group presentation</td><td>25</td></tr>
<tr><td>3</td><td>Project</td><td>Presentation</td><td>25</td></tr>
<tr><td>4</td><td>Mid-semester test</td><td>Written test</td><td>15</td></tr>
<tr><td>5</td><td>Final semester test</td><td>Written test</td><td>25</td></tr>
<tr><td colspan="3">TOTAL</td><td>100</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Class, MS. Powerpoint, Ms.Word, Laptop, LCD</td></tr>
<tr><td>Reading list</td><td>1. Shmulsky, R and P.D. Jones. 2019. Forest Products and Wood Science. An Introduction. 7th Edition. John Wiley & Sons Ltd, West Sussex, UK.
2. Kollmann F.F.P., E.W. Kuenzi & A.J. Stamm. 1975. Principles of Wood Science and Technology. Vol. I. Wood Based Materials. Springer-Verlag. Berlin New York
3. Dimitriou I dan Rutz D. 2015. Sustainable Short Rotation Coppice: A Handbook. WIP Renewable Energies, Munich, Germany, 1-109.
4. Kollmann F.F.P. and W.A. Cöte, Jr. 1984. Principles of Wood Science and Technology. Vol. I. Solid Wood. Springer-Verlag. Berlin
5. Pizzi, A. and K. L. Mittal. 2012. Wood Adhesives. CRC Press Taylor & Francis Group. Leiden Boston
6. Takeuchi K, Shiroyama H, Saito O dan Matsuura M. (Editors), 2019. Biofuels and Sustainability Holistic Perspectives for Policy-making. Springer Open, Tokyo. 1-247.
7. Louie H.. 2018. Off-Grid Electrical Systems in Developing Countries. Springer International Publishing, Switzerland. 1-477.
8. Sharma D dan Saini A. 2020. Lignocellulosic Ethanol Production from a Biorefinery Perspective: Sustainable Valorization of Waste. Springer
9. Amirta R, Suwinarti W, Yuliansyah, Haqiqi MT, Susanto D, dan Wulandari R. 2021. Peran Strategis Sektor Kehutanan dalam Mewujudkan Kemandirian dan Kedaulatan Energi di Kalimantan</td></tr>
</table>

Timur: Percepatan Penyediaan Listrik Desa di Wilayah Pedalaman (Remote Area), (Chapter). UNMUL Hebat, Kaltim Berdaulat, Kuat: Kontribusi Pemikiran Universitas Mulawarman di Usia 60 Tahun. IPB Press, 391-414.
10. Amirta R,. 2018. Pellet Kayu Energi Hijau Masa Depan. Mulawarman University Press, 1-93.
11. Amirta R, Angi EM, Yuliansyah, Ananto BR, Setiyono B. 2017. Desa Mandiri Listrik: Potensi Pengembangan Energi Listrik Berbasis Biomassa Hutan. Mulawarman University Press, 1-115
12. Amirta R, Haqiqi MT, Saparwadi, Septia E, Mujiasih D, Setiawan KA, Sekedang MA, Yuliansyah, Wijaya A, Setiyono B, Suwinarti W. 2019. Searching for potential wood biomass for green energy feedstock: A study in tropical swamp-peat forest of Kutai Kertanegara, Indonesia. Biodiversitas, 20 (6): 1516-1523.
13. Amirta R, Mukhdlor A, Mujiati D, Septia E, Supriadi, Susanto D. 2016. Suitability and availability analysis of tropical forest wood species for ethanol production: a case study in East Kalimantan. Biodiversitas, 17 (2): 544-552.
14. Amirta R, Nafitri SI, Wulandari R, Yuliansyah, Suwinarti W, Candra KP, Watanabe T. 2016. Comparative characterization of Macaranga species collected from secondary forests in East Kalimantan for biorefinery of unutilized fast growing wood. Biodiversitas, 17 (1): 116-123.
15. Amirta R, Yuliansyah, Angi EM, Ananto BR, Setiyono B, Haqiqi MT, Septiana HA, Lodong M, Oktavianto RN. 2016. Plant diversity and energy potency of community forest in East Kalimantan, Indonesia: Searching for fast growing wood species for energy production. Nusantara Bioscience, 8 (1): 22-31.
16. Amirta R, Herawati E, Suwinarti W, Watanabe T. 2016. Two-steps Utilization of Shorea Wood Waste Biomass for The Production of Oyster Mushroom and Biogas – A zero waste approach. Agriculture and Agricultural Science Procedia, 9: 202–208.
17. McKendry P. 2002. Energy production from biomass (part 1): overview of biomass. Bioresour Technol 83 (1): 37-46
18. McKendry P. 2002. Energy production from biomass (part 2): conversion technologies. Bioresour Technol 83 (1): 47-54
19. McKendry P. 2002. Energy production from biomass (part 3): gasification technologies. Bioresour Technol 83 (1): 55-63