



UNIVERSITI TEKNOLOGI MARA

BCT562: BIO-COMPOSITE TECHNOLOGY I

Course Name (English)	BIO-COMPOSITE TECHNOLOGY I APPROVED
Course Code	BCT562
MQF Credit	4
Course Description	<p>The course will review the general technology of composites, and focus on the bio-based composites field, moving to a more detailed examination of the significant of bio-composites produced in Malaysia (solid materials, modified materials and laminated products like plywood, laminated veneer lumber, glued-laminated timber, and mechanically connected laminates which are based on solid, laminate and veneer based composites). It also provides an overview of wood-based composites as an increasingly important part of the wood utilization industry. The composite technology as is viable solution to material limitations in both natural and manufactured products. The development of bio-based composites maximizes the use of the forest and agricultural plantation resources. A generalized composite model is described in terms of laminates size and orientation, and adhesive systems. The product and process requirements will be considered in terms of chemical characteristics and structure; material requirements; preparation; resin technology; presses (particularly continuous press technology); panel performance requirements and test procedures; and environmental impacts of both products and processes. The performance of composite panels is considered in relation to market requirements, and from an environmental perspective. Field trips will be undertaken to familiarize students with the manufacture and recent technology of wood and bio-based composites products in Malaysia.</p>
Transferable Skills	Students are able to elaborate or explain the production process of solid materials, modified materials and laminated products of bio-composites.
Teaching Methodologies	Lectures, Lab Work, Field Trip, Practical Classes
CLO	<p>CLO1 State the definition, description and classification of bio-composite from solid and veneer materials</p> <p>CLO2 Describe the harvesting and processing of bio-cellulosic materials such as wood, bamboo, oil palm, rattan and other non-wood materials</p> <p>CLO3 Apply the manufacturing of bio-composite products made from solid bio-cellulosic materials (solid wood, solid bamboo, solid oil palm trunk, solid rattan and other materials) and laminated panel materials (laminated solid-based materials and laminated veneer-based materials)</p> <p>CLO4 Examine and analyze the mechanical, physical and chemical behavior of bio-composite products</p> <p>CLO5 Justify the appropriate cellulosic materials for bio-composite products</p>
Pre-Requisite Courses	No course recommendations
Topics	<p>1. Introduction</p> <p>1.1) 1.1. Composites - definition and descriptions</p> <p>1.2) 1.2. Classifications of laminated and veneer-based bio-composites</p> <p>2. Solid composites</p> <p>2.1) 2.1 Harvesting of bio-cellulosic materials</p> <p>2.2) 2.2 Lumber manufacturing</p> <p>2.3) 2.3 Non-wood sawn products</p>

3. Modified materials

- 3.1) 3.1 Chemically treated materials: processing systems and properties testing
- 3.2) 3.2 Fire retardant materials: processing systems and properties testing
- 3.3) 3.3 Resin-impregnated materials: processing systems and properties testing
- 3.4) 3.4 Irradiated materials: processing systems and properties testing

4. Layered composites and components

- 4.1) 4.1 Glued-laminated beam: manufacturing processes and products performance
- 4.2) 4.2 Parallel laminates: manufacturing processes and products performance
- 4.3) 4.3 Cross laminates: manufacturing processes and products performance
- 4.4) 4.4 Stress-skin panels
- 4.5) 4.5 Structural insulated panels
- 4.6) 4.6 Sandwich panels
- 4.7) 4.7 Mechanically connected laminates

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment	20%	CLO5
	Quiz	Quiz	20%	CLO3
	Test	Test	20%	CLO4

Reading List	Recommended Text	<ul style="list-style-type: none"> • <i>Standard Method of Manufacturing Glued Laminated Timber Beams</i> • <i>Standard Method of Manufacturing Laminated Veneer Lumber</i>
	Reference Book Resources	<ul style="list-style-type: none"> • Rubin Shmulsky, P. David Jones 2011, <i>Forest Products and Wood Science</i>, 6th Ed., 17, John Wiley & Sons [ISBN: 081382074X] • Tang Yiping 2014, <i>Advanced Manufacturing Technology</i> [ISBN: 1842659146] • Forest Products Laboratory 1999, <i>Handbook - Wood as an Engineering Material</i>, . Madison, WI: US Department of Agriculture, Forest Service, FPL • Roger M. Rowell 2012, <i>Handbook of Wood Chemistry and Wood Composites, Second Edition</i>, CRC Press [ISBN: 1439853800] • Jack Porteous, Abdy Kermani 2013, <i>Structural Timber Design to Eurocode 5</i>, Wiley-Blackwell [ISBN: 0470675004]
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	