UNIVERSITI TEKNOLOGI MARA

BCT599: BIO-COMPOSITE TECHNOLOGY II

Course Name (English)	BIO-COMPOSITE TECHNOLOGY II APPROVED
Course Code	BCT599
MQF Credit	4
Course Description	The course will review the general technology of composites, and focus on the bio-based composites field for particle-based, fiber-based and flour composite (Chipboard, MDF. and paper). It also provides an overview of bio-based composites products as an increasingly important part of the wood utilization industry. The advantages of composite technology as a viable solution to material limitations in both natural and manufactured products, and draw from this the reasons for the development of bio-based composites as a solution that maximizes the use of the forest resource. A generalized composite model is described in terms of particle 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 familiarise students with the manufacture and recent technology of wood and bio-based composites products in Malaysia.
Transferable Skills	Students are able to elaborate or explain the production process of bio-based composites field for particle-based, fiber-based and flour composite .
Teaching Methodologies	Lectures, Lab Work, Field Trip, Practical Classes
CLO	CLO1 Explain the definitions, descriptions and classification of bio-composite products from particles, fibres and flours CLO2 Describe and apply the processing and manufacturing of bio-composite products made from particles, fibres and flours CLO3 Examine the mechanical, physical and chemical behavior of bio-composite products CLO4 Construct the bio-composite products for structural and non-structural application CLO5 Justify the appropriate cellulosic materials for bio-composite products, the major bio-composite products from particles, fibres and flours that available in current markets
Pre-Requisite Courses	No course recommendations

Topics
1. 1.0 Introduction 1.1) 1.1 Composites- definition and descriptions 1.2) 1.2 Classification of particle and fiber-based Bio-Composite wood composites, non-wood composites and wood-nonwood compostes
2. 2.0 Particle composites 2.1) 2.1 General processing systems 2.2) 2.2 Properties and testing 2.3) 2.3 Parameters affecting board properties 2.4) 2.4 Major particleboard products chipboard, flakeboard, waferboard, oriented strandboard and com-ply

3. 3.0 Fiber composite 3.1) 3.1 General processing systems 3.2) 3.2 Properties and testing 3.3) 3.3 Parameters affecting board properties 3.4) 3.4 Major fiberboard products: Insulation board, Medium density fiberboard and hardboard
4. 4.0 Pulp and paper 4.1) 4.1 General processing systems 4.2) 4.2 Properties and testing 4.3) 4.3 Parameters affecting pulp and paper properties 4.4) 4.5 Major paper products
5. 5.0 Flour composites 5.1) 5.1 General processing systems 5.2) 5.2 Properties and testing 5.3) 5.3 Parameters affecting board properties 5.4) 5.4 Major flour composite products Moulded fiber composites and extruded fiber products
6. 6.0 New development in Bio-Composite 6.1) 6.1 General statement 6.2) 6.2 New products development 6.3) 6.3 Future bio-fibres supply

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Assignment	10%	CLO1 , CLO2 , CLO3 , CLO4 , CLO5
Group Project	Practical Report	15%	CLO1 , CLO2 , CLO3 , CLO4 , CLO5
Practical	Industrial visit	6%	
Quiz	Quiz 1	3%	CLO1
Quiz	Quiz 2	3%	CLO2 , CLO3
Quiz	Quiz 3	3%	CLO4 , CLO5
Test	Test 1	10%	CLO1 , CLO2
Test	Test 2	10%	CLO3 , CLO4

Reading List

Recommended Text

- **Maloney, T. M 1977, *Modern Particle Board & Dry Process Fibre-Board Manufacturing*, Miller Freeman Publication.**
- ***Standard Method of Manufacturing Glued Laminated Timber Beams***
- ***Standard Method of Manufacturing Laminated Veneer Lumber***
- **Kollmann, Cote Il. 1985, *Principles of Wood Science and Technology I. Solid Wood***
- **Forest Products Laboratory 1999, *Wood Handbook – Wood as an Engineering Material*, US Department of Agriculture, Forest Service Madison, WI**
- **6. Jim L. Bowyer, Rubin Shmulsky and John G Haygreen 2007, *Forest Products and Wood Science*, Blackwell Publishing**
- **Ky?to Daigaku & MokuzaiKenky?jo 2003, *Wood Research*, Wood Research Institute**
- **8. Amar K. Mohanty, Manjusri Misra & Lawrence T. Drzal 2005, *Natural Fibres, Polymer and Their Composites*, Taylor and Francis**
- **Richard P. Wool and Xiuzhi Susan Sun 2005, *Bio-Based Polymer and Composite*, Academic Press**
- **Alex T. Wilson, Mark Piepkorn & Nadav Malin 2005, *Green Building Products. The Green Spec Guide to Residential Building Materials*, New Society Publisher**

Article/Paper List

Reference Article/Paper Resources

- **Leonard S. Fifield 2012, Bacterial Cellulose Composites Opportunities and Challenges**
- **Alexander Bismarck, Supriya Mishra, and Thomas Lampke 2005, Plant Fibers as Reinforcement for Green Composites, *Natural Fibers, Biopolymers, and Biocomposites***

Other References

This Course does not have any other resources