PROPOSAL FOR PERODUA ECO-CHALLENGE 2013
BY
FACULTY OF ENGINEERING & BUILT ENVIRONMENT AND
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Introduction

Two distinguished faculties of Universiti Kebangsaan Malaysia (UKM) namely the Faculty of Engineering & Built Environment (FKAB) and the Faculty of Economics & Management (FEP) will be working closely together once again to strive harder for the upcoming PEC 2013. Like in previous years, with the aids and full supports from our very own Centre of Automotive Research (CAR) we are highly committed to support and facilitate progress in addressing new challenges of our new concept car.

Undeniably, Perodua Eco-Challenge is an ideal platform to impart the technical knowledge to our undergraduate students by giving them a flavour of real life pressures that come with the drives to complete projects with existing resources within stipulated duration. Active involvements of students in this competition are expected to cultivate strong interests in the automotive field, team working spirit, good time- and tasks-management, habits and skills to develop business relationships with customers, authorities and suppliers.

For two consecutive years, we have won silver and bronze for the Design and Engineering categories. So, we are putting high hopes in improving ourselves this year.

Objectives

The main objective of this challenge is to design and to improve the internal spacing arrangement and the roof for a fuel-efficient concept car. In order to achieve the target, our strategies are as follows:

1. Advanced modifications on the engine to achieve higher thermal efficiency, super lean combustion process and lower emission.
2. Optimisation of the engine control via ECU (engine control unit) modification and micro-hybrid system for better fuel efficiency
3. Produce a sleek and stylish design for the concept city-car by using indigenous and cutting edge materials for lightweight effects.

Concept

The name of the car is ***i-Bond***. The car derives its concept from the *intelligent* structural segmented bonding (*i-Bond*) process of green composites for the body as well as the i-power regeneration system (i-PRES) that enables several innovative ideas to be in place such as i-engine-stop and the like. *i-Bond* is an i-car that identifies with a sustainable environment yet provides added safety of the impact withstanding body, hence green, bonding and caring. Its stylish aerodynamic exterior calls to mind the suave personality of James Bond of 007 fame.

New designs and modifications

New designs and modifications are proposed taking into account the duration and possibly limited financial resources the team must work with.

Modifications	Expected benefits
Engine: • Modification of combustion chamber/piston to achieve higher compression ratio. • Injection control by using multiple step injection technique to control combustion temperature. • New design of a 4-2-1 exhaust manifold system. Modification of intake manifold by using CFD software Star CCM analysis before actual modification.	• Improve thermal efficiency and increase output power. • The feasibility of super lean combustion. • Low NO_x. (Nitrogen oxides) • Since higher compression ratio will lead to higher knock, an adjustment to the exhaust manifold design to avoid hot gas entering the combustion chamber is needed. • Changing in swirl ratio lead to improve of air intake and overall combustion process and achieving high thermal efficiency.
Electronics: • ECU modification to control multiple step injection strategy. • Intelligent stop and go system.	• Super lean combustion. • Low NO_x • Low fuel consumption, longer engine durability, low CO_2 (carbon dioxide) emission
Upper body modification: • Optimisation of dimension and weight of steel-based tubular structure using MSC Nastran/Patran and Mode Frontier (AA) • Composite structure	• Strong, light and optimised frame that can reduce overall fuel consumption and provide safety to the driver
Aerodynamics design: • Optimisation of body shape to minimise aerodynamic drag by using CATIA, STAR-CCM and Mode Frontier	• Reduce drag and fuel consumption • Aesthetic design

Equipment/software

The following are among the available equipment in our laboratories that can be utilised to test and achieve the above design and modification ideas.

1. Engine testbed (AC and eddy-current dynamometer, hydro kinetic dynamometer) with control and analysis software
2. Combustion analyzer
3. Portable gas analyzer
4. Fuel system with electronics fuel metering
5. Software (CATIA, STAR-CCM+, Mode Frontier, MSC Nastran/Patran, AVL Boost, AVL Fire, ADAMS Car/Engine)

Marketing Strategies

The UKM team adopts the following marketing strategies:

1. Product strategy
    a. Compact concept city car with 2-doors
    b. Fuel efficiency for city driving and
    c. Safety features – absorb higher impact due to advanced green composites absorber characteristics.
2. Price strategy
    a. Expected price RM50,000
    b. 3 years warranty for labour, parts and services.
    c. 10-years warranty for green composites body parts.
3. Place strategy
    - Perodua outlets all over Malaysia.

4. Promotion Strategy
    a. Road-shows in major shopping centre.
    b. Invite the professional drive to test drive the car and makes a public comments.
    c. The potential buyer will be invited to test drive the car.
    d. Aggressive promotion thru social networks and alternative media to reach the target market.
5. Positioning Strategy
    - The car will be position as a city car which offers maximum fuel efficiency.
6. Segmentation Strategy
    - Target segment are the young generation which are the middle income earner.

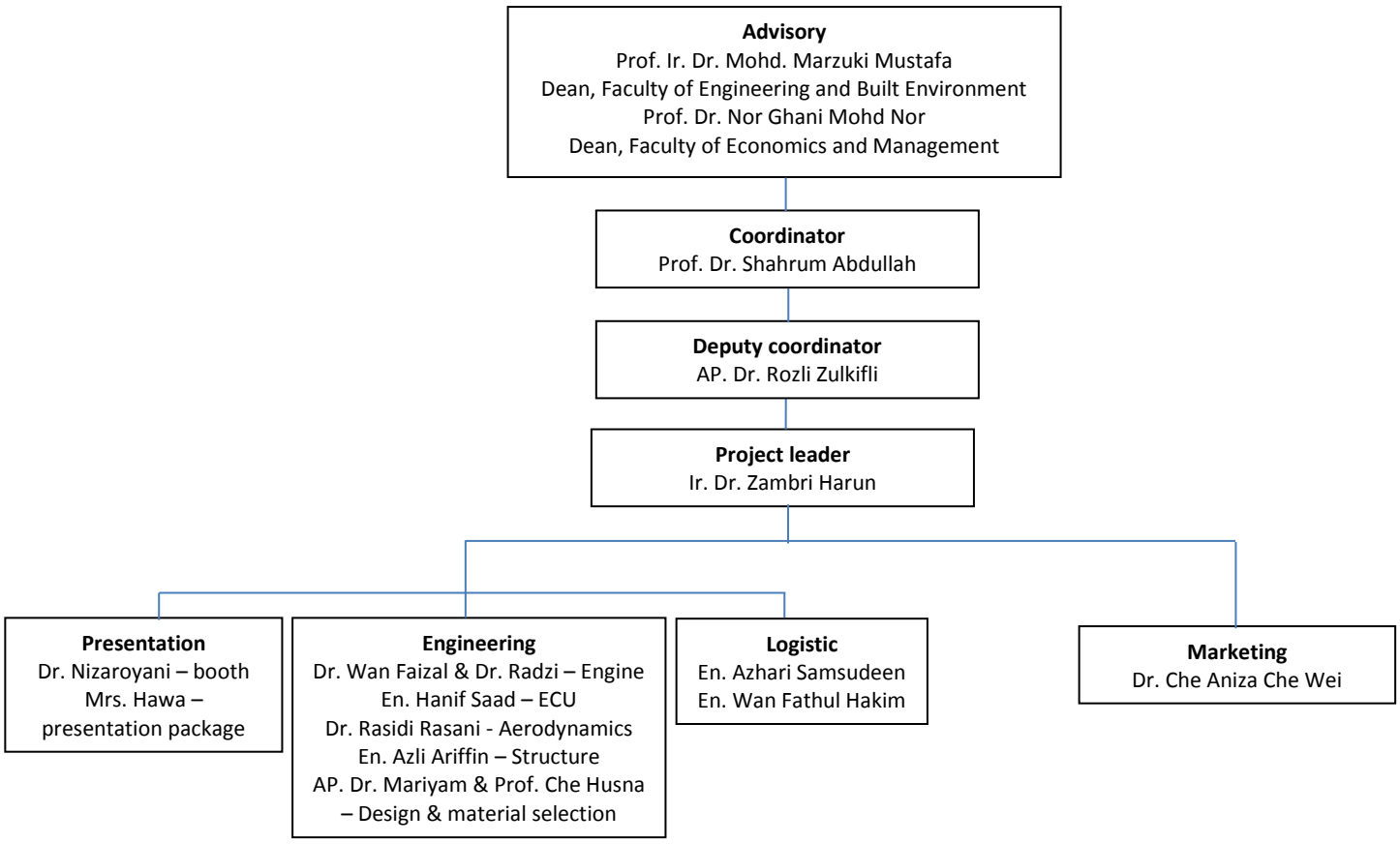
Timeline of Activities

Time	Month	Jun				July				Aug				Sep				Oct				Nov				Dec			
	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Activities	Notification of successful proposal	■																											
	Components handover		■																										
	Overall planning of manpower and facilities		■	■	■	■																							
	Upper body design and modification						■	■	■	■																			
	Aerodynamics design and analysis						■	■	■	■																			
	Combustion chamber/piston crown, injection and exhaust manifold modification						■	■	■	■	■	■																	
	ECU Modification						■	■	■	■	■	■																	
	Design and development of stop and go system						■	■	■	■	■	■																	
	Other components design and development						■	■	■	■	■	■																	
	Full body construction										■	■	■	■															
	Integration of all the components and system for a complete vehicle														■	■	■	■	■										
	Vehicle testing																			■	■	■							
	Driver training																				■	■	■						
	Car delivered for inspection																							■					
	Various marketing activities and preparation						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
	Eco-Challenge race																								■	■	■	■	■

Team member

No	Name	Role	Designation
1.	Prof. Dr. Shahrum Abdullah	Coordinator	FKAB, Professor, Head of Dept.
2.	AP. Dr. Rozli Zulkifli	Deputy coordinator	FKAB, CAR, Head
3.	Ir. Dr. Zambri Harun	Project leader	FKAB, Lecturer
4.	Dr. Wan Mohd Faizal Wan Mahmood	Engine	FKAB, Senior Lecturer
5.	Dr. Mohd Radzi Abu Mansor	Engine	FKAB, Lecturer
6.	AP. Dr. Mariyam Jameelah Ghazali	Design	FKAB, Lecturer
7.	Prof. Dr. Che Husna Azhari	Design	FKAB, Professor
8.	Mr. Haniff Saad	ECU	FKAB, Lecturer
9.	Mr. Azli Ariffin	Structure	FKAB, Lecturer
10.	Mr. Azhari Shamsuddin	Logistic	FKAB, Science Officer
11.	Dr. Mohd Rasidi Rasani	Aerodynamic	FKAB, Senior Lecturer
12.	Mrs. Hawa Hishamuddin	Engineering Presentation	Tutor
13.	Mr. Zulkhairee Zainol Abidin	Fabrication	FKAB, Lecturer
14.	Dr. Nizaroyani Saibani	Presentation	FKAB, Senior Lecturer
15.	Mr. Wan Fathul Hakim Wan Zamri	Logistic	FKAB, Lecturer
16.	Dr. Che Aniza Che Wel	Marketing leader	FEP, Program coordinator
17.	Mrs. Roshayati Abd. Hamid	Launching and promotion	FEP, Lecturer
18.	Dr. Mohd Hizam Hanafiah	Marketing Presentation	FEP, Senior Lecturer
19.	Dr. Zaleha Yazid	Video	FEP, Senior Lecturer
20.	Dr. Nor Liza Abdullah	Sponsorship	FEP, Senior Lecturer

Organization Chart



Summary

Our automotive experts are uniquely qualified to address complex issues with compliant design and implementation. The combination of strong industry knowledge and subject matter expertise makes us uniquely qualified to assist industry participants and navigate most challenging situations. We are very confident and motivated to win this year's prestigious Perodua Eco-Challenge 2013.