The difficulty in obtaining the required density and smoothness of constructed pavement, establishing conformity between registered process input parameter and tested output of asphaltic concrete; couple with the effect of small change in aggregate gradation on the workability of asphaltic concrete just as inadequate compaction can result to moisture induced damage are the main factors that triggers this research. The research was therefore undertaken to improve means of measuring workability. The research was divided into three tasks. Task one was consideration of all the materials used in the research. Task two was undertaken to achieve the first objective which is development of an improved workability measuring device. The components were designed, fabricated and a suitable transducer was incorporated. In order to obtain the best paddle suitable for the device out of three types paddle configurations named A, B and C. Seven types of mixes were designed in accordance with (PWD) Malaysia’s specifications for road works. Marshall Mix design method was used to obtain the optimum asphalt binder content for the AC14 gradation of three different aggregate fractions used to test the paddles. The first three mixes designed used bitumen of 80/100 penetration, while the other three mixes designed were identical gradation of bitumen 60/70 penetration and the last mix used the Reclaimed Asphalt Pavement (RAP). The RPM was set essentially to 5, and then adjusted to 10,15,20,25 RPM. The device developed was used to blend the mixes at six different temperatures. Dry sieved aggregate, wet sieved aggregate and warm mix asphalt was used to assess the gradation of aggregate and the reliability of device operation. Task three was undertaken to achieve the second, third and fourth objectives. The first three mixes designed were used at different mixing temperatures 140 °C & 150 °C and 5 different compaction temperatures. It was found that Paddle B having speed of 10 RPM is suitable for the device because it provides a wide range of torques. For the second objective, it was found that the value of Torque is influenced by compaction, mixing temperature and gyration; there is however no significant relationship between torque; resilient modulus, Stability and Flow. Also, the research finding suggests that the higher the mixing temperature, the lesser the value of torque. Furthermore, it was found that the increase in gyration will result in the increase in the value of torque. For the third objective, the finding demonstrate that all the three proportions of the same nominal maximum aggregate size AC14 yielded different values of torque. It was also found that the fine aggregate yields more torque (less workable). In addition, the range of torque for AC 14 is 12kNm to 20kNm; and that wet sieved aggregate mix yielded less torque than the dry sieved aggregates. Results for the fourth objective suggest that any increase in TSR at different levels of mixing and compaction will decrease the value of torque any value of torque above 17.2kNm is an indication of moisture-induced damage. It was recommended that the findings in this research be tested on a full-scale, flexible pavement construction.

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The geometrical tolerance verification of machined part is a process composed of a set of inspection procedures and rules that are complex, tedious and slow. The methods and instruments used to inspect geometrical tolerance of the parts are quite conventional and require a high skill and knowledge to assess the quality of the machined parts. For this reason, this research develop a method to effectively perform the inspection process by recommending non-contact approach using machine vision and new simple mathematical models that can be used for the creation of an inspection system to assist in the verification of an important form tolerance of machined parts. The main goal of this research is to develop method and procedure of roundness measurement that are simple to implement but at the same time is fast and effective to provide reliable technique that help the metrologist to make evaluation for the inspected parts. Two samples of cylindrical machined parts are selected to be measured by this non-contact approach. A test-rig set-up which consists of main components such as workholding fixture, CCD camera, lighting device and motor was developed in order to carry out this study. This research proposes new procedure in image processing by using WiT software. In addition, a new mathematical model for evaluation of roundness error is proposed according to the analogy given by Minimum Zone Circle (MZC) method. The proposed approach and mathematical models were analyzed using several mathematical models were analyzed using several.
set of number of part images. The results showed that the non-contact inspection system for roundness error were effective and reliable enough to assess this form tolerance. This concept of measurement can be further improved to obtain better accuracy of the roundness error assessment. In summary, this research suggests a new method for geometrical tolerance inspection for machined parts by using machine vision. This system provides flexibility in term of the inspection set-up and is potentially applied for in-line and hundred percent (100%) inspection of the cylindrical machined parts.

**Name:**
Rizal Effendi Bin Mohd Nasir

**Title**
Longitudinal Flight Dynamics And Stability Of Blended Wing-Body Unmanned Aerial Vehicle With Canard As Control Surface

**Faculty**
Mechanical Engineering

**Supervisor:**
Prof. Ir. Dr. Wahyu Kuntjono (MS)
Prof. Dr. Wirachman Wisnoe (CS)

Blended wing-body (BWB) aircraft concept has its body “blended” with the wing in smooth transition. Unlike conventional aircraft design, BWB aircraft’s body produces lift force and this causes large impact on the flight dynamics and stability. This thesis focuses on flight dynamics of a small unmanned aerial vehicle (UAV) with BWB configuration incorporating a set of canard as longitudinal control surface. The objective is to predict the flight dynamics and stability behaviour of UiTM’s Blended Wing-Body (BWB) unmanned aerial vehicle (UAV) with canard as control surface, known as Baseline-II E-2, in longitudinal mode with classical-approach stability augmentation to achieve level 1 phugoid and short-period modes flying qualities (restricted to damping ratios) as stated in MIL-F-8785C standard. This study proposes simple scheduled feedback gains to the canard. Wind tunnel experiments, computational simulations and empirical estimations were conducted to characterize its aerodynamics and to come up with its aerodynamic mathematical model for flight dynamics derivatives calculation. The flight dynamics model was derived to become Model-N state-space representation and compared to established models. Transient response to a unit step canard input was simulated using these models for flight conditions inside the airplane operating flight envelope (OFE) within its allowed angle of attacks. It was found that the BWB airplane without SAS, despite being statically and dynamically stable, has poor flying qualities for both short-period and phugoid modes. The change of short-period and phugoid modes’ natural frequencies and damping ratios with respect to airspeed, dynamic pressure and altitude were studied to establish mathematical relationships that were used to design a suitable scheduled gains to be fed to the canard control surface. Classical method was used to come up with feedback gains relationships with respect to dynamic pressure. By setting the required damping ratios for both modes to a demanded value couples with simplifications to these equations, the magnitude of feedback gains could be determined. The relationship between feedback gains and dynamic pressure was used to construct a representative block diagram of the complete aircraft control system with stability augmentation using canard control surface in Matlab SIMULINK. The resulting transient response were analyzed to compute values of short-period and phugoid modes’ damping ratios. The results of these damping ratios show that the aircraft with SAS has good flying qualities (Level 1) while maintaining short-period and phugoid modes’ damping ratios to around 0.7. This study has shown that it is possible to provide adequate stability and good flying quality for a flight limited to its operational flight envelope via simple feedback gains governed by dynamic pressure.

**Name:**
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**Title**
Control Of Daylight And Artefacts Display And Placement In Historic Museum Galleries

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Daylighting in historic museum galleries is not an easy criterion to manage as natural light fluctuates according to the sky conditions; hence the need for strategic daylight control programme becomes evident. Currently, there is limited information on daylight performance for conservation of artefacts in daylit historic museums in Malaysia. This thesis aims to evaluate daylight performance for artefact conservation through passive design and control strategies in historic museums under the tropical sky conditions. This research focuses on evaluating the existing illuminance levels, UV levels, daylight factor, light-fastness survey and visitors’ perception on the exhibits’ conditions and their visual responses on the daylighting conditions. The performance of daylighting was evaluated based on typical