Courtyards are regarded as a microclimate modifier, and their application has become popular in various forms of public buildings. This thesis reviews design factors of courtyards in hospitals in Malaysia, and assesses the resulting thermal performance of the courtyard space and energy performance of the attached built volume. The study took a sequential approach whereby knowledge gained from each phase of research served to inform the direction for the next phase of the study. It began with the initial inquiry on what are the courtyard characteristics applied in hospitals in Malaysia. Data were gathered through field survey, followed by a typology analysis involving 34 courtyards in 19 government hospitals. The survey revealed extensive use of O-Enclosure Courtyard (OEC) and U-Enclosure Courtyard (UEC), and that although the spaces inside the surveyed courtyards appeared as appealing, activities inside these courtyards were rather limited. This led to the next research inquiry on the thermal condition inside the courtyard and the adjacent rooms/built volumes. A field measurement was conducted on a case study hospital, where the thermal condition in the OEC appeared as appealing, activities inside these courtyards were rather limited. This led to the next research inquiry on the thermal condition inside the courtyard and the adjacent rooms/built volumes. A field measurement was conducted on a case study hospital, where the thermal condition in the OEC and UEC were collected, analysed and compared. The findings indicate UEC as the better design option. Consequently, the UEC configuration was chosen for further investigation through a parametric analysis using the Integrated Environment Solution <Virtual Environment> (IES<VE>) simulation software. Mean radiant temperature (MRT) in the courtyard and the energy consumption of the attached built volume were the criteria of thermal performance. In the final phase of the research, the results from the parametric analysis were used for dual purposes: (1) to ascertain the thermal condition inside the courtyard through Computational Fluid Dynamic (CFD) analysis, and (2) formulation of an energy performance prediction equation, constructed using Structural Equation Modelling (SEM) technique. The structure model shows that eight predictors, i.e., Area, Length, Width, Height, Cantileveredroof, Orientation, Flow-in and Flow-out, can explain 97% of variations in energy. The significant finding of the thesis is the proposed preliminary Energy Estimation Formula (EEF) for UEC in the tropical climate that could benefit architects, designers and clients with deep concerns for a responsive design resolution.

Woodcarving is a form of Malaysian traditional art. After the advent of Islam in the Malay Peninsula in the 13th century (Pesisir) and 14th century (Malacca), Islamic motifs such as calligraphic woodcarvings are added to the local art forms, particularly to embellish Malaysian mosques. Although Malaysian mosques have been built using three architectural styles, namely the vernacular, colonial and modern, the designers did not distinguish between the styles when installing calligraphic woodcarving ornamentations in the prayer halls. Furthermore, although many studies have been conducted to investigate the characteristics of Malaysian woodcarvings, findings on the opinions of mosque users are lacking. Hence, this thesis aims to identify the various forms of calligraphic woodcarving ornamentations through the analysis of their writing styles and other characteristics of this ornamentation from the selected peninsular Malaysian mosques. The objectives are: i) to establish the judgments of mosque users about calligraphic woodcarving ornamentations based on types of scripts, legibility, locations, function, aesthetic, desirability and combination of patterns; ii) to analyse the current calligraphic woodcarving ornamentation (writing styles, locations and contents) of Malaysian mosques; and iii) to propose recommendations on the appropriate design of calligraphic woodcarving ornamentations for Malaysian mosques. This study employed quantitative and qualitative methodologies. Five scripts - Thuluth, Kufi, Naskh, Nastaliq and Diwani and eight mosques in the North East and South West regions of Peninsula Malaysia were selected for the case studies. Firstly, the field study documented existing decorative woodcarving inscriptions in the mosques. Then, from the total number of 408 respondents, the assessments of mosque users on wood-carved calligraphy are conducted. The qualitative data are discussed comprehensively while SPSS is used to analyse the quantitative data of the questionnaire survey. The investigated variables included the locations, readability, aesthetic, function, mixture with other motifs and preference of scripts. The findings showed that calligraphy not only functions as ornamentation in a spiritual atmosphere, but also for recitations. Thuluth and Kufi are the most preferred scripts as decoration of mosques as woodcarving ornamental inscriptions. The users of mosques preferred individual inscriptions in terms of legibility while they desire to observe Arabic inscriptions to decorate Mihrab, Mimbar and entrances respectively. The designers preferred Thuluth scripts, but the selected contents did not follow the principle of connection between location and content of inscription. The study summarised design recommendations which will assist calligraphers, woodcarvers and designers of mosques to provide more desirable calligraphic woodcarving ornamentations for Malaysian mosques based on the users’ assessments and the existing decorative inscriptions.