Turning experiments were conducted on a CNC centre Lathe machine under dry condition. In this work, AL 7075-based aluminium alloy reinforced with silicon carbide particle of size 25 μm with 17% volume fractions and graphite 3% volume manufactured through stir casting route was used for experimentation. The hardness and micrograph of Al HMMC were studied before experimentation. To conduct experiments, the workpiece materials were cut into plates of 250×30 mm. The surface roughness, material removal rate, cutting force and power consumption values were collected under different cutting conditions for various combinations of turning parameters. The result details of this research work are discussed below.

In the first stage, the properties of the Al HMMC were found from various necessary experiments like hardness, tensile and compression. Those values are compared with the necessary material and graph was drawn from the values. In the present study, Al7075 alloy-based metal matrix composite reinforced with mixtures of silicon carbide (SiC) and graphite particles were fabricated by stir casting method. The mechanical properties such as Hardness, Tensile, and Compressive strength were studied on developed samples according to ASTM standards. The hardness of the specimen was measured at room temperature. The magnitude of hardness increases naturally as the function of the volume fraction of the particle. The influences of SiCp and graphite reinforcement on tensile strength have been evaluated. The
microstructure was also evaluated using SEM image. The results show that the reinforcement has been increased the mechanical properties.

In the second stage, the investigation is to find the optimum machining parameter of CNC turning centre on Al-HMMC. The primary purpose is to find the optimum cutting parameters to attain a low value of surface roughness and high Material Removal Rate (MRR). The cutting parameters considered in this experimental investigation are cutting speed, feed rate and depth of cut. Taguchi L27 orthogonal array was chosen to conduct the experiments. Signal to Noise ratio (S/N) and Analysis of Variance (ANOVA) were used to study the effect of cutting parameters on surface roughness and Material Removal Rate. The role by each cutting parameter to surface roughness and MRR was also determined.

From the experimental results, the calculated S/N ratio and ANOVA, the following conclusions are drawn for the machining of Al-HMMC using CNC machine. To attain better surface finish the recommended parametric combination is A3, B1, and C1 which represents spindle speed at 150m/min, the feed rate at 0.1 mm/rev and depth of cut at 0.5mm respectively. From the ANOVA results, it is found out that the feed rate is the most significant parameter, cutting speed is the second significant parameter and the depth of cut is the third significant parameter on surface roughness. For higher MRR the recommended parameter combination is A3, B3, and C3 which represents spindle speed at 150m/min, the feed rate at 0.3 mm/rev and depth of cut at 1 mm respectively. From the ANOVA results, it is found out that the feed rate is the most significant parameter, cutting speed is the next significant parameter and the depth of cut is the third significant parameter on MRR.

In the third stage, this area discusses the derivation of an optimum setting of machining process parameters namely cutting speed, feed rate and
depth of cut to obtain optimal values of cutting force and power consumption while machining of Al-HMMC reinforcement. The effects of selected process parameters on the chosen input characteristics and the optimum settings of the parameters have been accomplished using the Taguchi design approach. The analysis of the results shows that the optimal settings for a low value of cutting force and lesser power consumption are cutting speed, feed rate, and depth of cut and keeping them at a lower level in the selected parameter levels. The confirmation test results agree well with the experimentally predicted results.

From this analysis, the experiments were conducted on Al-HMMC using Taguchi design methodology. Cutting speed, feed rate and depth of cut were considered as input parameters to minimize the power consumption and cutting force. From the experimental results the following conclusions have arrived:

- For minimum power consumption and lower cutting force, the recommended parameter combination is cutting speed, feed rate, and depth of cut, all at level 1.

- For minimum power consumption, the optimum machining parameter is cutting speed at 140 rpm, the feed rate of 0.1 mm/min and depth of cut 0.5 mm.

- For lower cutting force, the optimal parametric combination is cutting speed rate at 140 rpm, feed rate at 0.1 mm/min and depth of cut of 0.5 mm.

- From the ANOVA results, it is found that the cutting speed is the most significant parameter and depth of cut is the second significant parameter, and the third significant parameter is the feed rate in respect of power consumption.
• From the ANOVA results, the cutting speed is the most significant parameter, and depth of cut is the second important parameter followed by feed rate in respect of cutting force.

The confirmation test results show that the predicted optimum values agree well with the experimental values.