

RESEARCH EXPERIENCE

May-July 2017

I started a project with Professor Harpreet Singh in my 2nd year during which I analysed a lot of research paper and thesis on my project topic. I was so interested by the project that I decided to dedicate my summer break of two months to this project during which I worked in the lab for most part of it and did most of the experiments on my own. This project helped me to gain tremendous amount of research experience. During this two months I learned to make surface composites of Magnesium using Friction stir processing. X-ray diffraction was also done of the fabricated composite in order to confirm the presence of reinforcement particles. The method used to form surface composites over here is Friction stir processing which depends on lot of parameters. These parameters were optimized for defect free output. The FSPed sample was then mounted using Bakelite and were polished for mirror finishing in order to see the microstructure. Etching was done of the polished sample with a preferable etching agent. Microstructural images of the sample were then taken using normal optical microscope as well as Leica microscope and the grain size of the captured images were analysed using ImageJ software. Before fabricating the composite, the reinforcement particles which were Calcium phosphate were tested for stability at high temperature by doing its Thermal Gravimetric Analysis. The results of which were then analysed in order to confirm the stability so that the formed composite is that of Calcium phosphate and not of its any other form. This polished samples were then tested for micro-hardness using Vickers hardness instrument. Contact angle test were also done of the specimen to find if the composite formed has more retention to liquid droplets than the original material. I also learned to do find the corrosion resistivity of the specimen using gamry instrument. The project was still underway at the end of my summer break, so I was unable to write a paper on it; however, I am confident that my efforts will contribute to the final assessment.

January-April 2017

A course project under "Materials Characterization Techniques" course was successfully carried out in which many journal papers on carbon fibre composites were analysed in order to make hair reinforced composites. The main aim of the project was to optimize the amount of hair that must be used to make the composite in order to increase the mechanical properties of the composite. Therefore, different samples were created using different concentrations of hair in them. The specimens were created using epoxy and hardener in a specified ratio which was determined from the analysis of research papers. I also learned about curing when this samples were made to cure at 60°C in an oven for 2-3 hrs. After curing the samples were cut into dog-bone shaped standard dimension using a dog-bone cutter. The specimens were then tested for true stress strain graph using universal testing machine. The data acquired from the experiments were then analysed in order to compare the specimens so as to optimize the concentration of the hair that should be present in the composite for maximum improvement in the mechanical properties.

A product was also Designed and Fabricated for "Product Design and Realization - Intermediate" course which was a lab course. The project aimed at manufacturing a portable device for hikers that can be used to generate electricity by both Wind as well as small rivulets to charge cell-phones and other gadgets where there is no source of electricity.

August-November 2016

In Material Science Engineering lab a lot of new techniques has been learned by me directly and some through projects as well. Techniques such as polishing, grinding, etching, examining the microstructure under a microscope were all learnt in this course. A small project was carried out in which grain sizes of hammered and un-hammered copper heated for different temperatures were compared and it was found that the hammered copper has elongated grains compared to the un-hammered ones.

RESEARCH EXPERIENCE

June-July 2016

After the completion of my first academic year I undertook an industrial internship in Jyoti CNC Ltd. where I acquired practical knowledge of manufacturing a Computer Numeric Control Machine. During my internship period I earned a lot of exposure about designing a CNC in R&D Department using CAD software like creo and how its simulation is done in Hypermesh. I also got learned about a lot of manufacturing processes like casting, knock off, shot blasting, Fettling, Machining, Assembling, Quality control, Testing measurements like co-ordinate measuring machine, Roundness testing measurements, Surface Roughness measurements, Alignment test, squareness test, Laser testing, Ball bar testing, Vibration testing, Autocollimator and many others. to casting of the designed products in foundry, their machining in the Machine shop to their final assembly in the Assembly area until its dispatch was experienced.

January-April 2016

Under “Product Design and Realization –1” course I was introduced to many basic manufacturing methods which includes Turning, Facing, Milling, Welding, Grinding, Drilling, Boring, Taping, Filling, metal shearing methods etc. A course project was carried out under which a Stair climbing locomotive was designed and Fabricated. This manual driven locomotive can be used to manoeuvre goods up the stairs by a mechanism of three wheels on both sides in such a way so as to produce rotatory motion while climbing up the stairs.

Courses Completed

The relevant courses completed includes Material Science & Engineering, Material Characterization Techniques, Mechanics of Materials, Theory of Machines, Energy Science & Technology, Fluid Mechanics *Manufacturing with Metallic Materials, *Heat & Mass Transfer, *Machine Element Design, *Manufacturing with Metallic Materials, *Machine Vibration Analysis, Classical Mechanics, Engineering Mechanics, Product Design and Realization.

The * marked courses are to be completed before the start of the project.