

## **Course Reflection by Shashank Heda, 11110094**

I liked this course very much as it revealed to me a completely new world, 'the world of Parallel Programming'. It was totally different from the other conventional courses where we have either very little or no practical implementation of whatsoever being taught. I used to wonder and even ask my friends about the way to use all cores of an i5 system etc. as I had read in a newspaper that normally laptops do not work on all cores (Old Microsoft Products were all single core based probably). This course gave me some insight into the same. The course and the corresponding labs were very well-structured and the presentations on each Friday were the best thing I looked for. It was sometimes scary though when we had problems with the data or got errors with the code but gave a nice feeling and made us more confident.

The codes we wrote for this course could also be put to use in many other ways as we had numerical methods being taught in Maths and Fast Fourier Transform in Signals and Systems. Thus it was great syncing all of them, i.e., gaining knowledge from a course and putting it to use for many other courses.

After this course, I frequently used to look at the performance of my laptop (only to find that most of the times, 2 out of the 4 cores were 'Parked'). Discussed this with Ravi and searched for explanations on Internet. The answers indicate that most programs run onto one core and the system parks the idle cores in order to save power, and only things like Microsoft Excel (as I know) use all the cores for computation. Then came the Parallel MATLAB. It is one of the best parallel software and has made things quite interesting for the user. I am waiting for such a release from NVIDIA, in which, as you mentioned in class, they are going to make CUDA user friendly like openMP.

OpenMP was the easiest compared to others (as we didn't have to do a lot many things to parallelize), then came Pthreads and then MPI. But if we look from a different perspective, we found that user control is maximum in MPI. Second was Pthreads and then openMP. After learning this from various comparison checks, we got our facts straight that MPI was equally useful as Pthreads and OpenMP. CUDA is the best of course.

### **The things I missed after such a wonderful experience:**

I had thought of implementing many of the things we did on GARUDA and check out its performance. I do not know whether it would be useful since there was so much scope in this course that we could not even fully utilize our own HPC Cluster.

As we progressed through the course, I found that I needed a lot of time for many things. . OpenMP inside MPI has been done by many and has given fruitful results. But things like using MPI in openMP and then gaining control over all threads and process being used is quite tedious. Many a times, we got inspired about such hurdles. People say MPI in openMP will make it slower. But if such hypotheses can be put to test, it would be wonderful. So the basic idea behind all this is to have this course done in a period of two semesters about implementation and performance of various methods. First Semester may have extensive MPI, Pthreads and OpenMP and various combinations of them (Hybrid Models). The second half (Advanced AAA) may have CUDA and its counterparts. This would greatly add to the value of this course as I have seen many people from my batch who want to take up such courses but due to lack of time (and the time we need to put in doing the

compulsory humanities courses), they are not able to take up such courses. Distributing the course load over two semesters would greatly help all of us.

Finally, I would say that this course was one of the best courses I ever did at IIT Gn. Recently, I had a call for interview from a Mumbai based company (by IIT-B graduates). After clearing the first two rounds, they asked me to present on any topic (related to technology). The topic of my presentation was about Parallel Computing which covered the basic parallelising platforms and CUDA (advantages and disadvantages) and thanks to the course, especially to you, I got selected. This course was wonderful and I look forward to more such courses in the coming semesters.