



Week1 - 2nd to 9th June

Student Details

Name: Vishwas Vasuki Gautam

ID No: 2019A3PS0443H

PS Instructor: Dr. Vijay Chatterjee

Week: Week1 - 2nd to 9th June

Plan for the Week: (what was your plan for this week in terms of learning and project objectives)

1. Exploring the CEERI Website to understand the range of work it encompasses.
2. Understanding the problem statement by reading and skimming through papers.
3. Reading the papers published by my mentor to understand his research domain and his work better.

Learning Outcomes of the Week

About the PS 1 Station

(Did not make in terms of points, wrote it in terms of a paragraph)

CEERI is involved in a wide range of research in intelligent systems, semiconductor fabrications, semiconductor design, packaging, etc. Each of these departments has several independent/interdisciplinary projects. A specialized research group is dedicated to solving these problems in each department. CEERI has adequate facilities and laboratories such as network management, mechanical/semiconductor/vacuum device fabrication facilities to assist the ongoing research. They publish papers and acquire patents regularly, which demonstrates the quality of research.

About the Project Domain

(Did not make in terms of points, wrote it in terms of a paragraph)

Numerical analysis of microfluidic device components such as micromixers, microchambers, and microchannels. These components were modeled and simulated on COMSOL Multiphysics software. A micromixer is a component of a microfluidic device that allows the stabilized mixing of fluids from several inlets, and a microchamber is used for a uniform filling of the fluids.

A comprehensive review of microfluidic approaches used in real clinical analysis was presented in a few papers.

General overview of numerical techniques and tools such as finite element (FE), finite volume (FV), boundary element, etc. Techniques for computational analysis can be classified by the particular method by which the governing equations are discretized.

Paper 6. developed a thin-film gold/titanium (Au/Ti) microheater for micro thruster ignition, micro explosive boiling, and microsensor applications. The microheater was fabricated onto a Pyrex bulk substrate using a micro-fabrication technology.

Papers Read/Skimmed:

1. Numerical Simulation of Microfluidic Devices
2. Real sample analysis on microfluidic devices
3. Integrated microfluidic devices
4. Microfluidic devices for cellomics: a review
5. Towards numerical prototyping of labs-on-chip: modeling for integrated microfluidic devices
6. Fabrication, modeling and testing of a thin film Au/Ti microheater
7. *Few other papers were skimmed through*

Skills Gained (Technical as well as soft skills)

1. Overview of the intricacies involved in modeling and simulating microfluidic components.
2. Insight into the applications of lab-on-chip microfluidic devices in various

fields.

3. Awareness of the different fields of VLSI and electronics domains.

Project Milestones

1. Understood the problem statement.
2. First productive interaction with mentor, faculty, and teammate.
- 3.

Major Challenges

1. Comprehending the convoluted domains of electronics and the extensive research that goes into each of them.
2. Struggled to complete a few papers due to lack of knowledge in fluids.
- 3.

Work Plan for Next Week

Interacting with my mentor to get a clearer picture of the exact nature of work, and to continue exploring the domain of microfluidics devices.



Week2 - 9th to 16th June

Student Details

Name: Vishwas Vasuki Gautam

ID No: 2019A3PS0443H

PS Instructor: Dr. Vijay Chatterjee

Week: Week2 - 9th to 16th June

Plan for the Week: (what was your plan for this week in terms of learning and project objectives)

1. Understanding the problem statement further by reading and skimming through papers.
Trying out COMSOL for modeling microfluidic devices.
2. Interactions with other students in CEERI through group discussions.
3. Discussing with my teammate to understand his inputs regarding the project and working as a team.

Learning Outcomes of the Week

About the PS 1 Station

CEERI has worked on several projects that involve the domain of microfluidics. For example, they have technology/IP in devices such as MEMS microfluidic platform, Micro-fluidic Lab-On-a-Chip Sensors to detect and monitor viscosities for a variety of biochemical applications, etc.

About the Project Domain

1. More insight into different microfluidic Lab-on-a-chip devices such as microheaters, micromixers, viscometers, micropumps, microchambers, etc.
2. Introduction to modelling and simulations of microfluidic components on COMSOL.

Skills Gained (Technical as well as soft skills)

1. Overview of the intricacies involved in modeling and simulating microfluidic components.
2. Developed speaking abilities with the spot topic and group discussion with team members.
3. A basic understanding of COMSOL.

Project Milestones

1. Understood the problem statement, further narrowing down the project domain to devices such as viscometer, microchamber, micropump.
2. More familiarity with teammates and their abilities making coordination easier.
3. Completed group discussion component.

Major Challenges

1. Making valid points for an on-the-spot topic which was given in the group discussion
2. Comprehending the advanced nature of papers.
3. Maintaining contact with CEERI mentor through online mode.

Work Plan for Next Week

Interacting with my mentor to fix one topic (like viscometers/micropump/etc.), and try to improve abilities in COMSOL.



Week3 - 17th to 23rd June

Student Details

Name: Vishwas Vasuki Gautam

ID No: 2019A3PS0443H

PS Instructor: Dr. Vijay Chatterjee

Week: Week2 - 17th to 23rd June

Plan for the Week: (what was your plan for this week in terms of learning and project objectives)

1. Fixed our topic to microfluidic viscometer, micropump, microchamber. So, exploring these devices and their modelling in COMSOL
2. Preparing for the seminar and report components of PS1.

Learning Outcomes of the Week

About the PS 1 Station

Had a good interactive discussion regarding microfluidic devices and the project domain with my teammate and mentor. Learnt a lot from their inputs.

About the Project Domain

1. Modelled a microfluidic device for multiphase laminar flow of air and water. It was single-inlet-single-outlet 2D asymmetric model, consisting of two rectangles and a moving boundary. Decided the inlet and outlet lines. Simulation was done keeping velocity and pressure in mind. This helped me learn more about COMSOL and modelling of microfluidic devices.
2. Learnt more about microchambers, viscometers, micropumps.

Skills Gained (Technical as well as soft skills)

1. Modeling and simulating microfluidic components in COMSOL.
2. More about microfluidic devices. Specifically viscometer, microchamber, micropumps.
3. Teamwork, writing, and communication while preparing for the report and seminar components.

Project Milestones

1. Completing the seminar and report components.
2. Fixed on one project and getting started with good simulations

Major Challenges

1. Fixing on one project due to the vast nature of Microfluidic domain
2. Comprehending the advanced nature of papers.
3. Maintaining contact with CEERI mentor through online mode.

Work Plan for Next Week

Trying to implement viscometers, micropumps, and microchambers in COMSOL.