Instructors:

Profs Z. Gu and A. Donatelli  
Chemical Engineering  
EB222 (ZG) and EB310 (AD)  
Phone: 978-934-3540 (ZG)  
Phone: 978-934-3156 (AD)  
E-mail: Zhiyong_Gu@uml.edu  
Alfred_Donatelli@uml.edu  

Prof. H. Sun  
Mechanical Engineering  
Ball Hall 222 (HS)  
Phone: 978-934-4391 (HS)  
E-mail: Hongwei_Sun@uml.edu  

Profs B. Budhlall and C. Barry  
Plastics Engineering  
Ball Hall 203 (BB) and 119 (CB)  
Phone: 978-934-3414 (BB)  
Phone: 978-934-3436 (CB)  
E-mail: Bridgette_Budhlall@uml.edu  
Carol_Barry@uml.edu

Prerequisites:

Chemical Engineering: 10.303 and 10.304; Mechanical Engineering: 22.381, 22.341 and 22.342; 

Textbook/Reference Book:

No textbook is required; the following reference books will be useful resources.


Lectures MF 1:00 pm - 1:50 pm in Ball Hall 208; Lab Thurs 1:00pm to 3:50pm in Kitson Hall 302 (other lab location will be announced).

Office Hours:

TBA

Teaching Assistants:

TBA

Purpose: This is an interdisciplinary course taught by faculty from the Chemical, Mechanical and Plastics Engineering Departments, who have special knowledge in nanoscale fluid mechanics and heat transfer. The course constitutes a bridge between existing fluid and heat transfer courses in multiple disciplines and emerging nanotechnology concepts to reflect the forefront of nanomanufacturing. The course is designed to incorporate recent advances in manufacturing polymer-based nanodevices. Key issues of the implementation and maintenance costs for fabrication will be addressed. Hands-on laboratory experiments
will be performed to complement the lectures with the ultimate goal of designing and building a complete nanodevice at the end of the course.

**Course Outcomes:**

At the end of the course, students should be able to know:

- Fluid flow behavior (macro vs. micro) and related system design
- Forced convection heat transfer (macro vs. micro systems)
- Enhanced heat transfer (micro pin fin cooler)
- Enhanced heat transfer (nanofluids)
- Electrodynamics and electroosmosis
- Electrophoresis and dielectrophoresis
- Microscale reaction engineering and micro-reactor design
- Micro/Nanomanufacturing methods, such as micromolding, NIL, and microfabrication methods

**General Requirements:**

Homework will be assigned by instructor (if necessary), and must be submitted for grading. Late homework will not be accepted. Class attendance may be taken during each lecture and lab session. Lab reports are normally due in one week after finishing the respective lab sessions (except with prior notification). All electronic devices such as cell phones and personal computers must be turned off in class and labs. Absence from class or labs will lead to credit loss unless the student has an excused absence with appropriate paperwork.

**Grading System:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>10%</td>
</tr>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Lab reports (including presentations)</td>
<td>40%</td>
</tr>
<tr>
<td>Final project</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Tentative Course Schedule will be provided separately.**

**Lab policy will be provided separately.**