**PTFE/CHEM/MSE/CHBE 6752/4141 Polymer Characterization Fall 2015**

| Week | Date | Topic | Comment |
|---|---|---|---|
| 1 | 8/18 | Intro & Data Analysis | |
| | 8/19 | **Survival Skills** | |
| | 8/20 | [η] isn't η | Last day to drop w/o "W" |
| 2 | 8/25 | Dimensions, Mass Fractals | |
| | 8/26 | **SLS data gathering exercise** | |
| | 8/27 | Excluded Volume | |
| 3 | 9/1 | Self-Avoiding Walk, Persistence Lengths | |
| | 9/2 | **DIY SAW Program** | |
| | 9/3 | 3 Non-idealities | |
| 4 | 9/8 | Van't Hoff Law | |
| | 9/9 | **NaPSS tube osmometer** | |
| | 9/10 | Beginning GPC | |
| 5 | 9/15 | Alphabet Soup: GPC/MALS, AF4/MALS | |
| | 9/16 | **DIY GPC** | |
| | 9/17 | DLS | |
| 6 | 9/22 | PT, DFM, Microviscosity | |
| | 9/23 | **DLS data gathering exercise** | |
| | 9/24 | Inverse Space (Scattering Basics) SALS to SANS | |
| 7 | 9/29 | SALS | |
| | 9/30 | Rheometry – Fundamentals & rotational rheometry | |
| | 10/1 | Rheometry – Capillary & extensional rheometry | |
| 8 | 10/6 | Review | |
| | 10/7 | **Part 1 Exam** | |
| | 10/8 | Analysis of Exam | |
| 9 | 10/13 | Fall Recess: End Module 1; Begin Module 2 | |
| | 10/14 | **Introduction in Part 2 and lab overview** | |
| | 10/15 | Property predictions | |
| 10 | 10/20 | Mechanical properties – Fundamentals & sample prep, static testing & impact, fatigue, friction | |
| | 10/21 | **Mechanical properties homework** | |
| | 10/22 | Mechanical properties – viscoelastic behavior | Last Day to Withdraw, 10/25 |
| 11 | 10/27 | UV, IR and Raman spectroscopies and microscopies | |
| | 10/28 | **Spectroscopy demo and data collection** | |
| | 10/29 | UV, IR and Raman spectroscopies and microscopies | |
| 12 | 11/3 | Thermal Analysis: DSC, TGA, TMA, DMA, and SThM | |
| | 11/4 | **Thermal analysis homework** | |
| | 11/5 | Thermal Analysis: DSC, TGA, TMA, DMA, and SThM | |
| 13 | 11/10 | Scanning Probe Microscopy (SPM): general principles | |
| | 11/11 | **SPM homework** | |
| | 11/12 | SPM: main modes and critical results | |
| 14 | 11/17 | SPM imaging modes: STM, AFM, FFM, NSOM | |
| | 11/18 | **SPM demo and data collection** | |
| | 11/19 | SPM probing modes: SFS, CFS, CFM, EFM and others | |
| 15 | 11/24 | Electron microscopies: TEM, STEM, SEM, ESEM, EDS | |
| | 11/25 | | Official Class Break |
| | 11/26 | | Thanksgiving holiday |
| 16 | 12/1 | Electron microscopies: TEM, STEM, SEM, ESEM, EDS | |
| | 12/2 | **SEM demo and data collection** | |
| | 12/3 | Surface-sensitive methods: XPS, ellipsometry, contact angle, Part 2 review | |
| 17 | **Thursday 12/10, 8-11 Part 2 Exam** | | |

**PTFE/CHEM/MSE/CHBE 6752/4141 Polymer Characterization Fall 2015**

*Syllabus*


**Professors:** Prof. Vladimir Tsukruk — **Office:** MoSE 4100K
vladimir@mse.gatech.edu — **Office Hours**: by appointment

Prof. Paul Russo — **Office:** MRDC Rm 3508
paul.russo@mse.gatech.edu — **Office Hours:** Wednesdays ~5 pm or by appointment


**Description:**
This course is an advanced sequence of topics dealing with polymer characterization, and in particular practical aspects of data collection and analysis. Topics to be covered include property predictions, as well as techniques for bulk and molecular characterization of polymer properties.

**Class Time:** Lectures T/Th 09:30-11:00 hrs — Instructional Center 217
Labs W 15:00-18:00 hrs — Bunger Henry 357 and/or Love 299

**Electronic Delivery: Tsquare**

**Optional Russo Notes (Lecture Notes/Thoughts/Musings)**
https://onedrive.live.com/redir?page=view&resid=E3F40C58146332A!2962&authkey=!APSecegP7PfH5R8

**Textbook:** *There is no standard text book (yet) which covers all the topics in this course. Therefore, notes will be provided as well as suggested bibliography as appropriate for the various topics.*

**Grading:** 20% quizzes, 30% Labs & Assignments, 25% Part 1 Exam, 25% Part 2 Exam

**Course Expectations:**

- Short quizzes will be given in class. These will be generally closed book unless otherwise indicated.
- Midterm and final exams will be closed book, relevant equations will be supplied. Any changes will be indicated.
- In some cases physical labs cannot be accommodated due to limitations of equipment availability and class numbers: assignments will be provided instead. All assignments need to be completed in the time stated. Any late submissions (except where proper reasons are given) will be marked but score 0.

**Course Outcomes:**
At the end of the course you will be able to:

1. Make predictions about critical polymer properties, often without calculator or internet access.
2. Identify which properties are to be analyzed to evaluate the polymer.
3. Determine which techniques are) most appropriate to determine the property of interest.
4. Understand how to prepare the sample and collect the data.
5. Understand the fundamental basis of the measurement technique.
6. Analyze the experimental data and determine/calculate the relevant properties.