**PTFE/CHEM/MSE/CHBE 6752/4141 Polymer Characterization Fall 2016**

| Week | Date | Topic | Comment |
|---|---|---|---|
| 1 | 8/23 | Introduction and Misc issues | |
| | 8/24 | | |
| | 8/25 | Overview of things to come | |
| 2 | 8/30 | Dimensions, Mass Fractals, Models of chains, Self-Avoiding Walk, Persistence Lengths | Random walks & Analogies |
| | 8/31 | | |
| | 9/1 | Polymer Solvent Interactions, [η] isn't η | |
| 3 | 9/6 | [η] isn't η – Continuation | |
| | 9/7 | | |
| | 9/8 | Scattering – Way of thinking about scattering – Blue sky, osmotic pressure, Van't Hoff Law | |
| 4 | 9/13 | Scattering – Continued (Static) | |
| | 9/14 | **SLS data gathering exercise (will confirm)** | |
| | 9/15 | Scattering (Dynamic, and Differential Dynamic Microscopy –DDM) | |
| 5 | 9/20 | **Spectroscopy – 1 (Nuclear Magnetic Resonance)** | **Dr. Haskell Beckham** |
| | 9/21 | | |
| | 9/22 | Spectroscopy – 2 | |
| 6 | 9/27 | Spectroscopy - 3 | |
| | 9/28 | | |
| | 9/29 | Spectroscopy - 4 | |
| 7 | 10/4 | Spectroscopy - 5 | |
| | 10/5 | | |
| | 10/6 | Spectroscopy - 6 | |
| 8 | 10/11 | **Viscometeric Methods (Melts and Solutions)** | |
| | 10/12 | | |
| | 10/13 | **Continuation of Viscometric methods** End Module 1 | |
| 9 | | | |
| | 10/18 | **Introduction in Part 2 and overview** | |
| | 10/20 | Property predictions | |
| 10 | 10/25 | Mechanical properties – Fundamentals & sample prep | |
| | 10/26 | | |
| | 10/27 | Mechanical properties – viscoelastic behavior | Last Day to Withdraw, 10/29 |
| 11 | 11/1 | UV, IR and Raman spectroscopies and microscopies | |
| | 11/2 | **Spectroscopy and mechanical homework** | |
| | 11/3 | UV, IR and Raman spectroscopies and microscopies | |
| 12 | 11/8 | Thermal Analysis: DSC, TGA, TMA, DMA, and SThM | |
| | 11/9 | **Thermal analysis homework** | |
| | 11/10 | Thermal Analysis: DSC, TGA, TMA, DMA, and SThM | |
| 13 | 11/15 | Scanning Probe Microscopy (SPM): general principles | |
| | 11/16 | | |
| | 11/17 | SPM: main modes and critical results | |
| 14 | 11/22 | SPM imaging modes: STM, AFM, FFM, NSOM | |
| | 11/23 | **SPM demo and homework** | Official Class Break |
| | 11/24 | SPM probing modes: SFS, CFS, CFM, EFM and others | Thanksgiving holiday |
| 15 | 11/29 | Electron microscopies: TEM, STEM, SEM, ESEM, EDS | |
| | 11/30 | | |
| | 12/1 | | |
| 16 | 12/6 | Electron microscopies: TEM, STEM, SEM, ESEM, EDS | Reading Period |
| | 12/8 | **SEM demo** | Exam week |
| | 12/13 | Surface-sensitive methods: XPS, ellipsometry | |

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|---|---|---|
| 17 | **Thursday 12/10, 8-11 Part 2 Exam** | |

*Syllabus*

**Professors:** Prof. Vladimir Tsukruk — **Office:** MoSE 3100M
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Prof. Mohan Srinivasarao — **Office:** MRDC Rm 4506
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**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 unless otherwise notified

**Electronic Delivery: Tsquare**

**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.