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Advanced Topics in Materials Science - Course Syllabus

Course Number: MSE392

Course Title: Advanced Topics in Materials Science

Academic Semester: Spring **Academic Year:** 2015/ 2016
Semester Start Date: Jan 24, 2016 **Semester End Date:** May 19, 2016

Class Schedule: Mon, Thu, 2.30-4.00pm

Classroom Number: TBD

Instructor(s) Name(s): Pedro Costa
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Office Location: Mar-36

COURSE DESCRIPTION FROM PROGRAM GUIDE

Lecture-based class.

COMPREHENSIVE COURSE DESCRIPTION

Unbeknownst to many, Carbon materials and technological products based on these are pervasive in modern Society. In addition, recent advances in the area of Nanocarbons have resulted in intensive scientific activity that aims to develop further the use of this class of Materials. The course aims to contextualize the recent advances in Nanocarbons by providing a broader view of what is Carbon Science and the industry that surrounds it. Besides describing different types and uses of Carbon allotropes and materials, fundamental principles such as Carbonization, Graphitization, Intercalation, Activation and others will be covered. While analyzing the current and prospective technological applications, the course will also dwell into the industrial landscape for both raw carbon materials providers and carbon-based product developers.

GOALS AND OBJECTIVES

At the end of this course students should be able to:

- Define what Carbon Science is, identify different allotropes and their industrial applications
- Describe synthesis, characterization and application routes for varied Carbon allotropes

- Understand concepts such as Carbonization, Graphitization, Intercalation and devise experimental strategies to realize these
- Identify and explain why Nanocarbons have different properties from their bulk counterparts
- Design and write a small research proposal related to Carbon Science

REQUIRED KNOWLEDGE

At least two MSE Core Courses completed or, alternatively, one of the electives: MSE201 or MSE318. Students with a higher education degree in MSE (BS or MS) are exempted.

REFERENCE TEXTS

- 1) M. Inagaki and F. Kang, Materials Science and Engineering of Carbon: Fundamentals, 2nd Edition, Elsevier, 2014. ISBN: 978-0-1280-0858-4.
- 2) Y. Gogotsi and V. Presser, Carbon Nanomaterials, 2nd Edition, CRC Press, 2014. ISBN: 978-1-4398-9781-2.
- 3) Recent articles from the literature (as needed)

METHOD OF EVALUATION

Percentages %	Graded content
40%	Homework
10%	Papers
30%	Research Proposal
20%	Research Proposal (Presentation and Discussion)

COURSE REQUIREMENTS

Assignments

There will be three assessed outputs from the course:

1. Homework, a set of problems will be handed in monthly; students must return homework in the stipulated deadline.
2. Paper, class presentation (in groups of 2) of a recent scientific article from the literature; this must be related to a topic taught during the immediately preceding lectures.
3. Research Proposal, the students must describe a novel idea and explain how (s)he would go about developing it for the next two years; up to 10 pages in total with: 1) title, 2) name (applicant) and address, 3) keywords (up to 5), 4) abstract, 5) brief background/state-of-the-

art, 6) objectives, 7) methodology, 8) milestones/deliverables, 9) timeline, 8) budget plan, 10) references; the topic of the proposal needs to be sanctioned by the course instructor(s).

4. Research Proposal (Presentation and Discussion), the students will have up to 10-15 minutes to present the research proposal following which a 20-15 minutes discussion will take place.

Course Policies

Note that an adjustment to the final grade (up to 5%) may take place to account for unsatisfactory course participation such as irregular attendance and late assignment submissions.

Additional Information

Notes on Use of References and Plagiarism:

- All bibliography or sources used, including websites, MUST be declared as referenced sources.
- Copying of sections/paragraphs from sources is not allowed, unless they are in quotation marks and referenced as a direct quote. It is not acceptable to slightly change a few words, while copying the bulk of a text.
- Plagiarism, and copying and pasting, will not be tolerated. We have access to software to check the originality of submitted work, although it is usually obvious when it is not a student's own words.

NOTE

The instructor reserves the right to make changes to this syllabus as necessary.