



Course Syllabus: Contemporary Topics in Materials Science - MSE 394

Division	Physical Science and Engineering Division
Course Number	MSE 394
Course Title	Contemporary Topics in Materials Science
Academic Semester	Spring
Academic Year	2017/2018
Semester Start Date	01/28/2018
Semester End Date	05/24/2018
Class Schedule (Days & Time)	10:30 AM - 12:00 PM Wed , 02:30 PM - 04:00 PM Mon

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Pedro Miguel Da Costa	Pedro.DaCosta@KAUST.ED U.S.A	+966128084453	3336, 3, Ibn Sina (bldg. 3)	By appointment.

Teaching Assistant(s)	
Name	Email
n.a.	n.a.

Course Information	
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.
Course Description from Program Guide	Lecture-based class
Goals and Objectives	At the end of this course students should be able to: <ul style="list-style-type: none"> •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, <i>Materials Science and Engineering of Carbon: Fundamentals</i> , 2nd Edition, Elsevier, 2014. ISBN: 978-0-1280-0858-4. 2) Y. Gogotsi and V. Presser, <i>Carbon Nanomaterials</i> , 2nd Edition, CRC Press, 2014. ISBN: 978-1-4398-9781-2. 3) Recent articles from the literature (as needed).

Method of evaluation	20.00% - Presentation 30.00% - Written report 10.00% - Scientific review article presentation 40.00% - Homework /Assignments
Nature of the assignments	1. Homework: a set of problems will be handed periodically; students must return homework by the stipulated deadline – 40% of final mark. 2. Student's 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 – 10% of final mark. 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) – 30% of final mark. 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 – 20% of final mark.
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	n.a.

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 01/29/2018 Wed 01/31/2018	[{"DayId":1312018,"Details": #1 (29 Jan, Monday), Introduction \n #2 (31 Jan, Wednesday), Carbon Allotropes ","Id":1}]
2	Mon 02/05/2018 Wed 02/07/2018	[{"DayId":2072018,"Details": #3 (5 Feb, Monday), Carbon Metrology \n #4 (7 Feb, Wednesday), Carbon Characterization I ","Id":2}]
3	Mon 02/12/2018 Wed 02/14/2018	[{"DayId":2142018,"Details": #5 (12 Feb, Monday), Guest Lecture \n #6 (14 Feb, Wednesday), Carbon Characterization II ","Id":3}]
4	Mon 02/19/2018 Wed 02/21/2018	[{"DayId":2212018,"Details": #7 (19 Feb, Monday), Carbonization \n #8 (21 Feb, Wednesday), Graphitization ","Id":4}]
5	Mon 02/26/2018 Wed 02/28/2018	[{"DayId":2282018,"Details": #9 (26 Feb, Monday), Porosity \n #10 (28 Feb, Wednesday), Intercalation ","Id":5}]
6	Mon 03/05/2018 Wed 03/07/2018	[{"DayId":3072018,"Details": #11 (5 March, Monday), Student's Paper \n #12 (7 March, Wednesday), PolyC-Graphite ","Id":6}]
7	Mon 03/12/2018 Wed 03/14/2018	[{"DayId":3142018,"Details": #13 (12 March, Monday), HOPG \n #14 (14 March, Wednesday), Glass-like Carbon ","Id":7}]
8	Mon 03/19/2018 Wed 03/21/2018	[{"DayId":3212018,"Details": #15 (19 March, Monday), Fibers I \n #16 (21 March, Wednesday), Fibers II ","Id":8}]
9	Mon 03/26/2018 Wed 03/28/2018	[{"DayId":3282018,"Details": #17 (26 March, Monday), Guest Lecture \n #18 (28 March, Wednesday), Nanocarbons - Fullerenes ","Id":9}]
10	Mon 04/02/2018 Wed 04/04/2018	[{"DayId":4042018,"Details": Spring Break (1-7 April) ","Id":10}]
11	Mon 04/09/2018 Wed 04/11/2018	[{"DayId":4112018,"Details": #19 (9 April, Monday), Nanocarbons - Carbon Nanotubes \n #20 (11 April, Wednesday), Nanocarbons - Graphene ","Id":11}]
12	Mon 04/16/2018 Wed 04/18/2018	[{"DayId":4182018,"Details": #21 (16 April, Monday), Student's Paper \n #22 (18 April, Wednesday), Composites I ","Id":12}]

13	Mon 04/23/2018 Wed 04/25/2018	<pre> [{"DayId":4252018,"Details":" #23 (23 April, Monday), Composites II \n #24 (25 April, Wednesday), Applications - Energy Storage ","Id":13}] </pre>
14	Mon 04/30/2018 Wed 05/02/2018	<pre> [{"DayId":5022018,"Details":" #25 (30 April, Monday), Applications - Environmental \n #26 (2 May, Wednesday), Applications - Others ","Id":14}] </pre>
15	Mon 05/07/2018 Wed 05/09/2018	<pre> [{"DayId":5092018,"Details":" #27 (7 May, Monday), Industry & Market - Graphite/Graphene \n #28 (9 May, Wednesday), Industry & Market - Diamond/Nanodiamond ","Id":15}] </pre>
16	Mon 05/14/2018 Wed 05/16/2018	<pre> [{"DayId":5162018,"Details":" #29 (14 May, Monday), Guest Lecture \n #30 (16 May, Wednesday), Visit to the Lab. for Carbon Nanostructures ","Id":16}] </pre>
17	Mon 05/21/2018 Wed 05/23/2018	<pre> [{"DayId":5232018,"Details":" Exam's Week (Research Proposal Presentation & Discussion) ","Id":17}] </pre>
18		[]

Note

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