

Course Syllabus

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COURSE **NUvention Advanced Materials (ENTREP 490)**

TEXT *Radical Abundance*, K Eric Drexler, Public Affairs, 2013
Disciplined Entrepreneurship, Bill Aulet, Wiley, 2013
(Both available on Amazon as an e-book)

CASE BOOK <http://cb.hbsp.harvard.edu/cbmp/access/51599298>
<http://cb.hbsp.harvard.edu/cbmp/access/51599298> <https://cb.hbsp.harvard.edu/cbmp/access/40262173>
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TIME Wednesdays, 1-4:00PM

LOCATION The Garage, North Parking garage, 2nd floor

PROFESSOR **Mark Werwath**, Clinical Associate Professor & Co-Director, FCEI
m-werwath@northwestern.edu (<mailto:m-werwath@northwestern.edu>), Tech C-118, 847-491-4696

FACULTY **Horacio Espinosa** (<mailto:jservaites@northwestern.edu>)

TA **Vignesh Ramasamy, Vignesh Ramasamy** <VigneshRamasamy2016@u.northwestern.edu>

IP from Argonne <http://www.anl.gov/technology/technologies/materials>
<http://www.anl.gov/technology/technologies/materials>

PROGRAM <https://entrepreneur.northwestern.edu/nuventionnano/>
<https://entrepreneur.northwestern.edu/nuventionnano/>

WEBSITE

Startup wind site: <http://startupwind.com/> <http://startupwind.com/>

CONTENT WEBSITE <https://www.udacity.com/course/viewer#!c-ep245/l-48743167/m-48750057>
<https://www.udacity.com/course/viewer#!c-ep245/l-48743167/m-48750057>

IIN conference: <http://www.iinano.org/2015-iin-symposium-events> (<http://www.iinano.org/2015-iin-symposium-events>)

OFFICE HOURS I will try to be in the classroom by 6:15PM and will stay after class is completed. I am on campus every weekday. Please email me to schedule a time. Please contact other NUvention members directly to schedule an appointment.

PROGRAM **Farley Center for Entrepreneurship and Innovation**, Ford Engineering Design Center, 2133 Sheridan Road, #1.221-Ford 1st floor across from MMM) Evanston,
OFFICES 847-467-6347

COURSE OVERVIEW

The Farley Center (FCEI) in partnership with the International Institute for Nanotechnology (IIN) have partnered to create NUvention Nano. The partnership model proposed here is similar to the NUvention Energy where the Farley Center partnered with ISEN-Institute for Sustainability and Energy at Northwestern., NUvention classes have been the most consistent source of start-ups flowing out of any Northwestern class.

NUvention Nano will differ from other NUvention classes in a number of areas:

- *Partnership with Researchers* – Interdisciplinary students teams will be created and assigned to an NU faculty member to work on commercializing a technology the faculty member believes has potential. This technology will have been already disclosed to INVO and the faculty member has expressed an interest in creating a start-up to commercialize. There is no expectation for student-developed intellectual property. Any decision to create a start-up rests with NU faculty member, INVO and class faculty.
- *Commercialization Innovation* – Focus of class is to determine a viable business model to commercialize faculty research. Student teams are not engaged in technology innovation, but their efforts may inform technology evolution. This singular focus has not been attempted in other NUvention classes.
- *Alumni/Industry Engagement* – Alumni mentoring and industry engagement is even more critical when working with early stage nanotechnology.

This class cannot make you into an entrepreneur. It can help you better assess whether an idea is a business opportunity and how to transform that opportunity into a business.

As you already know, the best way to learn something is to actually do it. Since we cannot find companies for all of you to run, we will do the next best thing. The class project will involve putting together a business model for your technology within a small interdisciplinary groups. This process should help students take advantage of whatever current or future business opportunities they may choose to pursue in their careers.

COURSE GOALS

Our overall goal is to help you understand how to evolve a technology into a business. Our course objectives include:

- Work with an interdisciplinary team to build a business model for an early stage nanotechnology
- Learn about the broad area of nanotechnology from company success and failures
- Learn and apply Lean Startup methodologies
- Learn how to assess whether an idea is a good business opportunity
- Understand how to create value in a business
- Learn to develop compelling idea pitches and business models

Over time, you will more than likely forget some of the frameworks, cases and other things you learn here. My hope is you never forget how to spot a good idea and develop it into a business.

STUDENT ROLE

In return for the time you spend reading, researching, getting out of the building conducting Customer Development, it is my responsibility to see that you get the most out of your efforts. I hope to create a classroom environment that is interesting and fun. Your participation in class is **CRITICAL** to accomplishing our goal. You should come prepared to discuss the assigned case and reading.

INSTRUCTOR ROLE

My role as instructor is to facilitate the learning. You will do the majority of the talking. I will be taking notes on the board to help provide a path through the class discussion.

GRADING

Class participation will be graded based on quality versus quantity. I place high importance on comments that move the class discussion forward. Class and team attendance will be factored into your participation score.

CLASS FORMAT

60% of class time will be allotted to discussing the topic of the session, 40% will be allocated to either team feedback time and/or team workgroup time

POST-CLASS START-UP

A reminder about the language in the class application you agreed to:

I understand that projects in NUvention Nano involve Northwestern University research and intellectual property. Completing the requirements of the class does not entitle student teams to continue working on the project once the class has completed. The decision to pursue a start-up company based on work in the class will be made by the NU faculty member(s) that invented the technology and the Innovation New Ventures Office (INVO).

Rest assured that any potential start-up will be carefully considered by the faculty member and INVO and we hope that student teams may continue and will do all we can to encourage post-class efforts.

Week	Date	Topic	Assignment
1	9/21/16	<p>Class Intro</p> <p><i>Mark Werwath</i></p> <p>INVO overview</p> <p>Team Formation</p> <p><i>Case study: Surface Logix</i></p> <p>Guest speaker: James Kornacki (Ullö)</p>	<p>Read Illinois and Mirkin Nano Overviews</p> <p>Prioritize Projects, team formation in class</p> <p>Purchase required texts</p> <p>Register to attend International Institute of Nanotechnology Symposium on 10/1/15</p> <p>Submit Surface Logix case on canvas</p>

2	9/28/16	<p>Lean Startup, Customer Development, Business Model Canvas & LaunchPad Central</p> <p><i>Mark Werwath</i></p> <p>Ullo Live Case Study</p>	<p>Read Aulet steps 1-2</p> <p>Read Drexler Chapters 1-3</p> <p>View Blank Udacity Lessons 0-1.5B</p> <p>Submit Team Charter via Leadership Portal</p>
Guest Speaker: Professor Horacio Espinosa			
3	10/5/16	<p>Customer Discovery, Value Proposition, and Hypothesis Testing</p> <p><i>Mark Werwath</i></p> <p>Debrief IIN conference</p> <p><i>Class to be held in ISTP-Guest speakers on resident companies including Hazeltech and Polyera and others</i></p>	<p>Read Aulet steps 3-4</p> <p>Read Drexler Chapters 4-6</p> <p>View Blank Udacity Lessons 2-3</p> <p>LPC-Complete initial BMC</p> <p>Submit team weekly status via LPC</p> <p>Have 10 customer interviews documented in LPC</p>
4	10/12/16	<p>Channels and Customer Relationships</p> <p>Guest speaker: Ben Hernandez (NuMat)</p> <p><i>Case study: Cambridge</i></p>	<p>Read Aulet steps 5-6</p> <p>Read Drexler Chapters 7-9</p> <p>View Blank Udacity Lessons 4-5</p> <p>LPC-Update BMC</p> <p>Submit team weekly status via LPC</p> <p>Have 5 additional customer interviews documented in LPC</p> <p>Submit Cambridge questions on Canvas</p>
5	10/19/16	<p>Revenue Models and Partners</p> <p>eLucid Live Case Study (Servaites)</p> <p><i>In class coaching session #1</i></p>	<p>Read Aulet steps 5-6</p> <p>Read Drexler Chapters 7-9</p> <p>LPC-Update BMC</p> <p>Submit team weekly status via LPC</p> <p>Have 5 additional stakeholder interviews documented in LPC</p>












6	10/26/16	Resources, Activates and Costs	Read Drexler Chapters 10-11
		Guest speaker: Samir Mayekar of SINODE	View Blank Udacity Lesson 8
			LPC-Update BMC
			Submit team weekly status via LPC
			Have 5 additional stakeholder interviews documented in LPC
7	11/2/16	MIDPOINT REVIEW	Midpoint Review Presentation
		<i>Faculty, and Guests</i>	LPC-Update BMC
			Submit team weekly status via LPC
			Have 5 additional customer interviews documented in LPC
			Complete Team Assessment Mid-Point Review
8	11/9/16	Customer Validation	Read Aulet steps 7-8
			Read Drexler Chapters 12-14
		Positioning, Pricing, etc.	LPC-Update BMC
			Submit team weekly status via LPC
		Live case study:Greg Topel (Tanvas)	Have 5 additional stakeholder interviews documented in LPC
9	11/16/16	Legal issues in startups	Read Aulet steps 9-11
			Read Drexler Chapters 15-16
			LPC-Update BMC
		In class coaching session #2	Submit team weekly status via LPC
		Guest speaker: Greg Grossman, DLA Piper	Have 5 additional stakeholder interviews documented in LPC
10	11/23/16	Funding & Financing (Angel, Venture Capital, and Public Markets). Guest Nick Moran of New stack ventures	Read Drexler Chapters 17-18
			Final Aulet steps
			LPC-Update BMC
		<i>Panel Discussion facilitated by Mark Werwath</i>	

Submit team weekly status via LPC

Have 5 additional customer interviews documented in LPC

11	11/30/16	FINAL PRESENTATIONS	Final Presentation
		<i>Faculty, Guests</i>	LPC completely documenting team efforts
			Completed Team Assessment End of Quarter Review
12	12/5/15	<i>All submissions must be completed for the course</i>	

Assignments Summary:

Date	Details	
Wed Sep 28, 2016	 Team contract	due by 11:59am
	 Surface Logix case study	due by 12:59pm
Wed Oct 5, 2016	 Interviews	due by 11:59pm
Wed Oct 12, 2016	 Market research	due by 11:59am
	 Ladder of science	due by 12:59pm
Wed Oct 19, 2016	 A123 systems	due by 12:59pm
	 Competitive analysis	due by 1pm
Wed Oct 26, 2016	 Midpoint team feedback	due by 11am
	 Techno economic model	due by 1pm
	 Cambridge case study	due by 11:59pm
Wed Nov 2, 2016	 Midpoint review slides	due by 11:59pm

Wed Nov 9, 2016

 **[Turn your science into a business](https://canvas.northwestern.edu/courses/43606/assignments/261105)**
<https://canvas.northwestern.edu/courses/43606/assignments/261105>

due by 12:59pm

Wed Nov 16, 2016

 **[Pro forma income statement](https://canvas.northwestern.edu/courses/43606/assignments/247455)**
<https://canvas.northwestern.edu/courses/43606/assignments/247455>

due by 1pm

Wed Nov 30, 2016

 **[Final team feedback.](https://canvas.northwestern.edu/courses/43606/assignments/247452)**
<https://canvas.northwestern.edu/courses/43606/assignments/247452>

due by 11am

 **[Advisor feedback](https://canvas.northwestern.edu/courses/43606/assignments/261101)**
<https://canvas.northwestern.edu/courses/43606/assignments/261101>

due by 11:59pm

 **[Morphosys case study](https://canvas.northwestern.edu/courses/43606/assignments/247413)**
<https://canvas.northwestern.edu/courses/43606/assignments/247413>

due by 11:59pm

Fri Dec 2, 2016

 **[Final pitch deck](https://canvas.northwestern.edu/courses/43606/assignments/247410)**
<https://canvas.northwestern.edu/courses/43606/assignments/247410>

due by 11:59pm