



**COMM 4311 / STS 3500 / MAE 6592 : Manufacturing in the Global Economy**  
Course syllabus (Spring 2018 – Version 1.0)

Time: Monday, 3:30pm – 5:45pm  
Room: Robertson Hall (**Room 256**)  
Instructor: Dean C Roberts  
Office: Room 201  
Office Hours: Monday, 1:00pm – 3:00pm (or by appointment)  
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Overview: This course provides an understanding of the advanced manufacturing sector, the role of innovation in the economy and compares national industrial policy systems. The prevalence of complex product systems such as aircraft at the technological frontier will be explored. At the firm level case studies will consider the globalization strategies of aerospace companies from the US, Brazil, Germany, and China. There will be guest speakers from consulting, government and industry. At the end of the course there will be a visit to the Virginia Commonwealth Center for Advanced Manufacturing (CCAM) and the new Rolls-Royce manufacturing facilities at Crosspointe, near Richmond.

The set book for the course is by the course lecturer:

Roberts, Dean (2017), *Entering the Civil Aircraft Industry: Business realities at the technological frontier*

This course is cross listed at both the McIntire School of Commerce and the School of Engineering and Applied Science. Applicants are encouraged from both schools as the course is readily applicable to either subject area and students will learn from each other's perspective.

**a) Course context and aims:**

Why manufacturing ?

When we consider manufacturing the subject is beset by contradictions. The refrain that “the US does not make anything anymore” contrasts with the fact that America is second only to China as the largest manufacturing nation on Earth. Then there are differences within developed nations of their attitude to the importance of manufacturing. For instance, the share of manufacturing of the German economy is 28% which contrasts with 21% for the US. Another aspect is what each nation manufactures can be radically different. There is a hierarchy in manufacturing starting from nuts and bolts at one end to a \$200m Boeing 787 at the other. The industry is complex and provides a wide selection of learning opportunities to broaden your knowledge and analytical skills which can be applied widely no matter what career a student follows.

Why aerospace ?

According to the Organization for Economic Co-operation and Development (OECD), aerospace is one of the most technologically challenging industries. For example, in their assessment of R&D intensity Pharmaceuticals operates at 10.5% narrowly beating Aerospace at 10.3%. Medical and precision instruments comes in at 9.7% while the office, accounting, computing, radio, TV industries coalesce at around 7% (Apple's ratio was 3% in 2014 cf. Airbus 3% and Rolls-Royce 8%). This may surprise many who are influenced by the general media's usage of the term “High-Tech” to describe the consumer electronics sector. Yes it is leading edge industry but so is aerospace.

What is so interesting about aerospace from a learning perspective is that as it operates at the technological frontier. It therefore enables us to explore many issues such as – innovation economics, governments' role, industrial policy, international supply chains, industry entry barriers, the control of intellectual property, and global competition.

Course learning outcomes - The objectives of the course are:

- Understand the role of manufacturing in economies. Be able to articulate the intellectual positions on whether the industry is important or not
- Understand how firms manage innovation, the rationales for national industrial policies and the technology hierarchy of products
- The development of a deep industry analysis skill set acquired from a mixture of theory, case studies and exposure to expert speakers.
- The honing of the student's professional communication skills both written and giving presentations

#### **b) Class Format:**

This format design has benefited significantly from prior student input. It optimizes the need to get through the course material while making the subject stimulating, engaging and interesting.

Thirteen “double” sessions lasting two and ¼ hours, each typically consisting of:

- A lecture on the day's topic where I will provide a presentation of the key concepts, terms and models.
- Two or three students each week will lead a class discussion on a live issue in advanced manufacturing as raised in recent media coverage.
- Seminars which will examine a particular company, country or issue.
- An occasional guest lecturer.
- Near the end of the course there will be a tour of an advanced manufacturing facility and a research institute.

#### **c) Course prerequisites:**

The course is open to:

- McIntire School of Commerce - fourth-years
- School of Engineering & Applied Science - third year undergraduates and Mechanical and Aerospace Engineering Masters degree students.

In addition, **if places are still available**, the lecturer will consider applications, at his sole discretion, for a none McIntire/Engineering students. The criteria for acceptance of these latter students will be for candidates who can, as a minimum, demonstrate:

- 1) An interest in the subject
- 2) They can contribute to class discussions and keep pace with the coursework
- 3) They have a demonstrated experience of analyzing business or economics
- 4) They have demonstrated the ability to work in a team under time pressure

The lecturer may assign a piece of analysis work to assess the skill set of none McIntire/Engineering students and an interview may be required.

Special Comment for Engineering students - All STS 2XXX and 3XXX courses invite students to explore the implications of STS core concepts within a specific topical or disciplinary area. Though the topics of these courses vary widely, all are designed to help students (1) understand the impact of engineering

solutions in a global and social context and (2) recognize and analyze the role that science and engineering play in contemporary issues.

**d) Readings from:**

- Course set book: Roberts, Dean (2017), *Entering the Civil Aircraft Industry: Business realities at the technological frontier*
- Articles and press reports will be posted on Blackboard prior to lessons and will be required reading. These will form the material for the small group work.

Blackboard – course materials will be posted to the COMM 4311 section of the McIntire’s Blackboard web space. Because the class is dynamic, changes will often be made to lecture material as the course progress. Lectures will be posted at least one day in advance.

**e) Course Structure and Grading:**

This course will be taught using lecture / discussion / case method with in-class exercises and group related external exercises. Furthermore, we will have several expert guest presenters to deepen the understanding of various subject areas.

The grading will be structured thus:

- |   |     |
|---|-----|
| • Class engagement, contribution to learning    | 25% |
| • Live issue presentation in class (Appendix 1) | 15% |
| • Individual written assignments (Appendix 2)   | 20% |
| • Group Project/presentation (see Appendix 3)   | 25% |
| • Final paper                                   | 15% |

Class Engagement - this is considered a crucial part of this course. There are two principal reasons for this. Firstly, your learning experience will be improved by your active class participation. You will learn from fellow students as they interact and discuss the subject matter. Secondly, active engagement will hone your professional skills in a supportive setting. This will prepare you for your career where you will be expected to contribute to team discussions, to actively listen to colleagues and argue your case. Engagement will be specifically assessed from your:

- Contribution to the Live Issue discussions.
- In class participation
- Preparation for and questioning of guest speakers
- Preparation for and questioning of our tour guides on the course trip
- Contribution to the Group project (as assessed by your fellow team members)

The engagement rating structure is shown in Appendix 4.

Students are expected to work hard in class and take intellectual risks. Regurgitation of the facts is not enough and you will be expected argue your opinion in a professional manner in preparation for your life beyond your School.

**Live issues (Appendix 1)** - During each class we will have three or four students lead a short (3 minute) discussion on a significant current event on the subject of high-technology manufacturing. The idea is to bring the real world into the classroom with discussion of a live issue. For example, this could be an article on Indonesia’s aspirations in high-technology, or a major Western advanced manufacturing company “in-sourcing” jobs back into the US.

**Written Assignments (Appendix 2)** - Through the course there will be short papers required to assess your grasp of the subject matter and prepare for your participation in later parts of the course. They may also require you to react to an article and/or argue your position.

**Group Project (Appendix 3)** - The group project will test your research and analysis skills. It will also improve your team contribution skills. You will have the option to use your skills on a high-technology industry other than aerospace. It will also stretch you further as you will be expected to articulate a policy for a particular challenging objective. Further, your team will present and argue your policy recommendations in front of the lecturer and class.

**Final Paper** - The final paper will be a take-home test with material drawing from lectures and classroom activities.

**Graduate Students** – The lecturer expects a higher standard of assignment from graduate students and they can expect their assignments to be marked harder. In addition there will be one assignment extra for graduate students

**f) Graduate Assistant**

The graduate assistant for this semester will be:

TBD

**g) Name cards**

Name cards are required. Please display name cards at the start of every class. I am keen to maximize my engagement with the class, this will help.

**h) Honor Code**

The McIntire School of Commerce relies upon and cherishes its community of trust. We firmly endorse, uphold, and embrace the University's Honor principle that students will not lie, cheat, or steal, nor shall they tolerate those who do. We recognize that even one honor infraction can destroy an exemplary reputation that has taken years to build. Acting in a manner consistent with the principles of honor will benefit every member of the community both while enrolled in the McIntire School and in the future. Students should report all suspected violations to an honor violations immediately to an honor representative. If you have any questions about your Honor System or would like to report your suspicions of an honor offense, please contact McIntire Honor representative.

**i) Attendance**

If you are not able to attend a class, you must notify your instructor in advance and receive approval for an excused absence. You will receive an "0" for an excused absence in the Participation Grading. Absences generally will not be excused except in the case of illness, other exceptional circumstance, or a maximum of one interview during the semester. Any student absent for more than 50 percent of class meetings will fail the course. Any student who misses more than two classes during the semester, without prior approval from the instructor, will receive a course grade no higher than B-.

**j) Late assignment policy**

Your future employer will not tolerate missed deadlines. Being late is not professional and is unthinking about the disruption it causes to your instructor's schedule. Plenty of time is provided to complete assignments so there is no excuse for lateness. Therefore to encourage professional work habit so late assignments will be penalized 10% for each calendar day past the deadline. As a general rule your assignment will be due at **11pm on the Friday immediately after the Monday class**. I will mark them over the weekend and hand them back to you next class. My intent is to give you prompt feedback on your work.

### **k) In class behavior**

Class time is a special time. It is a unique environment where you have the opportunity to interact with your instructor and fellow students. To create this environment for all students the following rules apply:

- Turn off electronic devices before class starts (eg iPads, phones, laptops). Interruptions are never welcome to the instructor or your fellow students.
- No eating or drinking in class. No slovenly behavior or lack of respect for your fellow students.

None adherence to these requests will be noted in your Class Engagement assessment.

### **l) Snow Days**

In the past we have found at least one class in the semester had to be cancelled due to inclement weather. With one class cancellation there is enough contingency in the schedule to catch up the lost class time. However, if we have two or more cancellations then time will need to be made up. This will be done by extending the class time for following session(s). The lecturer will be flexible for those individuals who have another class immediately after the session but inform the lecturer before time.

### **m) Facilities Visit**

The course includes a visit to the Virginia Commonwealth Center for Advanced Manufacturing (CCAM) and the new Rolls-Royce manufacturing facilities at Crosspointe, near Richmond. Crosspointe was opened by President Obama in 2012 and represents the very latest standard of a high technology manufacturing facility. From student evaluations this is one of the most popular parts of the course. The day long trip will take place on a Friday near the end of the course.

m) Class Session Schedule:

Session	Week (Monday)	Theme	Lecture / Discussion	Live Issue / Small Group / Feedback to class	Guest Lecturer	
1	22-Jan-18	Course Introduction	Overview of course. The course analytical framework	Group work and class feedback: Developing, developed nations agenda for High-tech manufacturing		
2	29-Jan-18	Is is manufacturing important ?	Is manufacturing important to the US economy ?	What can we learn from <b>Hawker Beechcraft</b> experience - was it globalization or just bad management	Peder Andersen - International Trade Commission (ret'd). Overview of Civil Aircraft industry	
3	5-Feb-18	Three industry sector model	Is the three sector industry model applicable ?	Let's source all our manufacturing from <b>Mexico</b> , has Mexico got their strategy right ? / Group project direction		
4	12-Feb-18	Comparative advantage	Comparative advantage redux	<b>Brazil's</b> Embraer: from crop dusters to the third largest commercial aircraft manufacturer in the World		
5	19-Feb-18	High-tech and complex products	The continuum of high-technology products and what is so special about complex products	Contrast the technologies needed to be mastered to produce a helicopter compared to a cell phone - <b>Europe's</b> Airbus A380 supply chain	Michael Ryan - Sales Director, Rolls-Royce Civil Aerospace	
6	26-Feb-18	Entry barriers	Why is is so hard to reach the technological frontier	Why do some countries lead in certain high-tech industries but lag in others - <b>Japan's failed</b> attempts at market entry		
	5-Mar-18	Spring Recess				

Continued.....

**Class Session Schedule continued:**

Session	Week (Monday)	Theme	Lecture / Discussion	Live Issue / Small Group / Feedback to class	Guest Lecturer
7	12-Mar-18	National Innovation policies	Rationales for government intervention	It not fair, non US governments support their governments; <b>US</b> manufacturing is doomed - How do firms manage innovation	
8	19-Mar-18	Industry clusters	Why companies cluster in a certain region	Can local initiatives shift national capability - Live demonstration of cluster database	Ann Battle Macheras - VP Regional Research at Federal Reserve Bank of Richmond
9	26-Mar-18	German and Canadian Innovation policy	Should all nations emulate Germany's innovation policy	Should the US emulate <b>German</b> industrial policy. Is <b>Canadian industrial</b> policy fair ?	
10	2-Apr-18	Strategic Trade Theory	Strategic Trade Theory: when national monopolies cannot be tolerated	Why was <b>Airbus</b> created by European governments ?	John Stack, Managing Director, Aerospace Practice - The McLean Group - The current aerospace sector M&A scene
11	9-Apr-18	China	China - Threat or Opportunity	China discussion / Group project comments / Facility tour preparation	
Visit	Friday, 13th April 2018	<b>8am to 4pm - Facility Tours - Commonwealth Center for Advanced Manufacturing and Rolls-Royce Crosspointe - TO BE CONFIRMED</b>			
12	16-Apr-18	International IPR projection	Why IPR, is it realistic in a connected world	IPR - the view from industry and the view from government	Jeff Merrel - VP, Global Trade Compliance - Rolls-Royce - Wither Globalization ?
13	23-Apr-18	Group Presentations	Review of Course	Presentation of Group Projects	
	1-May-18	<b>Final Paper due</b>			

**Appendix 1 – Live Issue Discussion (15%)**

In preparation, you should read and analyze an article and also seek another perspective on the story from another source. Then you should develop a view and take a position. At this point please consult with your

lecturer who will provide you feedback on your approach. You will present and defend this view to the class. Your fellow students will then be expected to chime in with their views. In total each discussion will last 3 minutes maximum.

Grading will count towards 15% of the course for the individual. The importance here is not whether you are right or wrong but how well you marshal your argument.

**Sources for the Live Issues Discussion:**

- The Economist
- MIT Technology Review
- Foreign Affairs
- Foreign Policy
- The New Yorker
- The Atlantic
- The Week
- The New York Times
- The Wall Street Journal (this popular publication is acceptable, but do try the other sources to provide some diversity on your commentary)
- Others, please discuss with you lecturer.

**Appendix 2 – Assignments (20%)**

Assignments will be short papers to assess your grasp of a subject, it may require you to carry out some research and you will often be expected to express your view on the subject. Assignments will often be used to prepare for you for your active engagement in class discussions.

An assignment will normally consist of a maximum of **THREE** typed, double spaced pages of text in 12 point font.

Generally, there will be an written assignment every other week.

**Appendix 3 – Group Project Overview (25%)**

The Group project is popular with students. It is intended to give you the opportunity to work on a real world issue in a realistic working environment: a team. You will be part of a team of approximately four or five randomly selected people that will work together to provide analysis and policy recommendations. In this project you should consider yourself acting like a team of consultants advising a government or company.

Your group will be required to select an issue from these three themes:

1. National government policy to move its manufacturers up the manufacturing hierarchy.
2. The globalization strategy for a company
3. A policy to address a specific national need (eg outsourcing)

You are free to select a subject but this will need to be agreed by the instructor.

Some prior year examples:

- Selecting a high-speed train supplier for California
- Expansion by Harman into Asia
- Should Boeing put an assembly plant in the UAE
- Will commercial space industry make an adequate return without government support
- Strategy for Russia's United Aircraft Company

## Group Project Deliverables:

More details will be provided in class but for guidance here are the key deliverables:

- a) An **initial list of project** options to discuss with your instructor with a justification for your final recommendation. Two pages maximum, due **11pm, Friday, 23<sup>rd</sup> February 2018**
- b) After discussing and agreeing your project with your instructor provide a **project plan** outlining the main themes of the analysis – Two pages maximum, due **11pm, Friday 16<sup>th</sup> March 2018**
- c) A report consisting of a maximum of 15 typed, double spaced pages of text in 12 point font (excluding any reference, appendices and bibliography). In evaluating the report I will be looking at three issues:
  1. The quality of the writing, how it flows, would I be willing to circulate it to the C-level management (Report assessment weighting 20%)
  2. Quality of analysis and coherence of the recommendations (Report assessment weighting 40%)
  3. Intellectual bravery. I expect sensitive issues to be addressed and unwelcome but optimal policy advice to be given. (Report assessment weighting 10%)
  4. Your individual team contribution will be weighted 30%. This will be assessed by your fellow team members
  5. **Due 11pm, Friday 20<sup>th</sup> April 2018**
- d) Group presentation (**23<sup>rd</sup> April 2018**) – at the end of the semester all groups will make a presentation of their findings. The presentation will involve a formal presentation, followed by 3 minute Q&A. Select at least two individuals from your group you want to present. The entire group is expected to join the presenters at the front of class for the Q&A session. The audience will consist of your fellow students and your instructor. At least a week prior to your formal in class presentation you should present it to your lecturer and seek their feedback.
- e) The two contributions to the project will be weighted; the report 60%, the presentation 20%, your personal contribution as assessed by fellow teams members 20%.

Your Group report is due the day before the presentations. The PowerPoint presentation is due the day of the presentation.

### Appendix 4 – Grading and Participation

**Grading Scale:**

Grade	Boundaries	
A (A+)	93.0	100.0
A-	90.0	92.90
B+	87.0	89.90
B	83.0	86.90
B-	80.0	82.90
C	70.0	79.90
D	60.0	69.90
F	----	59.90

**Class Engagement:**

Participation	Criteria	Example
+3	Exceptional contribution	Offers insightful comments and questions that go beyond assigned material, moves class thinking to a higher level and/or displays intellectual risk taking
+2	Positive contribution	Contributes comments or questions that demonstrate thorough preparation of assigned material and careful attention to class discussion
+1	Attentive but no meaningful contribution,	Pays attention and politely listens to others but does not materially engage in or substantially add to the discussion
0	Unprepared attendance, or excused absence	Unprepared for a cold call, inattentive, or absence from class without prior notification
-1	Negative behavior or unexcused absence	Inappropriate, disruptive, disrespectful or distracting behavior or comments; absence from class without prior approval; and late to class or late back from break

### Appendix 5 – General Further Reading

**COURSE SET BOOK:**

Roberts, Dean C (2017), *Entering the Civil Aircraft Industry: Business Realities at the Technological Frontier*

**A strongly recommended and easily read book on economics is:**

Kishtainy, Niall (2017), *A Little History of Economics*, Yale

**Highly readable and informative reviews of high-technology competition ( not compulsory):**

Hartley, Keith (2014), *The Political Economy of Aerospace Industries: A Key Driver of Growth and International Competitiveness ?*, Edward Elgar

Mazzucato, Mariana, (2013), *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*, Anthem

Atkinson, Robert, Ezell, Stephen (2012), *Innovation Economics: The race for global advantage*, Yale

Lin, Justin (2012), *The quest for prosperity: How developing economies can take off*, Princeton

Marsh, Peter (2012), *The New Industrial Revolution: Consumers, Globalization and the end of mass production*, Yale

Fallows, James, (2012), *China Airborne*, Pantheon

Segal, Adam, (2011), *Advantage: How innovation can overcome the Asian challenge*, Norton

Jensen, Bradford, (2011), *Global Trade in Services: Fear, facts, and offshoring*, Peterson Institute (in particular Chapter 4 – Comparative Advantage: Lessons from Manufacturing”

Newhouse, John (2007), *Boeing versus Airbus: The inside story of the greatest international competition in business*, Knopf.

**The following provide some of the theoretical underpinning of the course. It is not essential that they are read but they will provide greater depth of areas that take your interest:**

Acemoglu, Daron, Robinson, James (2012), *Why Nations Fail: The origins of power, prosperity, and power*, Crown

Dicken, Peter, (2011), *Global Shift: Mapping the changing contours of the world economy*, Sixth Edition, Guilford Press

Narayanan, V K, O’Connor, Gina (Eds) (2010), *Encyclopedia of Technology and Innovation Management*, Wiley

Eriksson, Soren, (Technovation, 20 (2000) 653-664), “Technology spill-over from the aircraft industry: the case of Volvo Aero”

Cimoli, Mario, Dosi Giovanni, Stiglitz Joseph – Editors (2009), *Industrial Policy and Development: The political economy of capabilities accumulation*, Oxford Press.

Busch, Marc (1999), *Trade Warriors: States, Firms, and Strategic-Trade Policy in High-Technology competition*, Cambridge

Nelson, Richard, (1993), *National Innovation Systems: A comparative analysis*, Oxford,

Hobday, Mike (Research Policy 26 (1998) 689-710), “Product complexity, innovation and industrial organization”

Porter, Michael (1990), *The Competitive Advantage of Nations*, Macmillan Press

