PA5731: Emerging Science & Technology
Syllabus
Spring 2021 | 3 credits

Instructor: Peter Calow
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Office Hours: HHH 163 by appointment; arrange by email

Course Sessions:
- Location: Remote
- Time: M,W 2.30pm – 3.45pm

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Instructor Bio

Peter Calow has spent a long career researching the risks from chemicals in the environment in Europe and North America working at universities and for governments, including the European Union. He has special interests in the interface between science and public policy. Currently he has positions at the University of Minnesota in the Humphrey School of Public Affairs and the Department of Geography.

Delivery Methods and Technology Needs

This course is completely remote and synchronous. The course will be through ZOOM and Canvas. You will therefore need desktop or laptop computers less than six years old with at least 1GB of RAM, with the most recent version of Chrome or Firefox with JavaScript enabled. Internet connections should be at least 512kbps.

In class, you will be required to use the audio facility of ZOOM. You are not required to turn on your camera; but I shall encourage it to build our classroom community.

For more information, see the U’s Information Technology page: https://it.umn.edu/working-learning-campus/get-internet-access-campus

Most of our exchanges will be during class time through ZOOM, but you can arrange one-on-one meetings at any time by email. I will also contact you from time to time by email.

Course Description

Recognizing that innovations in emerging science and technology bring great benefits to human welfare but also non-trivial risks to people and environment this course will develop an understanding of how these trade-offs might be balanced in making policy and law. It will show how risk assessment and management, markets and government intervention, and ethics are involved in doing this. We shall consider if green (new) deals make sense in terms of promoting innovation; how intellectual property rights are used to protect innovations including biological materials; and if/how the process and products of innovation raise ethical challenges that disadvantage some. Principles will be applied broadly to innovations including genetic modification, new (nano-) materials and artificial intelligence. The course will reflect the uniquely interdisciplinary nature of innovations in science and technology that require collaboration between scientists and engineers from virtually all disciplines, as well as involvement of social scientists, ethicists, lawyers and policy analysts.

The first part of the course will consider general principles. Examples here will focus on innovations behind the green revolution in farming, including genetic manipulation. In the second part of the course, you will apply these principles to your chosen innovation and write a final paper showing if/how the principles apply. In the first part of the course, the general pattern will be each week to consider a new principle with me on the first day covering the general issues and then you acting as individuals or in teams exploring important aspects of the topic.
Class Texts & Resources

See the class schedule below. Key readings will be on Canvas in Library Resources.

Learning Objectives

After completing this course, you should understand: how risks and costs and benefits of innovations are weighed in policy; how innovations interact with the economy; what part markets or government intervention play in driving innovation; what part patents play in encouraging innovation; the main ethical issues; how all these aspects are used in shaping policy and law.

In addition to learning more about innovation you will have an opportunity to sharpen a critical approach to weighing pros and cons of new developments based on appraisal of a variety of papers, reports and on-line sources. There will be many opportunities for developing skills in presenting arguments in public.

Grades & Grading

You must submit assignments on time as specified in the syllabus. Submission after a deadline will incur a penalty – reduced by up to one grade point (e.g. A to B) depending on circumstances; failure to submit at all before the end of the course will lead to zero grade. If you are ill or there are exceptional circumstances that prevent you from submitting the work, you should notify me in advance by email.

There will be 1 quiz that will be graded. This will be through Canvas and will be accessed by your laptop or equivalent. It will be carried out in class time over a strictly timed period without reference to your notes. It is multiple choice: 25 questions with 3 options only one of which is correct. It will cover course material up to the quiz. Canvas will give immediate results once you press submit. In the event of technology failure during these periods, you must contact me as soon as you can and I will arrange substitutes.

Feedback on assignments will be given in a general way in class. Specific feedback will be given confidentially to each student electronically.

Grading Table

<table>
<thead>
<tr>
<th>Learning Activity</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall attendance and contribution in class</td>
<td>30%</td>
</tr>
<tr>
<td>Quiz</td>
<td>30%</td>
</tr>
<tr>
<td>Final paper on a selected innovation</td>
<td>40%</td>
</tr>
</tbody>
</table>
Grade Distribution

<table>
<thead>
<tr>
<th>Percentage Achieved</th>
<th>Course Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>93-100</td>
<td>A</td>
</tr>
<tr>
<td>90-92</td>
<td>A-</td>
</tr>
<tr>
<td>87-89</td>
<td>B+</td>
</tr>
<tr>
<td>83-86</td>
<td>B</td>
</tr>
<tr>
<td>80-82</td>
<td>B-</td>
</tr>
<tr>
<td>77-79</td>
<td>C+</td>
</tr>
<tr>
<td>73-76</td>
<td>C</td>
</tr>
<tr>
<td>70-72</td>
<td>C-</td>
</tr>
<tr>
<td>67-69</td>
<td>D+</td>
</tr>
<tr>
<td>63-66</td>
<td>D</td>
</tr>
<tr>
<td>60-62</td>
<td>D-</td>
</tr>
<tr>
<td>0-59</td>
<td>F</td>
</tr>
</tbody>
</table>

Percentages between grade borders (i.e. equal to or greater than: 92.5%, 89.5%, 86.5%, 82.5%, 79.5%, 76.5%, 72.5%, 69.5% and 59.5%) will be rounded up to the next highest grade.

Attendance and Participation

Attendance in this course is worth 30% of your grade. You are expected to attend classes; i.e. be present through ZOOM at the allotted times for the classes. If you are ill or there are exceptional circumstances that prevent you from attending in this way you should notify me in advance by email.

There will be a roll call at the start of each class. The overall grade of 30% will be reduced in proportion to absences.

You are also expected to actively participate by having prepared for class ahead of time and completed any readings, by asking questions and by participating in discussions and debates.
Team work is an important part of the course and grading. All are expected to work together in delivering the products of the team work. Where team members are not making expected contributions in terms of preparatory work and final deliverables, following discussions with the course tutor their grade may be adjusted relative to other members of the team to reflect the difference.

**Instructional Time & Student Effort**

For this 3-credit course at graduate level it is expected that you invest at least 9 hours of effort in carrying out the work to deliver successfully. This includes the instructional time of 2.5 hours in class. The precise amount of effort is likely to vary from week to week.

**University Policies on Grading and Student Conduct**

For links to University of Minnesota, policies please click the “U of M Policies” link on the course Canvas site, or see: https://z.umn.edu/PolicyStatements. Policies include information on student conduct, scholastic dishonesty, sexual harassment, equal opportunity, disability accommodations, and more.

**Set Your Canvas Notification Preferences**

This course depends upon your ability to receive communications from your instructor and/or about the class. It is important that you set up your Canvas “notification preferences” to choose how and when you would like to receive messages via text, email, or both. Find easy-to-follow instructions at *How do I set my Canvas notification preferences as a student?* - https://community.canvaslms.com/docs/DOC-10624-4212710344. We strongly recommend that you opt to receive notification of Announcements, Conversation Messages, and Added to Conversation so that you do not risk missing important class communication. In other words, you should not set any of your Canvas notifications to “None”.
Class Schedule

**Week 1 Jan 20**
Innovation and the Risk Society
Introduction to people and course. PC explains how innovations in emerging science and technology have created opportunities for economic development and allowed us to address big world problems. At the same time most, if not all, of these innovations can lead to unintended, negative impacts on people and ecological systems. So anticipating and managing these risks becomes an important role for Government in modern society.


**Week 2 Jan 25 & 27**
Primer on Risk
Jan 25 PC will cover principles for both human health and ecological impact
Jan 27 class considers precautionary principle as an alternative


**Week 3 Feb 1 & 3**
Innovation in Food Production
Feb 1 PC describes green revolution and GMOs
Feb 3 in groups, class considers risk assessment and management of an insecticide (Neonicotinoids and bees) and/or a herbicide (Roundup and cancer in people) and/or GMO (effect on people and/or ecosystems)

http://dx.doi.org/10.1098/rspb.2015.1821.


Week 4 Feb 8 & 10
Innovation in food production contd.
Feb 8 class continues group work
Feb 10 class reports back

Week 5 Feb 15 & 17
Economics of innovation
Feb 15 PC describes principles
Feb 17 Class considers total factor productivity – and if we are running out of innovation


Week 6 Feb 22 & 24
Green (new) deals – are they good for innovation?
Feb 22 PC describes issues of government intervention versus markets
For Feb 24 class divides into teams to debate either for (that they are) or against (that they are not)


Week 7 March 1 & 3
Protecting innovation through intellectual property rights and patents
March 1 PC draws attention to the principles and the way (and why) they are addressed in the US Constitution.
March 3 class explores application to biological materials in the US and around the world.


**Week 8 March 8 & 10**
Ethics of innovation
March 8 PC considers principles. Class starts work on equity issues involving social justice and racism.
March 10. Teams will report back on equity issues.


**Week 9 March 15 & 17**
Class Forum and Quiz
March 15 PC summarizes course to date and gives a view on the essentials for making innovation flourish. There will be an opportunity for qs in anticipation of the quiz
March 17. The quiz will be in-class, on line and without notes.

**Week 10 March 22 & 24**
Start Research for Final Paper
On both days class explores topics Week

**Week 11 March 29 & 31**
Work on Paper
On March 29 class agrees topics with PC. On March 31 class starts the work.

**Week 12 April 5 & 7**
Mid-term break

**Week 13 April 12 & 14**
TBD

**Week 14 April 19 & 21**
TBD

**Week 15 April 26 & 28**
Presentations of Papers

FINAL PAPERS DUE: April 28 at 5pm