

**Carleton University**  
**THE NORMAN PATERSON SCHOOL OF INTERNATIONAL AFFAIRS**

**IPIS 5101**  
**Critical Infrastructure Protection: Issues and Strategies**

**Course Syllabus Version 1.0 at 18 December 2011**

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*IPIS 5101: Critical Infrastructure Protection: Issues and Strategies*

Instructor: Wayne Boone

Office: DT-1315

Contact details:

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613-520-2600 ext. 6672

Class:

**Thursdays 1805 hrs to 2055 hrs  
in DT-1318**

Office Hours Fall Term 2011:

**Wednesdays and Thursdays  
1400-1700 hrs**

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**Assessment**

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*Class Participation and Peer Assessment: 20%*

*Seminar: 20%*

*Briefing Note: 10%*

*Major Paper Outline: 15%*

*Major Paper: 35%*

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**Key Dates**

*05 January: Class 1 begins*

*26 January: Class 4: Briefing Note due*

*09 February: Class 6: Major Paper Outline due*

*16 February: Class 7: Peer Assessment 1 and Readings Assessment 1 due*

*23 February: no class (Reading Week)*

*15 March: Class 10: Major Paper due*

*22 March: Class 11: Peer Assessment 2 and Readings Assessment 12 due*

*29 March: Class 12: Course ends*

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This course examines the concept and components of Critical Infrastructure Protection (CIP) and distinguishes it from other specialties within asset protection and security (AP&S).

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**Course Objectives**

- To introduce the asset protection and security (AP&S) specialty of CIP.
- To develop an informed and critical contemporary perspective and understanding of CIP.
- To appreciate the complexity, criticality and interdependencies within the CIP specialty and among the National Critical Infrastructures (NCIs).
- To develop critical thinking skills through an examination of the literature and doctrine on CIP.
- To practice critical and active reading skills.
- To practice leadership skills.
- To develop effective written and oral communication skills and the ability to argue CIP issues effectively.

**Overview**

This seminar-based course has been rewritten substantially since portions have been split off to form another course, so this can be considered a pilot course. Student feedback will be especially valuable for this first serial. Students are expected to have read the required readings for each week of the course. Introductory lectures or guest presentations identify issues for discussion and key questions. Following the introductory lecture the class operates in seminar mode. Presentations by students on recommended readings or their own papers are followed by a Q & A session (peer review and comment), and group work on assigned topics. The final section of each week's class typically involves a critical assessment of the topic under discussion. At all times, students are encouraged to engage the instructor and guest speakers through questions and comments, as long as the [Chatham House Rule](#) is respected.

**Students registering for this course must be prepared to think critically and engage in challenging debates about the protection of National Critical Infrastructures that contribute to national security, sovereignty, economic prosperity, and the health and safety of Canadians. Effective protection strategies are based on an in-depth understanding of the value of critical infrastructures, as well as of the threats and vulnerabilities that can cause risks to the availability, integrity and confidentiality of these valued assets. Countering threats and vulnerabilities through the implementation of**

**effective controls and safeguards will result in an appropriate asset protection and security posture for critical infrastructures.**

## Course Schedule and Assignment Due Dates

This course will cover both CIP concepts and the 10 National Critical Infrastructures (NCIs). Readings and questions for consideration in preparation for class are provided separately on WebCT.

Class	CIP Topic	NCI Addressed	Assignment Due
1.	Introduction to Course Introduction to CIP	All	
2.	Key CIP Concepts Regulatory Frameworks	Government	
3.	Demand, Capacity and Fragility	Transportation	Seminar 1
4.	Response and Emergency Management	Safety	Briefing Note Seminar 2
5.	Business Continuity and Incident Management	Manufacturing	Seminar 3 Seminar 4
6.	Information-sharing and Critical Infrastructure Information	Finance	Major Paper Outline Seminar 5
7.	SCADA and Information System Security	IT and Telecommunications	Peer Assessment 1 Readings Assessment 1 Seminar 6
8.	Physical and Operational Interdependencies	Health	Seminar 7 Seminar 8
9.	Oversight and Governance	Food	Seminar 9 Seminar 10
10.	“Follow the Pipe”	Water	Major Paper Seminar 11
11.	Strategies for CIP	Energy	Peer Assessment 2 Readings Assessment 2 Seminar 12
12.	Conclusions on CIP	All	

## Course Assessment in Detail

### *Class Participation and Peer Assessments: 20%*

Participation in weeks 2 to 12 is assessed by the instructor and by your peers to allocate 20% of your final mark. Students can earn participation marks for attendance, for active, relevant participation in discussions, and for other high quality contributions to the class. Peer assessments (formats provided separately) are due at the end of class 7 and at the end of class 11 to the instructor in hard copy.

*Peer Evaluation:* On both breakout and class discussions, students will be evaluated by their peers on:

- How well prepared they are for class and seminar breakout sessions (having read the material and considered the questions under discussion);
- How well they contribute to breakout session discussions and how well they support the session lead;
- The quality of their analysis; and
- Most importantly, their willingness to display teamwork and contribute to the completion of all deliverables **to the best of their ability**. Students are not to be evaluated on their previous knowledge in AP&S and/or CIP, but only on their **application** of research, knowledge, skills and experience gained before and during the course.

***Seminar Presentation: 20%***

Students will be paired to produce a 40-minute presentation to the class regarding an NCI or key CIP concept. Each student within the pair is to present a different topic within the NCI or CIP concept. Students will be invited to pick an NCI and topic in class 1 on the provided schedule (beginning during the coffee break). Presentations begin in week 3 and continue through week 11. Student teams are required to provide copies of a two-page synopsis for all class members (double-sided please). Not all of the material on the synopsis must be covered in class; this is intended to provide additional value added or clarification. Students will be penalized if they duplicate substantially the material in the handout and the PPT presentations.

The seminar should be broken down at follows:

- a. Common summary of the NCI/concept – 5 mins
- b. Topic 1 – 10 mins
- c. Topic 2 – 10 mins
- d. Concluding material – 5 mins
- e. Questions - 10 mins

The presentation will be assessed for the way in which the students:

- f. Summarize succinctly the topic Adhere to the timings and seminar breakdown;
- g. Demonstrate the link to CIP concepts learned to date;
- h. Provide critical analysis of the topic or incident;
- i. Include other current and salient literature;
- j. Add new insights to assigned readings or class lectures, including original thought and analysis;
- k. Provide additional value in the handout;
- l. Present the material (PPT, graphics, training aids, etc.);
- m. Communicate quickly, authoritatively and clearly; and
- n. Respond to questions.

Synopses and PPT presentations (if used) are to be **provided in soft copy to the professor by 1730 hrs of the day of presentation**. The attachment is to be identified as follows: Last Names5101Seminar.doc and Last Names5101SeminarPPT.doc for consistency.

***Briefing Note: 10%.***

Each student will produce a two-page briefing note (BN) to senior management on a CIP-related concern or issue. This concern or issue could be based on your current or former employment, your co-op experience, or material covered in the course. The aim of the BN will be to inform and seek a decision. The format for the BN is provided in a separate guidance document. The BN will be assessed on:

- a. the credibility of the issue;
- b. the explanation of how it maps to CIP;
- c. the conciseness and focus of why the BN was written, the supporting information provided, and the argument for the decision being sought;
- d. the reasonableness of the decision being sought; and
- e. grammar, style, adherence to format.

The BN is to be submitted in soft copy (no hard copy required) to [wayne\\_boone@carleton.ca](mailto:wayne_boone@carleton.ca) by 1730 hrs class 4. The attachment is to be identified as follows: Last Name5101BN.doc.

***CIP Analysis Paper: (outline 15%, paper 35%)***

Each student will choose a CIP-related topic upon which to write a critical analysis paper. The NCI and/or topic for this paper may be the same as that for the seminar, or can be different. The topic should be approved by the instructor no later than 1700 hrs on week 4. The paper should include a brief synopsis of the topic under analysis, why this topic was chosen, the NCIs to which it applies, the main thesis statement (what stand you are taking), key elements of the topic

that support (and refute) your argument, analysis of key policies that apply to the topic and/or NCI(s), implications of your research for CIP, and recommendations to improve CIP within your topic and/or NCI.

There are two assessment components to this paper: the **outline**, which is designed to develop organisational and research skills, and the **final paper** which is designed to demonstrate analytical skill, development of cogent arguments, and effective writing style. It is appreciated that the outline represents the “best guess” of key arguments of the final paper, and that further research and analysis may very well change the initial theses provided in the outline. Students will not be penalized if their final paper is different in content and findings from the outline. However, it is expected that final papers will retain the formal structured presented in the outline.

NOTE: Students are to provide a separate legend page for both the outline and paper of all abbreviations and acronyms used (not part of the word count). These attachments are to be identified as follows: Last Name5101outlinelegend.doc or Last Name5101paperlegend.doc for consistency.

*Outline:* Outlines should be minimum 1000 words (no maximum), and are to be double-spaced. The outline is to be submitted in soft copy (no hard copy required) to [wayne\\_boone@carleton.ca](mailto:wayne_boone@carleton.ca) by 1730 hrs class 6. The attachment is to be identified as follows: Last Name5101Outline.doc for consistency.

The **outline** will be assessed on the following:

- a. Appropriateness of the chosen topic;
- b. Format and structure (including cover page, main and sub-headings, etc.);
- c. Main theses or themes (i.e., what are the aims and objectives of the paper);
- d. Main areas to be addressed (should be considered in the format);
- e. Main arguments proposed within the areas proposed and how they tie to the main theses;
- f. Abbreviated literature review (i.e., which sources are used and what essentially is going to be used in the paper; bibliography and citation in the outline;
- g. Proposed conclusions and recommendations; and
- h. Grammar and style.

*Paper:* Papers should be between 3,250 and 3,750 words in length, not including bibliography, notes, annexes etc. (one grade will be deducted for every 100 words over or under), and papers are to be double-spaced (**include word count on front page; footnotes, graphics and annexes are not included in the word count**). The paper is to be submitted in soft copy (no hard copy required) to [wayne\\_boone@carleton.ca](mailto:wayne_boone@carleton.ca) by 1730 hrs class 9. The attachment is to be identified as follows: Last Name5320paper.doc.

The **paper** will be assessed on:

- a. The assessment criteria for the outline plus;
- b. The appropriateness of the key components that are argued in the paper (including why some components were not included);
- c. Effectiveness of incorporation of CIP concepts that were taught in class;
- d. Strength of conclusions and recommendations offered in the paper;
- e. Effectiveness of incorporation of relevant references;
- f. Inclusion of new information from references additional to the assigned or recommended readings;
- g. Effectiveness of coverage of the topic;
- h. Clarity of argument and writing and
- i. Effectiveness of incorporation of salient citations and quotations.

Outlines and papers are to be submitted in soft copy to the instructor ([wayne\\_boone@carleton.ca](mailto:wayne_boone@carleton.ca)) in class 6 and class 11 respectively by 1730 hrs.

### Late submission penalties

Deadlines for submission of written work and presentations are strictly adhered to. Failure to submit a piece of work by the stated deadline without permission results in the following penalties being applied to that piece of work:

- Failure to make the presentation on the designated day in class will result in a mark of zero.
- Late submission of written work within 24 hours = drop by one grade (e.g., B+ to a B).
- Late submission of written work within 96 hours = drop by two grades (e.g., B+ to a B-).
- Late submission of written work after 96 hours = drop by three grades (e.g., B+ to a C+).

These penalties are harsh because ALL students registered for this course know the type of assessment being undertaken and the dates of submission from week one of the course. Plan your workload according to these deadlines.

## Administrative Issues

### Correspondence with the Instructor

Information from the instructor will be passed usually electronically through WebCT. Students are expected to check their account daily for emails. Students are requested to use the following email address if they wish a speedy reply: [wayne\\_boone@carleton.ca](mailto:wayne_boone@carleton.ca) since it is monitored more closely than the WebCT; if the response is not critical, then WebCT is an acceptable email venue. For urgent matters, students may use the instructor's cell phone (613) 863-2993. This number is also preferable to the work local, since the instructor may be out of the office when a response is required.

### Procedures for handing in work

Work must be submitted via email by the stated deadline. Email all work to ([wayne\\_boone@carleton.ca](mailto:wayne_boone@carleton.ca)).

### Absences and missed assignments

Only documented, family, and medical emergencies will be accepted as legitimate reasons for an absence. Students with appointments relating to employment or other reasons should discuss with the instructor before departure. Unless agreed, or otherwise documented, absences from class will result in zero participation for a particular day. Seminar presentation dates cannot be altered without approval of the instructor.

### Academic integrity and academic offences

All academic offences are reported. Students are obliged to familiarize themselves with the regulations for Graduate Study, as contained in the 2010-2011 Graduate Calendar: see, in particular, section 14 on Academic Integrity for plagiarism etc.: <http://www.carleton.ca/calendars/grad/current/regulations/#14> and make themselves aware of the penalties for plagiarism and the submission of the same piece of written work to more than one course. Cheating, plagiarism and/or other breaches of academic integrity as identified in the Calendar will be penalized. The penalties for an offence may include a failing grade or expulsion or suspension from studies at the University.

### Accommodations

You may need special arrangements to meet your academic obligations during the term. It is up to you to identify these to me as soon as possible (after class, during student interviews or office hours) within the first two weeks of the course. For an accommodation request the processes are as follows:

- *Pregnancy obligation*: write me with any requests for academic accommodation after the need for accommodation is known to exist. For more details visit the Equity Services website [http://www.carleton.ca/equity/accommodation/student\\_guide.htm](http://www.carleton.ca/equity/accommodation/student_guide.htm)
- *Religious obligation*: write me with any requests for academic accommodation. For more details visit the Equity Services website [http://www.carleton.ca/equity/accommodation/student\\_guide.htm](http://www.carleton.ca/equity/accommodation/student_guide.htm)
- *Students with disabilities requiring academic accommodations* in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for any assessments, please submit your request for accommodations to PMC by the deadlines published on the PMC website: <http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/>

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://carleton.ca/equity/accommodation>

## Bibliography

The following books are **assigned texts** for the course:

- Lewis, Ted G.: *Critical Infrastructure Protection in Homeland Security – Defending a Networked Nation*. Wiley-Interscience (2006)
- Radvanovsky, Robert & McDougall, Allan: *Critical Infrastructure, Homeland Security and Emergency Preparedness* Second Edition. CRC Press, Taylor & Francis Group (2010)

The following books are identified as useful texts:

- Atlas, Randall I., '21<sup>st</sup> Century Security and CPTED: Designing for Critical Infrastructure and Crime Prevention', CRC Press, Taylor & Francis Group (2008)
- Boyer, Stuart A., 'SCADA: Supervisory Control and Data Acquisition, 3rd Edition' ISA-The Instrumentation, Systems, and Automation Society (2004)
- Crowe, Timothy D., 'Crime Prevention Through Environmental Design, Second Edition', Butterworth-Heinemann (2000)
- Hyslop, Maitland, 'Critical Information Infrastructures, Resilience and Protection', Springer (2007)
- Lee, Elsa, 'Homeland Security and Private Sector Business: Corporations' Role in Critical Infrastructure Protection', CRC Press, Taylor & Francis Group (2009)
- Macaulay, Tyson, 'Critical Infrastructure, Understanding its Component Parts, Vulnerabilities, Operating Risks, and Interdependencies', CRC Press, Taylor & Francis Group (2009)
- McDougall, Allan & Radvanovsky, Robert, 'Transportation Systems Security', CRC Press, Taylor & Francis Group (2008)
- Pfleeger, Charles P. & Pfleeger, Shari Lawrence, 'Security in Computing, Fourth Edition', Prentice Hall PTR (2007)
- Radvanovsky, Robert, 'Critical Infrastructure, Homeland Security and Emergency Preparedness', CRC Press, Taylor & Francis Group (2006)
- Shaw, William T., 'Cybersecurity for SCADA Systems', PennWell (2006)

The following articles are useful, and are recommended readings:

- Doran, Charles F., 'The New American Administration and the Perpetual Problem of the Security of Energy Supplies', in Brian MacDonald (editor), *The Strategic Impact of Energy Dependency*, The Conference of Defence Associations Institute, Vimy Paper (2009), pp.111-125
- Wilson, Brian & Luster, Jeff, 'The Energy Security Challenge: Developing an Integrated American Response', in Brian MacDonald (editor), *The Strategic Impact of Energy Dependency*, The Conference of Defence Associations Institute, Vimy Paper (2009), pp.126-140
- Additional articles will be added to this list as the course progresses, some of which may be assigned.

All the readings listed in this course outline are available from the Library of Carleton University, the NPSIA Resource Centre, or from the Instructor. Book chapters from the **required** reading list or which are being used for **student seminar presentations** are available on WebCT.

#### Required Readings

Each week there are typically at least three (3) required readings for this course. Students are expected to read them and consider the arguments put forward. These readings form an important part of the class discussion. Periodically, students may be provided with questions for consideration to guide their reading and analysis, as well as to focus class discussions. Students will be asked – without any prior notice – to summarize the main readings to begin the class discussion. All students are expected to read articles and chapters and make links to arguments and debates in previous weeks in the discussions.

#### Recommended Readings

Additional readings are included in the readings and questions list, and will be augmented periodically.

## Class Detail

### ***Class 1. CIP: Introduction and Course Overview***

The Instructor will introduce the course and its objectives, discuss the course outline and assessment with students, and provide an introduction to the subject of Risk Management as it pertains to CIP. The class will then highlight issues that they consider important and explore their perceptions and understanding of CIP to enable the instructor to address some of these issues during the course.

### ***Class 2. Key CIP Concepts and Regulatory Frameworks***

This class will delve further into the Asset Protection and Security (AP&S) specialty of CIP and review the regulations and policies that drive CIP. It also introduces the NCI of Government, especially continuity of operations.

### ***Class 3. Demand, Capacity and Fragility, Networks***

This class discusses throughput of goods and services that are protected by NCIs, and highlights vulnerabilities in the supply chain. The Transportation sector is introduced as a prime example of networks, a key CIP concept.

### ***Class 4. Response and Emergency Management***

This class explores the differences among emergency planning concepts and plans and ties them to NCIs in general. The Safety NCI is introduced as it contributes to emergency response as part of emergency management. Incident command and management systems are discussed.

### ***Class 5. Business Continuity and Incident Management***

This class builds on the previous class in distinguishing continuity plans from emergency response plans. The Manufacturing NCI is introduced and discussed in light of the need for continued production of essential goods and services.

### ***Class 6. Information-sharing and Critical Infrastructure Information (CII)***

This class discusses the cross-boundary requirement for sharing sensitive information, as well as its challenges. The Finance NCI is introduced, with its high integrity requirements and provision of a sound economic base for continuity of CIs.

### ***Class 7. SCADA and Information System Security***

This class introduces the threats to, vulnerabilities of, and protection requirements of information systems supporting NCIs, including Supervisory Control and Data Acquisition systems. The IT and Telecommunications NCI is introduced.

### ***Class 8. Physical and Operational Interdependencies***

This key concept of CIP, previously introduced, will be addressed in more detail, in order to highlight the challenges in analysis and assessment of boundaries, accountability and trust. The Health NCI is introduced as an exemplar.

### ***Class 9. Oversight and Governance***

This class reiterates the value of and further explores the AP&S concepts of oversight and governance in CIP, focusing on its challenges in the absence of hierarchy, ownership and appreciation of the threat. The Food NCI is introduced.

### ***Class 10. "Follow the Pipe"***

This class reinforces this CIP concept within the NCIs. This will be an exercise-based class, in which the logical, operational, physical, governance and accountability "pipes" are reviewed, discussed and developed. The Water NCI is introduced.

### ***Class 11. Future Strategies for CIP***

This class discusses the way ahead for the protection of our NCIs, utilizing all material learned to date. The aim is to propose an actionable CIP plan. The focus will be on innovative ideas from the class. The Energy and Power NCI is



introduced.

***Class 12. Conclusions on CIP***

This class will cover any outstanding questions or emergent issues, and will be a snapshot of CIP issues in Canada.

Dr. Wayne Boone  
Coordinator and Principal Instructor, IPIS Program  
18 December 2011