

OR 683 / SYS 680 / ECE 670
Principles of C4I

Instructor: Daniel T. Maxwell, Ph.D.
Location: University Hall Room 1202

I. Objective

The course seeks to provide students with a balanced overview of the basic principles of C4I (Command, Control, Communications, Computers, & Intelligence). The successful student will understand the complex relationship that exists among the engineering, psychological, and social issues that must be addressed in the design, development, deployment, and application of C4I systems.

II. Course Theme

Command and Control (C2) has been studied for centuries in the context of military operations. Over the past twenty-five years C2 studies and thinking has been extended to include the contributions and role of communication, computers, intelligence, (C4I) technologies. Additionally, C4I studies are now an integral part of disaster and emergency response management, as well as other complex operations. This course will provide engineering students with an appreciation of the complexities involved in the design and development of a “System of Systems”. The scope will include military command and control, as well as the theory, application and practice including C2 technologies and the design of C2 applications.”

The course will consist of a mixture of lectures, guest speakers, and practical exercises intended to provide students with an appreciation of the multi-disciplinary nature of the problem and some strategies for meeting the challenges presented when providing engineering support for complex systems of systems.

III. Readings

- a. Sweeney, M. (2002) *An Introduction to Command and Control*, Naval Post Graduate School, Monterey. (Available on Kindle)
- b. Alberts, D. & Hayes R. (2003) *Power to the Edge*, Command and Control Research Program, Washington D.C.
- c. Maxwell, D. & Tucker, C. (2014) “*Refining The Intelligence Cycle: Adapting to an Era of Population-Centric Security Challenges*”, in Human Geography: Socio-Cultural Dynamics and Challenges to Global Security, USGIF Monograph Series Volume 1, 2014.

IV. Assignments and Grading Policy

- a. Homework / Class Participation 40%
- b. Case Study Presentation / Report – 30%
- c. Final exam – Take Home 30%

V. Course Outline (By Week)

Principles of C4I

Date	Topic
26-Aug	Class Intro and Overview of C4I -- Command Intent (Dr. Hieb)
2-Sep	C2 Fundamentals, Enduring Principles, and Conceptual Models
9-Sep	Decision Making and Decision Support Modeling for C2
16-Sep	Situational Awareness / Information Fusion / Computational Models of Uncertainty
23-Sep	Operational Planning Processes and Frameworks
30 Sep	Intelligence Processes
7-Oct	Introducing “Power to the Edge”
14-Oct	No Class (Columbus Day)
21-Oct	Dealing with “Edge” Organizations
28-Oct	Measuring C4I Effectiveness
4-Nov	Planning and Course of Action Development
11-Nov	C2 Concept Development and Experimentation
18-Nov	C4I / Information Systems Engineering Frameworks (Architecture)
25-Nov	Implications for C4I Systems Design and Engineering in the Future
2-Dec	Review / Hand out Final Exams
9-Dec	Final Exams Due

VI. Instructor Availability

The instructor will be available for assistance before and after class, or by appointment. Call (703) 409-7828 to arrange a time.

VII. Supplemental Readings:

a. Command and Control – Agility

- i. Alberts (2011) *The Agility Advantage* DoD CCRP, Washington D.C.
- ii. Alberts and Hayes (2006) *Understanding Command and Control*, DoD CCRP, Washington D.C.

b. Risk and Uncertainty

- i. Savage, Sam. *The flaw of averages: why we underestimate risk in the face of uncertainty*. Hoboken, New Jersey: John Wiley & Sons Inc, 2009. Print ISBN: 978-0-471-38197-6
- ii. Anything by Paul Slovic

c. Planning and Decision Making

- i. Klein, G. (1998) *Sources of Power: How People Make Decisions*, MIT Press, Cambridge
- ii. Kahneman, D. *Thinking Fast and Slow*, Farrar, Strauss & Giroux, 2011 Print ISBN978-0-374-27563
- iii. Keeney, R. (1992) *Value Focused Thinking*, Harvard Press, Cambridge.

d. Complexity

- i. Dörner, Dietrich. *The logic of failure: recognizing and avoiding error in complex situations*. Basic Books, 1996. Print. ISBN: 978-0-201-47948-5

e. Architectures

- i. Spewak, S. (1992) *Enterprise Architecture Planning*, Wiley Press, New York
- ii. Anything that explores the Zachman Framework
- iii. Wisnosky, D. (2006) *DoDAF Wisdom*, Wizdom Systems, USA.

f. Intelligence

- i. Charters, David, Stuart Farson, and Glenn Hastedt. *Intelligence analysis and assessment*. Great Britain: Frank Cass & Co. Ltd, 1996. Print. ISBN: 0-7146-4249-5
- ii. Clark, Robert. *Intelligence analysis: a target-centric approach*. 2nd. Washington, DC: CQ Press, 2006. Print. ISBN: 978-1-933116-93-8
- iii. Lowenthal, Mark. *Intelligence: from secrets to policy*. 3rd. Wasington, DC: CQ Press, 2006. Print. ISBN: 1-933116-02-1