

**Strategisk interaksjon og samfunnssikkerhet**  
**Strategic Interaction and Societal Safety**

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**Instructor:** Kjell Hausken

**Room** To be announced

**Time** Z-day 12.15-16.00

**Credit points:** x

**Admission:** To be announced

**Mål for kurset**

Formålet med kurset er å eksponere deg for situasjonen til strategisk interagerende agenter involvert i ulykker, katastrofer, kriser, nødsituasjoner, uhell, farer, ødeleggelser, der fenomener relatert til pålitelighet, risiko, sikkerhet, usikkerhet, og sårbarhet er involvert. På individnivå beskrives aktørers holdning til risiko, og hvilke typer interaksjon som kan finne sted mellom enkeltindivider eller grupper av individer som ensidig velger ikke-kompatible strategier under usikkerhet og ufullstendig informasjon om omgivelsesparametre, nytte (payoffs), og preferanser. De kollektive følgene av individuelle strategier beskrives samt hvilke strategier som kan velges for å trigge eller dempe kriser og konflikter. På kollektivt nivå eller samfunnsnivå beskrives hvorledes premisser eller føringer kan legges for å skape insentiver for enkeltindivider til å handle forenlig med individuell sikkerhet og samfunnssikkerhet.

**Course objectives**

The purpose of the course is to expose you to the situation faced by strategically interacting agents involved in accidents, catastrophes, crises, disasters, emergencies, hazards, terrorism, where phenomena related to reliability, risk, safety, security, uncertainty, vulnerability are involved. At the individual level actors' attitude towards risk is described, and what kind of interaction can take place between individuals or groups of individuals who one-sidedly choose non-compatible strategies under uncertainty and incomplete information about surrounding parameters, utility (payoffs), and preferences. The collective implications of individual strategies are described, and what strategies can be chosen to trigger or dampen crises and conflicts. At the collective or societal level is described how premises or pre-conditions can be laid to create incentives for individuals to behave compatibly with individual and societal safety.

The course exposes you to a broad range of issues relevant for understanding and appraising individual and societal safety management. Starting with a grounding at the individual level, the course gradually moves to consider the most influential fields and directions involving strategic interaction and societal safety at the organizational and societal levels. Each introduced topic is presented from two or several different and often diametrically opposite viewpoints prevalent in contemporary research. The course trains you to make consciously

intelligent and scientifically justifiable stands within each sub-field, and contributes to your ability to organize these stands into a coherent whole.

### **Course requirements**

Each student will write a 3 pages double-spaced (say 600 words) essay due in class every week, starting the second week. Write concisely. I do not want to read a superfluity of sesquipedalian obfuscatory prolixity. You can take stands on the issues, but you need to justify them. You will be evaluated on your command of the material, and on the comprehension you reveal of the major factors relevant for each week's topic. Every week 2-4 of you will present your essays in class. Assignments will be arranged on the first week of class ensuring that the major viewpoints of each topic get presented. These essays to be presented are to be provided to me (or someone to be assigned the task) at 11 a.m. the day before every class. They will be copied, and can be picked up by all other students two hours later outside office C216. With less than 15 students, the course will be run as an informal lecture/discussion course. With more than 20 students, a larger auditorium will be assigned, and the course will be held in a more formal lecturing tone. Each student will write a final paper, due Thursday of exam week at 4 p.m. in my mailbox in C216. The paper should be 12-15 pages, 25-30K, and on a topic relevant for the course. Please come and see me if you want to discuss your topic, or if you want me to suggest possible topics for you. You will be evaluated 50% on your essays, 30% on your final paper, and 20% on your oral presentation including how well you withstand critique from the other students and myself. Office hours are Monday and Thursday 12.30-16.30 in C216.

### **Course Schedule**

#### **1. week: Prospect theory**

- Kahneman, D. and Tversky, A. (1979), "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica* 47,263-291.
- Tversky, A. and Kahneman, D. (1979), "The Framing of Decisions and the Psychology of Choice," *Science* 211, 453-458.
- Tversky, A. and Kahneman, D. (1979), "Judgment under Uncertainty: Heuristics and Biases," *Science* 185, 1124-1131.
- Viscusi, W.K. and Chesson, H. (1999), "Hopes and Fears: The Conflicting Effects of Risk Ambiguity," *Theory and Decision* 47, 153-178.

#### **2. week: Bounded rationality**

- Padgett, J.F. (1980), "Bounded Rationality in Budgetary Research," *American Political Science Review* 74, 354-372.
- Lindblom, C.E. (1959), "The Science of 'Muddling Through'," *Public Administration Quarterly* 19, 79-88.
- Simon, H.A. (1955), "A Behavioral Model of Rational Choice," *Quarterly Journal of Economics* 69, 99-118.

#### **3. week: Utilities and a decision oriented approach to risk analysis**

- Accorsi, R., Zio, E., and Apostolakis, G.E. (1999), "Developing Utility Functions for Environmental Decision Making," *Progress in Nuclear Energy* 34, 4, 387-411.
- Apostolakis, G.E. and Pickett, S.E. (1998), "Deliberation: Integrating Analytical Results into Environmental Decisions Involving Multiple Stakeholders," *Risk Analysis* 18, 5, 621-634.
- Bonano, E.J., Apostolakis, G.E., Salter, P.F., Ghassemi, A., and Jennings, S. (2000), "Application of Risk Assessment and Decision Analysis to the Evaluation, Ranking

- and Selection of Environmental Remediation Alternatives,” *Journal of Hazardous Materials* 71, 35-57.
- Pörn, K. (1997), “A Decision-Oriented Measure of Uncertainty Importance for Use in PSA,” *Reliability Engineering and System Safety* 56, 17-27.

**4. week: The economic approach to risk and uncertainty**

- Hammond, P.J. (1992), “Uncertainty,” in Newman, P., Milgate, M., and Eatwell, J. (eds.), *The New Palgrave Dictionary of Money and Finance*, 712-718, Macmillan, London.
- Machina, M.J. and Rotschild, M. (1992), “Risk,” in Newman, P., Milgate, M., and Eatwell, J. (eds.), *The New Palgrave Dictionary of Money and Finance*, 358-363, Macmillan, London.
- Shogren, J.F. and Crocker, T.D. (1999), “Risk and Its Consequences,” *Journal of Environmental Economics and Management* 37, 44-51.

**5. week: Risky tradeoffs**

- Berger, L.A. and Hershey, J.C. (1994), “Moral Hazard, Risk Seeking, and Free Riding,” *Journal of Risk and Uncertainty* 9, 173-186.
- Bordley, R.F. (1994), “Making Social Trade-offs Among Lives, Disabilities, and Cost,” *Journal of Risk and Uncertainty* 9, 135-149.
- Finkelshtain, I, Kella, O., and Scarsini, M. (1999), “On Risk Aversion with two Risks,” *Journal of Mathematical Economics* 31, 239-250.

**6. week: Tradeoffs between behavioral and economic views, self-interest, altruism, ideology**

- Hausken, K. (1996), “Self-Interest and Sympathy in Economic Behavior,” *International Journal of Social Economics* 23, 7, 4-24.
- Hausken, K. (1996), “Ethics and Efficiency in Organizations,” *International Journal of Social Economics* 23, 9, 15-40.
- Schoemaker, P.H. (1993), “Determinants of Risk-Taking: Behavioral and Economic Views,” *Journal of Risk and Uncertainty* 6, 49-73.
- Tribe, L.H. (1972), “Policy Science: Analysis or Ideology?” *Philosophy and Public Affairs* 2, 1, 66-110.

**7. week: Multiple attackers, interdependence, and substitution effects**

- Bier, V., Hausken, K., (2007), “Defending Against Multiple Different Attackers,” Ms.
- Enders, W., Sandler, T., 2003. What do we know about the substitution effect in transnational terrorism?. in A. Silke and G. Ilardi (eds) *Researching Terrorism: Trends, Achievements, Failures* (Frank Cass, Ilfords, UK), <http://www-rcf.usc.edu/~tsandler/substitution2ms.pdf>
- Hausken, K., 2006. Income, Interdependence, and Substitution Effects Affecting Incentives for Security Investment. *Journal of Accounting and Public Policy* 25, 6, 629-665.
- Hausken, K. (2007), “Whether to Attack a Terrorist’s Resource Stock Today or Tomorrow,” Ms.
- Kunreuther, H., Heal, G., 2003. Interdependent security. *The Journal of Risk and Uncertainty* 26, 2/3, 231-249.
- Lakdawalla, D., Zanjani, G., 2002. Insurance, self-protection, and the economics of terrorism. Ms., RAND and NBER Working Paper No. W9215, Federal Reserve Bank of New York.
- Zhuang, J., Bier, V.M., Gupta, A. 2006. Subsidies in interdependent security with heterogeneous discount rates, *Engineering Economist*, forthcoming.

### **8. week: Defense and attack of systems**

- Azaiez, N., Bier, V.M., 2006. Optimal Resource Allocation for Security in Reliability Systems. *European Journal of Operational Research*, Forthcoming.
- Bier, V.M., 2004. Should the model for security be game theory rather than reliability theory. In *Mathematical and Statistical Methods in Reliability* (Wilson et al., editors), Series on Quality, Reliability and Engineering Statistics, World Scientific, Singapore, 2005, pages 17-28.
- Bier, V.M., Nagaraj, A., Abhichandani, V., 2005. Protection of Simple Series and Parallel Systems with Components of Different Values. *Reliability Engineering and System Safety* 87, 315-323.
- Bier, V.M., Oliveros, S., Samuelson, L., 2006. Choosing What to Protect: Strategic Defense Allocation Against an Unknown Attacker. *Journal of Public Economic Theory*, Forthcoming.
- Hausken, K. (2007), "Strategic Defense and Attack for Series and Parallel Reliability Systems," *European Journal of Operational Research*, Forthcoming.
- Hausken, K. (2007), "Strategic Defense and Attack of Systems when Agents Move Sequentially," Ms.
- Hausken, K. (2007), "Strategic Defense and Attack for Reliability Systems," Ms.
- Hausken, K. (2007), "Strategic Defense and Attack of Series System of Parallel Subsystems and Parallel System of Series Subsystems," Ms.
- Hausken, K. and Levitin, G. (2007), "Protection and Separation of Parallel Homogeneous Elements," Ms.
- Hausken, K. and Levitin, G. (2007), "Protection and Separation of Parallel Non-Homogeneous Elements," Ms.
- Hausken, K. and Levitin, G. (2007), "Efficiency of Even Separation of Parallel Elements with Variable Contest Intensity," Ms.
- Hausken, K. and Levitin, G. (2007), "False Targets Efficiency in Defense Strategy," Ms.
- Hausken, K. and Levitin, G. (2007), "Defense and Attack of Reliability Systems," Ms.
- Levitin, G., 2003. Optimal allocation of multi-state elements in linear consecutively connected systems with vulnerable nodes, *European Journal of Operational Research* 150, 406-419.
- Levitin, G., Dai, Y., Xie, M., Poh, K.L., 2003. Optimizing survivability of multi-state systems with multi-level protection by multi-processor genetic algorithm, *Reliability Engineering and System Safety* 82, 93-104.

### **9. week: Defense and attack of complex infrastructures**

- Brown, G., Carlyle, M., Salmeron, J. and Wood, K., 2006, *Defending Critical Infrastructure*, *Interfaces* 36, 530-544.
- Hausken, K. (2007), "Protecting Complex Infrastructures Against Strategic Attackers," in Bier, V. and Azaiez, N. (eds.), *Game Theory and Reliability*, Springer Series on Reliability Engineering, forthcoming.
- Hausken, K. (2007), "Strategic Defense and Attack of Complex Networks," Ms.
- Levitin, G., 2007. Optimal Defense Strategy Against Intentional Attacks. *IEEE Transactions on Reliability*, Forthcoming.
- Patterson, S., Apostolakis, G., 2007. Identification of critical locations across multiple infrastructures for terrorist actions, *Reliability Engineering and System Safety*, Forthcoming.

### **10. week: Balancing defense against terrorism, natural disaster, and other hazards**

- Bier, V. and Hausken, K. (2007), "Defending against Terrorism, Natural Disaster, and All Hazards," Ms.
- Bier, V. and Hausken, K. (2007), "Endogenizing the Sticks, Carrots, and Emergence of Hatred Flowing from Fighting Terrorism," Ms.
- Glaeser, E.L., 2005. "The Political Economy of Hatred," *The Quarterly Journal of Economics*, MIT Press, vol. 120(1), pages 45-86, January.
- Keohane, N., Zeckhauser, R.J., 2003. The ecology of terror defense. *The Journal of Risk and Uncertainty* 26, 2/3, 201-229.
- Lakdawalla, D. and Zanjani, G., 2002. Insurance, self-protection, and the economics of terrorism. Ms., RAND and NBER, Federal Reserve Bank of New York.
- Zhuang, J., Bier, V., 2007, Balancing Terrorism and Natural Disasters - Defensive Strategy with Endogenous Attacker Effort, *Operations Research*, forthcoming.

### **11. week: Probabilistic risk analysis, decisions, actions, management, organization**

- Bier, V.M. (1999), "Challenges to the Acceptance of Probabilistic Risk Analysis," *Risk Analysis* 19, 4, 703-710.
- Bier, V. M. (1997). "An overview of probabilistic risk analysis for complex engineered systems," in *Fundamentals of Risk Analysis and Risk Management*, Molak, V. (ed.), Lewis Publishers, Boca Raton, pp.
- Hausken, K. (2002), "Probabilistic Risk Analysis and Game Theory," *Risk Analysis* 22, 1, 17-27.
- Murphy, D.M. and Paté-Cornell, M.E. (1996), "The SAM Framework: Modeling the Effects of Management Factors on Human Behavior in Risk Analysis," *Risk Analysis* 16, 501-515.
- Paté-Cornell, M.E., Lakats, L.M., Murphy, D.M. and Gaba, D.M. (1997), "Anesthesia Patient Risk: A Quantitative Approach to Organizational Factors and Risk Management Options," *Risk Analysis* 17, 4, 511-523.

### **12. week: Rational risk policy**

- Viscusi, W.K. (1993), "The value of risk to life and health," *Journal of Economic Literature* 31, 1912-46.
- Viscusi, W.K. (1994), "Risk-Risk Analysis," *Journal of Risk and Uncertainty* 8, 5-17.
- Viscusi, W.K. (1998), *Rational Risk Policy*, Oxford University Press, ISBN: 0-19-829363-1.

### **13. week: Risk regulation, differential payoff distribution, divergent risk information**

- Hopkins, A. (1999), "For Whom Does Safety Pay? The Case of Major Accidents," *Safety Science* 32, 143-153.
- Viscusi, W.K. (1997), "Alarmist Decisions with Divergent Risk Information," *Economic Journal* 107, 1657-1670.
- Viscusi, W.K. and Hamilton, J.T. (1999), "Are Risk Regulators Rational? Evidence from Hazardous Waste Cleanup Decisions," *American Economic Review* 89, 4, 1010-1027.
- Zeckhauser, R. and Viscusi, W.K. (1990), "Risk Within Reason," *Science* 248, 559-564.

### **14. week: Economic approaches to risk analysis**

- Cramton, P., Gibbons, R., and Klemperer, P. (1987), "Dissolving a Partnership Efficiently," *Econometrica* 55, 3, 615-632.
- Holmström, B. (1979), "Moral hazard and observability," *Bell Journal of Economics* 10, 1, 74-91.
- Holmström, B. (1979), "Moral hazard in teams," *Bell Journal of Economics* 13, 2, 324-340.

- Moresi, S. (1999), "Uncertain Lifetime, Risk Aversion and Intertemporal Substitution," *Economics Letters* 62, 207-212.
- To, T. (1999), "Risk and Evolution," *Economic Theory* 13, 2, 329-343.

**15. week: Game theoretic approaches to risk analysis**

- Land, M. and Gefeller, O. (1997), "A Game-Theoretic Approach to Partitioning Attributable Risks in Epidemiology," *Biometrical Journal* 7, 777-792.
- Palmini, D. (1999), "Uncertainty, Risk Aversion, and the Game Theoretic Foundations of the Safe Minimum Standard: A Reassessment," *Ecological Economics* 29, 463-472.
- Singpurwalla, N.D. and Wilson, S. (1993), "The Warranty Problem: Its Statistical and Game Theoretic Aspects," *SIAM Review* 35, 1, 17-42.

**16. week: Risk analysis and cost/benefit analysis:**

- Elliott, M., Wang, Y., Lowe, R., and Kleindorfer, P. (2004), "Environmental Justice: Frequency and Severity of U.S. Chemical Industry Accidents and the Socio-economic Status of Surrounding Communities," *Journal of Epidemiology and Community Health* 24-30.
- Fischhoff, B. (1977), "Cost Benefit Analysis and the Art of Motorcycle Maintenance," *Policy Sciences* 8, 177-202.
- French, S., Bedford, T. and Atherton, E. (2005), "Supporting ALARP decision-making by cost benefit analysis and multi-attribute utility theory," *Journal of Risk Research* 8, 207-223.
- Howard, R. (1980), "An Assessment of Decision Analysis," *Operations Research* 28, 4-27.
- Okrent, D. (1980), "Comment on Societal Risk," *Science* Vol. 208, 372-375.
- Pollak, R. (1998), "Imagined Risks and Cost-Benefit Analysis," *AEA Papers and Proceedings* 88, 2, 376-380.
- Rhoads, S. (1978), "How Much Should We Spend to Save a Life," *The Public Interest* 51, 74-92.
- Slovic, P., Fischhoff, B., and Lichtenstein, S. (1979), "Weighing the Risks," *Environment* 21, 17-20 and 32-38.
- Tengs, T., Adams, M., Pliskin, J., Safran, D., Siegel, J., Weinstein, M., and Graham, J. (1995), "Five-hundred Life-saving Interventions and Their Cost-effectiveness," *Risk Analysis* 15, 369-390.
- Zimmerman, R. (1997), "Environmental Justice," *Fundamentals of Risk Analysis and Risk Management* 281-291.

**17. week: The economics of catastrophes**

- Epstein, R.A. (1996), "Catastrophic Responses to Catastrophic Risks," *Journal of Risk and Uncertainty* 12, 287-308.
- Gjerde, J., Grepperud, S., and Kverndokk, S. (1999), "Optimal Climate Policy Under the Possibility of a Catastrophe," *Resource and Energy Economics* 21, 289-317.
- Noll, R.G. (1996), "The Complex Politics of Catastrophe Economics," *Journal of Risk and Uncertainty* 12, 141-146.
- Priest, G.L. (1996), "The Government, the Market, and the Problem of Catastrophic Loss," *Journal of Risk and Uncertainty* 12, 219-237.
- Zeckhauser, R. (1996), "The Economics of Catastrophes," *Journal of Risk and Uncertainty* 12, 113-140.

**18. week: Societal stability, crime, war**

- Clausewitz, C.V. (1832), *On War*, Princeton University Press, 1984.

- Hausken, K. (2004), "Mutual Raiding and the Emergence of Exchange," *Economic Inquiry* 42, 4, 572-586.
- Hausken, K. (2006), "The Stability of Anarchy and Breakdown of Production," *Defence and Peace Economics* 17, 6, 589-603.
- Hausken, K. and Moxnes, J.F. (2000), "The Microfoundations of the Lanchester War Equations," *Military Operations Research* 5, 3, 79-99.
- Hausken, K. and Moxnes, J.F. (2001), "Behaviorist Stochastic Modeling of Instrumental Learning," *Behavioural Processes* 56, 2, 121-129.
- Hausken, K. and Moxnes, J.F. (2002), "Stochastic Conditional and Unconditional Warfare," *European Journal of Operational Research* 140, 1, 61-87.
- Hausken, K. and Moxnes, J.F. (2005c), "Approximations and Empirics for Stochastic War Equations," *Naval Research Logistics* 52, 682-700.
- Hausken, K. and Moxnes, J.F. (2005d), "The Dynamics of Crime and Punishment," *International Journal of Modern Physics C*, 16, 11, 1701-1732.
- Sun Tzu (-320), *The Art of War*, transl. by Griffith, S.B., Oxford University Press, 1963; (also by Clavell, J., Hodder & Stoughton, London, 1981).

### **19. week: Economic risk and safety**

- Asche, F. and Aven, T. (2004), On the economic value of safety. *Risk, Decision and Policy* 9, 253-267.
- Aven, T., Nilsen, E. and Nilsen, T. (2004), Economic risk – review and presentation of a unifying approach. *Risk Analysis* 24, 989-1006.
- Oi, W.Y. (1995), Safety at what price. *American Economic Review* 85, 67-71.
- Osmundsen, P., Aven, T. and Vinnem, J.E. (2007), Safety, economic incentives and insurance in the Norwegian petroleum industry, *Reliability Engineering and System Safety*, Forthcoming.
- Osmundsen, P., Toft, A. and Dragvik, K.A. (2006), Design of drilling contracts—Economic incentives and safety issues, *Energy Policy* 34, 15, 2324-2329

### **20. week: Production risk**

- Asche, F. and Tveterås, R. (1999), Modeling production risk with a two-step procedure. *Journal of Agricultural and Resource Economics*, 24, 424-439.
- Kumbhakar, S.C. and Tveterås, R. (2003), Risk preferences, production risk and firm heterogeneity. *Scandinavian Journal of Economics* 105, 275-293.
- Olsen, T.E. and Osmundsen, P. (2005), Sharing of endogenous risk in construction, *Journal of Economic Behavior and Organization* 58, 4, 511-526.
- Osmundsen, P. (1999), Risk sharing and incentives in Norwegian petroleum extraction, *Energy Policy* 27/99, 549-555.
- Tveterås, R. (1999), Production Risk and Productivity Growth: Some Findings for Norwegian Salmon Aquaculture, *Journal of Productivity Analysis*, 12, 161-179.
- Tveterås, R. (2000), Flexible panel data models for risky production technologies with an application to salmon aquaculture, *Econometric Reviews* 19, 367-389.

### **21. week: Risk management and society:**

- Asche, F., Osmundsen, P. and Tveterås, R. (2002), European market integration for gas? Volume flexibility and political risk, *Energy Economics* 24, 3, 249-265
- Kasperson, R.E. (1992), "The Social Amplification of Risk: Process in Developing an Integrative Framework," in Krimsky, S. and Golding D. (eds.), *Social Theories of Risk*, Praeger, Westport, 153-178.

- Nilsen, A.S and Olsen, O.E. (2005) Different strategies - equal practice? Risk assessment and management in municipalities. *Risk Management: An International Journal* 7, 37-47.
- Nilsen, A.S and Olsen, O.E. (2004) Universal and contextual tools as a double strategy in emergency planning. *The International Journal of Emergency Management* 2, 1-2, 81-97.
- Olsen, O.E, Kruke, B.I. and Hovden, J. (2005) Societal safety – Concepts, borders and dilemmas. Ms.
- Ruckelshaus, W.D. (1985), “Risk, Science and Democracy,” *Issues in Science and Technology* 1(3), 19-38.
- Sclove, R. (1982), “Decision-Making in a Democracy,” *Bulletin of the Atomic Scientists* 38, 5, 44-50.
- Slovic, P., Flynn, J., and Layman, M. (1991), “Perceived Risk, Trust, and the Politics of Nuclear Waste,” *Science* 254, 1603-1607.
- Weart, S. (1991), “Images of Nuclear Energy: Why People Feel the Way They Do,” *IAEA Bulletin* 33:33, 30-36.

### **22. week: Mechanisms for risk management:**

- Apostolakis, G. and Pickett, S. (1998), “Deliberation: Integrating Analytical Results into Environmental Decisions Involving Multiple Stakeholders,” *Risk Analysis* 621-634.
- Covello, V.T. and Mumpower, J. (1985), “Risk Analysis and Risk Management: An historical perspective,” *Risk Analysis* 5, 2, 103-120.
- Johnson, B. and Slovic, P. (1994), “‘Improving’ Risk Communication and Risk Management: Legislated Solutions or Legislated Disasters?,” *Risk Analysis* 905-906.
- Lynn, F. and Busenberg, G. (1995), “Citizen Advisory Committees and Environmental Policy: What We Know, What’s Left to Discover,” *Risk Analysis* 147-162.
- Rasmussen, J. (1997), “Risk management in a dynamic society,” *Safety Science* 27, 183-213.
- Solow, R. (1971), “The Economist's Approach to Pollution and Its Control,” *Science* 173, 498-503.

### **23. week: Risk and project management**

- Aven, E., Løvås, K. and Osmundsen, P. (2006), Risk management versus incentives. *International Journal of Global Energy Issues*, 26, 1-2, 158-169.
- Emhjellen, M., Hausken, K., and Osmundsen, P. (2006), “The Choice of Strategic Core - Impact of Financial Volume,” *International Journal of Global Energy Issues* 26, 1/2, 136-157.
- Osmundsen, P., Emhjellen, K. and Emhjellen, M. (2003), Cost overruns and cost estimation in the North Sea, *Project Management Journal* 34, 23-29.
- Sandøy, M., Aven, T. and Ford, D. (2005), On integrating risk perspectives in project management. *Risk Management: an International Journal* 7, 7-21.

### **24. week: Frameworks for risk management**

- Aven T. (2005), A unified framework for risk and vulnerability analysis and management covering both safety and security, Ms.
- Aven, T., Asche, F., Lindøe, P., Toft, A., Wiencke, H.S., (2005), A framework for decision support on HSE regulations. Paper presented at SRA Europe, Italy, September 2005.
- Aven, T., Vinnem, J.E., and Wiencke, H.S. (2007), A decision framework for risk management, with application to the offshore oil and gas industry, *Reliability Engineering and System Safety* 92, 4, 433-448.

- Kristensen, V., Aven, T. and Ford, D. (2006), A new perspective on Renn and Klinke's approach to risk evaluation and management, *Reliability Engineering & System Safety* 91, 4, 421-432.
- Aven, T. and Kristensen, V. (2005), Perspectives on risk: review and discussion of the basis for establishing a unified and holistic approach, *Reliability Engineering & System Safety* 90, 1, 1-14.
- Renn, O. and Klinke, A. (2002), A New approach to risk evaluation and management: Risk-based precaution-based and discourse-based strategies. *Risk Analysis* 22, 1071-1094.

### **25. week: Risk analysis, perspectives, and risk acceptance criteria**

- Aven, T. and Kørte, J. (2003), On the use of risk and decision analysis to support decision-making, *Reliability Engineering and System Safety* 79, 3, 1 289-299.
- Nilsen, T. and T. Aven, T. (2003), Models and model uncertainty in the context of risk analysis, *Reliability Engineering and System Safety*, 79, 3, 1, 309-317.
- Aven, T. and Kvaløy, J.T. (2002), Implementing the Bayesian paradigm in risk analysis, *Reliability Engineering and System Safety* 78, 2, 195-201.
- Apeland, S., Aven, T., and Nilsen, T. (2002), Quantifying uncertainty under a predictive, epistemic approach to risk analysis, *Reliability Engineering and System Safety* 75, 1, 93-102.
- Aven, T. and Kristensen, V. (2005), Perspectives on risk – Review and discussion of the basis for establishing a unified and holistic approach. *Reliability Engineering and System Safety* 90,1-14.
- Aven, T. and Vinnem, J.E. (2005), On the use of risk acceptance criteria in the offshore oil and gas industry. *Reliability Engineering and System Safety*, 90, 15-24.

### **26. week: The philosophy of reliability and risk analysis**

- Aven, T. and K. Pörn, (1998), “Expressing and interpreting the results of quantitative risk analyses. Review and discussion?” *Reliability Engineering and System Safety* 61, 3-10.
- Singpurwalla, N.D. (1988), “Foundational issues in reliability and risk analysis,” *SIAM Review* 30, 2, 264-282.
- Vatn, J. (1998), “A discussion of the acceptable risk problem,” *Reliability Engineering and System Safety* 61, 11-19.
- Watson, S.R. (1994), “The meaning of probability in probabilistic safety analysis,” *Reliability Engineering and System Safety* 45, 261-269.
- Watson, S.R. (1995), “Response to Yellman & Murray’s comment on ‘The meaning of probability in probabilistic safety analysis,’” *Reliability Engineering and System Safety*, 49, 207-209.

### **27. week: Perceptions of risk and risk reduction**

- Andersson, K., Drottz-Sjöberg, B.-M., Espejo, R., Fleming, P. A., & Wene, C.-O. (2006). Models of transparency and accountability in the biotech age. *Bulletin of Science, Technology & Society*, 26, 46-56.
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