電気通信大学　平成17年度シラバス

授業科目名	コミュニケーションシステム設計論特論		
英文授業科目名	Advanced Lectures on Emergent Communication Systems Design		
開講年度	2005年度	開講年次	
開講学期	前学期	開講コース・課程	博士前期・後期課程
授業の方法		単位数	2
科目区分	電気通信学研究科-人間コミュニケーション学専攻-専門科目		
開講学科・専攻	人間コミュニケーション学専攻		
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【主題および達成目標】

Ranging from biological organisms to human organizations to today ’ s highly intricate communication networks, “ complex systems ”, or systems made of many interacting discrete parts, often show quite unexpected global behavior that emerges solely out of their local interactions. Such emergent behavior arises with no central control over the whole system, and rarely allows a simple explanation based on causality, optimality or procedural derivation. These properties make it hard to “ design ” such systems for a specific purpose using well-accepted design principles in traditional engineering.

This course aims to help students gain basic knowledge and insight about dynamics and consequences of such emergent phenomena in complex systems, learn possible approaches to designing and managing such complex systems, and attempt to apply them to real-world problems found in our everyday life.

【前もって履修しておくべき科目】

No strict prerequisites specified.

【前もって履修しておくことが望ましい科目】

Basic knowledge about linear algebra, calculus, probability, and computer programming skills desirable.

【教科書等】

Papers and handouts will be distributed as needed.

Suggested references (purchase not required):
Bar-Yam, Y. “ Making Things Work -- Solving Complex Problems in a Complex World ” (prepublication edution, NECSI Knowledge Press, 2004)

Barabasi, A.-L.“ Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life ”(reissue edition, Plume, 2003)

【授業内容とその進め方】

The first half of the course will be lectures introducing several key concepts of complex systems and typical examples, each followed by a short quiz and a free discussion on it. The topics to be covered in these lectures include:
1. Relationships between parts and wholes: Emergence, self-organization, pattern formation
2. Interdependence: Breakdown of reductionism, sensitivity, chaos, inefficacy of “ causality ”
3. Networks: Connectivity, robustness, dynamic responses
4. Collective behavior: Swarming, cooperation, competition
5. Interaction with environment: Adaptation, evolution
6. Designing complex systems: Collaborative / distributed / evolutionary approaches

The second half will be group work of collaborative problem solving on several selected real-life issues. Students are encouraged to suggest topics for this. Groups will be formed firstly at random, and may be re-organized during the classes to promote cross-fertilization of different ideas among the students. Discussions will aim to obtain a potentially better “ design ” of the topical systems and a “ roadmap ” toward that, based on scientific thinking, modeling and analysis of complex systems. Some possible topics might be:
1. Network use and abuse in society
2. Decision-making in human organizations
3. Problems in educational systems
4. Mass media and cultural trends
5. Competition and cooperation in sports
6. Dominance of English and linguistic diversity

Each topic will be announced at the end of a previous class so that students can have enough time by the next class to gather necessary information and put together their thoughts about the assigned topic: “ What are the problems to be addressed? ”, “ What are the dynamics underlying those problems? ”, “ What kind of solution would be possible and how would it improve the situation? ”, etc.

At the end of the course, a final exam will be carried out in a format of homework assignment.

【成績評価方法及び評価基準(最低達成基準を含む)】

Assessment will take into account responses to short quizzes, participation in class discussions, final exam, and attendance rate at the score proportion of 20%, 40%, 30%, and 10%, respectively.

【オフィスアワー：授業相談】

Students are welcome at any time (advance appointment needed).

【学生へのメッセージ】

This course is planned to be taught in English. International students are strongly encouraged to attend and participate in discussions.

The subjects covered in this course will range quite widely so that it is likely for students to face some unfamiliar terms and concepts. They are encouraged to freely ask any elementary questions at any time during lectures or discussions.

The format and materials of this course have been thoroughly renovated since last year, and therefore many pieces of this course are still at an experimental stage. Any suggestions, comments and/or constructive criticisms from participating students would be highly appreciated.

【その他】