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CS499 - Syllabus

1. Course Description

Inspired by empirical studies of networked systems such as the Internet, social networks, and bio- logical networks, researchers have in recent years developed a variety of techniques and models to help us understand or predict the behavior of these systems. In this directed study we review developments in this field, including such concepts as the small-world effect, degree distributions, clustering, network correlations, random graph models, models of network growth and preferential attachment, and dynamical processes taking place on networks.

2. Learning Outcomes

On successful completion of this course unit you will:

- Be familiar with developments in the field of complex networks
- Be familiar with concepts, theory and practice of complex networks

- Learn how to critique a paper
- Be knowledgeable about the presentation of academic research themes
- Be exposed to academic writing for conferences

3. Topics

I. Types of networks and other resources

II. Networks in the real world

- A. Social networks
- B. Information networks
- C. Technological networks
- D. Biological networks

III. Properties of networks

- A. The small-world effect
- B. Transitivity or clustering
- C. Degree distributions
- D. Network resilience
- E. Mixing patterns
- F. Degree correlations
- G. Community structure
- H. Network navigation
- I. Other network properties

IV. Random graphs

- A. Poisson random graphs
- B. Generalized random graphs

V. Exponential random graphs and Markov graphs

VI. The small-world model

- A. Clustering coefficient
- B. Degree distribution
- C. Average path length

VII. Models of network growth

- A. Price's model
- B. The model of Barabasi and Albert
- C. Generalizations of the Barabasi-Albert model
- D. Other growth models
- E. Vertex copying models

VIII. Processes taking place on networks

- A. Percolation theory and network resilience
- B. Epidemiological processes
- C. Search on networks
- D. Phase transitions on networks
- E. Other processes on networks

4. Textbooks

There is no text book for this study. A number of research papers will be used.

5. General Information

Classroom: *Henry Hall - H121* **Instructor:** *Dr. Martins*	**Email:** *pmartins@chaminade.edu* **Office Hours:** T, Th 3-4 pm
Office Number: ***Keiffer #26***	**Web:** **http://cs.chaminade.edu/faculty/pmartins/**
Telephone: *(808) 739-4601*	**Fax:** *(808) 440-4249*

6. Evaluation

Evaluation	# Points	Tentative Dates
First test (T1)	10	
Second test (T2)	10	
Third test (T3)	10	
Final exam (T4)	10	See Deadlines
1st Assignment (A1)	15	
2nd Assignment (A2)	15	
Quizzes (QZ)	30	

- The final grade (FG) will be determined as follows: FG = (T1+T2+T3+T4)*10 +30* Qn+10* (A1 + A2).
- For example, a student that obtained 10 points in the first test, 10 in the second test, 10 in the third test, a total of 7 points in the final exam, 30 in the quizzes, 10 in the first assignment, 14 in the second assignment, will accumulate a total of 91 points (meaning a final grade A).
- Quizzes will be the mean average of all quizzes taken, scaled at 30%. It can be calculated as QZ = 3 * (Q1 + Q2 + Q3 +...Qn)/n, where n is the total number of quizzes in this course. Each quiz will be graded in a scale from 0-10.
- For example, if there are five quizzes, then QZ = 3*(Q1 + Q2 + Q3 + Q4 + Q5)/5.

- The final exam is **comprehensive.**

Special Rules and Other Notes:

1. The lowest grade **midterm test** (i.e. T1, T2 or T3) will be replaced by the final examination (T4), if and only if the final examination grade is greater than the lowest grade test.

   This rule is based on the fact that the final examination is comprehensive, and is intended to motivate students who do not perform well on earlier exams to persevere and overcome those setbacks by further study. It also solves the problem of occasional emergencies which may cause a student to miss a midterm examination.

7. Grading

Grade	Interpretation	Points
A	Unusual degree of intellectual initiative.	90-100
B	Superior work done in a consistent and intellectual manner.	80-89
C	Average grade indicating a competent grasp of subject matter.	70-79
D	Inferior work of the lowest passing grade, not satisfactory for fulfillment of prerequisite course work.	60-69
F	Failed to grasp the minimum subject matter; no credits given.	00-59

8. Students Rights & Responsibilities

Please refer to the student rights and responsibilities in the Student Handbook.

9. Attendance

Experience has shown a high correlation between absenteeism and low grades. Role will be taken at each class. Attendance will be weighed in determining your final grade. Students are expected to attend all classes. If

a student misses class, it will have the following adverse effect on his/her grade:

- Grade lowered by one grade if 7 times absent.
- Student will be withdrawn from the course, or take a grade of "F," if 10 or more times absent.

10. Quizzes

Pop quiz may be given at any time without advance announcement, if I get the impression students are not keeping up with the course. There will be no make-ups for quizzes, but the same forgiveness rule applies as for attendance.

11. Communication

If you are experiencing difficulty or are concerned about your progress, please contact me right away. Problems are usually easier to solve when they are addressed early.

You are required to verify that your e-mail address is included in the class e-mail list. I will send everyone a message at the start of the term. If you don't get that first message, make sure you are added to the list.

Check regularly for electronic mail sent to you containing information about this course. You are also encouraged to use e-mail to ask questions and report problems. As a Chaminade student you have an email account firstInitial.LastName@student.chaminade.edu.

Please use acronyms in all forms of electronic communication.

Because of past problems with impersonation, I cannot reply to e-mails related to this course from other e-mail addresses.

This syllabus and other information, such as course announcements, assignments, lecture notes, and some useful links to other web sites, will be posted on the CS Department's web site for the course, which is located at http://cs.chaminade.edu/faculty/pmartins. Access to most of the materials on that site will require a special login

name and password, which I will provide to you via e-mail.

12. Punctuality

Students. Punctuality will also be weighed in determining your final grade. Students are expected to be on time for class. If a student is late to class (15 minutes or more) or leaves class early (15 minutes or more) , it will have the following adverse effect on his/her grade:

- Grade lowered by one grade if 7 times late or leaving class early.
- Student will be withdrawn from the course, or take a grade of "F," if 14 or more times leaving class late or early.

Faculty. I am normally punctual with classes. If in any circumstance I do not show up punctually, then you are expected to wait 15 minutes before considering the class cancelled and leaving.

A good time reference is the official U.S. time.

13. Exams

Missed exams will not be covered with extra exams or make up exams. A missed midterm will be replaced by the final exam.

Students are not allowed to do exams before or after the set date. You know the date of all your exams, therefore it is expected that you organize your trips around these dates.

Upon receiving your graded exam you should check for any discrepancies. Complaints will not be accepted after you leave the classroom or if the exam was originally written using a pencil. If a discrepancy is found the entire exam will be revised and not only the problem found. A revision of an exam may increase or lower your grade.

You always have the entire class time to answer the exam. You should not expect any extension to this time.

Students are expected to do their own exam. Copying from each other or from published sources is prohibited. The penalty for copying on tests, exams or quizzes, or (also for sharing information about your test on a testing scenario) is:

- A zero mark for that item of evaluation (exam, quiz, etc), OR

- An F for the entire course.

See also *Guidelines for taking AN EXAM*.

14. Assignments

All assignments are due on the day indicated on them and must be turned in as specified. *Do not expect forgiveness for lateness. Whether to accept any late turn-ins of assignments will be entirely at my discretion.* If a late assignment is accepted, the score will ordinarily be reduced. The amount of the reduction will be entirely at my discretion, and may depend on how late the assignment is. In any case, no work will be accepted for grading after a solution is discussed or handed out, either in the class or on the web. Late submissions without a substantial reason such as illness will generally be subject to penalties as follows:

- Same day as due but after desired time.....03%
- Next day.....10%
- Two to four days:.....20%
- Five days or more:.....30%

There are certain expectations concerning the format and substance of assignments. They will be assessed based on the following criteria:

- Comprehensiveness. Elaborate as much as you can on the issues or topics raised. Avoid giving short or incomplete answers.

- Originality. When formulating your answers, use your creativity (your own words, statements, programs etc...) i.e. avoid paraphrasing the text book.

- Correction. Needless to say, the ideal answer will be correct from a logical viewpoint.

- Organization. The structure, organization and clarity of the material that you present (program or document) is also part of the criteria for assessment and will also be considered in grading. Unless otherwise stated, only electronic document files are accepted - no handwriting please.

A major requirement of your programs is their coverage. No credit will be given for programs that cannot be compiled or that do not work on any of the test cases. Beyond this, a significant portion of the credit will be determined by how many of the test cases, and also which of them, your program handles correctly.

Plagiarism. While informal discussion is encouraged, students are expected to do their own work. Copying from each other or from published sources is prohibited, including "cut and paste" from websites. The penalty for copying on assignments is applicable to all parties involved, i.e. those who copy an assignment and those who share an assignment labeled *"individual"*. It consists of a zero mark for that item of evaluation for the first time, and an F for the course for the second occurrence.

Backup. Always keep a backup of all assignments and quizzes that you submit during the semester, in case you need to re-submit it later on.

Notifications. Needless to say, it is your responsibility to notify your instructor as soon as possible of any events that may prevent you from doing your assignment (such as computer or application malfunctioning in one our labs, essential information missing or misrepresented in a web page and so on), so that the appropriate actions can be taken to address the problem.

15. Participation

The study of much of Computer Science is cumulative (*i.e.*, understanding earlier material well is necessary to grasp later material. Do not allow yourself to fall behind, by postponing studying, and then figure you will jump ahead to catch up with the rest of the class.

16. Remarks

- **Copies.** All graded work will be returned in class for examination and taken back for the course records. Students who miss class are responsible for picking up their papers no later than one week after the start of the next semester. Work that is not picked up by then may be discarded. The one exception are final examinations. The original copies of all final examinations will be retained in the department for six months.
- **Note.** The contents of this syllabus can be changed with advance notification;
- **Class Meetings**. For a few of the scheduled days, shown in the course calendar, there may be no regular class because I am required to travel on University business. This class time will be made up by specially scheduled class meetings (to be arranged) in which students will demonstrate their projects for me and the other students who are able to attend. These meetings will be arranged at multiple times, if necessary, so that every student can demonstrate his or her project.

- **Lab policy.** No eating or drinking in the labs. Eating or drinking in a computer based lab is considered obstruction of teaching, administration. Determination of whether a student is being obstructive or disruptive is left to the sole discretion of the faculty responsible for the class or activity.