Application for New Course

1. Submitted by the College of Engineering Date: August 1, 2000
   Department/Division offering the course: Computer Science

2. Proposed designation and Bulletin description of this course:
   (a) Prefix & Number: CS 671
   (b) Full Title: Advanced Computer Networks
       Abbreviated Title (≤ 24 characters): Advanced Comp Networks
   (c) Lecture/Discussion hours per week: 3
   (d) Laboratory hours per week: 0
   (e) Studio hours per week: 0
   (f) Credits: 3
   (g) Course description:
       This course is intended to provide students with a solid understanding of the state of the art in computer network systems and protocols. Topics are covered in some depth, including both abstract and concrete aspects. The course begins with a study of implementations of the current Internet Protocols (TCP, UDP and IP); this provides a concrete backdrop for the rest of the course. The emphasis is on learning by doing, with programming and other hands-on assignments associated with most topics.
   (h) Prerequisites (if any): CS 571 or consent of instructor.
   (i) May be repeated to a maximum of: Not applicable

3. To be cross listed as: Not applicable
   Signature of cross-listing chair: _______________________________

5. Effective date: Fall 2001

6. Course to be offered: Fall Spring Summer

7. Will the course be offered annually; explain if not: Yes

8. Why is the course needed? Networking is increasing in importance in the world as well as computer science. The first Computer Networks course (CS 571) supplies a foundational knowledge of the principles and current engineering practices, including implementing simple protocols. This course builds on that foundation, dealing with deeper topics such as high-performance algorithms and implementations, network security, networking for multimedia, and the design of future advanced Internet services.

9. (a) By whom will the course be taught? Ken Calvert
    (b) Are facilities for teaching this course now available? Yes
        If not, what plans have been made for providing them?
10. What enrollment may reasonably be expected? 25

11. Will this course serve students in the Department primarily? Yes
   Will it be of service to a significant number of students outside the Department? No
   If yes, under what area?

12. Check the category most applicable to this course:
   □ traditional; offered in corresponding departments elsewhere;
   X relatively new, now being widely established;
   □ not yet found in many (or any) other universities

13. Is this course part of a new proposed program? No
   If yes, which?

14. Will adding this course change the degree requirements in any programs? No
   If yes, explain:

15. Attach a list of the major teaching objectives of the proposed course and outline
   and/or a reference list to be used: See attached

16. If the course is a 100-200 level course, please submit evidence (e.g., correspondence)
   that the Community College System has been consulted.
   not applicable

17. Within the Department, who should be contacted for further information about the
   proposed course?
   Name: Ken Calvert or Jim Griffioen    Phone: 257-6745/257-6746

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1Approval of this course will constitute approval of the program change unless other program modifications are proposed.
Signatures of Approval:

Department Chair:  
Dean of the College:  
Date of Notice to the Faculty:  
Undergraduate Council\textsuperscript{2}:  
University Studies\textsuperscript{2}:  
Graduate Council\textsuperscript{2}:  
Senate Council\textsuperscript{2}:  
Date of Notice to the University Senate:  

Action other than approval:  

\textsuperscript{2}If applicable, as provided by the Rules of the University Senate
**Needed Skills**
A basic understanding of computer networks and Internet Protocols (e.g., CS 571). Moderate to advanced programming skills are required. Ability to think abstractly and analytically about network systems. Mathematical background needed (calculus) to understand basic queueing theory.

**Learning Outcomes**
Students will gain a thorough understanding of the design of modern computer networks and protocols, including the Internet. They will understand the workings of at least one actual TCP/IP protocol stack, and will be able to apply this understanding in modifying it or implementing additional protocols.

**Week by Week Course Outline**

<table>
<thead>
<tr>
<th>Week</th>
<th>Activities</th>
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<tbody>
<tr>
<td>1</td>
<td>TCP/IP Implementation Overview.</td>
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<tr>
<td></td>
<td>IP Code Walkthrough.</td>
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<tr>
<td>2</td>
<td>UDP/TCP Code Walkthrough.</td>
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<tr>
<td>3</td>
<td>TCP Implementation Walkthrough.</td>
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<tr>
<td>4</td>
<td>Simple Queueing Theory.</td>
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<tr>
<td>5-6</td>
<td>Modeling Networks. Network Simulation Tools.</td>
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<tr>
<td>7</td>
<td>Multimedia Applications. Digital audio and video.</td>
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<tr>
<td>8</td>
<td>High-Speed, Integrated Services Networks. ATM, Label Switching.</td>
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<tr>
<td>9-10</td>
<td>Mechanisms and protocols for QoS.</td>
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<tr>
<td>11</td>
<td>Multicast Routing Protocols.</td>
</tr>
<tr>
<td>12</td>
<td>Web Performance Issues.</td>
</tr>
<tr>
<td>13-14</td>
<td>Various Topics: ALF, ILP.</td>
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</table>

**Examinations and Grading**
Exact details about examinations and grading will be determined by the instructor offering the course. Typically the emphasis in this advanced course will be on projects more than examinations. There may be a comprehensive final. Specific details will be made available in the syllabus at the start of each semester in which the course is offered.

**Possible Textbooks**
G. Wright and W. Stevens, TCP/IP Illustrated, Volume 2, Addison-Wesley, 1996.
(The text will be supplemented extensively with readings from the literature.)
Grading

Exact details about the types and numbers of assignments and their effect on the student's final grade will be determined by the instructor and will be fully specified in the syllabus at the first class meeting. The student's grade in the course will typically be determined by a weighted average of homework assignments, programming projects, examinations, and research report, with an emphasis on programming projects.

An example of a typical weighting is:

Homework: 10%
Programming projects: 40%
Research Report: 20%
Comprehensive Final Examination: 30%