

Electrical Eng

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PROPOSAL NUMBER: 99- 415

CURRICULUM PROPOSAL FORM

*DEADLINES:

REGULAR COURSE PROPOSALS: OCTOBER 23, 1998 FOR FALL, 1999 AND FEBRUARY 19, 1999 FOR SPRING, 2000
SHORT-TERM COURSE PROPOSALS: DECEMBER 11, 1998 FOR FALL, 1999 AND MARCH 26, 1998 FOR SPRING 2000

PROPOSAL TITLE: BACKPLANE DESIGN
SPONSOR/S: J. SCHMALTZ & ECE CURR. COMM.
DEPARTMENT: ENGINEERING 0909.481

CHECK ALL THAT APPLY:
 UNDERGRADUATE _____ GRADUATE
COLLEGE: ENGINEERING
If LAS: _____ History/Humanities
_____ Math/Sciences
_____ Social/Behavioral Sciences

TYPE OF PROPOSAL (Check ALL that Apply)
_____ General Education
_____ New Course in _____ Bank
_____ Existing course, Add To _____ Bank
_____ Multicultural/Global Designation
_____ Writing Intensive Designation
_____ New Minor/Concentration/Specialization
_____ New Major/Degree Program
_____ Short Term Course Proposal
 New Course (NOT Gen. Ed.)
_____ Name Change (Dept., School, Major)
_____ Changes in Degree Requirements
_____ Changes Involve Gen. Ed. requirements
_____ Minor Changes to Existing Courses
_____ Course is NOT General Education
_____ Course IS General Education

DEPARTMENT (SIGNATURE INDICATES APPROVAL)
Ravi Prabh Ramachandran 03/09/99
DEPT. CURRICULUM CHAIR / DATE
[Signature] 06/04/99
DEPT. CHAIRPERSON / DATE

COLLEGE CURRICULUM COMMITTEE
DATE OF OPEN HEARING (if necessary) _____
 APPROVED
_____ NOT APPROVED
Comments:
Peter P. Herforth 4/20/99
SIGNATURE DATE

ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)
_____ APPROVED
_____ NOT APPROVED
Comments:
[Signature] 3/2/99
SIGNATURE (Academic Dean) DATE
SIGNATURE (Graduate Dean) DATE

UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) 4/30/99 (college level)

APPROVED
 NOT APPROVED

Comments:

Final Review 5/7/99
SIGNATURE DATE

SENATE

Date announced at Senate 5/30/99

Voted upon at Senate: _____ Approved _____ Not Approved _____ Date: _____

EXECUTIVE VICE PRESIDENT/PROVOST

APPROVED
 NOT APPROVED If no, reasons are as follows:

STUDENT CREDIT HOURS _____ FACULTY LOAD HOURS _____ EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE): _____

DATE/SIGNATURE EXECUTIVE VICE PRESIDENT/PROVOST CJM 5/26/99

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED _____

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED 0909.481

DATE/SIGNATURE OF REGISTRAR Robert A. Kubat 7/6/99

NOTIFICATION FORWARD:

- SENATE CURRICULUM COMMITTEE CHAIRPERSON
- DEPARTMENT CHAIRPERSONS
- ACADEMIC DEAN(S)
- REGISTRAR
- SPONSOR(S)

Course Proposal

1. Details:

- | | |
|---|---|
| a) Course Title: | Backplane Design (0909.481) |
| b) Sponsor: | Dr. John L. Schmalzel, Electrical and Computer Engineering (ECE) and ECE Curriculum Committee |
| c) Credit Hours: | 3 credit hours |
| d) Course Level: | Undergraduate (UG) |
| e) Curricular Effect: | Elective course for UG students |
| f) Prerequisites: | Digital hardware background including VHDL |
| g) Suggested Time/
Scale of Implementation | Permission of Instructor
Fall 1999 and beyond
One section |
| h) Resources | No additional faculty are needed to meet this requirement. Laboratory equipment will be obtained consistent with College of Engineering multi-year budget. No additional library acquisitions will be required. |

2. Rationale:

The proposed course is a revision to part of the Engineering Curriculum Proposal approved by the College Senate in December, 1994. The proposed course is consistent with the establishment of the School of Engineering approved by the Board of Trustees in February, 1995.

Backplanes support modern computing and instrumentation systems. This is a very active area of technology development because many system performance issues are ultimately resolved by selecting an appropriate backplane architecture or optimizing the performance of elements designed to work with a previously selected backplane. While the major emphasis of this course will be on short-run buses (i.e., "in the box"), the continued development of high-speed serial buses intended to operate over relatively long distances (i.e., "out of the box") can't be ignored since they pose direct competition.

3. Essence of the Course:

a) Objectives:

The proposed course has a number of objectives:

- (i) Provide a working knowledge of fundamental backplane terms and concepts; e.g., bandwidth, control methods, parallel vs. serial buses, analog vs. digital backplanes.
- (ii) Provide an overview of backplane architectures. Survey representative backplanes paying particular attention to current and proposed standards.
- (iii) Introduce modeling and measurement tools appropriate to backplane design.
- (iv) Provide opportunities to apply didactic principles in a representative bus interface design application.

b) Topical Outline:

The content of the course will be designed to reflect current practice.

- Backplane architecture. Introduce basic definitions and features of backplanes.
- Backplane elements. Examine several current backplane technologies. For example, PCI bus, IEEE 1394, VMEbus, IEEE-488, SCSI, VXIbus, etc. Compare performances of competing backplane technologies and examine interfacing techniques. Examine bus master/slave hierarchies.
- Modeling and analysis tools. Introduce the modeling tools needed to support backplane analysis and synthesis. Emphasize the use of VHDL as the modeling suite useful for implementing backplane interfaces as well as simulating the necessary test vectors. Introduce the use of protocol analyzers for representative backplanes. Incorporate logic analysis equipment as in situ measurement tools for examining real-time bus operations.
- Applications. Solve a representative backplane design problem(s).

c) Evaluation and Grading Procedures:

Student grades will be based on projects, examinations, homework, and written and oral technical communication. Graduate students enrolled in the course will perform additional assignments (e.g., perform research into additional backplane structures) and will be expected to implement significantly more complex applications.

d) Course Evaluation:

The proposed course will be evaluated based on student evaluations and critical review by engineering faculty.

e) Texts:

Currently, no definitive texts exist in this topic area that adequately survey many backplane architectures. Representative books include several titles by D. Anderson:

T. Shanley and D. Anderson, *PCI System Architecture*, Addison-Wesley, ISBN 0201309742, 1999.

D. Anderson, *USB System Architecture*, Addison-Wesley, ISBN 0201461374, 1997.

D. Anderson, J. Wsindel, T. Shanley, *ISA System Architecture*, Addison-Wesley, ISBN 0201409968, 1995.

Another possible title is J. Black's book:

J. Black, *The System Engineer's Handbook: A Guide to Building VMEbus and VXIbus Systems*. Academic Press, ISBN 0121028208, 1992.

In addition, there are standards published for all major backplane interfaces. For example: (Anonymous) *IEEE Std 1155-1992: IEEE Standard for VMEbus Extensions for Instrumentation*.

The best approach will be to adopt a book that covers a widely-used, powerful backplane, such as PCI. Then the course will be complemented by course notes derived from backplane product vendors. Prior experience with using a published standard (e.g., IEEE 1155-1992 for VXIbus) suggests that it can complement a course, but it is difficult to base an entire course on a single standard.

4. Results of Consultations:

a) Consulted Departments: Computer Science.

b) Consultants and Consultant Statements:

c) Written Consultations:

5. Additional Supporting Information:

6. Catalog Description:

TITLE: Backplane Design

The course provides an overview of backplane design for a variety of digital systems. It surveys current technologies with treatment of emerging and updated standards. Methods of analysis, synthesis, and verification of backplane systems are presented. The course is complemented with project work for typical applications.

Prerequisite: Digital hardware background that includes VHDL--**Permission of Instructor**