

Through partial funding from NSF, CLASS-I is now equipped with additional UNIX-based virtual reality instruments, including a graphic supercomputer Onyx Reality Engine2 from Silicon Graphics.

The CLASS-III houses advanced software and a construction documents library, which includes a large body of safety-and-accident and failure-related literature. In addition, access through the on-line computer network with libraries nationwide is available. The CLASS is furnished with large office space for graduate students to conduct research and perform simulation studies.

The flagship University computer facility is the Ohio Supercomputer Center located on campus. This facility principally supports research computing. The University also provides a Homenet environment that gives students access to a variety of computer resources on campus, in Ohio, and on the Internet. In addition, the department maintains specialized facilities to address the needs of our programs. The facilities are under the auspices of the College of Engineering Region 1, which is supported, in part, by a University computer fee. The physical facility consists of 150 PCs and 25 SGI workstations. Students have 24-hour, 7 days a week access. Some are available on a walk-in basis; others provide studio settings for advanced users. At least 35 software packages are available including the Microsoft Office suite, AutoCAD, 3D Studio, various GIS and image processing packages, and ProEngineer. Many faculty also maintain dedicated computer facilities to support research.

## FACULTY

**Mireille Battikha, Ph.D. University of British Columbia, Visiting Assistant Professor** (construction engineering/management w/specific expertise in quality management, delay analysis, and information technology).

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**Josann Duane, Ph.D. The Ohio State University, Assistant Professor** (Spatial Mapping, 4<sup>th</sup> Dimensional graphics).

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**Fabian C. Hadipriono. Ph.D. University of California, Berkeley, Professor** (construction performance, safety, and simulation using virtual reality techniques; risk; reliability and knowledge engineering); Director of Construction Laboratory for Automation and System Simulation (CLASS) Construction Engineering and Management course are regularly supplemented with special lectures by industry professionals. These have included experts from architectural and engineering companies.

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## COURSE OFFERINGS

CE 681	Construction Methods, Equipment, & Performance
CE 682	Faults, Failures, & Forensics in Construction
CE 684	Construction Network Analysis
CE 685	Deterministic Construction Estimating & Pricing
CE 686	Construction Contracts & Claims
CE 687	Construction Project Administration
CE 781	Construction Risk & Decision Analysis
CE 788	Computer-Aided Construction Automation & Simulation
CE 881	Advanced Computer-Aided Construction Automation & Simulation
CE 882	Probabilistic Construction
CE 883	Design of Construction Operations
CE 884	Construction Forensics
CE 888	Event Tree, Fault Tree, & Fuzzy Systems in Construction

Numerous graduate level courses are taught by other CE faculty members, some of which are important for construction students. These areas include: structures, transportation, soil mechanics, hydraulics, and remote sensing.

Depending on the student's interest, additional courses may be found in other departments: computer related courses from CIS, urban planning courses from City & Regional Planning, operations research in Industrial & Systems Engineering, and geographical information system courses from Geography. Students pursuing a graduate degree in construction are encouraged to get a broad background in management in addition to the above listed fields. Management related courses can be taken from Business Administration. Courses typically taken include business management, operations planning and materials management, quality management, and the legal environment of business. In addition to the above, courses are available in several other departments such as Engineering Mechanics, Industrial & Systems Engineering, Materials Science & Engineering, Geology, Statistics, and mathematics. Graduate level course offerings for a minor field of study are also available within the department.

## Interdisciplinary Programs

The construction management program strongly supports and encourages interdisciplinary collaboration. The faculty and members of other departments cooperate to develop sets of courses that prepare graduate students to deal with interdisciplinary problems.

Architecture, Agriculture, City & Regional Planning, Sociology, and the Center for Mapping are some examples of potential partners. Generally, the need for an interdisciplinary program arises when a student chooses to work on a thesis that involves other areas. A construction might need to take some courses in ag engineering, which can be worked out with faculty from both departments. Close contacts with construction industry and other universities is encouraged.

## MINIMUM REQUIREMENTS

In addition to the general requirements of the Graduate School, there are minimum departmental requirements, listed in the general descriptive Graduate Civil Engineering Brochure, which need to be fulfilled by all students majoring in Construction Engineering and Management.

CE 882	Probabilistic Construction Estimates & Pricing	5
CE 883	Design of Construction Operations	5
CE 884	Construction Forensics	5
CE 888	Event Tree, Fault Tree, Fuzzy Systems in Construction	5
CE 831	Advanced Reinforced Concrete	5
CE 836	Advanced Matrix Analysis of Structures	5
CE 837	Advanced Structural Dynamics	5
CE 839	Finite Element Methods in Engineering Sci	5
CE 850	Advanced Seepage in permeable Materials	4
CE 851	Advanced Soil Properties	4

## TABLE A\*

CE 852	Advanced Soil Properties	4
CE 853	Advanced Civil Engineering Materials	4
CE 855	Soil-Structure Interaction	4
CE 872	Area Traffic Control	5
CE 874	Urban Transportation Network Analysis	5
CE 881	Adv Computer-Aided Construction Automation & Simulation	5
CE 885	Advanced Civil Engineering	3-5
CE 894	Group Studies in Civil Engineering	3-5
ISE 802	Operations Res Model/Methods	3
ISE 820	Human Error & Human Contribution to System Failures	3
ISE 824	Sequencing and Scheduling	3
ISE 854	Adv Simulation Design & Experimental Procedure	3

TABLE B\*\*

CE 681	Concrete Construction, Equipment & Performance	3	CIS 781	Information to 3D Image Generation	4
CE 682	Faults, Failures, Forensics in Construction	4	CIS 782	Advanced 3D Image Generation	3
CE 684	Construction Network Analysis	4	CIS 783	Geometric Modeling	3
CE 685	Deterministic Construction Estimating/Pricing	4	ISE 754	Simulation of Complex Systems	4
CE 686	Construction Contracts and Claims	4	ISE 772	Decision Analysis	3
CE 687	Construction Project Administration	4	ISE 774	Human-Computer Interaction in Complex Systems	3
CE 781	Construction Risk & Decision Analyses	5	GEOG 645	Geography of Transportation	5
CE 788	Computer-aided Construction Automation and Simulation	5	GEOG 685	Introto Geographic Information System	5
			GEOG 687	Design & Implementation of Geographic Info	5
			AG&CON540	Construction Systems	3
			AG&CON600	Agricultural Safety & Health	3

*OTHER CE COURSES*

CE 651	Soil Mechanics	4
CE 672	Traffic Engineering Studies	3
CE 693	Individual Studies	1-5
CE 694	Group Studies in Civil Engineering	1-5
CE 731	Intermediate Reinforced Concrete	4
CE 735	Matrix Structural Analysis	4
CE 736	Bridge Engineering	4
CE 737	Pre-stressed/Pre-cast Concrete Structures	4
CE 750	Seepage in Permeable Materials	4
CE 751	Principles of Foundation Analysis/Design	4
CE 753	Pavement Design and Materials	4
CE 754	Mechanical Properties of Engineering Materials	4
CE 760	Civil & Environmental Engineering Planning	5
CE 768	Introduction to Finite Element Methods	4
CE 774	Design/Operation of Road Traffic Facilities	5
CE 775	Urban Transportation Planning	4

*OTHER COURSES*

ACCT 711	Financial Accounting	4
ACCT 811	Management Accounting	3
CIS 541	Elementary Numerical Methods	3
CIS 570	File Design & Analysis	3
CIS 630	Survey of Artificial Intelligence I	3
CIS 670	Introduction to Database Systems	3
CIS 680	Data Structures	3
CIS 681	Introduction to Interactive Graphics	3
CIS 694	Group Studies	1-5
CIS 730	Survey of Artificial Intelligence II	3
CIS 731	Knowledge-based Systems	4
ISE 504	Engineering Economic Analysis	3
ISE 662	Intro to Applied Decision Analysis	3
ISE 671	Industrial Accident Prevention & Control	3
ISE 673	Cognitive Engineering	3
ISE 704	Intro to Discrete System Simulation	4

\*\*A majority of Table B credit hours should preferably be from CE courses.



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## GRADUATE STUDY in CONSTRUCTION ENGINEERING



**THE OHIO STATE UNIVERSITY**  
**Department of Civil & Environmental**  
**Engineering & Geodetic Science**



## RESEARCH

The areas of research activities of faculty and graduate students include safety of construction operations; safety of structures and infrastructures; system safety and reliability; development of improved methods for predicting time, cost, and cash flow; risk and decision analysis of construction processes; worker's training and safety; computer based planning and scheduling of construction projects; construction estimating and bidding. Several tools like fault tree analysis, fuzzy logic, expert systems, multi-media and visualization, and virtual reality—have been used to conduct research in the above areas.

Recent funded research activities of the program include: use of virtual reality techniques to simulate construction activities and construction safety; 3D modeling to address various construction activities and traffic accidents; development of an integrated computer package for analyzing cost of pavement projects; development of an expert system to diagnose construction accidents; development of a multi-media expert system for freeway incident management; development of a basic simulation and evaluation technique to evaluate agricultural water quality; development of an expert system to predict pavement treatment options; and regression models to predict pavement condition and life. Detailed information on current research activities can be obtained from Internet home page:

<http://class.eng.ohio-state.edu/>

The art Pentium-based computers equipped with multi-media/visualization peripherals, four high-capacity B/W laser and color-laser printers, Bernoulli drives, complete sets of audio-video recordings, color scanners, high-speed modems, LCD-based projectors, and virtual reality instruments (head mounted display and cyberglove).