## **Ottawa-Carleton Institute for Civil Engineering**

Mackenzie Building 277 Telephone: 788-5784 Fax: 788-3951

#### The Institute

Director of the Institute: Hiroshi Tanaka Associate Director of the Institute: K.T. Law

Established in 1984, the Institute combines the research strengths and resources of the Departments of Civil and Environmental Engineering at Carleton University and the Department of Civil Engineering at the University of Ottawa. Programs leading to master's and Ph.D. degrees are available through the Institute in a wide range of fields of civil engineering. Programs in water resources and environmental engineering, and in transportation engineering are centred at the University of Ottawa and Carleton University, respectively. Programs in geotechnical and structural engineering are available at both universities. Graduate students may pursue their research on either university campus, depending upon the choice of program and supervisor. Registration will be at the university to which the student's supervisor is affiliated. Requests for admission may be sent to the Director of the Institute.

#### **Members of the Institute**

The "home" department of each member is indicated by (C) for the Department of Civil and Environmental Engineering at Carleton University and (O) for the Department of Civil Engineering at the University of Ottawa.

Kazimierz Adamowski, Hydrology, Stochastic and Statistical Analyses (O) John Adjeleian, Structures, Building Design and

*Construction* (C), Professor Emeritus C.M. Allen,\* *Structures, Building Design and* 

Construction (C) G.E. Bauer, Geotechnical Engineering, Earth Retaining Structures, In-Situ Testing (C) Volker Barthel,\* Hydraulics (O)

J.J. Beaudoin,\* Cement Chemistry, Strength of Composite Materials (O)

\* Adjunct Professor, Adjunct Research Professor

J.P. Braaksma, Transportation, Airport Planning, Traffic Engineering, Pedestrian Circulation, Terminal Design (C) M.S. Cheung,\* Finite Element Analysis, Bridge Engineering (O) R.L. Droste, Environmental Engineering, Water and Wastewater Treatment (O) Erman Evgin, Finite Elements, Soil Plasticity, Environmental Geomechanics (O) B.H. Fellenius, Geotechnical Engineering, Deep Foundations (O) Leta Fernandez, Environmental Engineering, Agricultural Waste Management (O) N.J. Gardner, Structures, Reinforced Concrete, Earthquake Engineering, Construction Loads (O) V.K. Garga, Geotechncial Engineering, Dams, Harbours, Heavy Foundations (O) A.O. Abd El Halim, Transportation, Pavements and Materials, Geometric Design (C) G.A. Hartley, Structural Analysis, Finite Elements, Building Frame Analysis (C) N.M. Holtz, Computer-Aided Structural Engineering (C) J.L. Humar, Structures, Earthquake Engineering, Computer-Aided Design (C) W.F. Johnson,\* Urban Transportation Planning and Management (C) Deniz Karman, Environmental Engineering, Air Pollution and Control (C) S.J. Kennedy, Steel Structures, Composite Structures, Material Behaviour, Experimental Methods, Computer-Aided Structural Engineering (C) K.J. Kennedy,\* Environmental Engineering, Waste *Water Treatment* (O) A.M. Khan, Transportation, Systems Planning, Engineering and Management (C) D.T. Lau, Structural Mechanics, Earthquake Engineering, Numerical Methods and Modelling of Structures (C) K.T. Law, Geotechnical Engineering, Embankments, In-Situ Testing (C) R.R. Mayes,\* Engineering Management (C) R.M. Narbaitz, Waste Treatment (O) S.S.F. Ng, Structures, Numerical Methods, Dynamic Behaviour (O) A.G. Razaqpur, Structures, Concrete, Numerical Methods (C) Murat Saatcioglu, Building Structures, Reinforced Concrete, Earthquake Analysis and Design (O) J.J. Salinas, Building Structures, Wood Engineering, Structural Reliability (C) E.J. Schiller, Environmental Engineering, Water Supply and Irrigation (O)

A.P.S. Selvadurai,\* Geotechnical Engineering, Continuum Mechanics, Applied Mathematics (C)
T.S. Sridhar, Environmental Impact Assessment, Wastewater Treatment, Hazardous and Radioactive Waste, Pollution Control (C)
G.T. Suter, Structural Engineering, Masonry Structures (C)
O.J. Svec,\* Geomechanics, Pavement Materials, Numerical Methods (C)
Hiroshi Tanaka, Structures, Wind Engineering (O)
D.R. Townsend, Water Resource Engineering, Applied Hydraulics, River Engineering (O)
E.W. Wright,\* Structures, Computer-Aided Design

# (C)

#### **Master's Degree**

#### **Admission Requirements**

The normal requirement for admission to the master's program is a bachelor's degree with at least high honours standing in civil engineering or the subdisciplines normally considered to be civil engineering. Applications to a qualifying program will also be considered from graduates of other engineering programs or honours science programs under the following conditions:

 Graduates from engineering or honours science programs with a mathematics content equivalent to the civil engineering program will have to take a minimum of four qualifying undergraduate civil engineering courses in their area of graduate specialty;
 Graduates from other science programs will have to take all the core engineering undergraduate mathematics courses in addition to the requirements specified in (1) above.

The undergraduate courses required will be specified in the Certificate of Admission.

Undergraduate civil engineering courses will not be accepted towards a graduate degree. Graduate students may still be required to take undergraduate courses for credit to fulfil the admission requirements.

No more than one half of the program credit requirements or that stipulated in the university regulations in which the student is registered, whichever is less, can be transferred at admission. At least one half of the course work must be taken at the Institute.

#### **Program Requirements**

The requirements for course work are specified in terms of credits: one hour/week for one term. The requirements for the master's degree by thesis are:

- Equivalent of eighteen course credits
- Thesis
- Participation in the civil engineering seminar series

• Successful oral defence of the thesis The requirements for the master's degree by course work are: thirty six course credits of which a minimum of twenty four will be course credits and a minimum of six will be project credits.

#### **Doctor of Philosophy**

#### **Admission Requirements**

The normal requirement for admission into the Ph.D. program is a master's degree with thesis in civil engineering.

#### **Program Requirements**

The requirements for course work are specified in terms of credits: one credit = one hour/week for one term.

- A minimum of eighteen course credits
- Participation in the civil engineering seminar series
- Successful completion of written and oral comprehensive examinations in subject areas determined by the student's advisory committee
- Successful completion of a thesis proposal examination
- Thesis
- Successful oral defence of the thesis. The examination board for all theses will include an external examiner, and when possible, professors from both departments
- Subject to approval of his/her advisory committee, a Ph.D. student may take, or be required to take, courses in other disciplines Students who have been permitted to transfer into the Ph.D. program from a master's program without having completed the master's degree, will require thirty course credits for the Ph.D. degree which include transfer of credits from the incompleted master's program.

#### **Graduate Courses**

In all programs, the student may choose graduate courses from either university with the approval of the adviser or the advisory committee. Graduate courses are listed below, grouped by subject area. Course descriptions may be found in the departmental section of the calendar concerned. All courses are of one term duration. The codes given in parenthesis are those used by the University of Ottawa. Courses beginning with "82" are offered at Carleton University and those beginning with "83" are offered at the University of Ottawa. Not all courses listed are necessarily given during one academic year.

Geotechnical and Soils			82.524	(CVG7126)	Behaviour and Design of	
82.529	(CVG7100)	Case Studies in		× /	Structural Steel Members	
	· · · · · ·	Geotechnical Engineering	82.525	(CVG7127)	Behaviour of Elastic	
82.530	(CVG7101)	Advanced Soil		× /	Structures	
	· · · · · ·	Mechanics I	82.526	(CVG7128)	Prestressed Concrete	
82.531	(CVG7102)	Advanced Soil	82.527	(CVG7129)	Advanced Structural Design	
	(••••••••••	Mechanics II	82.528	(CVG7130)	Advanced Reinforced	
82 550	(CVG7104)	Earth Retaining Structures	021020	(0,0,100)	Concrete	
82.551	(CVG7105)	Foundation Engineering	82 560	(CVG7131)	Project Management	
82.552	(CVG7106)	In-situ Methods in	82 561	(CVG7140)	Statistics Probabilities	
02.002	(0101100)	Geomechanics	021001	(0,0,1,0)	and Decision-Making	
82 553	(CVG7107)	Numerical Methods in			Applications in Civil	
02.000	(0101101)	Geomechanics			Engineering	
82.554	(CVG7108)	Seepage and Water Flow	82.562	(CVG7141)	Advanced Methods in	
02.001	(0101100)	Through Soils	02.002	(0,0,1,1)	Computer-Aided Design	
82 580	(CVG7305)	to 82 584 (CVG7309)	82 563	(CVG7132)	Computer-Aided Design	
02.500	Special Topic	s in Geotechnical	02.505	(0107152)	of Building Structures	
	Engineering		82 564	(CVG7142)	Engineering Management	
83 500	(CVG5100)	Deep Foundations	82 565	(CVG7143)	Design of Steel Bridges	
83 501	(CVG5100)	Advanced Rock Mechanics	82 566	(CVG7144)	Design of Concrete Bridges	
83 502	(CVG5101)	Theoretical Soil Mechanics	82 575	(CVG7300)	to $82579$ (CVG7304)	
83 503	(CVG5102)	Dam Engineering	02.575	Special Topic	s in Structural Engineering	
83 504	(CVG5103)	Soil Testing and Properties	83 521	(CVG5142)	Advanced Structural	
83 505	(CVG5104)	Slope Stability	05.521	(0,000142)	Dynamics	
83 506	(CVG5106)	Site Improvements	83 522	(CVG5143)	Advanced Structural	
83 509	(CVG5170)	Geotechnical Engineering	05.522	(0,05145)	Steel Design	
05.507	(0105170)	in Cold Regions	83 523	(CVG5145)	Theory of Elasticity	
83 512	(CVG5171)	Strength and	83 524	(CVG5147)	Theory of Plates and	
05.512	(0,001/1)	Deformation Behaviour	05.524	(0,00147)	Shells	
		of Soil and Rock	83 526	(CVG5150)	Advanced Concrete	
83 513	(CVG5173)	Soil Dynamics	05.520	(0,05150)	Technology	
83 514	(CVG5174)	Soil Plasticity	83 527	(CVG5151)	Flow Induced Vibration	
83 515	(CVG5175)	Mathematical Modelling	83 528	(CVG5151)	Steel Bridges	
05.515	(0,05175)	and Finite Flement	83 529	(CVG5152)	Wind Engineering	
		Applications in	83 530	(CVG5144)	Advanced Reinforced	
		Geotechnical Engineering	05.550	(0,00114)	Concrete Design	
83 516	(CVG5176)	Soil Structure Interaction	83 531	(CVG5156)	Finite Element Methods I	
83 517	(CVG5177)	Offshore Geotechnique	83 532	(CVG5146)	Numerical Methods of	
83 518	(CVG5178)	Ice Dynamics	05.552	(0,10)	Structural Analysis	
05.510	(0105170)	ice Dynamics	83 533	(CVG5157)	Finite Element Methods II	
Structure	al Engineering		83.535	(CVG5148)	Prestressed Concrete Design	
82.511	(CVG7120)	Introductory Elasticity	83.536	(CVG5155)	Earthquake Engineering	
82.512	(CVG7121)	Advanced Elasticity	83.537	(CVG5158)	Elements of Bridge	
82.513	(CVG7122)	Finite Element Methods	001007	(0,00100)	Engineering	
82 514	(CVG7123)	Earthquake Engineering	Transpo	rtation		
02.314	$(C \vee G / 123)$	and Analysis	82 533	(CVG7160)	Pavements and Materials	
82 515	(CVG7124)	Advanced Finite Flement	82 534	(CVG7150)	Intercity Transportation	
02.515	(0/0/124)	Analysis in Structural	02.554	(0107150)	Planning and Management	
		Mechanics	82 535	(CVG7151)	Traffic Engineering	
82 516	(CVG7137)	Dynamics of Structures	82 536	(CVG7151)	Highway Materials	
82.510	(CVG7138)	Engineered Masonry	82.530	(CVG7152)	Urban Transportation	
02.020	(0,0,130)	Behaviour and Design	02.001	(0,0,100)	Planning and Management	
82 522	(CVG7139)	Behaviour and Design of	82 538	(CVT7154)	Geometric Design	
02.022		Steel Structures	82.539	(CVG7155)	Transportation Supply	
82.523	(CVG7125)	Theory of Structural	82.541	(CVG7156)	Transportation Economics	
	(	Stability		( = = = = = = = = = = = = = = = = = = =	and Policy	

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82.542	(CVG7159)	Transportation Terminals	Projects and Theses					
82.543	(CVG7158)	Airport Planning	82.590	Engineering Project				
82.585	(CVG7310)	to 82.589 (CVG7314)	82.599	M.Eng. Thesis				
	Special Topic	es in Transportation Planning	82.699	Ph.D. Thesis				
	and Technolo	ogy	CVG6000	Civil Engineering Report/				
				Rapport en génie civil				
92 550	(CVC5110)	Hydraulias of Open	CVG7999	M.A.Sc.Thesis/Thèse				
85.550	(CVG5110)	Channels	CVG9998	Comprehensive				
02 551	(CVC5111)	Undreastic Structures		Examination (Ph.D.)				
03.331 02.552	(CVG5111)	Hydraulics and Dorous		Examen general de doctorat				
83.332	(CVG5114)	Media	CVG9999	Ph.D. Thesis/Thèse				
83.553	(CVG5115)	Advanced Fluid Mechanics						
83.556	(CVG5120)	Water Resources Systems						
83.558	(CVG5122)	Groundwater and Seepage						
83.559	(CVG5123)	Advanced Topics in						
		Hydrology						
83.561	(CVG5125)	Statistical Methods in						
		Hydrology						
83.562	(CVG5126)	Stochastic Hydrology						
83.563	(CVG5127)	Hydrologic Systems						
		Analysis						
83.564	(CVG5128)	Water Resources Planning						
		and Policy						
83.566	(CVG5131)	River Engineering						
83.567	(CVG5140)	Irrigation and Drainage						
83.568	(CVG5135)	Water Supply and						
		Sanitation in Developing						
		Countries						
83.582	(CVG5118)	Theory and Operation of						
	· · · · ·	Hydraulic Models						
83.583	(CVG5119)	Computational Hydraulics						
	· · · ·	1 5						
Environ	nental							
83.590	(CVG5130)	Wastewater Treatment						
		Process Design						
83.591	(CVG5132)	Unit Operations of Water						
		Treatment						
83.593	(CVG5139)	Environmental Assessment						
		of Civil Engineering						
		Projects						
83.594	(CVG5136)	Water and Wastewater						
		Treatment Laboratories						
83.595	(CVG5137)	Water and Wastewater						
		Treatment Process						
83.596	(CVG5133)	Solid Waste Disposal						
83.597	(CVG5134)	Chemical Analysis for						
		Environmental Engineering						
Directed	Studies							
82 596 a	nd 82 597	Engineering Directed						
02.570 u	ild 02.597	Studies						
83 570	(CVG6108)	and 83 571 (CVG6109)						
Individual Directed Studies								
83.600-83.603 (CVG6300-6399)								
Advanced Topics								