DEPARTMENT OF CIVIL ENGINEERING

The Department's curriculum is designed to provide the students with broad educational and professional perception as well as to enhance their effectiveness as practitioners and researchers in the field of modern civil engineering, which includes planning, analysis, design and construction of buildings, bridges, foundations, dams, hydraulic structures and transportation facilities. It contains courses in mathematics, related basic sciences, fundamentals of general engineering and specific civil engineering subjects. Besides, the students are required to fulfill selected courses in English, humanities and social sciences so as to broaden their outlooks in their future careers.

Laboratories in various divisions and research units of the Department are set up to supplement classroom works and to facilitate the study of advanced topics.

The Department offers a 4-year undergraduate program leading to the Bachelor of Engineering degree as well as graduate programs for Master and Doctor of Engineering degrees.

HEAD :

Teerapong	Senjuntichai,	Ph.D. (Manitoba)

PROFESSORS :

Boonchai	Stitmannaithum,	D.Eng. (Tokyo)
Suched	Likitlersuang,	D.Phil. (Oxford)
Supot	Techavorasinskun,	D.Eng. (Tokyo)
Teerapong	Senjuntichai,	Ph.D. (Manitoba)
Thanyawat	Pothisiri,	Ph.D. (UI Urbana-Champaign)

ASSOCIATE PROFESSORS :

Akhrawat	Lenwari,	Ph.D. (Chula)
Anat	Ruangrassamee,	Ph.D. (Tokyo Tech)
Boonchai	Sangpetngam,	Ph.D. (Florida)
Boonchai	Ukritchon,	Sc.D. (MIT)
Jaroon	Rungamornrat,	Ph.D. (UT Austin)
Jittichai	Rudjanakanoknad,	Ph.D. (UC Berkeley)
Kasem	Choocharukul,	Ph.D. (Purdue)
Manoj	Lohatepanont,	Sc.D. (MIT)
Nakhon	Kokkaew,	Ph.D. (Columbia U.)
Noppadon	Jokkaw,	Ph.D. (Chula)
Phoonsak	Pheinsusom,	D.Eng. (Tokyo)
Saksith	Chalermpong,	Ph.D. (UC Irvine)
Sorawit	Narupiti,	Ph.D. (Michigan State)
Tanit	Tongthong,	Ph.D. (Maryland)
Tospol	Pinkaew,	D.Eng. (Tokyo)
Tirawat	Boonyatee,	D.Eng. (Kyoto)
Veerasak	Likhitruangsilp,	Ph.D. (Michigan)
Wanchai	Teparaksa,	D.Eng. (Kyoto)
Wisanu	Subsompon,	Ph.D. (Carnegie Mellon)
Withit	Pansuk,	Ph.D. (Hokkaido)

ASSISTANT PROFESSORS :

Chatpan	Chintanapakdee,	Ph.D. (UC Berkeley)
Pitcha	Jongvivatsakul,	Ph.D. (Tokyo Tech)
Sawekchai	Tangaramvong,	Ph.D. (UNSW)
Tanate	Srisirirojanakorn,	Ph.D. (UI Urbana-Champaign)
Vachara	Peansupap,	Ph.D. (RMIT)
Watanachai	Smittakorn,	Ph.D. (Colorado State)

LECTURERS :

Veerayut	Komolvilas,	D.Eng. (Yokohama National U.)

CIVIL ENGINEERING CURRICULUM
FIRST YEAR CURRICULUM
COMMON TO ALL ENGINEERING STUDENTS

COURSE NO.	SUBJECT	CREDITS
	THIRD SEMESTER	
2101252	STAT CE	3
2101490	PRE-PROJECT	1
2103213	ENG MECH I	3
2301207	CALCULUS III	3
5500208	COM PRES SKLL	3
xxxxxxx	GENERAL EDUCATION	3
		18
	FOURTH SEMESTER	
2101202	MECH MAT I	3
2101253	APP MATH CE	3
2101254	GEOL CE	2
2101302	MAT TESTING LAB	1
2108298	SURVEYING	3
2112346	HYDRAULICS I	3
XXXXXXX	GENERAL EDUCATION	3
		18
	FIFTH SEMESTER	
2101310	STRUCT ANAL I	3
2101311	CIV ENG MAT	4
2101321	SOIL MECHS	3
2101322	SOIL MECHS LAB	1
2101337	TRANS ENG	3
2112342	PRIN OF HYDROLOGY	3
2112344	HYDRAULIC LAB I	1
		18

COURSE NO.	SUBJECT	CREDITS
	SIXTH SEMESTER	
2101307	RC DESIGN	4
2101312	STRUCT ANAL II	3
2101335	CONS SUPVN	2
2101338	HIGHWAY ENG	3
2101421	GEO ENG DES CONS	3
2112440	HYDRAULIC ENG	3
2108306	FLD PRAC TOPO SURV	1
		19
	SUMMER SEMESTER	
2100301	ENG PRACTICE	2
		2
	SEVENTH SEMESTER	
2101406	STL/TIMBER DSGN	4
2101455	CONS ENG COST EST	3
2101256	CE PROFESSION	3
xxxxxxx	FOREIGN LANGUAGE	3
xxxxxxx	GENERAL EDUCATION	3
xxxxxxx	ELECTIVE COURSES	3
xxxxxxx	FREE ELECTIVES	3
		20
	EIGHTH SEMESTER	
2101454	CONST MANAGEMENT	3
2101499	CIVIL ENG PROJECT	3
or 2100499	ENG PROJ	3
xxxxxxx	GENERAL EDUCATION	3
xxxxxxx	APPROVED ELECTIVES	3
xxxxxxx	FREE ELECTIVES	3
		15

TOTAL CREDITS FOR GRADUATION = 146

CIVIL ENGINEERING

NAME OF THE MASTER'S DEGREE

: Master of Engineering
: M. Eng.

NAME OF THE DOCTORAL DEGREE

: Doctor of Philosophy
: Ph.D.

ADMISSION

To be eligible for admission to the M.Eng. program, an applicant must meet two basic requirements:

1. Hold a Bachelor's degree in Civil Engineering or equivalent.
2. Have other qualifications as prescribed by the regulations of the Graduate School or the committee of the program considers acceptable for admission.

To be eligible for admission to the Ph.D. program, an applicant must meet two basic requirements:

1. Hold a Bachelor's Degree in Civil Engineering or equivalent with a minimum of second-class honor (GPA > 3.25/4.00) for Option 3; or hold a Master's Degree in Civil Engineering or equivalent with good academic records for Option 2 and excellent academic records for Option 1.
2. Have other qualifications as prescribed by the regulations of the Graduate School or the committee of the program considers acceptable for admission.

DEGREE REQUIREMENTS

An acceptable thesis of not less than 12 credits, together with 9 credits of core courses plus 15 credits of elective courses are required for the Master's degree.

A student who has fulfilled the requirements of the Master's program with a passing grade point average of not less than 3.00, passing English examination and a minimum of one published technical paper. A period of study of not more than 8 regular semesters will be awarded the degree of Master of Engineering.

An acceptable dissertation of not less than 60 credits for Option 1 and 48 credits of Option 2 and Option 3 together with 12 credits of elective courses for Option 2 for or 9 credits of core courses plus 15 credits of elective courses for Option 3 are required for the Ph.D. Degree.

A student must fulfill the requirements of the Graduate school by passing the English examination and publishing technical papers in international peer – reviewed journals. The maximum period of study is 5 academic years for Option 1 and Option 2 and 8 academic years for Option 3.

COURSE REQUIREMENTS

A student must choose his major area of study from one of the followings:

1) Core Courses 9 credits

Structural Engineering

2101601	Advanced Structural Theory	3(3-0-9)
2101607	Advanced Mechanics of Materials	3(3-0-9)
2101680	Applied Mathematics I	3(3-0-9)

Geotechnical Engineering

2101621	Foundation Engineering	3(3-0-9)
2101637	Advanced Soil Mechanics	3(3-0-9)
2101835	Earth and Retaining Structures	3(3-0-9)

Transportation Engineering

2101660	Transportation Systems	3(3-0-9)
2101661	Transportation Planning and Policy	3(3-0-9)
2101662	Methods for Transportation Analysis	3(3-0-9)

Construction Engineering and Management

2101690	Construction Methods and Equipment	3(3-0-9)
2101692	Analytical Methods in Construction Management	3(3-0-9)
2101870	Construction Project Management	3(3-0-9)

2) Elective Courses 15 credits

Structural Engineering

2101510	Computer Methods for Civil Engineering	3(3-0-9)
2101512	Advanced Concrete Technology	3(3-0-9)
2101546	Introduction to Finite Element Method	3(3-0-9)
2101566	Dynamics of Structures	3(3-0-9)
2101606	Dynamics and Vibrations	3(3-0-9)
2101611	Matrix Analysis of Structures	3(3-0-9)
2101614	Behavior of Steel Structures	3(3-0-9)
2101618	Finite Element Method for Civil Engineers	3(3-0-9)
2101619	Seismic Design of Structures	3(3-0-9)
2101654	Engineering for Disaster Mitigation	3(3-0-9)
2101656	Disaster Damage Mitigation and Recovery Management	2(2-0-6)
2101799	Boundary Integral Equation Method For Applied Mechanics	3(3-0-9)
2101800	Advanced Solid Mechanics	3(3-0-9)
2101801	Fracture Mechanics	3(3-0-9)
2101802	Inelastic Behavior of Materials	3(3-0-9)
2101803	Nonlinear Analysis in Structural Mechanics	3(3-0-9)
2101804	Behavior of Reinforced Concrete Structure	3(3-0-9)
2101806	Numerical and Approximate Methods for Structural Engineering	3(3-0-9)
2101810	Fire Safety Design of Structures	3(3-0-9)
2101817	Structural Testing and Evaluation	3(2-3-7)

2101818	Life Cycle of Concrete Structures	3(3-0-9)

B. Geotechnical Engineering

2101524	Computer Programming and Computer Tools for Graduate Research	3(3-0-9)
2101534	Computer Application for Geotechnical Engineering	3(3-0-9)
2101535	Tunnel Engineering	2(2-0-6)
2101624	Elasticity in Soil Mechanics	3(3-0-9)
2101632	Rock Mechanics	3(3-0-9)
2101634	Plasticity in Soil Mechanics	3(3-0-9)
2101636	Interpretation of Field Exploration and Soil Testing	3(2-3-7)
2101639	Special Study in Soil Engineering	3(3-0-9)
2101655	Civil Engineering and Disaster Recovery	2(2-0-6)
2101820	Geo-environment Engineering	3(3-0-9)
2101821	Deep Foundation Design	3(3-0-9)
2101824	Finite Element Method in Geotechnical Engineering	3(3-0-9)
2101831	Engineering Ground Modification	3(3-0-9)
2101832	Engineering Geophysics	3(3-0-9)
2101833	Soil Dynamics and Earthquake Engineering	3(3-0-9)

C. Transportation Engineering

2101551	Pavement Design	3(3-0-9)
2101553	Public Transit Systems Planning and Operations	3(3-0-9)
2101555	Travel Behavior Survey and Analysis	3(3-0-9)
2101556	Air Transportation System	3(3-0-9)
2101557	Planning and Management of Airport System	3(3-0-9)
2101558	Transportation and Logistics System Optimization	3(3-0-9)
2101559	Traffic Engineering	3(3-0-9)
2101560	Sustainable Transportation	3(3-0-9)
2101567	Rail Transport System	3(3-0-9)
2101644	Urban Transportation Planning	3(3-0-9)
2101649	Probability Statistics and Decision for Civil Engineering	3(3-0-9)
2101653	Computer Model in Transportation	3(3-0-9)
2101664	Transportation Operations	3(3-0-9)
2101665	Highway Design	3(3-0-9)
2101666	Intelligent Transportation Systems	3(3-0-9)
2101667	Logistics System Analysis	3(3-0-9)
2101668	Evaluation of Transportation Project and Policy	3(3-0-9)
2101669	Transport Policy	3(3-0-9)
2101742	Advanced Transportation and Logistics System Optimization	3(3-0-9)
2101840	Traffic Modeling and Simulation	3(3-0-9)
2101841	Special Studies in Transportation Engineering	3(3-0-9)
2101844	Road Safety	3(3-0-9)
2101846	Railway Engineering	3(3-0-9)

D. Construction Engineering and Management

2101535	Tunnel Engineering	3(3-0-9)
2101550	Civil Engineering Project Planning	3(3-0-9)
2101580	Construction information Management	3(3-0-9)
2101590	Construction Techniques and Productivity	3(3-0-9)
2101621	Foundation Engineering	3(3-0-9)
2101649	Probability Statistics and Decision for Civil Engineering	3(3-0-9)
2101691	Special Studies	3(3-0-9)
2101694	Contracting in Construction Business	3(3-0-9)
2101695	Computer Applications in Construction	3(3-0-9)
2101697	Infrastructure Planning and Management	3(3-0-9)
2101698	Construction Business Management	3(3-0-9)
2101831	Engineering Ground Modification	3(3-0-9)
2101871	Risk Management in Civil and Environmental Engineering Systems	3(3-0-9)
2101873	Special Topics in Construction Engineering and Management	3(3-0-9)
2601511	Financial and Managerial Accounting	3(3-0-9)
2604501	Financial Management	3(3-0-9)

3) Thesis and Seminar

2101793	Graduate Seminar in Civil Engineering	3(3-0-9)
2101811	Thesis	12 credits
2101828	Dissertation	48 credits
2101829	Dissertation	60 credits
2101894	Doctoral Dissertation Seminar	0(0-0-0)
2101897	Qualifying Examination	0(0-0-0)

PROGRAM OF STUDY (CIVIL ENGINEERING)

Year	Semester	M.Eng.	Ph.D. (Option 1)	Ph.D. (Option 2)	Ph.D. (Option 3)
1	1	Core Courses 9 credits Elective Courses 3 credits	Dissertation 10 credits	Elective Courses 6 credits Dissertation 8 credits	Core Courses 9 credits Elective Courses 3 credits
	2	Elective Courses 12 credits	Dissertation 10 credits	Elective Courses 6 credits Dissertation 8 credits	Elective Courses 12 credits
2	1	Thesis 6 credits	Dissertation 10 credits	Dissertation 8 credits	Dissertation6 credits
	2	Thesis 6 credits	Dissertation 10 credits	Dissertation 8 credits	Dissertation6 credits
3	1		Dissertation 10 credits	Dissertation 8 credits	Dissertation6 credits
	2		Dissertation 10 credits	Dissertation 8 credits	Dissertation6 credits
4	1				Dissertation6 credits
	2				Dissertation6 credits
5	1				Dissertation6 credits
	2				Dissertation6 credits

COURSE DESCRIPTIONS

2101202 Mechanics of Materials I 3(3-0-6)
Condition: Prerequisite 2103213 or 2103211
Fundamental concepts of stress and strain; axially loaded members; torsion; shear force; bending moment in beams; deflection of beams; stresses in beams; composite beams; unsymmetrical bending; buckling of columns; combined stresses and Mohr's circle; failure criterion.

2101252 Statistics for Civil Engineering 3(3-0-6)
Necessity of statistical methods in civil engineering; probability theory; random variables; probability distribution models in civil engineering; statistical estimation and hypothesis testing in civil engineering; applications of regression analysis in civil engineering.

2101253 Applied Mathematics for Civil Engineers 3(3-0-6)
Condition: Prerequisite 2301207
Introduction to linear algebra, matrices and matrix operations, linear and nonlinear algebraic equations, eigen value problems; Fourier and Laplace transforms, series representation of functions, ordinary differential equations and partial differential equations; introduction to vector calculus, vector fields, differential and integral operators, integral theorems and applications; introduction to optimization problems; introduction to numerical techniques and the theory of approximations, and applications in civil engineering.

2101254 Geology for Civil Engineers 2(2-0-4)
A general survey of geology with particular reference to civil engineering; common rock forming minerals; general characteristics and origins of rocks; features of the earth and geological process; structural features of the earth's crust; geology of water supply, reservoirs and dam sites, erosion and flood control; river and harbor improvement; geological factors affecting quarrying, tunneling, landslide, land subsidence, foundations and building materials.

2101256 Civil Engineering Profession 3(3-0-6)
Development of concepts, methodology and processes of civil engineering; relationship between civil engineering and other professions and society; roles and contributions of civil engineering to economics and social developments; concepts of engineering design; fundamental of construction works; project planning; ethics; safety; sustainable development.

2101302 Materials Testing Laboratory 1(0-3-0)
Condition: Co-requisite 2101202
Fundamental behaviors and properties, introduction to inspection and testing of various civil engineering materials such as steel and rebar, wood, others civil engineering materials.

2101307 Reinforced Concrete Design 4(3-3-6)
Condition: Prerequisite 2101310
Concrete and reinforcement; fundamental behavior in axial load, flexure, torsion, shear, bond and combined actions; design of reinforced concrete structural components by working stress and strength design methods; design practice; practice in reinforced concrete design and detailing.

2101310 Structural Analysis I 3(3-0-6)
Condition: Prerequisite 2101202
Introduction to structural analysis; degree of statical indeterminacy and stability of structures; reactions shears and moments indeterminate beams and rigid frames including deflected shapes; analysis of determinate plane trusses; responses of plane structures under moving loads; deformation analysis by moment-area and conjugate structures; deformation analysis of structures by virtual work and related energy methods; analysis of indeterminate structures by flexibility methods.

2101311 Civil Engineering Materials 4(3-3-6)
Condition: Prerequisite 2101202
Fundamental behaviors and properties, introduction to inspection and testing of various civil engineering materials such as steel and rebar, wood, cement, aggregates and admixtures, mix design, fresh and hardened concrete, highway materials, others civil engineering materials.

2101312 Structural Analysis II 3(3-0-6)
Condition: Prerequisite 2101310
Methods of structural analysis; slope-deflection method; moment distribution method; matrix structural analysis; introductory plastic structural analysis; introduction to finite element method in structural analysis.

2101321 Soil Mechanics 3(3-0-6)
Condition: Prerequisite 2101254 or 2106296
Soil formation, index properties and classification of soil, compaction, permeability of soil and seepage problems, principle of effective stresses within a soil mass; stress distribution, compressibility of soil, shear strength of soil, earth pressure theory, slope stability, bearing capacity.

2101322 Soil Mechanics Laboratory 1(0-3-0)
Condition: Concurrent 2101321
Soil exploration; index properties of soils; permeability; compaction; CBR; stress-strain behavior of soils; shear strength and one dimensional consolidation.

2101335 Construction Supervision 2(2-0-4)
Construction methods; construction standards; components, methods, and procedures of construction supervision and inspection check list in foundation construction, structural and architectural works as well as infrastructure construction.

2101337 Transportation Engineering 3(3-0-6)
Introduction to transportation engineering; principles and concepts of transportation including transportation demand and supply; fundamental traffic operations and transportation system analysis; transportation economics, and transportation planning concepts.

2101338 Highway Engineering 3(2-3-4)
Condition: Prerequisite 2101337
Historical development of highways; highway administration; principles of highway planning and traffic analysis; geometric

design and operations; highway finance and economic; introduction to pavement design; highway materials; construction and maintenance of highways.

2101406 Steel and Timber Design 4(3-3-6)
Condition: Prerequisite 2101310
Design of timber and steel structures by ASD and LRFD methods; tension and compression members; beams; beam-columns; built-up members; plate girders; connections; design practice.

2101421 Geotechnical Engineering Design and Construction 3(3-0-6)
Condition: Prerequisite 2101321
Criteria in geotechnical engineering design; Terzaghi's bearing capacity formula design and construction of shallow foundation; design and construction of pile foundation and construction control; design and construction of retaining structures, sheet piles and diaphragm walls for excavation and filling; design of caisson and construction method; slope stability.

2101454 Construction Management 3(3-0-6)
Condition: Consent of Faculty
Project delivery systems; project organization; site layout; project planning; modern construction technology; critical path method (CPM); resource management; progress measurement; cash flow analysis, construction equipments; construction laws; construction safety; quality control systems.

2101455 Construction Engineering and Cost Estimating 3(3-0-6)
Condition: Consent of Faculty
Principle of construction engineering; construction materials and methods; construction productivity; principle of cost estimating; approximate and detailed estimating; quantity takeoff; methods of measurement; labor and equipment costing.

2101461 Building Design 3(2-3-4)
Condition : Prerequisite 2101307 or 2101336
Design of reinforced concrete buildings of various types; structural systems; slab systems; frame analysis; interaction of frames and walls; walls; footings.

2101462 Prestressed Concrete Design 3(2-3-4)
Condition : Co - requisite 2101307
Concept and principles of prestressing; properties of relevant materials; prestressing systems; loss of prestress; analysis and design of statically determinate members; flexure, shear, bond, anchorage and bearing; moment-curvature analysis; deflections and camber; design for anchorage zone reinforcement prestressed concrete piles; introduction to post-tensioned concrete floor systems; construction site visit.

2101464 Bridge Design 3(2-3-4)
Condition: Prerequisite 2101307
Theories of load distribution and application; simply supported bridges in reinforced concrete, steel and prestressed concrete; statically indeterminate bridges; ultimate load method; bridge economy.

2101490 Pre-Project 1(1-0-2)
Necessary skills for conducting project: thinking skills and problem identification, literature review, development of problem solving procedure and methodology, report writing, oral presentation, etc.

2101495 Advanced Topics in Civil Engineering I 3(3-0-6)
Topics of current interest or new developments in various fields of civil engineering; A complete written report is required by the Department. A final oral examination is optional.

2101499 Civil Engineering Project 3(0-6-3)
Condition: Prerequisite 2101490
Student shall carry out a practical project of interest on problems in various fields of civil engineering. The project is to be proposed by the student group and approved by the instructor and the Department. The work must be completed within one semester. A complete written report and a final oral examination are required.

2101510 Computer Methods for Civil Engineers 3(3-0-9)
Review of computer programming; elimination methods for linear equations: various decomposition and storage schemes, partial pivoting, errors and ill-conditioning; iterative methods for linear equations: Jacobi iteration, Gauss-Seidel iteration; numerical solution of differential equations; finite difference method; solution of nonlinear equations; emphasis on civil engineering applications.

2101512 Advanced Concrete Technology 3(3-0-9)
Review of concrete technology; improvement of concrete's quality by pozzolanic materials, mineral and chemical admixtures; high-performance concrete; fiber reinforced concrete; polymer concrete; durable concrete and other special concrete; repair and strengthening of concrete structures.

2101524 Computer Programming and Computer Tools for Graduate Research 3(3-0-9)
Object-oriented programming using C++, event driven and GUI programming, data flow programming for data acquisition and automatic control in laboratory; use of MATLAB and Mathematica, numerical algorithm for linear system, numerical algorithm for non-linear system.

2101534 Computer Application for Geotechnical Engineering 3(3-0-9)
Computer application for analyzing shallow foundation, slope stability, deformation and stability problems; analysis of tunnel lining and tunnel deformation due to adjacent construction activities.

2101535 Tunnel Engineering 3(3-0-9)
History of tunneling; soil tunneling methods; types of linings and face support; stand-up times and tunnel man's ground classification; groundwater control and soil modification methods; lining behavior and design; ground movements and changes of pore water pressure caused by tunnel construction; field observations, monitoring, and instrumentation; building distortion/damage and relation to ground movements; fundamentals of tunnel engineering related to soil types and construction techniques; design of tunnel lining in various subsoil conditions; applications and techniques of tunnel construction for infrastructure systems.

2101536 Underground Construction 3(3-0-9)
Condition: Consent of Faculty
Soil investigation plans; soil profile; selection of soil properties; construction of shallow foundation construction of deep pile foundation; pile load test; pile integrity test; pilot pile test; blow count test; construction of basement by sheet pile bracing system; construction of deep basement by diaphragm wall system; caisson sinking in soft clay.

2101546 Introduction to Finite Element Method 3(3-0-9)
Condition: Consent of Faculty
Concepts of weak form of governing differential equation, weight residual method, minimization principle, equivalence between weak and strong forms, weak solution and its uniqueness; Galerkin approximation, space of test and trial functions, basis functions, quality and convergence of approximate solutions; finite element approximation, element-based shape functions, element stiffness matrix and load vector, matrix assembly procedure, treatment of boundary conditions, convergence of finite element solution; introduction to finite element method to two- and three-dimensional boundary value problems; applications of finite element programs to various boundary value problems in civil engineering.

2101550 Civil Engineering Project Planning 3(3-0-9)
Principles of civil engineering project planning; analysis of technical requirements; financial and economic feasibility studies; capital budgeting; social, political and environmental impact assessment; fundamental decision analysis.

2101551 Pavement Design 3(3-0-9)
Principles of highway and airport pavement including pavement types and wheel loads; stresses in flexible and rigid pavements; consideration of properties of pavement components including the design test; methods of design of flexible and rigid pavement for highways and airports; methods of construction and maintenance.

2101553 Public Transit Systems Planning and Operations 3(3-0-9)
Condition: Consent of Faculty
Components of public transportation system; public transportation planning procedure; technological evolution of mass transit; selection of transit mode; transit station planning; basic operation elements; date collection and analysis; scheduling of service; fare policies; financing and cost structure of transit service.

2101555 Travel Behavior Survey and Analysis 3(3-0-9)
Condition: Consent of Faculty
Dimensions and characteristics of urban travel; travel demand; theories of travel behavior; methodologies of travel survey; experimental design; theory of sampling; analytical methods in travel behavior research.

2101556 Air Transportation System 3(3-0-9)
Condition: Consent of Faculty
Introduction to air transportation; air transportation economics; air transportation supply: network and carrier; air transportation demand; passenger and cargo; air transportation planning and management; air transportation infrastructure.

2101557 Planning and Management of Airport System 3(3-0-9)
Condition: Consent of Faculty
Preparation of a layout and design of an airport system including studies of a proposed site; surface and subsurface drainage; runway and taxiway; grading plane and earthwork estimates; design of base courses and runway surfaces; accessory structures and lighting; airport operations.

2101558 Transportation and Logistics System Optimization 3(3-0-9)
Condition: Consent of Faculty
Introduction to modeling and operations research ; linear programming; sensitivity analysis; integer programming; network optimization; heuristics; queuing system; applications of these tools to transportation and logistics problems.

2101559 Traffic Engineering 3(3-0-9)
Condition: Consent of Faculty
Theory of traffic flow, traffic studies, highway capacity analysis, traffic control devices, signal system, traffic system design and operations.

2101560 Sustainable Transportation 3(3-0-9)
Condition: Consent of Faculty
Principles of sustainable transportation; social, economic, and environment components; planning; planning for sustainable transportation system; measures-public transport, non-motorized transport, and other innovative measures; mobility management; evaluation; institutional and regulatory issues.

2101566 Dynamics of Structures 3(3-0-9)
Condition: Consent of Faculty
Analysis of structural systems with single and multi degree of freedom; equations of motions; free and forced vibrations; vibration natural frequencies and mode shapes of systems; numerical evaluation of dynamic response; response spectrum; modal response history and response spectrum analysis; response of inelastic SDF system; building codes on seismic design of structures.

2101567 Rail Transport System 3(3-0-9)

Condition: Consent of Faculty

This course covers the following topics: History of Rail Transport Development, Fundamental and Characteristics of Rail Operation, Rules of Safety, Composition of Rail System: infrastructure, Rolling Stocks, Signaling and Communication, Case Studies of Rail Transport Development in Thailand and Neighboring Countries.

2101580 Construction Information Management 3(3-0-9)

Condition: Consent of Faculty

Basic concepts of construction information, information flow in construction, construction information models, construction information management, computer programs for construction information management.

2101590 Construction Techniques and Productivity 3(3-0-9)

Condition: Consent of Faculty

Construction Processes, materials, tools, equipment; construction productivity; modern construction techniques; equipment in building and infrastructure works.

DESCRIPTIONS OF GRADUATE COURSES IN CIVIL ENGINEERING (M.ENG., PH.D.)

2101601 Advanced Structural Theory 3(3-0-9)

Analysis of trusses; frames and arches; influence lines; continuous frame with non-prismatic members: building frames subjected to lateral loads; introduction to matrix analysis of structures.

2101606 Dynamics and Vibrations 3(3-0-9)

Dynamic system modeling; equation of motion; analysis of systems with single and multi-degree of freedom; free and forced vibration; determination of natural frequencies of structures; distributed mass system; response spectrum method; dynamic analysis using numerical techniques; basic principles of non-linear system.

2101607 Advanced Mechanics of Materials 3(3-0-9)

Mathematical background and introduction to tensor analysis; definition of stress, equilibrium equations, stress transformation, principal stress; definition of strain, strain-displacement relation, infinitesimal strain, compatibility equations, strain transformation, principal strain; material constitutive, hyperelasticity, Hooke's law, material symmetry; formulation of boundary value problems for linear elasticity, Navier's equation, Beltrami-Mitchell's equation; energy principles, uniqueness of elastic state; St. Venant problems; plane problems in linear elasticity, method of stress functions; axis-symmetric and anti-symmetric problems.

2101611 Matrix Analysis of Structures 3(3-0-9)

Review of matrix algebra; matrix procedures for analysis of continuous beams, plane frames, space frames under static and quasi-static loading; stiffness and flexibility methods; techniques for solving large linear equation system; computer application.

2101614 Behavior of Steel Structures 3(3-0-9)

Researches which relate the basic behavior of structural steel members and frames to present design approximations; discussions are emphasized on background, use and limitations of the current specifications.

2101618 Finite Element Method for Civil Engineers 3(3-0-9)

Basic concepts of interpolation; finite element interpolation; introduction to the finite element techniques in mechanics; development of elements from various principles and application of the method to static continuum problems; convergence and compatibility requirement; assemblage of elements and boundary conditions; structure of a typical finite element computer program; introduction to the treatment of dynamics and stability and extension of the method to generalized field problems; application in civil engineering problems.

2101619 Seismic Design of Structures 3(3-0-9)

Elementary engineering seismology; seismic waves; intensity and magnitude; response spectrum and design earthquakes; earthquake codes and analysis; response spectrum analysis; random vibrations; artificial generation of earthquake records; structural design and detailing for earthquake resistance of special structures: bridges, dams, and nuclear power plants.

2101621 Foundation Engineering 3(3-0-9)

Application of soil mechanics principles to stress distribution in earth masses; settlement analysis; bearing capacity of spread footings, piles and caissons; excavation for foundation works, sheet pile, brace cut, anchored wall and cofferdams.

2101624 Elasticity in Soil Mechanics 3(3-0-9)

Vector and tensor analysis, Eigenvalue problem, introduction to continuum mechanics, stress-strain definition for small strain, equilibrium and compatibility equations, stress-strain relationship, stress-strain relationship, stress-strain parameters and invariants, stress function method, energy method and variational principle, Hooke's law, simple elastic model, anisotropic and non-linear elastic model.

2101632 Rock Mechanics 3(3-0-9)

Physical properties and classification of intact rock; theories of rock failure; state of stress in the earth's crust; stresses and deformations around underground openings assuming elastic, plastic, and time-dependent behavior; effect of geologic discontinuities on rock strength; introduction to stability analyses in rock.

2101634 Plasticity in Soil Mechanics 3(3-0-9)

Introduction to plasticity theory, classical plasticity theory, yield surface and flow rule, classical elasto-plastic model, modern plasticity theory, critical state soil mechanics, critical state soil model, advanced soil model, bounding surface

theory, multi yield surface theory, conventional method for plastic analysis, limit analysis, limit equilibrium, slip line method

2101636 Interpretation of Field Exploration and Soil Testing 3(2-3-7)

Site investigation for civil engineering, conventional and geophysics methods; laboratory and field works in soil sampling, classification and testing.

2101637 Advanced Soil Mechanics 3(3-0-9)

Soil classification, index properties, weight-volume relationship, permeability and seepage analysis, stress within soil mass, elastic solutions for stress, shear strength behaviour and Mohr-Coulomb failure criteria, stress paths, deformation behaviour, consolidation theory, secondary compression, settlement prediction.

2101639 Special Study in Soil Engineering 3(3-0-9)

Contemporary topics in soil engineering.

2101644 Urban Transportation Planning 3(3-0-9)

Transportation systems and characteristics of traffic flow in urban areas; planning of urban transportation facilities; mathematical models for prediction of traffic flow; interrelationship of and use and transportation.

2101649 Probability Statistics and Decision for Civil Engineering 3(3-0-9)

Elements of probability theory; common probability models; probabilistic models and observed data; elementary Baysian decision theory; analysis of independent random process.

2101653 Computer Models in Transportation 3(3-0-9)

Analytical models and practical tools for planning and analysis of transportation supply; computer application in the design and analysis of transportation and logistics networks; planning and analysis of transportation and logistics network facilities; routing and scheduling of transportation resources.

2101654 Engineering for Disaster Mitigation 3(3-0-9)

Introduction to engineering for disaster resilience; earthquake disasters-case studies and lessons from earthquake disasters learnt; seismic design concept; tsunami disaster-modeling, early warning system, and preparedness: field trips to disaster prone areas.

2101655 Civil Engineering and Disaster Recovery 2(2-0-6)

Problems and remedy measures of civil works after natural disaster, case studies from various countries, disaster management related to structures damaged by natural disaster, recovery of landslide induced by natural disaster, field trip to some organizations related to disaster recovery management or sites under natural disaster.

2101656 Disaster Damage Mitigation and Recovery Management 2(2-0-6)

Mitigation of disaster damage; hazard maps; crisis control: basic principles and management learning for business continuity: structural and non-structural mitigation measures from the viewpoint of the government to that of local communities: disaster recovery: communication and recovery technologies; case studies.

2101660 Transportation Systems 3(3-0-9)

Introduction to transportation systems; importance of transportation in the economy; development of transportation technology; roles of public and private sectors; transportation organizations; transportation system components and functions; types of transportation; modes of transportation; key characteristics of transportation models; intermodal transportation; general and mode-specific policy issues; social, economic, and political issues; careers in transportation sector.

2101661 Transportation Planning and Policy 3(3-0-9)

Policy context and transportation planning; decision making tools in transportation planning; modeling techniques in transportation; introduction to transportation economics; the four-step planning process and its limitation; alternative modeling approaches; transportation planning ethics.

2101662 Methods for Transportation Analysis 3(3-0-9)

Mathematical and statistical methods for transportation analysis; basic probability models and statistical analysis; introduction to mathematical programming; decision analysis, optimization and simulation.

2101664 Transportation Operations 3(3-0-9)

Techniques in transportation operational analysis, space-time diagram, cumulative plots, queuing theory, traffic flow theory, traffic control, transportation scheduling, operations of transportation terminals.

2101665 Highway Design 3(3-0-9)

Highway design procedures; basic design policies; geometric design and structure standards; cross section; design of traffic interchanges and intersections; highway capacity analysis; analysis of freeway and highway facilities; design of traffic control devices.

2101666 Transportation Systems 3(3-0-9)

The use of advanced surveillance, navigation, communication, and computer technology to monitor, analyze, and improve the performance of transportation systems; enabling technologies; application of technology to monitoring, analysis, evaluation, and prediction of transportation system performance and behavior, feasibility studies; human factors and institutional issues.

2101667 Logistics System Analysis 3(3-0-9)

Fundamentals of logistics management, framework for logistics system analysis, logistics system modeling, logistics network design, distribution planning and management, transportation system and operation analysis.

2101668 Evaluation of Transportation Project and Policy 3(3-0-9)

Basic microeconomics; Applications of microeconomic principles for transportation policy analysis; Evaluation of transportation projects and financing alternative.

2101669 Transport Policy 3(3-0-9)

Major policies concerning the transportation-related aspects of the environment, energy, economic development, community mobility/accessibility, freight transportation, advanced transportation systems, transportation safety and social justice; basic concepts in transportation policy formulation, research design and evaluation of legislation analysis and tracking, decision-making methods, public participatory techniques, transportation policy evaluation principles and methods.

2101680 Applied Mathematics I 3(3-0-9)

Ordinary differential equations; Fourier series; introduction to Fourier and Laplace trasforms; some applications to boundary value problems; vector analysis; matrices and linear equations.

2101690 Construction Methods and Equipment 3(3-0-9)

Construction method in civil engineering; planning for earthwork construction; construction equipment cost; selecting of construction equipment; calculating of machine power; analysis of equipment productivity such as dozer, scrapers, excavator, truck and hauling equipment, finishing equipment, pile-driving equipment, belt-conveyer, aggregate production, asphalt mix production and placement, concrete equipment, and cranes.

2101691 Special Studies 3(3-0-9)

Individual's problem solving in civil engineering.

2101692 Analytical Methods in Construction Management 3(3-0-9)

Analytical methods applied to modern construction engineering and management from both owner's and contractor's views; civil engineering systems modeling and analysis; applications of systems analysis, deterministic and probabilistic models, decision analysis, mathematical programming, optimization techniques, simulation techniques, and computer programs for civil engineering systems simulation; other analytical tools for rational decision making in construction engineering and management from project inception to completion.

2101694 Contracting in Construction Business 3(3-0-9)

Fundamentals of contracting in public and private construction projects; different contracts in construction business; rights and obligations of construction contracting parties; provisions regarding payment, quality, time extension; arbitration.

2101695 Computer Applications in Construction 3(3-0-9)

A broad range of computer applications in construction with emphasis on construction engineering and management; computer hardware and software components, operating system, programming languages, and information technology; analysis, design, development, and implementation of microcomputer-based systems such as database, spreadsheet, computer aided design and virtual reality technology; the effective utilizations of various construction management software; concepts of decision support system.

2101697 Infrastructure Planning and Management 3(3-0-9)

An integrated approach to the planning, construction, operation, and maintenance of infrastructure through an understanding of the performance of infrastructure and life-cycle cost evaluation; approaches the management, available technologies, and decision supporting tools in infrastructure and facility planning and management; economic framework for identifying and analyzing investment and operations options; relevant issues cuch an environment, laws, and regulations.

2101698 Construction Business Management 3(3-0-9)

Construction organization strategic construction business development; marketing plan, operational plan, financial planning and business valuation, quality control and management; construction process improvement.

2101742 Advanced Transportation and Logistics System Optimization 3(3-0-9)

Advanced optimization techniques for transportation and logistics networks; strength of mathematical formulation; large-scale optimization techniques: problem decomposition, row-and column-generation, branch-and-price-and-cut, genetic algorithms, and other state-of-the-art techniques.

2101793 Graduate Seminar in Civil Engineering 3(3-0-9)

Self studies on the topics provided by the division; oral presentation of the study outcome in conjunction with technical papers as well as answers to technical questions and comments from the audience; special lectures by guest speakers.

2101799 Boundary Integral Equation Method for Applied Mechanics 3(3-0-9)

Description of general boundary value problems and basic governing field equations; development of Green's functions and their derivatives; Integral relations for field quantities; Standard integral equations for state variables and body flux; Singularity-reduced procedure and singularity-reduced boundary integral relations; special cases of cracks and dislocations; Boundary integral equation method, formulation of governing integral equations, boundary and solution approximations; evaluation of kernels, numerical integration, post-process.

2101800 Advanced Solid Mechanics 3(3-0-9)

Review of basic principles of solid mechanics; plane problems in linear elasticity, green's functions for point loads on surface of semi-infinite plane; rigid punch problems; green's function for point load in infinite plane; edge dislocations and cracks, Wiliams asymptotic expansion, stress intensity factors; complex variable representations for anti-plane shear and plane problems; three dimensional linear elasticity, stress functions; representations of displacement field; green's functions of infinite and semi-infinite spaces, rigid punch problem, Hertz problem, Eshelby's equivalent method; introduction to composite media, macroscopic measures of stress and strain, averaging theorem, overall properties of multi-phase media; Somigliana's identity, boundary integral equations for two and three-dimensional linear elasticity.

2101801 Fracture Mechanics 3(3-0-9)

Introduction to fracture mechanics, stress analysis of linear elastic cracked bodies, the stress field theory of fracture, the energy concepts on fracture, numerical and experimental determination of fracture properties, effects of variables on fracture toughness, fracture mechanics design, and elasto-plastic fracture; analysis of simple two-dimensional fracture problems; introduction to fatigue, fatigue crack growth, fracture criteria, and fracture control plans.

2101802 Inelastic Behavior of Materials 3(3-0-9)

Review of basic principles of solid mechanics; introduction to inelastic behavior of materials, aspects of material behavior and evidences from experiments; nonlinear elasticity, total deformation for plasticity, J_2 total deformation theory; incremental theory of plasticity, concept of yield surface, plastic flow rule, consistency condition, J_2 flow theory, isotropic hardening, kinematic hardening; plasticity with nested yield surfaces, plasticity with a bounding surface; formulation of boundary value problems in plasticity, minimum principles, solution of simple BVPs in plasticity; pressure-sensitive materials, time dependent materials; application of inelastic material behavior in finite element analysis, radial return method.

2101803 Nonlinear Analysis in Structural Mechanics 3(3-0-9)

Finite strain mechanics; total Lagrangian and updated Lagrangian finite element formulation, nonlinear solution methods, large displacement behavior of structures and large displacement analysis of structural problems, finite element formulation of inelastic problems.

2101804 Behavior of Reinforced Concrete Structure 3(3-0-9)

The behavior and strength of reinforced concrete structures subjected to flexure shear, torsion, axial and eccentric loading; determination of deflections, bond and cracking, review of research and pertinent literature, with emphasis on background, structural models, the performance and criteria approach of present design codes and specifications.

2101806 Numerical and Approximate Methods for Structural Engineering 3(3-0-9)

Introduction to numerical computing; numerical methods for system of linear equations; numerical methods for linear least square problems; numerical methods for eigen value problem; numerical methods for system of nonlinear equations; method of interpolation: numerical integration and differentiation; approximate method for boundary value and initial value problems; introduction to optimization; applications to structural engineering problems.

2101810 Fire Safety Design of Structures 3(3-0-9)

Fire safety engineering; behavior of natural fires; parametric fires and standard fires; properties of materials at elevated temperatures; analysis of structural members subjected to fires; design of steel and reinforced concrete structures for fire safety; assessment and repair of fire-damaged structures.

2101817 Structural Testing and Evaluation 3(3-0-9)

Concept of structural testing and evaluation; destructive and non-destructive testing; structural models and components for testing; full scale testing; testing standards; equipment and measurement techniques; date analysis and evaluation of structural performance.

2101818 Life Cycle of Concrete Structures 3(3-0-9)

Life Cycle and structural performance; importance and necessity of maintenance of structures; concrete deterioration mechanism and its prediction; concrete evaluation; remedial measures; surface repair; strengthening and stabilization; examples of management system for maintenance.

2101820 Geo-Environment Engineering 3(3-0-9)

Solid wastes management, waste compositions, design and monitoring of landfills, contaminant transports, fate transports, and soil remediation techniques.

2101821 Deep Foundation Design 3(3-0-9)

Behavior of pile foundation, estimating pile capacity, driven and bored pile, grouting and non-grouting behavior, pile driving analysis, pile integrity and sonic logging test, pile load test, design of pile foundation, settlement analysis.

2101824 Finite Element Method in Geotechnical Engineering 3(3-0-9)

Revision of mathematics and continuum mechanics; principles of finite element method, element discretization, displacement functions and isoparametric elements, element equation; numerical integration; direct stiffness assembly method; weighted residual and variational method; boundary conditions; solution methods; non-linear and dynamic problems.

2101831 Engineering Ground Modification 3(3-0-9)

Aspects of soil mineralogy and its composition applied to soil engineering problems; origin and occurrence of soils; non-clay minerals in soil; structure and properties of clay minerals; classification and nomenclature of clay minerals; mineral

analysis; relation between soil composition engineering properties; soil compaction, lime/cement-soil mixing behavior, preloading and prefabricated vertical drain (PVD) techniques, cement grouting, cement columns, geotextile and geosynthetic.

2101832 Engineering Geophysics 3(3-0-9)

Application of elastic wave and electricity in ground prospecting, reflection survey, refraction survey, surface wave method; borehole method, down-hole, up-hole and cross hole; resistivity method for ground prospecting; electro-magnetic prospecting.

2101833 Soil Dynamics and Earthquake Engineering 3(3-0-9)

Earthquake mechanisms, earthquake magnitude and energy, strong ground motions, seismic hazard assessment, wave propagation theory, basic soil dynamics, effects of earthquakes in geotechnical aspects: liquefaction, dynamic bearing capacity and lateral earth pressure.

2101835 Earth and Retaining Structures 3(3-0-9)

Slope stability problems; methods of slope stability analysis; slope stability analysis under drained/undrained conditions and with/without groundwater seepage; field stability observations using geotechnical instruments; introduction to earth pressures; lateral earth pressures; lateral earth pressure theories; analysis and design of retaining wall.

2101840 Traffic Modeling and Simulation 3(3-0-9)

Traffic micro-simulation fundamentals; the use of transportation and traffic simulation and modeling software; data collection and preparation; base model development; model calibration; interpretation of outputs; related statistical analysis.

2101841 Special studies in Transportation Engineering 3(3-0-9)

Individual's problem solving in transportation engineering.

2101844 Road Safety 3(3-0-9)

Accident characteristics; sources of road traffic accidents; road safety indicators; statistical methods in traffic safety analysis; safety management system; road safety audit; counter measures; current research in road safety.

2101846 Railway Engineering 3(3-0-9)

Historical development of railways; principles of railway planning; geometric design; track structure; rolling stocks; signaling and operating system; financing and economics of railway development project; construction and maintenance of railways.

2101870 Construction Project Management 3(3-0-9)

Concept of construction project management, planning and scheduling techniques, estimating, and cost control techniques for construction projects; work breakdown structure; progress monitoring ; construction resource management; project risk management; project quality control and quality assurance; new project management techniques.

2101871 Risk Management in Civil and Environmental Engineering Systems 3(3-0-9)

Fundamental concepts of risk, risk management process, risk analysis, risk response, risk monitoring and evaluation, risk management tools and techniques, reliability of civil and environmental engineering system, risk benefit assessment, acceptable risk, risk management system, applications and case studies in civil and environmental engineering systems.

2101873 Special Topics in Construction 3(3-0-9)

Fundamental concepts of risk, risk management process, risk analysis, risk response, risk monitoring and evaluation, risk management tools and techniques, reliability of civil and environmental engineering system, risk benefit assessment, acceptable risk, risk management system, applications and case studies in civil and environmental engineering systems.

2101811 Thesis 12 Credits

2101828 Dissertation 48 Credits

2101829 Dissertation 60 Credits

2101894 Doctoral Dissertation Seminar 0(0-0-0)

2101897 Qualifying Examination 0(0-0-0)