Organizational Chart

ChaoYang University of Technology

The Department of Construction Engineering was established in 1994, the same year as the University was founded. At that time, there were more than four hundred students enrolled in the undergraduate program. The Department initiated its first graduate program leading to Master’s degree of Science in Engineering in 1996. The Executive Master in Engineering (EME) program for practitioners was introduced in 1998. Right now, there are about 90 students enrolled in the regular Master’s program and 50 students enrolled in the EME program. Besides, there are about 150 students enrolled in the evening division to pursue Bachelor’s degree.

Program

Undergraduate Program

Objectives:
The objective of the Department is to design and develop, on the basis of regular review and revision, an adequate and relevant curriculum for training undergraduate students with a major in civil and construction engineering. Students graduate from the Department should exhibit sufficient design skills in structural engineering, geotechnical engineering, construction management, and related fields. In addition, the Department places emphasis and encourages students to pursue Master’s degree after finishing his/her Bachelor’s degree from the Department. Areas of studies include, but not limit to, design and analysis, construction management, materials for construction.

Design and Analysis:
Incorporates analysis of structural and foundation behavior, engineering mechanics, structural design, and the latest construction methods and techniques.

Construction Management:
Includes construction project planning, cost control, productivity analysis, investment and decision-making, and construction law.

Materials for Construction:
Includes concrete quality control, asphalt materials and the behavior and qualities of various construction materials, such as rules for mixing materials, testing standards, and material testing methods.

Graduate Program

The background of the faculty members includes structural engineering, geotechnical engineering, and management. Research projects are usually focused on topics related to construction technology, construction management, and construction materials.

Construction Technology:
This specialization includes advanced course work in structural analysis, soil mechanics, structural design, foundation design, slope stability analysis, earthquake engineering, and new construction methods and technology.

Construction Management:
This specialization includes advanced course work in engineering management, engineering planning, construction control, investment and decision, and aspects of the legal system relevant to the construction industry.

Construction Materials:
This specialization includes course work in the mechanics and characteristics of a wide variety of construction materials, testing standards, and laboratory techniques. Technologies involving nondestructive testing methods (NDT) prior to repair and rehabilitation are also emphasized in this area of study.
Faculty Research Areas

Structural
Chia-Chi Cheng
Associate Professor
Ph.D., Dept. of Civil Engr., Cornell University
Email: eecheng@mail.cyut.edu.tw
**Technical Interests:**
Non-destructive evaluation for structural concrete
**Research Topics:**
Impact-echo method
Durability of concrete
Evaluation of bond stress in RC structure using the NDT.

Chi-Hung Chiang
Associate Professor
Ph.D., Dept. of Mechanical Engr., University of Colorado
Email: chiangc@mail.cyut.edu.tw
**Technical Interests:**
NDT of Structural Materials
Signal Processing
**Research Topics:**
Wavelet analysis of elastic waves propagating in damaged concrete beams
Time-temperature analysis of residual compressive strength of concrete after fire exposure
Applications of neural network to NDT

Yu-Cheng Kan
Associate Professor
Ph.D., Dept. of Civil Engr., Kansas State University
Email: yckan@mail.cyut.edu.tw
**Technical Interests:**
Concrete Engineering
**Research Topics:**
Structural Behavior of Reinforced Concrete Members
Fracture Mechanics of Concrete
Repair Materials of Concrete

Won-Sun King, Ph.D
Professor, Dean of Academic Affairs
Ph.D., Dept. Civil Engr., Purdue University
Email: wsking@mail.cyut.edu.tw
**Technical Interests:**
Steel Structures
**Research Topics:**
Structural Analysis
Structural Test
Engineering Education

Ming-Gin Lee
Associate Professor
Ph.D., Dept. of Civil Engr., University of Florida
Email: mglee@mail.cyut.edu.tw
**Technical Interests:**
Concrete Engineering
Pavement Engineering
**Research Topics:**
The Concrete Behavior and Steel Corrosion
The Study on Advance Concrete

The Durability of Retrofit Composite Materials

Chi-Ling Pan
Associate Professor, Dean, Office of Student Affairs
Ph.D., Dept. of Civil Engr., University of Missouri at Rolla
Email: clpan@mail.cyut.edu.tw
**Technical Interests:**
Cold-Formed Steel Structures
**Research Topics:**
The Structural Behavior of Hybrid Cold-Formed Steel Members
The Shear Lag Effect on Cold-Formed Steel Tension Members
The Strength of Cold-Formed Steel Framing System

Grace Shuchuan Wang
Assistant Professor, P.E.
Ph.D., Dept. of Civil Engr., University of California at Irvine
Email: grace@mail.cyut.edu.tw
**Technical Interests:**
Earthquake Engineering
**Research Topics:**
System Identification
Structural Reliability
Seismic Evaluation

Shengmin B. Wu
Associate Professor, P.E.
Ph.D., Dept. of Civil Engr., University of Cincinnati
Email: swu@mail.cyut.edu.tw
**Technical Interests:**
Steel Structures
Engineering Law
**Research Topics:**
The Effective Length Factor of Steel Tapered Steel Members
The Teaching Aid Model of Connections of Steel Structures

Chih-Peng Yu
Assistant Professor
Ph.D., Dept. of Civil Engr., University of Texas at Austin
Email: cpyu@mail.cyut.edu.tw
**Technical Interests:**
NDT Techniques
**Research Topics:**
Application of impact responses to the assessment of concrete members/structures
Nonlinear modeling of structural members
Model analysis and test for infrastructures

Geotechnical
Tzyy-Shiou Chang
Associate Professor
Ph.D., Dept. of Civil Engr., University of Michigan at Ann Abbor
Email: tschang@mail.cyut.edu.tw
**Technical Interests:**
Soil dynamic
Earthquake engineering
**Research Topics:**
Soil dynamic and geotechnical earthquake engineering
Seismic hazards mitigation
Soil mass stability and soil improvement.
Shih-Tsung Hsu
Associate Professor, P.E.
Ph.D., Dept. of Construction Engr., National Taiwan Univ. of Technology
Email: shthsu@mail.cyut.edu.tw
**Technical Interests:**
- Ground Anchors

**Research Topics:**
- Uplift Behavior of Anchors
- Anchorage Behavior of Anchor Groups
- Behavior of Inclined Anchors
- Piles Behavior

Sung-Chi Hsu
Associate Professor, P.E., Director, CYUTCE Technical Service Center
Ph.D., Dept. of Civil Engr., University of Texas at Austin
Email: schsu@mail.cyut.edu.tw
**Technical Interests:**
- Rock Engineering
- Tunneling
- Engineering Geology

**Research Topics:**
- Stability and Failure Mechanism of Weak Rock Masses
- Liquefaction Potential and Associated Failure Phenomenon in Taiwan
- Anchorage Behavior of Anchors in Gravel Formation

Jiunnren Lai
Assistant Professor
Ph.D., Dept. of Civil Engr., University of Texas at Austin
Email: jrlai@mail.cyut.edu.tw
**Technical Interests:**
- Geotechnical Laboratory Testing
- In-Situ Monitoring

**Research Topics:**
- Non-Destructive Testing of Piles
- Failure Potential of Highway Slopes
- The Shear Strength of Gravels

Ji-Yuan Lin
Associate Professor, P.E.
Ph.D., Dept. of Civil Engr., National Chung Hsing University
Email: jylin@mail.cyut.edu.tw
**Technical Interests:**
- Hazard Mitigation of Debris Flows

**Research Topics:**
- Hazard Assessment of Debris Flows using Geographic Information System (GIS)
- Hazard Mitigation on Debris-Flow Countermeasure in Lab and Field Investigation
- Monitoring of Slope Land and Slope Stability Analysis
- Multivariate Analysis and Artificial Neural Network Applied on Geotechnical Engineering

Shang-Yuh Lin
Associate Professor, P.E.
Ph.D., Dept. of Civil Engr., National Chung Hsing University
Email: sylin@mail.cyut.edu.tw
**Technical Interests:**
- Site Investigation and Earthwork Design
- Highway Planning and Designing
- Deep Excavation of Basement

**Research Topics:**
- A Study of the Dynamic Properties of Taichung Gravelly Formation
- The Technical Treatments on Slope Stabilization for the Gravelly Formation along Freeway in Southern Taiwan
- Hazards Mitigation of Geotechnical Engineering Combined with Environment、Ecology and Landscape

Pei-Hsun Tsai
Assistant Professor, P.E.
Ph.D., Dept. of Civil Engr., National Cheng Kung University
Email: phtsai@mail.cyut.edu.tw
**Technical Interests:**
- Soil Stabilization

**Research Topics:**
- Cement Stabilization of Clay
- Vibration Screening by Trench
- Slope Protection by Soil-Cement

**Construction Management**

Tao-Ming Cheng
Associate Professor, Chairman
Ph.D., Dept. of Civil Engr., Purdue University
Email: tmcheng@mail.cyut.edu.tw
**Technical Interests:**
- GA/Simulation Applications

**Research Topics:**
- Effective simulation mechanism for construction operations

Wen-Ta Hsiao
Instructor, P.E.
Ph.D. Candidate, Dept. of Civil Engr., National Chung Hsing University
Email: wdshiau@mail.cyut.edu.tw
**Technical Interests:**
- Civil Engineering Construction

**Research Topics:**
- The Optimization of Construction Operations

Yishuo Huang
Assistant Professor
Ph.D., Dept. of Civil Engr., University of Florida
Email: yishuo@mail.cyut.edu.tw
**Technical Interests:**
- Digital Photogrammetry
- Data Visualization
- Spatial Data Analysis

**Research Topics:**
- Exploring the Spatial Information from Given Imagery
- Visualizing the Analyzed Data by Different Mathematic Methods
- Analyzing the Collected Spatial Data and Applying the Data in Spatial Information System
The Geographic Information System Lab mainly provides students opportunities to collect and analyze spatial data to explore GIS applications. In general, the lab provides an interface between academic researches and industrial needs. Academic researches focus on the fields of geomatics, including spatial data structure, spatial data base, digital photogrammetry, remote sensing, and related fields. Furthermore, the lab explores the GIS applications to satisfy the needs of the industrial and local government.

Major Equipment
CalComp Drawing Board III, 36” x 48” surface digitizing board. This device allows GIS users to create digital maps from paper media by tracing over features of a map on an electro-magnetic surface.
CalComp ScanPlus II 800C Scanner. This large-format scanner allows color scanning of maps and drawings at a maximum width of 36” and a resolution of 800 dpi.
Hewlett-Packard DesignJet 800PS Color Plotter. This large-format, color plotter allows GIS users to print presentation quality posters and maps on paper 36” wide.
Hewlett-Packard 2100 Laser Printer. This provides a network laser printer for users of the GIS Lab.
TOPCON GPS Equipment. Two receivers will allow users to take latitude/longitude/elevation measurements by receiving signals from the NAVSTAR satellite network.

Geotechnical Engineering Lab
Overview
The mission of the Geotechnical Engineering Laboratory is to support teaching and research activities in the filed of geotechnical engineering.

Facility
Equipment is available for performing all standard geotechnical tests for measuring soil index properties, including specific gravity, grain size distribution, Atterberg limits, minimum and maximum index densities, and soil compaction.
More sophisticated equipment is available for measuring hydraulic conductivity, consolidation, shear strength, and dynamic properties.

Nondestructive Testing Lab
Overview
The Nondestructive Testing Laboratory, NDTL, was established in 2001. A cluster of advanced testing equipment is maintained by the nondestructive testing group at the Chaoyang University of Technology. These facilities are suitable for experimental research involving nondestructive testing and evaluating internal defects of structural materials. There are currently three professors and nineteen graduate students devoted to various NDT research projects and service contracts.

Description of Major Systems
Impact echo - Elastic waves are excited using impact sources. Two broadband displacement sensors are used to capture surface wave signals for concrete crack detection, bond performance assessment, and plate thickness. (ASTM 1383-98a)

Infrared camera - Surface conditions of buildings or other infrastructures can be examined by the recorded thermal images. (ASTM C1153-97; P4788-88)

Integrity Testing of Piles - This test method covers the procedure for determining the integrity of individual vertical or inclined piles by measuring and analyzing the velocity (required) and force (optional) response of the pile induced by an (hand held hammer or other similar type) impact device applied axially to the pile normally at the pile head. This test method is applicable to long structural elements that function in a manner similar to foundation piles, regardless of their method of installation provided that they are receptive to low strain impact testing. (ASTM D3882)

SASW System - Elastic waves are excited using impact sources. Two geophone sensors or accelerometers are equipped within certain distance to capture surface wave signals for plate-like and layered media. Profiles of tested objects can be classified in terms of shear wave velocities by the Spectral Analysis of Surface Waves (SASW) procedures.

Ultrasonic pulse velocity - Travel time of elastic waves propagating in concrete is measured using ultrasonic pulse excitation. Concrete homogeneity and depth of surface-opening crack can be examined using two piezoelectric transducers. (ASTM C597-02)

Ultrasonic pulser-receiver - Flexible configurations of ultrasonic pulse excitation and reception are made in conjunction with signal conditioning circuitry and external peripherals. Prototypes are tested for the measurement of stress level of steel tendons and other applications.

Ultrasonic flaw detector - The quality of welded components are evaluated based on the pulse-echo measurements of steel, aluminum, and other metals. (ASTM E1901-97)
Vibration Monitoring - Data Acquisition Modules with HP VXI standard can be applied to the monitoring and feedback-control for various structural systems.

Rock Mechanics Lab

Overview
The mission of the Rock Mechanics Laboratory is to support teaching and research activities in the field of rock mechanics and engineering geology.

Services
The laboratory has facilities for testing and research on the following fields:
- Rock classification and characterization tests
- Rock engineering design tests
- Air-photo Interpretation
- Geologic and engineering geologic mapping
- Applied and environmental geophysical surveys

Main Equipments
- UDEC and PFC programs
- DIPS program
- 200 tons Hydraulic jack for testing of anchor
- Point Load Tester
- Slake Durability Apparatus
- Schmidt Hammer-L Model
- Laboratory Coring Machine
- Rock Core Trimmer Machine
- Rock and Masonry Cutting Machine
- 10 tons Direct Shear Apparatus

Small Scale Structure Testing Lab

Overview
Computerized structural analysis is a powerful and beneficial tool for structural engineering students. However, proficiency in computerized structural analysis without complementary laboratory experiences can undermine the ability of students to visualize the physical responses of basic structures under various loading conditions. In addition, lack of practical laboratory experiences can cause students to have a false sense of security or "blind faith" in computer output.

In view of these potential problems, an AN/EX (Analysis and Experiment) facility has been developed to encourage cross-verification between computer analyses and laboratory experiments. This is accomplished by first predicting the behavior of small-scale structural models by running a sophisticated structural analysis computer program, and then actually measuring the responses of these structural models in the AN/EX test bed using a sophisticated data acquisition system. AN/EX then facilitates real-time comparisons between the analytical predictions and the experimental data. AN/EX can be used by students who fall within a broad spectrum of computer expertise-- from those who have little computer background to those who use computers extensively. AN/EX software includes a friendly preprocessor to the on-board structural analysis program named "M-STRUDL" (Microprocessor Structural Design Language). The preprocessor, called INPUT, contains thorough instructions and on-line help to facilitate the creation of a valid M-STRUDL input file that will be used to perform an M-STRUDL computer analysis of the small-scale model structure.

Objectives
Teach students to use a sophisticated, professional-quality structural analysis software package (M-STRUDL) without requiring them to wrestle with a voluminous user's manual.
Enable students to perform side-by-side comparisons of manual analyses, computer (M-STRUDL) analyses, and small-scale model experiments. Demonstrate the pitfalls of accepting, without verification, either analytical results or experimental data, and reinforce the importance of independent solution checks and mutual verification of analysis and experiment.
Enable students to develop a deeper understanding of the physical response of structures to various loading conditions.
Enable students to become familiar with data acquisition systems and proper experimental techniques.

Slope Hazard Mitigation Lab

Overview
Lab for research activities include the application of soil and rock mechanics principles to the evaluation, design and construction of structures in and on soil or rock, including design of anchor systems, and site improvement techniques.

Services
- Slope stability analyses
- Landslide evaluations for causation and mitigation
- Slope stability evaluations for development
- Landslide mapping for planning
- Landslide repair design and cost estimating
- Landslide repair construction control
- Debris flow evaluations for causation and mitigation

Main Equipments
- Prototype debris flow simulator
- Equipment for sand equivalent value of soils and fine aggregate
- Plate loading system (Jack 30tf with pump and gauge)
- Inclinometer (Probe, cable and readout)
- Load cell for anchor
- Piezometers
- Pressure cells
- Digital strain indicator
- Direct residual shear apparatus
- FDM program FLAC 3D
- Slope stability analysis program (STABLE and UTEXAS3)
- Ground excavation analysis program (RIDO)

Structural Lab

Overview
The structural lab was built after the 921 Earthquake in 1999. It is equipped with a 20 m x 10 m x 70 cm reaction slab and an 8 m x 7.2 m x 1m reactions wall, which provide the vertical and horizontal loading reactions for large-scale structural load test. A lifting crane system with 14 m clear height and 20 tons capacity is also equipped for transporting large specimens. The structural lab provides sufficient room and equipments for research and teaching tasks.

Research Fields
Structural lab provides the tests and analyses of steel elements and concrete elements subject to static or dynamic loadings. The main research topics in the latest 3 years are as follows:
- Mechanical property of cold-formed steel structure
Ultimate load capacity of structure
Non-destructive test (NDT) for concrete structure
Prediction of loading capacity of pre-stressed concrete by stress wave
Failure mechanism of concrete elements
Assessment and repair of cracking concrete members

**Test Items**
- Scaffold load test
- Load test for small-scale structural elements
- Load test for large-scale structural elements
- Load tests for various types of construction materials

**Main Equipments**
- 135 tons, 4.5 m clear height scaffold loading system
- 50 ton MTS actuator for structural test
- 50 ton MTS load frame for material test
- One-dimensional small scale shaking table
- DE1200 data acquisition system with up to 120 channels
- Load cells with load capacities of 5 ton, 10 ton, 20 ton and 50 ton
- LVDT's with travel lengths of 1 cm, 2 cm, 5 cm 10 cm and 20 cm

Structural

Professor Won-Sun King

Associate Professor Chia-Chi Cheng
1. Evaluation of the degree of deterioration in mass concrete for nuclear facilities using the impact-echo method. (NSC, 2002)
2. Using impact-echo method to detect void around steel rebar in structural concrete after severe earthquake. (NSC, 2000-2001)
4. Investigation on deriving transfer function from the impact-echo response and possible application on evaluating concrete structure (NSC, 2000)

Associate Professor Chih-Hung Chiang
1. Comparative analysis of reinforcement development and fracture mechanisms toward the assessment of bond performance (NSC, 2000)
2. Long-term monitoring of un-grouted pre-stressing tendon and measurement of pre-stress loss using nondestructive techniques (NSC, 2000)
4. Enhancing the detectability of defects in concrete using novel ultrasonic signal processing techniques (NSC, 2003)

Associate Professor Yu-Cheng Kan
1. Fundamental Study of Mechanical Property for Fiber-Reinforced Heavy Concrete (2000–2001)

Associate Professor Ming-Gin Lee
2. The study of microwave accelerated curing on the strength and permeability of concrete (NSC, 2000)
3. The testing study for durability of CFRP sheets on strengthening concrete members (NSC, 2001)
4. New RPC material for the protection of nuclear power or waste storage utility (NSC, 2002)

Associate Professor Chi-Ling Pan
1. The Study of Load-Carrying Capacity of Light-Gauge Steel Wall Studs under Axial Loads (NSC, 2000)
2. Drafting the Design Specification and Commentary for Cold-Formed Steel Structures (ABRI, 2000)
3. The Effect of Web Perforation of Cold-Formed Steel Compression Members (NSC, 2001)
4. Drafting the Design Example and Design Manual for Cold-Formed Steel Members (ABRI, 2001)
5. The Study of the Behavior and Strength of Cold-Formed Steel Wall Frames under Compression (NSC, 2002)
7. The Behavior and Strength of Cold-Formed Steel Wall Framing System under Axial Loading Condition (NSC, 2003)
8. Integrating the Detail Design of Light Weight Buildings and Structures (ABRI, 2003)

Associate Professor Shengmin B. Wu
1. Teaching Aid Research on Connections Design of Steel Structures (2000-2001)
2. Teaching Aid Model on Connections Design of Steel Structures (2001-2002)
3. 3D Visual Simulation and Internet Application of Teaching Aid Model for Steel Connections (2003-2004)

Assistant Professor Grace Shuchuan Wang
1. Design Seismic Input in Mid-Taiwan Area (NSC, 2000)
2. Inelastic Response Spectra of RC Buildings in Taiwan Area (NSC, 2000-2001)

Assistant Professor Chih-Peng Yu
1. Feasibility Study Of Dynamic Foundation Response Test For Bridge Foundations (NSC, 2000)
2. Application Of Continuous Formulation In Frequency Domain To Dynamic Analysis Of Structures (NSC, 2001)
3. On the Exact Dynamic Stiffness Derived from Rigorous Theories of Linear Members with Consideration of Distributed Springs and Dashpots (NSC, 2002)

Geotechnical

Associate Professor Tzyy-Shiou Chang
2. Liquefaction Potential Analysis For Gravelly Sand (NSC, 2000-2001)

Associate Professor Ji-Yuan Lin
1. A study on the type and installation position of the debris flow monitoring instrumentation(Ⅱ)(NSC, 2000)
2. A study on the type and installation position of the debris flow monitoring instrumentation(Ⅰ)(NSC, 2001)

Associate Professor Sang-Yuh Lin
1. The technical treatments on slope stabilization for the gravelly formation alone freeway in southern Taiwan(Ⅱ)(NSC, 2002)
2. The technical treatments on slope stabilization for the gravelly formation alone freeway in southern Taiwan(Ⅰ)(NSC, 2003)
3. The edit of teaching materials of mitigation of hillside hazards including environment, ecology, landscape and geotechnical engineering (CYUT, The college of science and engineering, 2003)
Associate Professor Shih-Tsung Hsu
1. Uplift behavior of different-type anchors in silty sand (I) (NSC, 2000)
2. Uplift behavior of different-type anchors in silty sand (II) (NSC, 2001)
3. Anchorage behavior of inclined anchors in silty sand (NSC, 2002)
4. A study on the interactive behavior of underreamed anchor in sand (NSC, 2003)

Associate Professor Sung-Chi Hsu
1. Anchorage Behavior of Ground Anchors in Gravel Formation (NSC 2000)
2. Evaluation of Liquefaction Potential and Measurement of Shear Wave Velocity for Soils in Wufeng Areas (NSC 2000)
3. Investigation of Liquefaction Potential at Wufeng, Taichung County during the 921 Chi-Chi Earthquake (NSC 2000)
4. Study on liquefaction analysis and national wide liquefaction potential Map: Taichung Count (NSC 2000)
5. Failure Mechanism Study of Toppling Failures in Central Taiwan (I) (NSC 2001)
6. Study on liquefaction analysis and national wide liquefaction potential Map: Taichung City and Nantou County (NSC 2001)
7. Failure Mechanism Study of Toppling Failures in Central Taiwan (II) (NSC 2002)
8. Study on Liquefaction analysis and national wide liquefaction potential Map: Miaoli, Taichung, and Nantou Counties (NSC 2002)

Assistant Professor Jiunnren Lai
2. Integrity Testing of Caissons under Chung-Jen Bridge at Taipei City (Join Consultant Inc., 2003)
3. Integrity Testing of Piles under Shing-Shen High Rise Bridge at Taipei City (Join Consultant Inc., 2000)
4. Integrity Testing of Piles under Tze-Chiang Bridge along the 19th Provincial Highway (Taiwan Provincial Highway Administration, 2000)

Assistant Professor Pei-Hsun Tsai
1. Study on the screening effectiveness of surface waves by in-filled trenches (NSC, 2000)
2. Study on the screening effectiveness of vibrations induced by high speed train with open trenches (NSC, 2001)
3. The study of clay improvement with slag cements (NSC, 2002)
4. Study the suitability of soil cement as slope protection (NSC, 2003)

Construction Management

Associate Professor Tao-Ming Cheng
1. The establishment of decision-making support system for the choice of leaking-stopping methodology (NSC, 2000)
2. The establishment of decision-making support system for the selection of assembled accommodations (NSC, 2000)
3. Integrating fuzzy number, learning curves, and genetic algorithms in the development of construction operation simulation system (NSC, 2001-2002)

Assistant Professor Yishuo Huang
2. Applying Algebraic Geometry on Complex Scenes to Restore the 3D Environment, (NSC 2001)
3. Extracting Artificial or Natural Objects from Digital Aerial Photos with Employing Mumford-Shah Function, (NSC 2002)
4. Constructing the Module of Regional Matching with Geodesic Active Regions And Level Sets Approaches, (NSC 2003)
UNIT OF STUDY DESCRIPTIONS

CEE1501 Advanced Structural Analysis- 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in semester 1, in every year.

Assessment: Homework assignments and exam.

Objectives: This course emphasizes the systematic approach to the stiffness method and flexibility method, along with its application in complex structures. There is no pretense that this course will cover all topics in all disciplines of engineering.

Outcomes: Students will develop analysis skills to deal with the sophisticate problem of structures.

CEE1502 Structural Dynamics - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in every year.

Assessment: Homework assignments, term project and exams.

Objectives: To review the fundamental concepts regarding dynamic responses of structures and to develop a relatively thorough understanding of the dynamic behavior of more realistic physical systems.
Outcomes: Students will become familiar with dynamic behavior of various types of structures and be able to deduce required formulations when dealing with more advanced dynamic problems of certain physical systems.

Syllabus summary: This course will review the fundamental concepts used in solving SDOF systems, procedures for the modal analysis of MDOF systems, and direct integration scheme for both linear and nonlinear systems. Several advanced topics including exact formulations of several linear members, seismic responses and its application to seismic design, and Frequency domain analysis will be covered.

CEE1503 Elasticity - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in every year.

Assessment: Homework assignment, mid-term and final examinations

Objectives: To understand preliminary analytical treatment of elastic solid mechanics and its applicability to civil engineering.

Outcomes: Students will gain better insight into engineering mechanics and learn to solve structural problems analytically for simple configurations of loading and boundary condition.

Syllabus summary: Topics including introduction to Cartesian tensors, stress and strain, behavior of engineering materials, constitutive law for linear elastic behavior, boundary value problems, plane stress plane strain problems, beams on elastic foundation, and plate theory.

CEE1505 Experimental Stress Analysis - 3 credits

Classes: Recitations – 3 hours/wk (54 hours) in Semester 1, in every year.

Assessment: Homework assignment, quiz and term project.

Objectives: To understand the theory and procedure of stress-strain measurement in the lab.

Outcomes: Student who had this course will know the methodology in the measurement of strain and stress and be familiar with various testing equipments.

Syllabus summary: This course introduces the fundamental theory of plain stress, failure theory and regular measuring equipments and their applications. Calibration skill for equipment and testing procedure will be addressed in this course via a experimental project. Statistical skills used in the experiment will be also introduced in this course.

CEE1508 Fuzzy Set Theory and Application - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in odd year.

Assessment: Homework assignments, term project, and exam.

Objectives: To develop an understanding of the concepts of fuzzy set theory and its applications for the construction operation decision makings.

Outcomes: Students will develop skills in the construction operation decision makings using fuzzy set theory and its related techniques.

Syllabus summary: Topics in fuzzy set theory and rationality including fuzzy logic, fuzzy linear programming, fuzzy optimization, and fuzzy classification. Applications are drawn from engineering decision making, and engineering control system.

CEE1528 Numerical Modeling - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in every 2 year.

Assessment: Homework assignments, term project and exams.

Objectives: To develop a relatively thorough understanding of the treatment to various types of physical systems.

Outcomes: Students will become familiar with characteristics of equilibrium problems, eigen-problems, and propagation problems and know how to use appropriate numerical skills to interpret the physical systems.


CEE1530 Seismic Capacity Evaluation- 3 credits

Classes: Lectures –3 hours/wk (54 hours) in Semester 2, in every year.

Assessment: Homework assignments, term project, and exam.

Objectives: It provides students with methods of seismic capacity evaluation for buildings and its corresponding application with suitable examples.

Outcomes: Students will develop the basic skills in the analysis of seismic capacity for buildings.

Syllabus summary: Topics including seismic capacity evaluation for RC buildings and steel buildings.

CEE1546 Cold-Formed Steel Structure Design- 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in semester 2, in every 2 year.

Assessment: Homework assignments, quiz, and exam.

Objectives: This course provides students with a better understanding of the analysis and design of the thin-walled, cold-formed steel structures that have been widely used in building construction and other areas in recently years.

Outcomes: Students will develop skills in the analysis and design of cold-formed steel structures.
**Syllabus summary:** Throughout this course, descriptions of the structural behavior of cold-formed steel members and connections are given from both theoretical and the experimental point of view.

**CEE1551 Experiment of Structural Mechanics - 3 credits**

**Classes:** Lectures – 3 hours/wk (54 hours) in semester 1, in every year.

**Assessment:** Homework assignments, experimental reports, and exam.

**Objectives:** Under the given loads, the structural member forces and structure deflections can be obtained by the small-scale structure model experiment. The discrepancy between the theoretically analysis and experimental result can be compared and studied in this course.

**Outcomes:** Students will learn the technique in the analysis of experimental data and develop the skill in the design of experiments.

**Syllabus summary:** The technique of experiment, application of analysis soft program, and statistics of experimental data are studied and covered in this course.

**CEE1552 Behavior of Reinforced Concrete Member - 3 credits**

**Classes:** Recitations – 3 hours/wk (54 hours) in Semester 1, in every year.

**Assessment:** Homework assignment, quiz and term project.

**Objectives:** To understand the advanced theory and behavior of reinforced concrete.

**Outcomes:** Student who had this course will understand the behavior of reinforced concrete members.

**Syllabus summary:** This course introduces the advanced theory of reinforced concrete structure and its behavior subject to loads. The content includes analysis of non-prismatic beam element, flexural analysis which includes cracking of element, bond, fracture mechanics, torsion, yield line theory and other special topics.

**CEE1553 Earthquake Engineering - 3 credits**

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 2, in every 2 year.

**Assessment:** Homework assignments, term project and exams.

**Objectives:** To develop a thorough understanding of the earthquake related topics such as engineering seismology, wave propagation phenomenon, structural behavior under seismic loadings, seismic codes, preparedness and hazard mitigation and so on.

**Outcomes:** Students will gain ability to carry out basic building design based on seismic codes and to develop engineering intuition in earthquake related issues.

**Syllabus summary:** This course covers subtopics including Engineering Seismology, Seismic waves and propagation of wave, Ground Motions and Design Earthquake, Brief Summary of Structural Dynamics, Computational Software (ETABS), Seismic Analysis, Seismic Design, Effect of Soil Structure Interaction (SSI), Evaluation of Vulnerability, Seismic Hazard Mitigation, Seismic Retrofitting (optional).

**CEE1555 Composite Materials - 3 credits**

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 2, in every 2 years.

**Assessment:** paper assignments, term project, presentation and exam.

**Objectives:** To develop and understand of composite materials including introduction to composite materials, composite materials science, fiber reinforcing polymer materials, processing, fabrication and applications.

**Outcomes:** Students will develop and understand skills in composite materials including introduction to composite materials, composite materials science, fiber reinforcing polymer materials, processing, fabrication, application and their durability.

**Syllabus summary:** The course covers the properties, processing, fabrication, and applications of the different composite materials which including fibers (glass fiber carbon fiber and ceramic fiber), matrices (polymeric matrices, metal matrix composite and ceramic matrix composite) and glass-ceramic composite. The construction materials such as asphalt, concrete, plastics, rubber, glass and timber are discussed in class.

**CEE1556 Finite Element Method- 3 credits**

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

**Assessment:** Computer assignment, written assignment, mid-term and finial examinations.

**Objectives:** To understand formulation and behavior of various finite elements and its application to civil engineering.

**Outcomes:** Students will be prepared for proper choice of models and solution methods for analyzing engineering problems and good interpretation of finite element analysis results.

**Syllabus summary:** Topics including Element Formulation-variational method and residual method, Element Behavior Modeling, Shape Functions, Isoparametric Elements, Numerical Integration, Element Instabilities, Stress recovery, and Error Estimation.

**CEE1557 Theory of Plates and Shells- 3 credits**

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

**Assessment:** Homework assignments, and exam.

**Objectives:** It provides students with a simple, comprehensive, and methodical presentation of the principles of plate and shell theories and their applications to numerous structural elements, including dome, pressures vessels, tanks, and pipes. Selected topics included are
Outcomes: Students will develop the basic skills in the analysis of plates and shells.

Syllabus summary: Topics including plate bending theory, circular plates, rectangular plates, numerical method for plates bending, plates under lateral and in-plane loading, large deflection of plates, membrane stresses in shells, bending stresses in shells, Cylindrical shells under general loads, and application.

CEE1558 Advanced Topics in Concrete - 3 credits

Classes: Lectures –3 hours/wk (54 hours) in Semester 2, in every 2 years.

Assessment: paper assignments, term project, presentation and exam.

Objectives: To develop and understand of the advanced concrete technology including self-compact concrete, reactive powder concrete, high performance concrete, reinforcing concrete repair and strengthen, nondestructive test methods on concrete structures, controlled low strength material and concrete durability.

Outcomes: Students will develop and understand skills in the advanced concrete technology such as self-compacting concrete, high performance concrete, reinforcing concrete repair and strengthen, nondestructive test methods on concrete structures, controlled low strength material and concrete durability.

Syllabus summary: The course is the advanced course for concrete practice. The purpose of this course is to teach students learning on the handing, mixing, measuring, transporting and placing of all the materials used in making normal weight and light weight concrete, fiber reinforced concrete, high strength concrete, high performance concrete, self-compacting concrete, reactive powder concrete and so on. The special Concrete materials and construction methods are briefly discussed in class.

CEE1582 Structural Reliability - 3 credits

Classes: Lectures –3 hours/wk (54 hours) in Semester 2, in every year.

Assessment: Homework assignments, and exam.

Objectives: It provides students with knowledge of computational methods for structural reliability, including analytical method, approximate method and simulation method.

Outcomes: Students will develop the basic skills in the analysis of structural reliability.

Syllabus summary: Topics including review of probability and statistics, extreme value statistics, safety margin and safety factor, second-moment formulation, reliability-based design and system reliability.

CEE1583 Behavior of Steel Structure - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

Assessment: Homework assignments, and exam.

Objectives: To develop an understanding of the behavior of steel structure.

Outcomes: Students will develop skills in the analysis of the behavior of steel structure.

Syllabus summary: Topics including the behavior of columns, beams, trusses, and frames are covered. In addition, the analysis of the load-carrying capacity of steel structure is enclosed.

CEE1585 Structural Stability - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

Assessment: Homework assignments, and exam.

Objectives: To develop an understanding of the analysis of structural stability for columns, beams, beam-columns, and frames.

Outcomes: Students will develop skills in the analysis of Structural Stability.

Syllabus summary: This course presents a simple, concise, and reasonably comprehensive introduction to the principles and theory of structural stability that are the basis for structural steel design and shows how they may be used in the solution of practical building frame design problems.

CEE2501 Application of Nondestructive Evaluation on Civil Engineering - 3 credits

Classes: Lectures –3 hours/wk (54 hours) in Semester 1, in every 2 year.

Assessment: Reading assignments, hands-on experiments, and exam.

Objectives: To develop knowledge and skills of nondestructive testing (NDT) and evaluation for civil engineering.

Outcomes: Students will gain broad knowledge on nondestructive testing and evaluation and develop skills in nondestructive testing and condition assessment of concrete structures.

Syllabus summary: Topics including ultrasonic techniques and in-place estimate of concrete properties, in-place methods to estimate concrete strength, stress wave techniques for detecting defects in concrete structure, NDT for bridges and piles, NDT of steel structures. Hands-on experiments are included.

CEE2503 Earthquake Resistant Design - 3 credits

Classes: Lectures –3 hours/wk (54 hours) in Semester 1, in every year.

Assessment: Homework assignments, term project, and exam.

Objectives: It provides students with knowledge of seismic design code for buildings and its corresponding application with suitable examples.

Outcomes: Students will develop the basic skills in the seismic design of buildings.

Syllabus summary: Topics including earthquake engineering,
seismic hazard analysis, response spectra, and seismic design code for buildings.

CEE2504 Fracture Mechanics - 3 credits
Classes: Recitations – 3 hours/wk (54 hours) in Semester 1, in every year.
Assessment: Homework assignment, quiz and term exam.
Objectives: To understand the theory and applications of fracture mechanics in engineering design and analysis.
Outcomes: Student who had this course will have the advanced knowledge in the work of engineering design and analysis.
Syllabus summary: This course introduces the fracture mechanics theory and its applications to steel structures and concrete structures as well. The content will cover the failure of structures, linear elastic fracture mechanics, nonlinear elastic fracture mechanics, fracturing process of materials, fracture toughness, R-curve, applications of FM to concrete structures and other areas.

CEE2514 Structural Plastic Analysis - 3 credits
Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.
Assessment: Homework assignments, and exam.
Objectives: To develop an understanding of the basic concepts and methods used in structural plastic analysis.
Outcomes: Students will develop skills in the plastic analysis of structures.
Syllabus summary: Topics including Basic concepts, Plastic hinge, Tools used in plastic analysis and design, Equilibrium method, Work method, Estimate of deflections, First-order hinge-by-hinge analysis are covered. In addition, Second-order plastic hinge analysis is enclosed.

CEE2569 Pavement Design - 3 credits
Classes: Lectures –3 hours/wk (54 hours) in Semester 1, in every 2 years.
Assessment: Homework assignments, term project, and exam.
Objectives: To develop an understanding of the design and construct of advanced pavement engineering including rigid pavements, flexible pavements, pavement materials, soils, and concretes.
Outcomes: Students will develop skills in the design and construct of advanced pavement engineering such as rigid pavement and flexible pavement.
Syllabus summary: The course is the advanced course for pavement engineering. The purpose of this course is to teach students learning how to design and construct pavement engineering. It covers the introduction of pavement engineering, the design of rigid and flexible pavement, the construct of rigid and flexible pavement, pavement performance management, and pavement rehabilitation. The pavement materials and construction methods are briefly discussed in class. In addition, pavement recycling, pavement maintenance and rehabilitation are enclosed.

CEE2570 Construction and Design of Bridge Engineering - 3 credits
Classes: Lectures –3 hours/wk (54 hours) in Semester 2, in every year.
Assessment: Homework assignments, term project, and exam.
Objectives: To introduce the concept of rock mechanics and application of rock mechanics to slopes and foundations.
Outcomes: Students will be able to predict or measure the properties of rock and joints, to select a suitable method to measure the in situ stresses in rock formation, to analyze/stabilize the stability of a rock slope, and to design a foundation in/on rocks.
Syllabus summary: Topics including engineering properties of rock and joints, stress and distribution inside the rock, stereographic projection method, rock slope stability analysis,
reinforcement of rock slopes, foundations in/on rock, laboratory practices, and related problems in rock engineering.

CEE1559 Advanced Foundation Engineering - 3 credits

Classes: Lectures – 54 hours in Semester, in every year.


Objectives: The objective of this course is to teach the students the concepts of dynamic foundation engineering and design of foundations for special purposes.

Outcomes: Students will develop skills in the design of dynamic and special foundations.

Syllabus summary: Topic covered in this course including: introduction; vibration isolating design; dynamic foundation design; soil liquefaction and amplification effects of earthquake motion; design of foundations for special purposes (deep foundation; deep excavation; etc.).

CEE1560 Application of Numerical Analysis on Geotechnical Engineering - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in every year

Assessment: Homework assignments, a midterm, and a final exam.

Objectives: This course introduces the theory behind the finite element method and presents its application to analysis of geotechnical problems.

Outcomes: Ability to select an appropriate solution method for a defined problem, obtain and verify that the solution satisfies all conditions, determine the behavior or response of the system being analyzed from the solution that was obtained, and state the limits of the solution.

Syllabus summary: The objectives of the course are to: introduce the finite element method to solve partial differential equation; formulate various finite elements in one, two and three dimensions; present the principles of modeling and nonlinear analysis; apply these principles to finish a programming assignment; introduce a typical finite element software package.

CEE1581 Advanced Geotechnical Laboratory - 3 credits

Classes: Lectures – 54 hours in Semester, in every year.

Assessment: Laboratory reports, reading assignments, and exam.

Objectives: Knowledge of shearing properties of soils is essential in various courses in geotechnical engineering, and is clearly important in engineering practice. The objective of this course is to let the students understand the behaviors of soils during shear.

Outcomes: Students will develop skills in obtaining the shearing properties of soils using various testing apparatus.

Syllabus summary: The shearing properties of two-phase soil systems (dry or saturated soils) is emphasized in this course, limited consideration to the shearing properties of partially saturated soils is given as well. Laboratory testing to obtain the shearing properties of soils will also be incorporated into this course, and related topics such as laboratory apparatus, testing errors, will be discussed as well.

CEE1590 Constitutive Models for Soil Materials - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in every year.

Assessment: Homework assignments, term paper, midterm, and final exam.

Objectives: To develop the capacities of calculation and analyses on stress-strain relations of geotechnical materials

Outcomes: Students will obtain the concepts on yielding criteria, theorem of plasticity, nonlinear stress-strain relations of soils. Then they could use the constitutive models to analysis the behavior of soil - structure iteration in real engineering problems.

Syllabus summary: Topics including uniaxial behavior in plasticity, stress tensor and strain tensor, yielding criteria, theory of plasticity, Hyperbolic model, and Cam-clay model.

CEE2507 Advanced Soil Mechanics - 3 credits

Classes: Lectures – 54 hours in Semester, in every year.

Assessment: Homework, reading assignments, and exam.

Objectives: This course is concerned with one of the fundamental and classical aspects of geotechnical engineering, the prediction of the amount and rate of settlement for structures placed on or in soil. Consolidation problems will be solved using both classical and numerical methods.

Outcomes: Students will develop skills in the prediction of the amount and rate of settlement for structures placed on or in soil


CEE2508 Ground Improvement - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in every year

Assessment: Homework assignments, two midterms, and a final exam.

Objectives: The course presents the treatment of site improvement would concentrate on the topics of compaction, preloading, surface stabilization with admixtures, and soil reinforcement.

Outcomes: Students will understand basic principles of ground improvement, including function and typical design parameters, and be ability to design a system for ground improvement.

Syllabus summary: This course will cover method of shallow surface compaction, deep compaction techniques, pre-consolidation, vertical drains, cement stabilization, lime stabilization, grouting, reinforced wall, reinforced embankment, reinforced foundation.
CEE2509 Earth Dam Engineering - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in every other year.

Assessment: Homework/reading assignments, term paper, and exams.

Objectives: To introduce the concept of seepage in dam, construction of a dam, and design of earth dams.

Outcomes: Students will be able to draw the flow nets in dams, to know how to build a dam, and analyze the stability of earth dams.

Syllabus summary: Topics including site investigation, seepage through dams, construction of earth dams, rehabilitation of earth dams, and dams in Taiwan.

CEE2515 Special Topics in Geotechnical Engineering - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

Assessment: Assignment & Report, Discussion, Mid-Term Exam, Final Exam.

Objectives: To provide graduate students with advanced knowledge in seismology, wave propagation and attenuation, site effect and liquefaction related science and engineering issues.

Outcomes: The students will develope adequate skills in geotech-related earthquake engineering for both research and practical application purposes.


CEE2558 Deep Foundation Engineering - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in every year.

Assessment: Homework assignments, two midterms, and a final exam.

Objectives: The main purpose of this course is to teach students how to design deep foundations.

Outcomes: Students will understand basic principles of deep foundation and be ability to design a system for deep foundation.

Syllabus summary: The following topics are covered in this course: ultimate capacities and load-deflection of piles and drilled shafts subjected to compressive loads, tensile loads, and lateral loads; soil-structure interaction; dynamic formula for the bearing capacity of piles; group effects of deep foundations; non-destructive tests of pile integrity; effects of installation; inspection of deep foundations and full-scale field tests.

CEE1509 Construction Operation Research - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in odd year.

Assessment: Homework assignments, term project, and exam.

Objectives: To explore the potential applications of OR theories in construction through the introduction of OR theories.

Outcomes: Students will develop skills in the construction operation decision makings using fuzzy set theory and its related techniques.

Syllabus summary: OR applications have been successfully implemented in many areas. Based on the characteristics of construction, the objectives of the course is to explore the potential applications of OR theories in construction through the introduction of OR theories, which cover game theory, inventory theory, dynamic programming, simulation, queuing theory, Marcov chains, linear programming and non-linear programming.

CEE1511 Project Management and Control - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 1, in every year.

Assessment: Homework assignments, term project, and exam.

Objectives: To develop an understanding of the techniques used in construction project management and control.

Outcomes: Students will develop skills in the construction project management and control.

Syllabus summary: Based on the characteristics of construction project, the topic covers different project management techniques, which includes project organizations, feasibility analysis (economic, financial), scheduling, cost planning and control, materials management, quality management, resource management, and operations theory application in construction.

CEE1563 Productivity Analysis in Construction - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

Assessment: Homework assignments, term project, and exam.

Objectives: To develop an understanding of the design and analysis of productivity for construction operations and its applications.

Outcomes: Students will develop skills in the design of models used in the analysis of productivity for construction operations.

Syllabus summary: Topics including CYCLONE simulation system, details of discrete event simulation methodology, queuing theory, and MPDM model are covered. In addition, mechanism for the integration of genetic algorithms and simulation is enclosed.

CEE1564 Project Financial Management - 3 credits

Classes: Lectures – 3 hours/wk (54 hours) in Semester 2, in
every year.

**Assessment:** Homework assignments, term project, and exams.

**Objectives:** To provide students with the skills necessary to understand, direct, and employ important accounting, estimating, and project control technologies in construction.

**Outcomes:** Students will gain fundamental knowledge in project financing, accounting, cost estimating.

**Syllabus summary:** Topics including cost engineering for construction organizations, projects, and operations; construction financing; break-even, profit, and cash flow analyses; capital budgeting; equipment cost and procurement decisions; construction financial accounting; cost control systems, databases; cost indices; parametric estimates; unit price proposals, measuring work.

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**CEE 1584** Computer Applications in Construction - 3 credits

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

**Assessment:** Homework assignments and exams.

**Objectives:** To provide students with the tools to apply computer technologies in the planning and execution of construction projects.

**Outcomes:** Students will become familiar with various computer applications for site-layout planning, scheduling construction projects, and integrated cost and time management.

**Syllabus summary:** Topics including project information systems structure; networking and communication technologies; digital document formats and environment; spreadsheets, database systems, and CAD modeling standards for interoperability with estimating and planning applications; discussion of developing new applications of computer and IT tools in construction.

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**CEE 2511** Quality Control in Construction - 3 credits

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 1, in odd year.

**Assessment:** Homework assignments, term project, and exam.

**Objectives:** To develop an understanding of the concepts and techniques used in construction quality control.

**Outcomes:** Students will develop skills in the construction quality control.

**Syllabus summary:** This course is taught in technique-oriented way that emphasizes statistical tools. Topics covered include sampling and descriptive statistics, probability distribution, control chart, and acceptance sampling.

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**CEE 2513** Construction Management Information System - 3 credits

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 2, in even year.

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**CEE2560** Geographic Information System Application in Construction Engineering - 3 credits

**Classes:** Lectures – 54 hours in Spring Semester

**Assessment:** Homework assignments, term project, and exams.

**Objectives:** To understand the principles of spatial analysis, and how to apply those theories and spatial analyses in construction engineering.

**Outcomes:** Students develop the capability to explore the applications of the spatial analyses in geographic information system.

**Syllabus summary:** Topics including spatial data structure, basic principles of spatial analyses, spatial data collection, spatial data modeling, creating and maintaining a spatial databases, and accuracy of spatial databases will be covered in the class.

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**CEE2561** Artificial Intelligence Application in Engineering Analysis - 3 credits

**Classes:** Lectures – 54 hours in Spring Semester

**Assessment:** Homework assignments, term project, and exams.

**Objectives:** To understand the principles of learning from experimental data and transferring human knowledge into analytical model, and apply those theories in construction engineering.

**Outcomes:** Students explore the possibility to apply the material covered in class in construction engineering.

**Syllabus summary:** Topics including support vector machines, artificial neural network, statistical learning, and fuzzy logic models will be covered in the class.

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**CEE 2562** Decision Making and Risk Management - 3 credits

**Classes:** Lectures – 3 hours/wk (54 hours) in Semester 2, in every year.

**Assessment:** Homework assignments and exams.

**Objectives:** To describe the elements in the analysis of decision alternatives and choices, as well as the objectives that guide
decision-making and risk assessment.

**Outcomes:** Students will realize the key issues related to a decision-maker's preferences regarding alternatives, risks, criteria for choice, and choice modes. They will also be familiar with commercial software and develop decision-making skills.

**Syllabus summary:** Topics including introduction to probability and statistics, subjective probability assessment; decision trees, sensitivity analysis, multiple sampling, values of information (EVPI and EVSI), utility assessment, utility and asset position, group utility, multiattribute utility; commercial decision-making software (DPL), Monte Carlo simulation and applications.