Course List

1st Year Required Courses

Calculus (general mathematics) (1)(2)(3)(4)
501 10520 Conceptual Design Studio
501 17010 Surveying (I)
501 27120 Surveying Practice
501 10600 Engineering Graphics
501 10710 Physical Model Design Laboratory
501 11010 Applied Mechanics 1
501 11020 Applied Mechanics 2
501 12010 Engineering Mathematics 1
501 12020 Engineering Mathematics 2
501 10800 Computer Programming

2nd Year Required Courses

General Physics (b)
General Physics Lab. 1
501 20010 Engineering Mathematics (I)
501 20210 Mechanics of Materials
501 23200 Engineering Statistics
501 25010 Transportation Engineering
501 20020 Engineering Mathematics (II)
501 23000 Fluid Mechanics
501 22010 Engineering Mathematics 3
501 27900 Engineering Material
501 32410 Structural Theory (I)
501 36000 Soil Mechanics
501 23300 Engineering Material and Soil Mechanics Lab.

3rd Year Required Courses

501 32060 Structural Engineering and Fluid Mechanics Lab.
501 32320 Reinforced Concrete
501 32900 Hydrology
501 33360 Hydraulic Engineering
501 35700 Engineering Economics
501 36210 Foundation Engineering

501 37800 Construction Management

501 34130 Civil Engineering Capstone Challenge

F-1 Civil Engineering Group (choose 4 out of 5 courses)

Curriculum #	Course Title	Remarks
521 U8770	**Railroad Transportation Engineering**	
501 49640	**Introduction of Seismic Design of Structures**	
501 42100	**Prestressed Concrete**	
521 U3190	**Object-oriented Programming**	Just counting one if you take both courses
521 U9230	**Introduction to Machine Learning and Deep Learning**	

Course Description

1st Year Required Courses

Calculus (general mathematics) (1)(2)(3)(4)

Instructor	Keh Ming Shyue
Curriculum Number	MATH4006
Curriculum Identity Number	201 49810 / 201 49820
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
Differentiation and Integration, or, collectively, Calculus, on functions of a single variable together with their profound applications in various subject areas are introduced in this course. On differentiation, it includes the definitions of limits and continuity, techniques of differentiation, strategies in solving extreme-value problem and so on; on integration, it includes the definition of integrals, the Fundamental Theorem of Calculus, techniques of integration, finding areas and volumes, solving elementary differential equations and more. Definitions are discussed and the most important theorems are derived in the lectures with a view to help students to develop their abilities in logical deduction and analysis. Practical applications of Calculus in various fields are illustrated in order to promote a more organic interaction between the theory of Calculus and students' own fields of study. This course also provides discussion sessions in which students are able to make their skills in handling calculations in Calculus more proficient under the guidance of our teaching assistants.	
Course Objectives	
Students would be familiar with Calculus as a tool and be able to apply it in various subjects after finishing this course. "Calculus 1 ~4" provide the basis for the study of various advanced courses like Engineering Mathematics, Analysis and Differential Equations.	
Course Requirement/Prerequisite Courses	
Students participating in the course should be already skilled in high school mathematics. They are expected to attend and participate actively in lectures as well as discussion sections.	

Textbooks/Reference Books
James Stewart, Calculus Early Transcendentals, 8th edition.

back to course list

Conceptual Design Studio

Instructor	On-Lei(Annie) Kwok
Curriculum Number	CIE1012
Curriculum Identity Number	501 10520
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
Working individually and in groups, students develop design proposals for a campus site, with guidance from instructors and practitioners.	
Course Objectives	
● Develop design thinking, spatial sense, sensitivity to context and people. ● Practice the new skills learned in concurrent survey and graphics course. ● Learn to use drawing, on paper and on screen, to visualize an existing situation, its past, and its design-impacted future. ● Learn to provide and respond to constructive criticism from peers and instructors.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
N/A	

back to course list

Surveying (I)

Instructor	Jen-Yu Han, Jen-Jer Jaw, Pai-Hui Hsu
Curriculum Number	CIE1010
Curriculum Identity Number	501 17010
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
The main focuses on this course are to illustrate the following subjects: (1). Surveying theories;	

(2). The applications of surveying in civil engineering; (3). Surveying instrument and methodologies; (4). The procedures and methods of topographic mapping. This course also serves as a basis for “Surveying practice” which provides the students with the opportunity for carrying out the surveying activities in practical projects.
Course Objectives
The goal is to bring out the concepts, methods, equipment and procedures fundamental to modern surveying.
Course Requirement/Prerequisite Courses
N/A
Textbooks/Reference Books
C. D. Ghilani and P. R. Wolf, 2015, “Elementary Surveying: An Introduction to Geomatics”, 14th Edition, Pearson Prentice Hall Inc. *B. F. Kavanagh, 2008, “Surveying: Principles and Applications”, 8th Edition, Prentice Hall Inc.* *B. F. Kavanagh, 2010, “Surveying with Construction Applications”, 7th Edition, Prentice Hall Inc.*

back to course list

Surveying Practice

Instructor	Jen-Yu Han, Jen-Jer Jaw, Pai-Hui Hsu
Curriculum Number	CIE2016
Curriculum Identity Number	501 27120
Credits	1
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
[1] Design of a survey plan [2] Practice of Total Station [3] Practice of Automatic Level [4] Level survey and adjustment computation [5] Practice of Theodolite [6] Traverse survey and adjustment computation [7] Topography survey [8] Report and presentation of survey results	

Course Objectives
This course is one of the required courses in the department of civil engineering. This course will inspire the students understand the basic principle and operation of surveying instruments. It also guides the students to plan and implement a complete surveying project via the basic surveying knowledge.
Course Requirement/Prerequisite Courses
Surveying(I) (have passed/are taking concurrently)
Textbooks/Reference Books
[1] Anderson, J.M., Mikhail, E.M. (2000). Surveying : Theory and Practice. 7th ed. *[2] P. Wolf, C. Ghilani (2002): Elementary Surveying 10th ed.* *[3] Moffitt: Surveying.*

back to course list

Engineering Graphics

Instructor	Po-Han Chen, Yu-Ting Hsu
Curriculum Number	CIE1005
Curriculum Identity Number	501 10600
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
Students will learn the fundamental concepts of visualization technologies applied for engineering purposes, through lectures, readings, laboratory, discussions and projects. They will learn to use various software tools to illustrate a new structure, machine, and system on a paper or and a computer screen to communicate with other members involved in the design or construction processes. Topics will include the fundamental background in engineering graphics, such as 2D and 3D CAD system, multi-view projections, sectional views, design and construction drawings, perspective, structural drawing, topographic drawings, and welding representations. Software tools, such as Autodesk, SketchUp, Twilight, and SketchyPhysics will be covered in this course.	
Course Objectives	
The major goal of this course is to help students develop proficient skills so that they can communicate with other professions by using graphical languages.	
Course Requirement/Prerequisite Courses	
N/A	

Textbooks/Reference Books
Technical Drawing (14th Edition) by Frederick E. Giesecke, Prentice Hall. Some websites: http://sketchup.google.com/ http://www.autodesk.com http://students.autodesk.com/ http://www.blender.org/ http://www.paintnet.com/ http://www.microsoft.com/taiwan/windowsxp/using/moviemaker/default.mspx

back to course list

Physical Model Design Laboratory

Instructor	Albert Chen
Curriculum Number	CIE1011
Curriculum Identity Number	501 10710
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
https://sites.google.com/a/caece.net/cornerstone107/menu/announcements	
Course Objectives	
● Allow first-year students to acquire an early design experience, without any prerequisite knowledge. ● Gain a first exposure to the design-build-test cycle through the fabrication of small-scale physical models. ● Acquire experience with hands-on teamwork and the management of challenging projects. ● Learn useful fabrication techniques that can be used to generate, test, and communicate ideas both for engineering design and scientific research. ● Become aware of technological issues like the choice and use of materials, construction and assembly procedures. ● Learn to integrate digital design with physical fabrication.	
Course Requirement/Prerequisite Courses	
Helpful skills: SketchUp & Java programming	
Textbooks/Reference Books	
N/A	

back to course list

Applied Mechanics 1

Instructor	Tai-Tien Wang, Tung-Yu Wu, Chia-Ming Chang
Curriculum Number	CIE1013
Curriculum Identity Number	501 11010
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
The course introduces the fundamentals of engineering mechanics on rigid body. The topics include the concept of free-body diagram, force system resultants, equilibrium of rigid body, friction, center of gravity, moment of inertia, and virtual work.	
Course Objectives	
This course aims to convey the fundamental concepts on engineering statics of a rigid body. It also serves as a basis for advanced courses in mechanics.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
R. C. Hibbeler, "Engineering Mechanics: Statics." Prentice Hall, 14th Edition in SI Units.	

back to course list

Applied Mechanics 2

Instructor	Tai-Tien Wang, Yin-Nan Huang, Chia-Ming Chang
Curriculum Number	CIE1014
Curriculum Identity Number	501 11020
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
The course studies the fundamentals of engineering mechanics concerning accelerated motions - dynamics. The topics of dynamics cover kinematics of particle force and acceleration, planar kinematics of rigid body force and acceleration, and work and energy of planar kinematics of rigid body.	

Course Objectives
To convey the fundamental concepts on engineering dynamics of a particle and a rigid body. It also serves as a basis for advanced courses in mechanics.
Course Requirement/Prerequisite Courses
N/A
Textbooks/Reference Books
R. C. Hibbeler, "Engineering Mechanics: Statics." Prentice Hall, 14th Edition in SI Units.

back to course list

Engineering Mathematics 1

Instructor	Ying-Chieh Chan, Shu-Wei Chang, On-Lei(Annie) Kwok
Curriculum Number	CIE1015
Curriculum Identity Number	501 12010
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
This course is about the mathematics that is widely used in the civil engineering core subjects: vector and linear algebra.	
Course Objectives	
The goal is to bring out the fundamental concepts and techniques that underlie and unify the many ways in which vector and linear algebra are used in applications.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
Kreyszig, Advanced Mathematics for Engineers, 10th Edition, John Wiley & Sons, 2011 *Gilbert Strang, Introduction to Linear Algebra, 5th Edition, Wellesley-Cambridge Press, 2016*	

back to course list

Engineering Mathematics 2

Instructor	Ying-Chieh Chan, Shu-Wei Chang, Fu-Shu Jeng

Curriculum Number	CIE1016
Curriculum Identity Number	501 12020
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
This course is about the mathematics that is widely used in the civil engineering core subjects: differential equations and Laplace transform.	
Course Objectives	
The goal is to bring out the fundamental concepts and techniques that underlie and unify the many ways in which vector and linear algebra are used in applications.	
Course Requirement/Prerequisite Courses	
https://nol.ntu.edu.tw/nol/coursesearch/print_pre_course.php?course_id=501%2012020&lang=EN	
Textbooks/Reference Books	
Kreyszig, Advanced Mathematics for Engineers, 10th Edition, John Wiley & Sons, 2011 *Zill and Gullen, 2006. Advanced Engineering Mathematics, 3rd Ed. Johes and Bartlett Publishers.* *Rahman, 1991. Applied Differential Equations for Scientists and Engineers, Vol. 2, Partial Differential Equations. Computational Mechanics Publications.* *Pinchover and Rubinstein, 2005. An Introduction to Partial Differential Equations. Cambridge University Press.* *O'Neil, 1991. Advanced Engineering Mathematics. Wadsworth.* *Grossman and Derrick, 1988. Advanced Engineering Mathematics. Harper Collings.*	

back to course list

Computer programming

Instructor	Shang-Hsien Hsieh, Chuin-Shan Chen, Albert Chen
Curriculum Number	CIE1008
Curriculum Identity Number	501 10800
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English

Course Description
This course introduces the Java programming language, design & implementation of computer programs, and how to use computer programs to help solving engineering problems.
Course Objectives
The objective of this course is to increase students' capability in logical thinking and utilization of computer programming for solving engineering domain related problems.
Course Requirement/Prerequisite Courses
N/A
Textbooks/Reference Books
Y Daniel Liang (2012), Introduction to Java Programming, Comprehensive Version (9th Edition), Prentice Hall

back to course list

2nd Year Required Courses

General Physics (b)

Instructor	Chih-Hung Chen
Curriculum Number	PHYS1008
Curriculum Identity Number	202 101B0
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
This course introduces the general physics covering the following topics: translational motion, classical dynamics, work and energy, equilibrium and elasticity, fluid dynamics, friction, oscillation, rotation, electricity, magnetism, optics, and modern physics.	
Course Objectives	
This course will help students acquire the physical knowledge that is applicable to the physics happening in the daily life. In particular, the development of the scientific thinking will be emphasized.	
Course Requirement/Prerequisite Courses	
Students should know the basic notations of calculus and are able to perform simple integration and derivative.	
Textbooks/Reference Books	
1. Principles and physics, Wiley *2. Physics for scientists and engineers with modern physics, Brooks/Cole Cengage learning*	

back to course list

General Physics Lab. 1

Instructor	Guin-Dar Lin
Curriculum Number	PHYS1025
Curriculum Identity Number	202 10500
Credits	1
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	

This is a one-credit hour class that meets almost once a week for about three hours. Each of the class focuses on a particular experiment described in the lab manual, Laboratory Experiments in Physics.
Course Objectives
Acquaint the student with scientific laboratory techniques and emphasize the underlying physical principles of physics.
Course Requirement/Prerequisite Courses
N/A
Textbooks/Reference Books
General Physics Laboratory, book edited by Phy/NTU 2012

back to course list

Engineering Mathematics (I)

Instructor	Ying-Chieh Chan, Tai-Tien Wang
Curriculum Number	CIE2001
Curriculum Identity Number	501 20010
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
This course is about the mathematics that is widely used in the civil engineering core subjects: linear algebra and vector calculus.	
Course Objectives	
The goal is to bring out the fundamental concepts and techniques that underlie and unify the many ways in which linear algebra and vector calculus are used in applications.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
Kreyszig, Advanced Engineering Mathematics. 9th Ed., John Wiley & Sons *Jeffrey, Advanced Engineering Mathematics, Harcourt/Academic Press, 2002.* *Reley, Hobson, and Bence, Mathematical Methods for Physics and Engineering, Combridge University Press,1998.* *Greenberg, Advanced Engineering Mathematics, Second Edition, Prentice Hall, 1998.* *Kaplan, Advanced Mathematics for Engineers, Addison-Wesley, 1981.* *Grossman, Advanced Engineering Mathematics, Harper & Row, 1988.*	

back to course list

Mechanics of Materials

Instructor	Kuo-Hsin Yang, Hong-Ki Hong, Yin-Nan Huang
Curriculum Number	CIE2006
Curriculum Identity Number	501 21210
Credits	4
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
This class will first introduce the general state of stress and strain and their relationships based on Hooke's law. Transformation equations and Mohr's circle will be discussed to determine the stress and stain at any plane of interest. Statically determinate and indeterminate structures are defined. Afterward, student will learn how to conduct structural analysis to analyze bar members subjected to axial load and torsion, familiar with how to plot shear and moment diagrams of beams, to analyze stresses within beams, to calculate the deflection of beams using differential equation of deflection curve and method of superposition, and to evaluate the buckling and stability of columns. Successful learning of this course involves an appropriate blend of understanding of course materials, and development of a correct engineering mechanics sense and structured solution process through active practice.	
Course Objectives	
Mechanics of materials is a basic engineering subject that, along with applied mechanics, must be familiarized by civil engineering students. The objective of this course is to introduce theories and methods for analyzing the force, deformation, stress and strain of linearly elastic structural elements (i.e., bar, beam and column) subjected to different loading conditions. Materials exhibiting plastic deformation will not be covered in this course.	
Course Requirement/Prerequisite Courses	
Prerequisite: Applied Mechanics	
Textbooks/Reference Books	
B.J. Goodno, J.M. Gere, Mechanics of Materials, 9th ed, Cengage Learning, ISBN: 9781337093354 *R.C. Hibbeler, Mechanics of Materials, 9th ed, Pearson, ISBN: 9780133254426*	

back to course list

Engineering Statistics

Instructor	Chih-Yuan Chu, Albert Chen, On-Lei(Annie) Kwok
Curriculum Number	CIE2011
Curriculum Identity Number	501 23200
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
The course introduces basic theory and application of probability and statistics for students, including but not limit to several kinds of probability distributions, mathematics of statistical analysis, estimation, hypothesis, and regression analysis. Various engineering examples are employed to make students understand the essence of the course.	
Course Objectives	
Upon completion of this course, students should be able to: (1) Compute and interpret descriptive statistics (2) Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution (3) Compute point estimation of parameters and determine sampling distributions (4) Construct confidence intervals (5) Perform simple linear regression	
Course Requirement/Prerequisite Courses	
No specific pre-Course Requirement/Prerequisite Courses, but must have Calculus basic knowledge.	
Textbooks/Reference Books	
Probability and Statistics for Engineers and Scientists by Walpole Myers, Myers, and Ye, 9th Edition	

back to course list

Transportation Engineering

Instructor	Yung-Cheng Lai, Tien-Pen Hsu
Curriculum Number	CIE2013
Curriculum Identity Number	501 25010
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	

Following topics will be covered: ● Long Term Transportation Planning ● Demand Modeling ● Project Evaluation ● Transportation System Management ● Route Selection ● Highway Design Concept ● Traffic Control ● Airport Planning ● Track Engineering ● Railway Control
Course Objectives
Study the fundamentals of planning, design, operation, management, and control of transportation systems.
Course Requirement/Prerequisite Courses
N/A
Textbooks/Reference Books
Wright, Paul H. and Norman J. Ashforol, Transportation Engineering ,Planning and Design, 4th edition, John Wiley & Sons,1998.

back to course list

Engineering Mathematics (II)

Instructor	Ko-Fei Liu, Shu-Wei Chang
Curriculum Number	CIE2002
Curriculum Identity Number	501 20020
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
Following topics will be covered: ● First-Order Ordinary Differential Equations ● Second-Order Linear ODEs ● Higher Order Linear ODEs ● Systems of ODEs ● Series Solutions of ODEs ● Laplace Transforms ● Fourier Analysis	

● Partial Differential Equations
Course Objectives
The course is designed to introduce students to some mathematical concepts and techniques that are widely used in the civil engineering core subjects. It is intended for students to gain relevant math skills that may be useful in their future professions.
Course Requirement/Prerequisite Courses
Calculus
Textbooks/Reference Books
E. Kreyszig, Advanced Engineering Mathematics, Wiley.

back to course list

Fluid Mechanics

Instructor	Hervé Capart, Liang-Hsiung Huang, I-Chi Chan
Curriculum Number	CIE2009
Curriculum Identity Number	501 23000
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
This course provides an introductory treatment of the dynamics of fluids with emphasis on incompressible fluids. Hydrostatics, thermodynamics, fluid characteristics, kinematics and dynamics, methods of analysis including the infinitesimal and finite control volume, development of stress rate-of-strain relations, the basic equations for continuity, energy, motion, and force-momentum are developed and applied. Measurement methods are included. Following chapters will be covered: ● Introduction (Chapter 1) ● Fluid Statics (Chapter 2) ● Elementary Fluid Dynamics (Chapter 3) ● Fluid Kinematics (Chapter 4) ● Control Volume Analysis (Chapter 5) ● Differential Analysis (Chapter 6) ● Similitude, Dimensional Analysis and Modeling (Chapter 7) ● Viscous Flow in Pipes (Chapter 8) ● Introduction to Boundary Layer (Chapter 9)	
Course Objectives	

By the conclusion of this course, you should be able to: ● Understand and apply concepts of mass, linear momentum and angular momentum balance ● Compute forces and moments exerted by static fluid and fluid in motion ● Master Bernoulli equation and apply it to solve a variety of practical problems ● Fully understand differential description of fluid motion and apply it to simple problems ● Sketch the energy line and hydraulic grade line for fluid in motion ● Take and interpret measurements of pressure and velocity ● Understand principle of similitude and dimensional analysis
Course Requirement/Prerequisite Courses
N/A
Textbooks/Reference Books
R. W. Fox, A. T. McDonald, and P. J. Pritchard, 2012, Introduction to Fluid Mechanics, 8th Ed., John Wiley & Sons, Inc. *F. M. White, 2004, Fluid Mechanics, 4th Ed., McGraw–Hill, Inc*

back to course list

Engineering Mathematics 3

Instructor	Ying-Chieh Chan
Curriculum Number	CIE 2021
Curriculum Identity Number	501 22010
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
This course is about the mathematics that is widely used in the civil engineering core subjects: boundary value problems, Green function and Fourier analysis, and partial differential equations.	
Course Objectives	
The goal is to bring out the fundamental concepts and techniques that underlie and unify the many ways in which boundary value problems, Green function and Fourier analysis, and partial differential equations are used in applications.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
Kreyszig, Advanced Mathematics for Engineers, 10th Edition, John Wiley &	

Sons, 2011
Zill and Gullen, 2006. Advanced Engineering Mathematics, 3rd Ed. Johes and Bartlett Publishers.
Rahman, 1991. Applied Differential Equations for Scientists and Engineers, Vol. 2, Partial Differential Equations. Computational Mechanics Publications.
Pinchover and Rubinstein, 2005. An Introduction to Partial Differential Equations. Cambridge University Press.
O'Neil, 1991. Advanced Engineering Mathematics. Wadsworth.
Grossman and Derrick, 1988. Advanced Engineering Mathematics. Harper Collings.

back to course list

Engineering Material

Instructor	Wen-Cheng Liao, Yin-Wen Chan
Curriculum Number	CIE2019
Curriculum Identity Number	501 27900
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
(1) Civil engineering and related materials (2) Introduction to cementitious and concrete materials (3) Aggregates and their grading (4) Properties of Portland cement (5) Microstructure of hardened cement paste (6) Fresh and hardened properties of concrete (7) Crystal structure of metal (8) Elastoplastic behavior of metal (9) Metal microstructure and phase diagram (10) Steel and cast iron (11) Heat treatment of steel (12) Corrosion of steels	
Course Objectives	
Engineering materials used in civil engineering, such as cement, cementitious materials, concrete and steel, are introduced. On successful completion of the course students will be able to: Explain the fundamental (engineering related) issues surrounding the use of the	

following Civil Engineering Materials; concrete and structural steel. Explain the manufacture associated with these materials. Describe and critically analyze the limitations of these materials under various loading circumstances. Communicate their learned knowledge of these materials.
Course Requirement/Prerequisite Courses
N/A
Textbooks/Reference Books
Nilson, A.H., "Design of Concrete Structures," Chapter 1~2, 12th Ed., McGraw-Hill Co., Inc. (1997) *Illston J.M. and Domone P.L.J. "Construction Materials — Their nature and behavior", 3rd edition, Spon Press. (2001)*

back to course list

Structural Theory (I)

Instructor	Liang-Jenq Leu, Chung-Che Chou, Aishwarya Y. Puranam
Curriculum Number	CIE3010
Curriculum Identity Number	501 32410
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
Teaching analysis method about beam, truss and frame structures and solve internal force of each members. This course nurture students to understand static structural behavior and structural principles. This course let students have the ability to reason and operate of structural problem.	
Course Objectives	
1. Capable of realizing the connotations of Structural Analysis and importance in various civil engineering and relative construction. 2. Capable of judging the stability and static indeterminacy of structures. 3. Capable of analysing the basic statically determinate structures, such as beams, trusses and frames. 4. Capable of solving the elastic deformation of structures. 5. Capable of using various method to analysing statically indeterminate structures. 6. Capable of using influence line to analyse the structures.	

7. Capable of reasoning and calculating the structural problems.
Course Requirement/Prerequisite Courses
Statics, Mechanics of Materials
Textbooks/Reference Books
Russell C. Hibbeler, "Structural Analysis" (9th edition)

back to course list

Soil Mechanics

Instructor	Jiunn-Shyang Chiou, Kuo-Hsin Yang, Meei-Ling Lin
Curriculum Number	CIE3026
Curriculum Identity Number	501 36000
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
The objective of this course is to introduce the fundamental elements of the soil mechanics based on the basic knowledge from mechanics courses including statics, material, and fluid. This is the first introductory course leading to the field of geotechnical engineering. The course is designed to proceed in parallel with the Soil Mechanics Laboratory to enhance learning and cognition of the subjects.	
Course Objectives	
1. Understanding the content of geotechnical engineering and its importance to civil engineering and the related facilities 2. Understanding the physical and engineering characteristics of soil 3. Understanding the interaction of soil and groundwater, and the flowing conditions and behaviors of water in soil 4. Understanding the concept of effective stress from the knowledge of stress and pore water pressure distributions in soil 5. Understanding the deformational behavior of soil (especially for clay) under compression based on the concept of effective stress 6. Understanding the shear stress-shear strain behavior and shear strength of soil 7. Applying the concept of effective stress to analyze earth pressure and slope stability based on shear strength of soil 8. Understanding and applying soil compaction methods to improve the engineering characteristics of soil for the need of engineering design 9. Having a brief understanding of geotechnical engineering related environmental protection issues	

Course Requirement/Prerequisite Courses
Students are required to have passed Statics and Mechanics of Material, and the course is to be taken along with the Soil Mechanics Laboratory.
Textbooks/Reference Books
B.M. Das, "Principles of Geotechnical Engineering", SI Version, 8th edition, 2014

back to course list

Engineering Material and Soil Mechanics Lab.

Instructor	On-Lei(Annie) Kwok
Curriculum Number	CIE2012
Curriculum Identity Number	501 23300
Credits	1
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
By performing laboratory experiments, students can verify the theories and laws which are taught in the companion Soil Mechanics course. This hands-on experience can enhance their learning and understanding. In this course, students would learn the proper procedures for testing soil specimens, analyzing the soil behavior, determining the engineering properties and writing the laboratory reports, which are practical applications in the field of geotechnical engineering.	
Course Objectives	
Students would perform a series of laboratory experiments (in teams) to determine the following soil behavior: 1. index parameters (such as grain size distribution, specific gravity, liquid limit and plastic limit etc.) that are used for soil classification 2. fluid flow in soil and hydraulic conductivity 3. consolidation process in soil and compressibility parameters 4. stress-strain behavior and strength of soil from direct shear and triaxial tests 5. compaction curve and field density	
Course Requirement/Prerequisite Courses	
Soil Mechanics (have passed/are taking concurrently)	
Textbooks/Reference Books	
Soil Mechanics Laboratory Manual by the Department of Civil Engineering, National Taiwan University *AASHTO, Materials.*	

ASTM(2002), ASTM Standards, Vols. 04.08 & 09.
Bishop, A. W. and Henkel, D. J.(1962), The Measurement of Soil Properties in the Triaxial Test, 1st edition, Edward Arnold Ltd., London.
BS1377(1967), Methods of Testing Soils for Civil Engineering Purposes, British Standards Institution, London.
HEAD, K. H.(1980), Manual of Soil Testing.
Lambe, T.W., Soil Testing for Engineers, John Wiley&Sons, New York.
US Department of the Interior, Bureau of Reclamation(1974), Earth Manual, 2nd edition, U.S. Government Print Office, WashingtonDC.

back to course list

3rd Year Required Courses

Structural Engineering and Fluid Mechanics Lab.

Instructor	Hervé Capart
Curriculum Number	CIE3005
Curriculum Identity Number	501 32060
Credits	1
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
● A number of fundamental experiments are provided to student to implement the theory of structure. The topics of experiment include theory of strain gauge, frame behaviors under deflection or torsion, slope deflection method, Maxwell reciprocal theory, rigid frame test and buckling test. ● Using experiments to enhance students' understanding of fluid mechanics theories. At the same time, students can learn how to improve their experimental skill and how to analyze complicated data.	
Course Objectives	
● Understand the theory and application of strain gauges, and measure the stresses and strains of various kinds of structures, such as beams, trusses, and rigid frames. ● Let students directly involve in preparation, practice, data analysis, and report writing of Fluid Mechanics Laboratory in order to achieve the following purposes: (1) to verify the theory of fluid mechanics, (2) to learn the correct operation procedures, and (3) to learn the data analysis and report writing of experiments.	
Course Requirement/Prerequisite Courses	
Structural Theory (I), Fluid Mechanics	
Textbooks/Reference Books	
A Brief Introduction to Fluid Mechanics, 2nd Ed., by D.F. Young, B.R. Munson and T.H. Okiishi, John Wiley & Sons, Inc., 2001.	

back to course list

Reinforced Concrete

Instructor	Yu-Chen Ou, Aishwarya Y. Puranam, Wen-Cheng Liao

Curriculum Number	CIE3009
Curriculum Identity Number	501 32320
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English

Course Description

This course is a fundamental course for structural designers. It is to develop the understanding of the mechanical behavior of concrete and steel reinforcement as individual materials and the combined mechanical behavior of concrete and steel reinforcement as reinforced concrete members. The combined behavior that will be studied includes the stress distributions and failure modes of beams and columns under flexural, shear and axial loads. Based on the mechanical behavior of materials and members, this course will further develop the understanding of the flexural, shear and axial design methods for beams and columns of reinforced concrete structures. The following topics will be covered:

(1) Mechanical behavior of concrete and steel reinforcement
(2) Design concepts
(3) Flexural design for beams
(4) Shear design
(5) Bond, anchorage and development length
(6) Crack and deflection control
(7) Column design

Course Objectives

The objective of this course is to understand the behavior of reinforced concrete members and to use theory and experience to proportion and detail them. Students shall study the design process, properties of steel reinforcement and concrete, and their combined use in elements such as columns, beams, and one-way slabs.

Course Requirement/Prerequisite Courses

N/A

Textbooks/Reference Books

Ministry of Interior, Design Code for Reinforced Concrete Structures
http://www.cpami.gov.tw/chinese/index.php?option=com_content&view=article&id=10431&Itemid=57
**ACI Building Code Requirements for Structural Concrete (ACI 318-14)*
Principles of Reinforced Concrete Design by Sozen, Ichinose and Pujol
ISBN: 978-1-4822-3148-9

Reinforced Concrete Mechanics and Design by Wight and MacGregor (5 or 6E)

back to course list

Hydrology

Instructor	Jiing-Yun You, Shang-Shu Shih
Curriculum Number	CIE3011
Curriculum Identity Number	501 32900
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
Hydrology is the study of the earth's waters - their movement, distribution, and other relative qualitative and quantitative issues. The objective of this course is to introduce the student to 1) Principles and processes governing the movement of water through the hydrologic cycle, including atmospheric moisture flow, surface runoff, infiltration, river routing and groundwater flow; and 2) The quantitative description of hydrologic characteristics, including, hydrologic measurement, hydrologic statistics, and frequency analysis techniques applied to problems of engineering hydrologic design.	
Course Objectives	
The overall objective of this course is to familiarize students with basic concepts of hydrologic processes and analyses. By the conclusion of this course, students should be able to: ● Identify, define, understand, and explain the role of the fundamental components of the hydrologic cycle; ● Apply statistic methods, frequency analysis, unit hydrograph and flow routing methods to solve related engineering problems and projects.	
Course Requirement/Prerequisite Courses	
Fluid Mechanics	
Textbooks/Reference Books	
"Applied Hydrology" by Chow, Maidment and Mays, McGraw-Hill.	

back to course list

Hydraulic Engineering

Instructor	Tim-Hau Lee, Gwo-Fong Lin, Shang-Shu Shih
Curriculum Number	CIE3013
Curriculum Identity Number	501 33360

Credits	2
Required/Elective	Required
Taught in English/Mandarin	English

Course Description

- The two basic purposes of hydraulic engineering are water-control (e.g. flood control) and water-use (e.g. water resources).
- The two essential methods are:
  1. Utilizing rivers, channels, conduits to transport water (by gravity), as well as using hydraulic structures to store, control, and use water;
  2. System planning and design to achieve water-control and water-use goals.
- The course content consists of three main parts:
  1. Open channel hydraulics, including basic principles of open channel hydraulics, analysis and calculation of steady-state water profile, open channel design, bridge impact analysis, channel (cross-section) transition and culvert design.
  2. Hydraulic structures, including dams, reservoirs (including siltation problems), spillways, energy sinks, gates, pumps, and hydropower.
  3. Flood control and water resources system planning, including the main considerations of (system) planning, Taiwan's flood control and water resources planning cases, and the particularity of Taiwan's water related issues.

  The 2nd and 3rd parts are achieved through students' selecting (Taiwan) hydraulic project cases, and learning by studying, visiting, discussing with teachers, and presenting final reports.

Course Objectives

To understand the functions of rivers and hydraulic structures in water conservancy projects, and to establish basic analysis and design capabilities. Through the hydraulic engineering cases of Taiwan, to grasp the concepts and basic elements of flood control and water resources system planning.

Course Requirement/Prerequisite Courses

Prerequisites : Fluid Mechanics, Hydrology and Fluid Mechanics Experiments

Textbooks/Reference Books

Mays, Larry, 2005 or 2010, W. Water resources engineering. Wiley.
Linsley, Ray K. et al, 1991, Water Resources Engineering (fourth Edition)
Bedient, P.B., Huber, W.C., 2008. Hydrology and Floodplain Analysis.
Loucks DP, van Beek E, Water resources systems planning and management: an introduction to methods, models and applications. UNESCO, 2005, Paris. Available

Water Resources Engineering, 2nd ed., by David Chin, 2006, Pearson Education. (Pearson International Edition) 3.1-3.5, 7.1, 7.2, 7.9, 7.10 *Water Resources Engineering, 4th. ed., by Linsley, Franzini, and Freyberg, and Tchobanoglous., McGraw Hill, 1992.*

back to course list

Engineering Economics

Instructor	Tien-Pen Hsu, Shyue-Koong Chang
Curriculum Number	CIE3025
Curriculum Identity Number	501 35700
Credits	2
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
Modern engineers in their career development are often involved in various management roles or decisions. Technical knowledge alone is not enough for engineers in today's complex and dynamic environment. Engineers need to know how to analyze the industry and economy, and how to quantitatively evaluate an engineering project and select a best alternative.	
Course Objectives	
The objectives of this course are 1. to introduce the basic concepts of Economics suitable for engineering economic analysis, and 2. to familiarize students with fundamental quantitative and analytical techniques for evaluating large engineering projects.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
Fundamental of Engineering economics.Chan S. Park *L. Blank and A. Tarquin, Basics of Engineering Economy, 2nd Ed., McGraw-Hill, 2014.*	

back to course list

Foundation Engineering

Instructor	Meei-Ling Lin, Jiunn-Shyang Chiou, Yuning Liuis Ge
Curriculum Number	CIE3028
Curriculum Identity Number	501 36210

Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
According to theories of soil mechanics, this course introduces the objectives, methods, and applications of site investigation, and general principles and considerations of foundation engineering design.	
Course Objectives	
1. Understanding the objectives, methods, and applications of geotechnical investigations for foundation engineering 2. Understanding the sources of foundation bearing capacity and estimation methods for ultimate bearing capacity of foundations 3. Introducing analysis methods for the vertical stress increment due to foundation loading and the associated ground settlement 4. Introducing mat foundations and the associated analysis methods for bearing capacity and settlement 5.Evaluating the earth pressure distribution, potential failure surface, and safety of retaining walls based on the knowledge of earth pressure and slope stability 6. Understanding the timing of use of sheet piles, types of sheet piles, and earth pressure distributions on the piles after excavation, and analyzing an appropriate pile type and the required length 7. Understanding the stability of cuts and the associated design methods for bracing 8. Being aware of various pile types, and understanding their construction and design methods	
Course Requirement/Prerequisite Courses	
Soil Mechanics	
Textbooks/Reference Books	
B.M. Das, "Principles of Foundation Engineering" 8th Ed.	

back to course list

Construction Management

Instructor	Po-Han Chen, Ying-Chieh Chan
Curriculum Number	CIE3030
Curriculum Identity Number	501 37800
Credits	3
Required/Elective	Required

Taught in English/Mandarin	English
Course Description	
The following topics will be covered: 1. Characteristics of Construction 2. Productivity Management 3. Cost Control & Reporting 4. Contract Type and Administration 5. Cost Estimating 6. Planning & Scheduling 7. Engineering Economy & Finance 8. Construction Accounting 9. Legal Aspects 10. Bonding & Insurance& Risk Management 11. Quality Control And Tqm 12. Labor Relation & Construction Safety	
Course Objectives	
This course introduces a broad set of fundamental topics regarding management of constructor business. It not only helps student understand the uniqueness of construction industry, but also, evaluate construction management's effectiveness, as well as apply modern management method to planning and scheduling for construction projects.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
1. Chang, Lun-Maan, Manual For The Course Of Construction Planning & Scheduling. *2. Chang, Luh-Maan, Gergy, Maged E., And Zahang, Lee, Engineering Productivity Measurement, Research Report 156-11, Construction Industry Institute, The University Of Texas At Austin, Texas, December 2001.* References: *1. Clifford J. Schexnayder, Richard E. Mayo, Construction Management Fundamentals, The Mcgraw-Hill Companies* *2. Construction Management, Halpin And Woodhead*	

back to course list

Civil Engineering Capstone Challenge

Instructor	Hervé Capart, Wen-Cheng Liao, Shang-Shu Shih,

	Yu-Ting Hsu
Curriculum Number	CIE3048
Curriculum Identity Number	501 34130
Credits	3
Required/Elective	Required
Taught in English/Mandarin	English
Course Description	
The course “civil engineering capstone challenge” aims to let students address realistic engineering problems, using the knowledge and skills they have acquired in technical courses. Guided by instructors and external experts, students work in teams to develop ideas, gather data, explore design alternatives, and propose feasible solutions.	
Course Objectives	
This course aims to teach students to integrate the multiple professional knowledge and skills learnt in class and plan a solution to a specific civil engineering problem through teamwork. The course objective is hoping students to have the ability to apply professional knowledge and techniques when facing real-life engineering problems. Under the guidance of professors and experts, the students will start with idea thinking, information gathering and propose various possible alternative methods, and finally put forward the feasible best solution. By participating in the course, the students are expected to have experience in field investigation, report writing and engineering practice.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
N/A	

back to course list

F-1 Courses

Railroad Transportation Engineering

Instructor	Yung-Cheng Lai
Curriculum Number	CIE5075
Curriculum Identity Number	521 U8770
Credits	3
Required/Elective	Elective
Taught in English/Mandarin	English
Course Description	
(1) Introduction to railroad transportation systems (2) Principles and analysis of railroad transportation efficiency, economics, energy, and engineering (3) Introduction to railroad infrastructure (4) Introduction to locomotive and rolling stock design, function, and operation (5) Introduction to railway traffic control and signaling (6) Introduction to railroad operations (7) Field trip: railroad track, equipment, and operations	
Course Objectives	
Rail transportation requires infrastructure, vehicles, motive power and energy to move goods and people. Each of these factors interacts to affect the efficiency, energy requirements and economics of railroad operation. This course covers the principles of railroad transportation efficiency, economics, energy, and engineering. Topics include introduction to railroad infrastructure, rolling stocks, signal systems, and operations. The course is designed to establish the basic understanding and skills for conducting railway research and industrial projects.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
N/A	

back to course list

Introduction of Seismic Design of Structures

Instructor	Lap Loi Chung
Curriculum Number	CIE4020
Curriculum Identity Number	501 49640

Credits	3
Required/Elective	Elective
Taught in English/Mandarin	English
Course Description	
Taiwan is located in the circum-Pacific Seismic Belt. It is a seismically active area. Therefore, civil structures in Taiwan must be seismically resistant. In this course, the theory and practice of seismic design of structures is introduced, including cause of earthquakes, damages induced by earthquakes, characteristics of strong motion and seismic design of structures.	
Course Objectives	
This course leads the students into the field of seismic design of structures. After taking this course, the students will have the ability to design civil structures with proper consideration of seismic loading. Therefore, the seismic performance of civil structures in Taiwan will be highly enhanced.	
Course Requirement/Prerequisite Courses	
N/A	
Textbooks/Reference Books	
N/A	

back to course list

Prestressed Concrete

Instructor	Yu-Chen Ou
Curriculum Number	CIE4003
Curriculum Identity Number	501 42100
Credits	3
Required/Elective	Elective
Taught in English/Mandarin	English
Course Description	
(1) Basic concepts (2) Materials (3) Prestress loss (4) Flexural design (5) Shear design (6) Continuous beams (7) Deflection control	
Course Objectives	
Understand the fundamental concepts of prestressed concrete	
Course Requirement/Prerequisite Courses	

Reinforced Concrete
Textbooks/Reference Books
Nilson, A.H., 1987, Design of prestressed concrete, Wiley. *Naaman, A.E., 2012, Prestressed concrete analysis and design, Techno Press 3000.* *Lin, T.Y. and Burns, N.H., 1981, Design of prestressed concrete structures, John Wiley &* *Sons.* *Collins, M.P. and Mitchell, D., 1997, Prestressed concrete structures, Response Publications.*

back to course list

Object-oriented Programming

Instructor	Albert Chen
Curriculum Number	CIE5029
Curriculum Identity Number	521 U3190
Credits	3
Required/Elective	Elective
Taught in English/Mandarin	English
Course Description	
(1) A tour of modern C++ (2) Basic concepts of C++ programming and STL (3) Class programming (4) Inheritance and polymorphism (5) Dynamic and static members (6) Template and more on STL	
Course Objectives	
Learn and comprehend modern C++ including its object-oriented and non-object-oriented features.	
Course Requirement/Prerequisite Courses	
Basic Programming Skills	
Textbooks/Reference Books	
Stephen Prata (2011), C++ Primer Plus, 6th Edition, SAMS. *Josuttis, N. (2012). The C++ Standard Library: A Tutorial and Reference, Second Edition, Addison-Wesley.* *Bjarne Stroustrup (2013), The C++ Programming Language, Fourth Edition, Addison-Wesley.*	

back to course list

Introduction to Machine Learning and Deep Learning

Instructor	Chuin-Shan Chen
Curriculum Number	CIE5133
Curriculum Identity Number	521 U9230
Credits	3
Required/Elective	Elective
Taught in English/Mandarin	English

Course Description

Data are now ubiquitous for engineering applications and it is essential for students with engineering background to acquire basic understanding on data science.

This course is designed to help students to view engineering problems from a data perspective and to understand principles of extracting useful knowledge from data. There is a fundamental structure to data-analytic thinking, and basic principles that should be understood. There are also particular areas where intuition, creativity, common sense, and domain knowledge must be brought to bear. A data perspective will provide students with structure and principles, and this will give students a framework to systematically analyze engineering problems.

Course Objectives

The objective of this course is to provide students with fundamental understanding of data science and with how to apply data science theories and techniques to analyze a large number of data in engineering applications. This course will also emphasize on hand-on experience of doing data science.

After taking this course, students should be able to: (1) approach engineering problems data-analytically, (2) understand fundamental principles of data science and (3) use Python and other tools to scrape, clean, and process data.

Course Requirement/Prerequisite Courses

Junior and senior undergraduate students and graduate students who are interested in solving engineering problem data-analytically.
Prerequisite: Computer Programming

Textbooks/Reference Books

Provost F. and Fawcett T. (2013) Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, O'Reilly.
Aggarwal C. C. (2015) Data Mining: The Textbook, Springer.
Grus, J. (2015) Data Science from Scratch, O'Reilly.

back to course list