STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
CONS 304 – REINFORCED CONCRETE DESIGN

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Canino School of Engineering Technology

Department: Civil and Construction Technology

Semester/Year: Spring 2021

A. **TITLE**: Reinforced Concrete Design

B. **COURSE NUMBER:** CONS 304

C. **CREDIT HOURS: 3 credit hour(s) per week for 15 weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☒ **Yes:** GER
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☐ **Spring** ☒ **Fall & Spring** ☐

G. **COURSE DESCRIPTION:**

In this course, the fundamentals of cast-in-place reinforced concrete design by the strength design method are introduced. Students design slabs, beams, girders, columns and footings in accordance with current version of American Concrete Institute Code 318. Computations are done by manual methods and spreadsheets. Students are introduced to design software. A design of elements of a small multi-story commercial building is incorporated into the class.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

CONS 336 (Structural Analysis), CIVL 339 (Structural Analysis Lab), and CONS 280 (Civil Engineering Materials)

CO-REQUISITES: None ☐ **Yes** ☒ **If yes, list below:**

CIVL 339 (Structural Analysis Lab) could be taken concurrently with this class.

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
a) Analyze and design a reinforced concrete slab			2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	Subsets Subsets Subsets Subsets
b) Analyze and design reinforced concrete beam (rectangular and tee-beam)			2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	Subsets Subsets Subsets Subsets
c) Analyze and design a reinforced concrete girder			2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	Subsets Subsets Subsets Subsets
d) Detail shear reinforcement for beams			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
e) Detail splices and anchorages for reinforcement			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator

J. **APPLIED LEARNING COMPONENT:** Yes ☐ No ☒

If YES, select one or more of the following categories:

- ☐ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service

- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship
  (program, class, project)

K. TEXTS:

Darwin, D., Dolan, C., Nilson, A. (2016) Design of Concrete Structures, 15th Edition. New York, NY: McGraw Hill Education. ISBN: 978-0-07-339794-8.

L. REFERENCES:

Current Building Code Requirements for Structural Concrete and Commentary. American Concrete Institute.

M. EQUIPMENT: None ☒ Needed:

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Exams**
- **Quizzes**
- **Design Project(s)**
- **Homework**

P. DETAILED COURSE OUTLINE:

I. Introduction
A. Concrete and Reinforced Concrete as a material
B. Advantages and Disadvantages of Structural Concrete
C. ACI Code
D. Reinforcing Steel
E. Concrete Mix Materials
F. Dead and Live Loads

II. Fundamental Principles of Bending
A. Behavior of a concrete beam in flexure
B. Analysis of unreinforced beam by the flexure formula
C. The internal couple method of analysis
D. The strength design method for composite material

III. Analysis and Design of Rectangular Reinforced Concrete Beams
A. Balanced, Over-reinforced, and Under-reinforced Beams
B. Criteria for a tension controlled section
C. Detailing requirements
D. Load Factors
E. Strength reduction factors and the maximum practical moment
F. Rectangular Beam Analysis for Moment (Tension Reinforcement only)
G. Rectangular Beam Design for Moment (Tension Reinforcement only)

IV. Slabs
A. Slab nomenclature

B. ACI Criteria for one way slabs
C. Slab analysis
D. Slab design
E. Design of slabs on grade

V. Tee Beams
A. Tee Beam Analysis for Moment (Tension Reinforcement only)
B. Tee Beam Design for Moment (Tension Reinforcement only)
C. Design of compression steel

VI. Girder Design
A. Introduction
B. Calculation of shears and bending moments
C. Girder design

VII. Design of Shear Reinforcement in Beams
A. Introduction
B. Analysis of beams with no shear reinforcement
C. ACI Code requirements for shear steel
D. Shear Reinforcement Design Procedure
E. Design for torsion

VIII. Development Length - Introduction
A. Development Length - Tension Bars
B. Development Length - Standard Hooks in Tension
C. Development of Web Reinforcement
D. Splices
E. Cutoff of tension bars
F. Design of additional shear reinforcing in zones where tension bars are terminated

IX. Column Design
A. Introduction
B. Strength of Reinforced Concrete Columns - Small Eccentricity
C. Code Requirements Concerning Column Details
D. Analysis of Short Columns - Small Eccentricity
E. Design of Short Columns - Small Eccentricity
F. Eccentrically loaded columns

X. Footings
A. Introduction
B. Design of Square Reinforced Concrete Footings

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐