University of Toledo
Construction Engineering Technology
Master Syllabus

Course Title: Architectural CADD   **Course Code & Number: CET-3010**

Credit Hour   **Total: 4.0**

                 Lecture Hours: **1.0**   **Lab Hours:**   **3.0**

Pre-requisite(s):   **CET-1100**

Course Coordinators: Beall

Text: Mastering Autodesk Revit 2018 1st Edition,   by Kirby, Krygiel & Kim, 2017
                 Publisher: Sybex   ISBN: 9781119386728

Software: AutoCAD 20XX, Revit 20XX by Autodesk,

A. Course Description (Approved catalog description)

This course is designed as an introduction to digital architectural documentation techniques for design, building and lifecycle building maintenance. The course explores techniques using both traditional CAD approaches as well as BIM and parametric modeling. The course emphasizes methods and procedures of AutoCAD, parametric modeling through Bentley Building and AutoCAD for Architecture and develops greater skills in BIM through Autodesk's Revit.

B. **Related Program Outcomes:**

Upon successful completion of the Construction Engineering Technology program, graduates will have:

ABET/Student Outcomes

1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;

3) an ability to apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.

The course also supports coverage of the following curricular areas:

Program Criteria

a) the utilization of techniques that are appropriate to administer and evaluate construction contracts, documents, and codes;

c) the utilization of measuring methods, hardware, and software that are appropriate for field, laboratory, and office processes related to construction;

e) the production and utilization of documents related to design, construction, and operations.

<u>Discipline Specific Content</u>

+ Industry standards & codes
+ Professional responsibilities

Evidence of the success of these outcomes is provided by the collection and analysis of:

- Written and graphic midterm exam.
- Written and graphic final exam.
- Case study presentations on BIM & building techniques.

C. Course Objectives:

1. An ability to apply current industry standards to architectural documentation using graphical and BIM methodology.

2. An understanding of current office practices and industry conventions

3. An ability to apply current CAD standards, both graphical and BIM-related to construction documentation and BOM, (Building Operations Model), for life-cycle facility and operations documentation.

4. Facility with current CAD packages: graphical, parametric and BIM.

D. Course Outline (List major content areas or units covered in the course.)

1. Understanding of the differences in approaches and applications of digital modeling software, parametric modeling software and BIM software.

2. Digital documentation strategies for schematic design, design development, construction documents and presentation drawings for architectural projects. Office and AIA standards are covered for construction documentation.

3. AutoCAD: two-dimensional representation, three-dimensional representation. Graphic representation, formatting for office conventions including layer filters, layer views, layer translations, paper space conventions, appropriate dimensioning and annotating of architectural documents, and attribute extractions for schedules.

4. Bentley Building for Architecture: master file conventions for parametric modelers, level conventions and manipulations, building the master model, three-dimensional graphic representation: extraction of two-dimensional views from the master model, sheet sets, extraction of quantities, (take-offs), for cost estimating. Interaction with other Bentley Building Suites, and Bentley's ProjectWise software.

5. Autodesk's Revit: file and level standards; building models; views of the model; systems and families; massing studies; detailed views.

6. Graphical rendering, viewing and presentation techniques.

7. Ecotect: energy modeling, lighting and sightline analysis of integral models and imported Revit models.

E. Suggested Laboratory Tests (List labs covered in the laboratory portion of the course).

a. Introduction to the AutoCAD drawing environment, view controls, drawing commands, editing commands.

b. More drawing and editing operations. File naming conventions.

c. Drawing templates, AIA and BIM layer standards for architecture and associated disciplines.

d. Drawing standards: architectural dimensioning and office conventions.

e. Symbol libraries, use of DesignCenter, blocks, attributes.

f. Modelspace and paperspace, sheet layouts, cartoon sets.

g. Additional capabilities of DesignCenter, manufacturer's details, file sharing conventions, use of publish and publish to web.

h. Grips, object and layer filters. Dynamic blocks, and attribute extraction.

i. 3-D viewing in AutoCAD, UCS manipulation, 3-D solids: regions, extrusions. Geometric modeling techniques.

j. 3-D extrusions, revolutions: boolean operations.

k. 3-D surfaces and lofting; introduction to lighting techniques and material applications.

l. Rendering, animations and saved model views.

m. Introduction to parametric Modeling with AutoCAD for Architecture 2008.

n. MicroStation Review: 2-D commands, 3-D seed files, AccuDraw in 3-D, sticky-z.

o. Introduction to solid modeling with Bentley TriForma.

p. Additional modeling with TriForma, lofting, spline control, surface modeling.

q. Introduction to parametric modeling with Bentley Building for Architecture.

r. Building Information Modeling and the Data Group System.

s. Cells and Compound Cells.

t. Models and the model manager.

u. Drawing extractions and sheet layout.

v. Schematic design and massing.

w. Building shell studies.

x. Wall placement and modification, architectural objects.

y. Data groups and schedules.

z. Floor and ceiling objects.

aa. Visualization techniques: lighting, rendering; walkthrough animations.

bb. Introduction to "intelligent" information modeling using Autodesk's Revit

cc. Building models: levels and structure.

dd. Building models: floors, roofs and walls.

ee. Model views: sheet layout, tagging and scheduling.

ff. Generating two-dimensional details from models

gg. Families and custom content.

hh. Renderings and walkthrough animations.

ii. Energy, lighting and sightline analysis using Ecotect.