Construction Drawing and CAD
EG 2201 AR

Year: II **Total: 5 Hrs. /week**
Semester: II **Lecture: 1 Hrs./week**
Tutorial: 0 Hrs./week
Practical: 4 Hrs./week
Lab: 0 Hrs./week

Course Description:
This course provides students with a broad introduction into 2-dimensional and basic of 3-dimensional Computer-Aided Drawing and Drafting (CADD) with a focus on civil engineering drawings. This course is an intensive introduction to the use of a Computer Aided Design and Drafting (CADD) system for the development of construction drawing and documentation. Moreover, it also intends to impart skills on preparing drawings and sketches of construction details for building construction and construction of other structures and its implementation in field.

Course Objectives:
After the completion of this course student will be able to:
1. Introduce CAD software programs (Autodesk Auto CAD) to model construction projects
2. Create basic Civil and Architectural drawings;
3. Prepare setting out drawings for construction activities;
4. Prepare working drawings of different components of earthquake resistant buildings;
5. Prepare working drawing of engineering constructions;
6. Prepare basic 3-d objects;
7. Perform hand drawing.

Course contents:

Theory

Unit 1: Introduction to the Construction Drawing and CAD: [2 Hrs.]
1.1. Overview of the type of drawings (Concept drawing, working drawing, Structural drawing and As-built drawing etc.)
1.2. Introduction to application software (especially CADD, Land Development software) and its installation.
1.3. Computer graphics fundamentals (raster object and vector application) data storage and retrieval, hierarchical storage system, introduction to basic graphical application, drawing exchange.

Unit 2: Starting a New Drawing/Opening an Existing Drawing: [2 Hrs.]
2.1. Setting up a drawing, starting from scratch, using a Wizard, using an existing template file and creating a new template file.
2.2. Opening an existing drawing
2.3. Screen layout, pull-down menus, screen icons, command line and dialogue boxes, status bar toggles,
2.4. Setting preferences (Setting Units and Scale, managing drawing area by using MV setup and Limits, setting and use of drafting aids.
2.5. Saving Drawing in different formats (. dwg, dxf, dwt, pdf) and version of files.
2.6. Recovering Unsaved files.

Unit 3: Drawing Commands: [4 Hrs.]
3.1. Co-ordinate input methods (absolute, relative, polar, and dynamic)
3.2. Point, Lines, Polyline, Multiline, Construction Lines

3.3. Circle, Arc, Ellipse, Donut
3.4. Polygon, Rectangle, Spline, Solids etc.
3.5. Hatching
3.6. Text (multi-line & single line / true type fonts
3.7. Dimension tools

Unit 4: Modify Commands: [1 Hr.]

4.1. Object selection
4.2. Real-time pan and Zoom
4.3. Erase, Trim, Break
4.4. Copy, Cut, Mirror, Offset, Array,
4.5. Move, Rotate, Scale, Stretch,
4.6. Lengthen, Extend,
4.7. Chamfer, Fillet, explode, break at point, joint etc.

Unit 5: Features: [2 Hrs.]

5.1. View tools,
5.2. Layers concept, match and change properties.
5.3. measure and divide
5.4. inquiry commands (Id, Distance, Area, List, Mass property etc.
5.5. Working with Block, W-block and External References.
5.6. Drawing Exchange (convert to other format from drawing format and into drawing format)
5.7. Using drawing attributes, uses of predefined objects etc.
5.8. Uses of script files.
5.9. Use of Layout, and viewport to scale object and manage paper space.

Unit 6: Application of CADD in Civil Engineering Field: [1 Hr.]

6.1. Land development and surveying,
6.2. CADD and Highway Engineering
6.3. CADD and Building Drawing
6.4. CADD with water supply and sanitary drawings

Unit 7: Basic use of 3-D modeling in AutoCAD [2 Hrs.]

7.1. Overview of different 3-D planes and views.
7.2. Switching between 2-D and 3-D mode.
7.3. Changing UCS in 3-D mode.
7.4. Using Basic 3-D commands (Orbit, Extrude, Subtract and Slice)
7.5. Creating Basic 3-D objects (Box, Cylinder, and Cone etc.)
7.6. Creating Simple 3-D objects from 2-D objects (Round Table and extrude wall)

Unit 8: Plotters and Plotting the Drawing: [1 Hr.]

Practical

Unit 1: Starting a New Drawing/Opening an existing drawing [2 Hrs.]

1.1. Set up a drawing starting from scratch, using a Wizard, using and creating a template file, drafting aids.
1.2. Open an existing drawing
1.3. Prepare Screen layout, pull-down menus, screen icons, command line and dialogue boxes, toggles keys, Screen organization.
1.4. Set preferences (Setting Units and Scale, managing drawing area by using MV setup and Limits.)
1.5. Save drawing in different formats (. dwg, dxf, dwt, pdf) and versions of files.

1.6. Recover unsaved files.

Unit 2: Drawing Commands [5 Hrs.]

2.1. Draw a rectangle using Co-ordinate input methods (directive, absolute, relative and polar)
2.2. Draw Point, Lines, Polyline, Multiline, Construction Lines
2.3. Draw Circle, Arc, Ellipse, Donut
2.4. Draw Polygon, Rectangle, Spline, solids etc.
2.5. Hatch Objects and areas between lines.
2.6. Write Text (multi-line & single line / true type fonts)
2.7. Give Dimensions to various objects (circle, line, rectangle, polygon etc.) using Dimensions tools.

Unit 3: Modify Commands [2 Hrs.]

3.1. Perform various Object selection methods.
3.2. Apply: Erase, Trim, Break tools to modify the existing drawing.
3.3. Apply: Copy, Mirror, Offset, Array tools to modify the existing drawing.
3.4. Apply: Move, Rotate, Scale, stretch tools to modify the existing drawing.
3.5. Apply: lengthen Extend commands to modify the existing drawing.
3.6. Apply: Chamfer, Fillet, explode, and break at point and joint commands to modify the existing drawing.

Unit 4: Features [3 Hrs.]

4.1. Create Layers and perform match and change properties.
4.2. Measure line and divide in parts
4.3. Apply Inquiry commands
4.4. Perform Drawing Exchange (convert to the other formats from one drawing format.)
4.5. Use Layout, template and viewport to scale object and manage paper space.

Unit 5: Hand Drawing and Field Work: [30Hrs.]

5.1 Prepare drawing plate/plates of a Single Storied R.C.C. building with three or more rooms per floor with reinforced concrete slab meeting the requirements of Nepal Building code (NBC).
5.2 Prepare setting out plans for earth cutting and construction lines of building drawn in task 1 above.
5.3 Practice staking out in the field of the plan prepared on task 2 above.
5.4 Draw detail drawings of:
  5.4.1 Dog legged stair case (RCC)
  5.4.2 Door and Window frames including joints and fixing details
  5.4.3 Flush and panel door including joints and fixing details.
  5.4.4 Casement window including joints and fixing details.
5.5 Prepare a roof plan and elevation with valleys for CGI, and RCC roofing materials including their construction details.
5.6 Draw Racking, Flying and Dead shores with fixing details.
5.7 Draw septic tank and soak pit including sanitary fittings details.

Unit 6: Application of CADD in Civil Engineering Field [12Hrs.]

6.1 Draw a complete architectural drawing using CADD software (Location plan, Site plan, Floor plans, Elevations, Sections and detailed structural drawing) of a R.C.C. building, with three or more rooms per floor and two and half storey, following Nepal Building Code (NBC).

Unit 7: Basic use of 3-D modeling in AutoCAD [5 Hrs.]

7.1 Make 3-D drawing of a single-room rectangular shaped building with flat slab.

Unit 8: Plot and change the scale of drawing from model space and also from layout. [1 Hrs.]

Textbooks:

1. Civil Engineering Drawing; Gurcharan Singh, Standard Publishers distributers
2. Mastering AutoCAD 2019 and AutoCAD LT 2019 by George Omura, SYBEX publisher

References:

1. Autodesk AutoCAD 2019 Fundamentals by Elise Moss, SDC Publications
2. Sushil Kumar; Building Construction, Standard Publishers Distributers
3. Dr. B.C. Punmia, A.K. Jain, Arun Kr. Jain, Building Construction, Laxmi publication
4. W.B. McKay, Building construction, Vols. I – IV, ELBS, LONGMAN,
5. "Building Drawing with an Integrated Approach to Built Environment" by Shah, Tata McGraw-Hill Education Pvt. Ltd
6. Building Planning and Drawing", S S Bhavikatti and M V Chitawa, I K International Publishing House Pvt. Ltd.

Minimum Standard:

1. A well – equipped computer lab.
2. Drawing hall with all necessary tools and infrastructure which includes drawing tables, boards and etc.
3. Setting out tools such as thread, pegs, hammer, level pipe, nails and set square etc.

Evaluation Scheme

S. N.	Chapter	Mark distribution
1	**Hand Drawing and Field work**	**20**
1.1	Architectural drawing of two storey Building (plans and Elevations / Plans and Sections)	10
1.2	Detail drawing of dog-legged staircase/door and window frames or flush and panel door or casement window, including joints and fixing details	5
1.3	Racking or flying or dead shores with fixing details/septic tank and soak pit including sanitary fitting 5 marks	5
2	**Application of CADD in Civil Engineering Field**	**20**
2.1	Architectural drawing of two storey Building (plans and Elevations /Plan and Section)	10
2.2	Detail drawing of dog-legged staircase/door and window frames/flush and panel door or casement window, including joints and fixing details	5
2.3	3-D modeling in AutoCAD for a single room R.C.C. building	5
	TOTAL	**40**

Note:

1. Examination should be conducted on practical basis.
2. Examination should be held in two shifts: each for hand drawing and AutoCAD drawing separately.