ESSENTIAL CURRICULUM

ARCHITECTURAL DESIGN

ACADEMY

HOWARD COUNTY MARYLAND

ARCHITECTURAL DESIGN ACADEMY

Architectural Design

Introduction / Overview of Course

This course will introduce the basic principles and methods of design as applied to architecture. Basic design theories and strategies related to the development of spatial concepts in architectural design, including composition, color, form, relationship of elements will be applied in the development of 2-D and 3-D design projects. This course further emphasizes the architectural design process while relating these principles to general construction practices.

The course will include a study of form, function and efficiency of modern and historical architectural work, and hands-on design of residential and or commercial structures. Additionally the course introduces students to the concepts, practices, standards, and graphic representations used in the architectural design. A major focus will be to develop a clear understanding of the evolutionary processes of architectural styles and how they relate to present day architectural design. Students will study the concepts of form follows function; including the factors that affect exterior and interior design, and the relationship between function and space. Upon completion the student will be able to go from conceptual design, to design development, to the production of usable construction documents. Students will further enhance their repertoire of skills by designing several different types and styles of residential buildings using selected 3D Parametric Modeling software.

A major focus will be to develop complete sets of construction documents, electronic renderings, 3D animations and architectural models. Utilizing architectural specific software, students will create a full set of residential and or commercial plans including floor plans, elevation views, details, and sections, bill of materials, cost estimates, and presentations in electronic format.

Students will also learn the basic procedures, formulas for calculations and techniques used in construction cost estimating. This includes bidding procedures, different types of construction estimates and the appropriate procedures for each, and the process of quantity take-offs and cost calculations including equipment, overhead and profit components.

Construction scheduling will be introduced as a tool for project delivery and documentation, from project conception to building occupancy emphasizing the interrelationship of the trades and sequencing of the work during the construction process.

Students are responsible for:

- Maintaining a portfolio of all class assignments, projects, research and homework.
- Submitting all assignments on time.
- Observing school and county policies related to classroom expectations and respect for their peers and staff.
- Replacement cost of any material, equipment, software and hardware damaged intentionally.
- Using only appropriate internet sites as they relate to class assignments or related research.
- Using only the computers, and all other hardware that has been assigned.
- Recognizing that guest speakers are volunteering their time and expertise and demonstrate proper respect

Student teams are responsible for:

- Recognizing individual strengths within the team.
- Capitalizing on individual strengths through the division of work.
- Recognize that a combination of individual parts make up the total project.
- Demonstrating regard for the team in submitting their part on time.
- Working cooperatively, they are expected to ask others for input.
- Maintaining notes on project specifications, and research items.
- Understanding the project and their responsibility to the team.
- Using time wisely and efficiently and do not waste the time of others within the team.
- Submitting all charts, and materials in an organized manor.

PROGRAM

HIGH SCHOOL
CORE LEARNING GOALS

SKILLS FOR SUCCESS CORE LEARNING GOAL LEDGER

Each of the objectives listed in the subsequent curriculum outline is labeled to reference the core-learning goal it supports. The following ledger defines this labeling system.

LEARNING SKILLS [LS]
THINKING SKILLS [TS]
COMMUNICATION SKILLS [CS]
TECHNOLOGY SKILLS [TC]
INTERPERSONAL SKILLS [IS]

1st Year – Semesters One and Two
What is Architecture / Architectural Design?
1. The World of Architecture
2. Basic House Designs
3. Primary Considerations
4. Introduction to Computer-Aided Drafting and Design (CAD)
5. CAD Commands and Functions (AutoCAD)
6. Room Planning—Sleeping Area and Bath Facilities
7. Room Planning—Living Area
8. Room Planning—Service Area
9. Plot Plans
10. Footings, Foundations, and Concrete
11. The Foundation Plan
12. Sill and Floor Construction
13. Wall and Ceiling Construction
14. Doors and Windows
15. Stairs
16. Fireplaces, Chimneys, and Stoves
17. Traverse, Longitudinal and Wall Sections
18. The Floor Plan
19. Roof Designs **Submit for payment**
20. Elevations – Exterior and Interior
21. Residential Electrical
22. Information, Communication, and Security Wiring
23. The Electrical Plan
24. Residential Plumbing
25. The Plumbing Plan
26. Residential Climate Control
27. Climate Control Plan
28. Career Opportunities
2nd Year – Semester One
29. Solar Space Heating
30. Designing Environmentally Friendly Green Homes (EFGH)
31. Nontraditional Structures **Submit for payment**
32. New Products and Methods of Construction
33. Modular Applications
34. Perspective Drawings
35. Presentation Drawings / 3D Studio Viz Software – Animation Walkthrough
36. Architectural Models
37. Material and Tradework Specifications
38. Estimating Building Cost / TimberLine Estimating Software
39. Architectural Remodeling, Renovation, and Preservation
40. Designing for Health and Safety
41. Revit Software
2nd – Semester Two
42. Site base work mentorship or See No. 43
43. In-House Project – Example; "Design Energy Free Home" **Submit for payment**

ARCHITECTURAL DESIGN- 1st Year
OVERARCHING GOALS

Unit: What is Architecture / Architectural Design?

Goal: Explain the significance of architecture and the historical and social forces that influence today's built environment.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] List several descriptions of architecture from different architects.
2. [TS] Describe historical influences on today's architectural styles.
3. [TS] List social forces that dictate architectural design.
4. [TS] Predict what forces will determine architectural designs in the future.
5. [TC] Use the Internet to conduct research on different architectural periods.
6. [CS] Write about different architectural periods.

Unit: 1 The World of Architecture

Goal: Identify the elements of contemporary dwellings and current trends in architecture.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] Identify the historical influences that helped shape today's home designs.
2. [TS] Recognize and describe the elements of contemporary dwellings.
3. [CS] Discuss current trends and influences in architecture.
4. [TS] Identify types of multifamily housing.

Unit: 2 Basic House Designs

Goal: Describe the advantages and disadvantages of the four basic house designs.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List the four basic house designs.
2. [TS] Explain the chief advantages of each house design.
3. [LS] List disadvantages of each house design.
4. [CS] Explain traffic circulation in a floor plan.

Unit: 3 Primary Considerations

Goal: Identify the major factors that dictate the design of a structure.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Discuss key site considerations, restrictions, zoning, and codes.
2. [TS] Evaluate a site with respect to important considerations.
3. [LS] Record topographical features of a site.
4. [LS] List family needs that should be considered when planning or purchasing a dwelling.
5. [TS] Develop a budget for purchasing or constructing a house.
6. [CS] Describe the basic construction drawings used to build a structure.

Unit: 4 Introduction to Computer-Aided Design (CAD)

Goal: Describe the advantages of CAD and AEC programs.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Explain computer-aided design, (CAD).
2. [LS] Identify common applications for CAD in architecture.
3. [LS] List the components of a typical CAD workstation.
4. [LS] Identify features of CAD software and how they should be evaluated when selecting a program.
5. [CS] List several Architectural Engineering and Construction, (AEC) specific software programs.
6. [CS] Explain the advantages of AEC specific CAD software.

Unit: 5 CAD Commands and Functions (AutoCAD)

Goal: Identify the common commands and functions used in CAD programs.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List several general categories of commands used in popular CAD programs.
2. [LS] Sketch an example of linear, angular, and leader dimensioning.
3. [CS] Explain drawing aids.
4. [CS] Discuss the purposes of colors, linetypes, and layers in typical CAD programs.
5. [CS] Explain layer-naming conventions as related to architectural drawings.

6. [CS] Describe 3D drawing.
7. [CS] Explain rendering.
8. [CS] Explain animation.

Unit: 6 Room Planning – Sleeping Area and Bath Facilities

Goal: Describe the important factors that influence the design of sleeping areas and bath facilities.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Discuss factors that are important in the design of bedrooms.
2. [TS] Plan the size and location of closets for a typical residence.
3. [TS] Plan a furniture arrangement for a room.
4. [LS] List requirements to make a bedroom accessible to the disabled.
5. [TS] Implement important design considerations for bathrooms.
6. [TS] Plan a bathroom that follows solid design principles.
7. [LS] List the requirements to make a bathroom accessible to the disabled.

Unit: 7 Room Planning – Living Area

Goal: Describe the important factors that influence the design of living area.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] Identify the rooms and areas that comprise the living area.
2. [TS] Apply design principles to planning a living room.
3. [TS] Integrate the furniture in a living room plan.
4. [TS] Analyze a dining room using good design principles.
5. [LS] Design a functional entry and foyer.
6. [CS] Communicate the primary design considerations for a recreation room.
7. [TS] Integrate patios, porches, and courts into the total floor plan of a dwelling.

Unit: 8 Room Planning – Service Area

Goal: Describe the important factors that influence the design of service area.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Plan the service area of a home by applying good design principles.
2. [LS] Design a functional kitchen to meet a family's needs.
3. [TS] Select kitchen appliances that are appropriate for a design.

4. [LS] Plan an efficient clothes care center.
5. [CS] Describe appropriate dimensions for garage space.

Unit: 9 Plot Plans

Goal: Design and draw, with CAD, a plot plan using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Identify the various features shown on a typical plot plan.
2. [TS] Visualize land elevations from contour lines.
3. [TS] Recognize typical topographical symbols and apply them to site considerations.
4. [LS] Properly locate a building on a site.
5. [LS] Draw a plot plan using correct symbols and conventions.
6. [LS] Draw a plot plan using CAD.

Unit: 10 Footings, Foundations, Concrete, Concrete Masonry Units and Brick Construction.

Goal: Analyze a simple structure to determine the type foundation system to support the structure and determine which materials are most appropriate for the site conditions and budget.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Describe the procedure for staking out a house location.
2. [LS] List the major considerations when designing a footing for a residential foundation.
3. [TS] Analyze a typical floor plan to determine the appropriate foundation.
4. [CS] Discuss the design considerations for wood, concrete, and masonry foundation walls.
5. [TS] Calculate the load to be supported by a beam.
6. [TS] Determine the proper size beam from standard beam sizes.
7. [CS] Explain the purpose of a lintel.
8. [TS] Determine the proper lintel size from standard lintel sizes.

Unit: 11 The Foundation Plan.

Goal: Design and draw, with CAD, a foundation / basement plan using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Identify the primary features included in a foundation plan.

2. [CS] Discuss the difference between a foundation plan and a basement plan.
3. [TS] Design and draw a foundation plan for a typical residential structure using CAD.

Unit: 12 Sill and Floor Construction

Goal: Identify and design sill and floor systems.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Explain the difference between platform and balloon framing.
2. [TS] Plan the appropriate floor support using joists or trusses for a structure.
3. [LS] Determine proper joist sizes using a typical span data chart.
4. [CS] Describe the components of a floor system.
5. [CS] Explain the principles of post and beam construction.
6. [TS] Select the appropriate engineered wood products for specific applications in residential construction.

Unit: 13 Wall and Ceiling Construction

Goal: Identify and design wall and ceiling systems.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List the members of a typical frame wall.
2. [CS] Explain methods of frame wall construction.
3. [CS] Explain information shown on a ceiling joist span data chart.
4. [LS] Sketch the various types of exterior walls used in residential construction.
5. [CS] Explain the applications, advantages, and disadvantages of steel framing in residential construction.
6. [TS] Identify the basic processes used to produce a quality, three-coat stucco finish.

Unit: 14 Doors and Windows

Goal: Identify the different types of windows and doors.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List the functions that doors and windows perform.
2. [TS] Compare the types of doors used in a residential dwelling.
3. [TS] Draw proper door and window symbols on a typical floor plan.
4. [LS] Determine the code requirements for windows and doors.
5. [CS] Explain the information shown in a window or door detail.
6. [TS] Prepare window and door schedules.

Unit: 15 Stairs

Goal: Using code requirement designs a stairway for a simple residence.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Define common stair terminology.
2. [CS] Explain the appropriate use of the various stair designs.
3. [LS] Determine the code requirements for stairs.
4. [TS] Design a stairway for a residential structure.
5. [LS] Draw structural details for main stairs.
6. [TS] Perform stair calculations for a residential stairway.
7. [LS] Identify model code requirements for handrails and guardrails.

Unit: 16 Fireplaces, Chimneys, and Stoves

Goal: Applies codes requirement and appropriate design principles to design a fireplace.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Compare various types of fireplaces that are appropriate for a residence.
2. [LS] Identify the parts of a standard masonry fireplace and chimney.
3. [TS] Determine the code requirements for fireplaces and stoves.
4. [TS] Apply the appropriate principles to design a typical fireplace.
5. [LS] Use a fireplace design data chart.
6. [CS] Explain the difference between a radiant and circulating stove.

Unit: 17 Traverse, Longitudinal, and Wall Sections

Goal: Design and draw, with CAD, traverse, longitudinal and wall section using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Identify the primary features included on a traverse, longitudinal and wall section.
2. [CS] Discuss the difference between traverse, longitudinal and wall sections.
3. [TS] Design and draw a traverse, longitudinal and wall section for a typical residential structure using CAD.

Unit: 18 The Floor Plan

Goal: Design and draw, with CAD, floor plans using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List the information required on a typical floor plan.
2. [LS] Represent typical materials using standard architectural symbols.
3. [TS] Design and draw, with CAD, a residential floor plan using accepted symbols and techniques.
4. [LS] Dimension a floor plan in a clear and precise manner.
5. [TS] Recognize the difference between a good and poor drawing of a floor plan.

Unit: 19 Roof Designs

Goal: Identify the different styles of roofs and roofing material.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Name and sketch ten different types of basic roof designs.
2. [CS] Describe the construction of a typical frame roof.
3. [LS] Draw a roof that has a typical roof slope (pitch).
4. [TS] Interpret information found on a rafter span chart.
5. [CS] Explain the importance of proper attic ventilation and roof flashing.
6. [TS] Compile the appropriate information to order roof trusses for a house.
7. [CS] Describe the differences between roof rafters and engineered roof trusses.
8. [LS] Identify different types of roofing materials.

Unit: 20 Exterior / Interior Elevations

Goal: Design and draw, with CAD, exterior and interior elevations using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List features that should be included on an exterior elevation.
2. [LS] List features that should be included on an interior elevation.
3. [TS] Identify the dimensions commonly shown on exterior and interior elevations.
4. [CS] Explain symbols that are often found on exterior and interior elevations.

5. [LS] Draw, using CAD, a typical exterior interior elevation that demonstrates proper techniques.

Unit: 21 Residential Electrical

Goal: Calculate the circuit and load requirements for a residential structure.

Objectives: At the completion of this unit, the student will be able to:

1. [TS] Define typical residential electrical terms.
2. [TS] Plan for the electrical needs of a modern home.
3. [LS] Identify and explain the three types of electrical circuits used in a residential structure.
4. [TS] Calculate circuit requirements for a residence.
5. [CS] Explain the advantages and disadvantages of low voltage exterior lighting.

Unit: 22 Information, Communication, and Security Wiring

Goal: Designs an information, communication and security wiring system for a simple residence.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] Identify the features related to information, communication, and security that should be considered when designing a new home.
2. [LS] List the types of lines or cables used in residential telephone systems.
3. [CS] Define common terms associated with information, communication, and security wiring.
4. [LS] List the components of a security system designed to protect residential property.
5. [CS] Discuss the components of a home automation system.
6. [CS] Describe the elements of a low-voltage switching system.

Unit: 23 The Electrical Plan

Goal: Design and draw, with CAD, electrical plans, electrical legend and fixture schedules using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Describe an electrical plan and identify its features.
2. [CS] Describe an electrical legend and fixture schedule.
3. [LS] Identify typical electrical symbols found on a residential electrical plan.

4. [LS] Draw an electrical legend and fixture schedule using CAD.
5. [LS] Draw an electrical plan for a residential structure using CAD.

Unit: 24 Residential Plumbing

Goal: Identify the elements of both the residential water-supply system and the waste-removal system.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Discuss the purpose of a residential plumbing system.
2. [CS] Describe the significance of a residential plumbing system.
3. [TS] Identify the elements contained in a residential water supply system.
4. [TS] Identify the elements of a residential water and waste removal system.
5. [CS] Explain the operation of various in-house water treatment systems.
6. [CS] Explain the layout of a private sewage disposal system.
7. [LS] List the basic code requirements for a residential plumbing system.

Unit: 25 The Plumbing Plan

Goal: Design and draw, with CAD, residential plumbing plan using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Explain the purpose of a residential plumbing plan.
2. [LS] Identify the components of a residential plumbing plan.
3. [LS] Draw plumbing symbols and fixtures on a plumbing plan using CAD.
4. [LS] Develop a residential plumbing plan.
5. [TS] Compile a plumbing fixture schedule.

Unit: 26 Residential Climate Control

Goal: Identify the elements of a residential climate control system.

Objectives: At the completion of this unit, the student will be able to:

1. [CS] Discuss the components of a complete climate control system.
2. [LS] List the advantages and disadvantages of various types of residential heating systems.
3. [TS] Perform heat loss calculations for a typical residential structure.

4. [TS] Select building materials that will provide the best insulation properties.

Unit: 27 Climate Control Plan

Goal: Design and draw, with CAD, residential climate control plan using correct symbols and conventions.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List features included on a residential climate control plan.
2. [TS] Plan the ductwork for a typical forced-air system.
3. [LS] List the advantages and disadvantages of both a forced-air system and hot-water system.
4. [LS] List the advantages and disadvantages of a radiant heating system.
5. [TS] Select an appropriate heating or cooling unit for a given structure.
6. [LS] Draw, using CAD, a climate control plan using proper symbols and conventions.

Unit: 28 Career Opportunities

Goal: Describes various career options in architecture and residential construction.

Objectives: At the completion of this unit, the student will be able to:

1. [LS] List various career options in architecture and residential construction.
2. [TS] Compare the duties and educational requirements of various occupations in architecture and construction.
3. [CS] Describe the type of objectives found in a model ethics code.
4. [CS] Explain why job site safety is important.
5. [LS] List leadership traits.
6. [CS] Explain the advantages and disadvantages of entrepreneurship.