












UNIT 5: RESIDENTIAL DESIGN

Welcome to the fifth unit of *Civil Engineering & Architecture*! In this unit, you get to reapply all the information you've learned this semester about Revit, building codes, planning for residential design, furniture components, electrical and plumbing systems, as well as site planning and home efficiency. In the end, the expectation is that you learn the following:

- How to plan a complete residential design
- How to create the foundation of your home
- How to plan electrical and plumbing systems
- How to build your home and install components in Revit
- How to plan for and calculate wastewater runoff and drainage

As we move through this unit, you are responsible for making adequate progress through the assignments, and for being done by the Unit Due Date (**November 27, 2019**). You are also responsible for completing each part before moving on to the next. Our unit is broken up into three main parts:

Part 1: Planning (40 pts) Approx. 3 days	
As you start your final residential design project of the semester, you'll have the freedom to choose the design challenge you'd like to tackle. You need to start by choosing one of the four (4) design challenge options. Then, work with the proper stakeholder to identify building needs and parameters before creating a bubble diagram and putting up the walls, floors, ceilings, doors, windows, and roof of your design!	 Design Notes
	 Bubble Diagram
	 Revit Design
Part 2: Foundation & Electrical (40 pts) Approx. 3 days	
Next, add a footer foundation to your building and start adding electrical components. Get your entire house wired for switches, lights, sockets, and appliances. As you do this, plan out your various counters and cabinetry so that your house is starting to come together! As you start putting various appliances and furniture into your home, be sure to check out RevitCity for new components that might make your house extra special!	 Brainstorming Notes
	 Revit Foundation
	 Revit Furniture & Appliances
	 Revit Wiring Annotations
Part 3: Plumbing & Water Planning (40 pts) Approx. 3 days	
To wrap up this unit, get the plumbing in place in your home. Place any water fixtures like sinks, toilets, and showers. Plan out the plumbing following the given criteria (like no pipes in exterior walls!), and get the rest of your furniture in place. By now, the house itself should be mostly complete. Take some time to make a few really nice 3D renderings of your final design. Think about the aesthetics and make the whole thing look as cool as possible!	 Brainstorming Notes
	 Revit Furniture & Fixtures
	 Revit Plumbing Annotations
	 3D Renderings

(40 pts) Approx. 3 days




This unit gives you a chance to design a new residential structure following the design parameters outlined in your client request. Here you'll start by choosing a design project, and then getting to work brainstorming and designing your new residential home.



1. Start by watching the presentations *Architecture Design*, *Floor Planning* and *Design Ideas*. Start taking some notes on these ideas, and start to think about which challenge you want to tackle!
2. Next, you'll need to pick a design challenge. Each challenge is briefly summarized below, and there are full design parameters listed on our class website:

<p>★ DESIGN CHALLENGE 1: Home Redesign</p> <p>Your family is interested in redesigning and completely rebuilding your home. If you choose this design challenge, you'll be tasked with creating a new home with your own family's needs in mind. In this challenge, you'll be limited to 150% of your current home size.</p>	<p>★ DESIGN CHALLENGE 2: College Dorm</p> <p>UAF is looking to make some new 4-person apartment-style dorms, and you could design them! In this challenge, you'll be asked to make a 4-bedroom, 2-bathroom dorm for UAF.</p>
<p>★ DESIGN CHALLENGE 3: Mars Habitat</p> <p>NASA is working with Space-X to create a manned station on Mars, and you could be the one to design it! In this challenge, you'll be asked to create a 12-person Mars station made up of 6 octagonal units.</p>	<p>★ DESIGN CHALLENGE 4: Emergency Housing</p> <p>The Federal Emergency Management Agency (FEMA) is trying to design new, efficient, emergency housing for use in disaster areas, and they've come to you for a design! Here you'll be designing small single-family short-term housing units.</p>

3. Now, create at least 2 complete bubble diagrams to help organize and brainstorm possible design layouts. Include your bubble diagrams in your engineering notebook.
4. Finally, get into Revit and start to build the basic framework of your residential design. Make sure that your design includes floors, ceilings, walls, roofs, windows, and doors. Enough to start getting things well-organized.





Part 1: Tasks	5 points	4-3 points	2-1-0 points
<p> Design Notes</p>	<p>+ You took a page of notes on your chosen challenge + Your notes include details on your constraints and other design elements</p>	<p>- Your notes are less than a page or missing important information</p>	<p>- Your notes are severely lacking</p>
<p> Bubble Diagram</p>	<p>+ You created at least 2 bubble diagrams to brainstorm possible layouts</p>	<p>- You only completed 1 bubble diagram</p>	<p>- You did not make any bubble diagrams</p>
<p> Revit Design</p>	<p>30-20 points</p> <p>+ You built your basic Revit design + Your basic design includes walls, floors, ceilings, a roof, windows, and doors + Your basic design follows all the criteria outlined in your chosen challenge</p>	<p>19-10 points</p> <p>- Your basic design is missing important elements - Your basic design does not meet all criteria</p>	<p>9-0 points</p> <p>- Your basic design does not follow the parameters at all</p>



(40 pts) Approx. 3 days

The second part of our unit gives us time to focus on some of the details of our building. Just as with the Habitat for Humanity House, we need to add a footer to the wall to serve as a foundation. Then, we'll start adding furniture to the home, thinking about how people will likely use it. Finally, we need to make sure that all the electrical appliances are installed so that we can add the wiring, electrical sockets, lights, and switches that are needed in the house.

1. The first thing to do is watch the three presentations on site planning: *Residential Electrical Ideas 1*, *Residential Electrical Ideas 2*, and *Zero Energy Housing*. Take a full page of notes on these ideas and think about how these concepts will impact your Habitat for Humanity design.
2. Next, follow the same process you did in the last unit to add a concrete footer to the wall of your building. This will give us a simple foundation to work with. Use this same type of footer on all designs regardless of the challenge you chose
3. Now, start adding your furniture. As you look for furniture and appliances, check out RevitCity (revitcity.com) and use our class login info: *username: LHSCEA password LHSCEA*. Here at RevitCity you can find lots of new components to add to your Revit designs and make them even cooler!
4. When all your electrical fixtures are in (TVs, electric stoves, refrigerator, washer & dryer, etc), start wiring your house for electrical. As you do this, you need to follow these design codes:
 - a. No plumbing should be in exterior walls (so keep your electrical devices like refrigerators and washer/dryers away from exterior walls too, since they will also need water).
 - b. Every room should have at least 1 electrical outlet.
 - c. Every wall longer than 10 feet should have at least 1 electrical outlet.
 - d. It should never be more than 8 feet between electrical outlets.
 - e. Outlets placed near running water (kitchen/bathroom) need to be GFR Outlets for safety reasons
 - f. Light switches in large common rooms should be accessible from multiple entrances
5. Finally, just like with the Habitat for Humanity House, create an electrical plan that shows where all the wiring, switches, and outlets will go in your new home design.





Part 2: Tasks	10-7 points	6-4 points	3-0 points
 Brainstorming Notes	+ You took a full page of notes from the videos and started your own design brainstorming + Your brainstorming is apparent	- Your notes and brainstorming are less than a page or missing important information	- Your notes & brainstorming are severely lacking
 Revit Foundation	+ You created a footer foundation on the wall cross section of your home. + The footer matches the parameters of the footer from the last unit	- Your footer is incorrect - Your footer is not visible on the house when viewed	- Your footer is missing - Your footer is significantly wrong
 Revit Furniture & Appliances	+ You began adding furniture to your home + All appliances requiring electricity have been placed in the house	- Your furniture is barely included - Obvious appliances are still missing	- No furniture has been added
 Revit Electrical Plan	+ You created an Electrical Plan layout + Your plan follows the design codes above + Your plan has all important parts	- Your electrical plan is missing some elements - Your electrical plan does not follow the guidelines	- Your electrical plan is missing



(40 pts) Approx. 3 days

The final part of our unit returns to the idea of planning for water in our home. Here you'll put in the remaining furniture and all fixtures that require water. (If you're planning for a building on Mars, assume a ready-supply of clean water from a nearby water collection system). You'll also need to create a few nice 3D renderings of your home so that you can show off your design to others!

1. The first thing to do is watch the three presentations on site planning: *Residential Plumbing Kitchen Design*, and *Rainwater Harvesting*. Take a full page of notes on these ideas and think about how these concepts will impact your Habitat for Humanity design.
2. Now, continue adding your furniture. You need to get all your water fixtures (toilets, sinks, etc) in place so you know where your plumbing needs to go. As you look for furniture and appliances, check out RevitCity (revitcity.com) and use our class login info: *username: LHSCEA password LHSCEA*. Here at RevitCity you can find lots of new components to add to your Revit designs and make them even cooler!
3. When all your plumbing fixtures are in, start annotating the pipes for incoming clean water and outgoing wastewater. As you do this, you need to follow these design codes:
 - a. No plumbing should be in exterior walls (so keep your electrical devices like refrigerators and washer/dryers away from exterior walls too, since they will also need water).
 - b. Every electrical outlet near water fixtures needs to be a GFR outlet.
 - c. A full bath (if you make one) has a toilet, sink, bathtub, and shower
 - d. A ¾ bath (if you make one) has a toilet, sink, and shower
 - e. A half-bath (if you make one) has a toiler and sink
 - f. Wastewater pipes leaving toilets should leave at 45 degrees
4. Finally, use the Render tool to get at least 3 nice 3D renderings of your house. Make sure to get at least 1 outside view and at least 2 inside views.

Part 2: Tasks	10-7 points	6-4 points	3-0 points
 Brainstorming Notes	+ You took a full page of notes from the videos and started your own design brainstorming + Your brainstorming is apparent	- Your notes and brainstorming are less than a page or missing important information	- Your notes & brainstorming are severely lacking
 Revit Furniture & Water Fixtures	+ You added the rest of your furniture for your home design + All water fixtures have been added + You followed the design codes listed for plumbing	- Your furniture is not all added - Your plumbing does not meet the required codes	- Your furniture is missing - Your water fixtures are missing
 Revit Plumbing Plan	+ You made a complete plumbing plan in Revit + Your plumbing includes incoming clean water and outgoing wastewater	- Your plumbing is missing important parts - Your plumbing is incomplete	- Your plumbing is missing
 Renderings	+ You created at least 1 outside 3D rendering + You created at least 2 inside 3D renderings	- You did not make all 3 renderings	- Your 3D renderings are missing.

