

## Design Build Course Outline

### *Learn to design, build and maintain your own house!*

All lectures and workshops are approximately 4 clock hours.  
Course fees \$95.00 per lecture/\$45.00 per workshop.

**Introduction** – (*Lecture*) Slide show of construction process, energy efficient systems, architectural details- Implication of population growth and resource consumption on housing-Criteria for design (use, need, Telesis, association, aesthetics, method) Individual activity patterns/space requirements.

**Homework:** analysis of present dwelling using criteria for design.

**Drafting** – (*Workshop*) Conventions of blueprints-Explanation of drafting tools and details. Each student draws floor plans and section elevations by hand

**Micro/Macro Climate** – (*Lecture*) Effect of climate, including human comfort zone, effect of sun and wind, how to plot solar insulation, predicting BTU and local sun time – How to modify, use and improve climate through location of landscaping and construction – Effect of snow, water, glare, proximity to body of water, altitude, latitude, and declination.

**Homework:** Graph BTU/hour/surface year round.

**Site** – (*Lecture*) Bringing services to site (driveway, septic system, water, power). Navigating the permitting process. Understanding road design and construction for driveways.

**Site** – (*Workshop*) Use of transits to sight heights for driveways, septic systems, foundations and construction – Setting batter boards and using water levels – Pond building – Culvert design site laws.

**Heat Transfer Calculations** – (*Lecture*) Understanding the nature of heat loss for predicting size of HVAC system, costs of heating with different fuel sources and amounts, types of insulations, volume of living space of house and materials used – Complete explanation of R – value, infiltration, U-values, conduction, convection, radiation and degree days.

**Wiring** – (*Lecture*) Nature of electricity – Types of wire and conduits and their uses – Bringing services into the home (installing meter box, service entrance, grounding wire, planning and installing circuits) Wiring with respect to vapor barriers and structural members – Tips to improve trade practices and make circuits more accessible and expandable.

**Wiring** – (*Workshop*) Demonstration and practice of wiring a service entrance circuits, switches and boxes.

**Physics of Materials** – (*Lecture*) How trees grow – Relative advantage of plain and quarter – sawn lumber – Moisture content of wood and how to dry it properly. Decay, shrinkage, weathering and grading in regards to evaluating rot, checks, splits and shakes. Steel as fasteners, beams and post strength, durability and fire resistance.

**Overturn and Bending Moments** – (*Lecture*) Analysis of wind load and building resistance. Moment calculations for wind loads. Bending moment calculations for beam sizing. Bearing properties of wood. Calculations for code standards of stud or timber framed houses.

**Shear, Deflection and Rack** – (*Lecture*) (Part 2 of Stress Calculations for Renovation) New construction – Rack resistance through bracing, racking panels and steel. Sizing footings for different soil types – load capacity and design of footings.

**Foundations** – (*Lecture*) Considerations checklist – Foundation layout, batter boards, reinforcement of concrete and fastening. Basic principles and details of 14 different foundations from expensive, complex and comprehensive full basements, to low cost, simple pole foundations. Costs, site requirements, efficiencies, benefits, installation, maintenance, codes, equipment and materials needed.

**Mass and Glass** – (*Lecture*) Sizing glass for amount of mass needed to store passive solar gain. Graphing ration of glass to BTU gain and amount. Type of mass and system circulation. Alternative systems for photovoltaic electricity, active solar collection, wind mills, and electricity storage. Conventional heat systems, sizing and radiant in-floor heat systems. Energy efficient alternatives.

**Plumbing Incoming** – (*Lecture*) Complete system layout from supply to waste. Comparison of hand, reciprocating and piston pumps. Septic system choices, alternative systems and on site treatment plants. Evaluation of copper, PVC, polyethylene, and PEX for interior plumbing. Drafting of system for maximum layout.

**Plumbing Outgoing** – (*Lecture*) Description of the components of outgoing plumbing. Options for waste management including septic systems, composting toilets and grey water. Sweat pipes and joints set up plumbing tree to understand supply and waste.

**Framing I** - (*Lecture*) House Shape and Floor Framing Historical and architectural perspective on house design, shape and roofline. On-center framing from 12” to 12’ and resulting forces on shape. Basic post and lintel components in shed, gable, saltbox, clerestory, rainbow, gambrel, hip, mansard and octagon rooflines. Drawing framing details of the first floor for stiffness and prevention of piano failure and heat loss around perimeter. Alternative beams (plywood, box, trusjoist, glulam, microlam)

**Sheathing, Insulation and Fasteners** – (*Lecture*) Function, durability, efficiency, cost, ease of installation of sheathing materials. New and old insulations re: toxicity, ease of use, appropriateness, R-value, Moisture and fire resistance. Moisture migration and the air tight drywall system. Fasteners made on site vs. ready made fasteners (hurricane fasteners, shear wall resistance, truss design strength.)

**Framing II – Walls and Roofs** – (*Lecture*) Framing and alternative finishing for dormers, valley rafters and hip rafters. Double stud wall framing for super insulation. Double roof construction to allow air flow over insulation. Building your own large cavity for super insulation, and modifying the “envelope.”

**Framing III** – (*Lecture*) Framing openings for windows, doors, stairs skylights and chimneys. Calculating ventilation requirements for roofs and living space. Understanding air-to-heat exchangers. Attic and eave ventilation requirements. Comparison of materials (installation, durability, aesthetics, fire codes, costs).

**Wrap-up** – (*Lecture*) Financing options from traditional to creative. Closing costs of newly constructed homes or existing structures. Legal responsibilities and contracts. Insurance for construction period and after. Designing for sound with an understanding of decibel levels. Safety on the construction site. Designing for fire resistance. Beginning with a blank piece of paper ... create the house of your dreams.

### **Optional Workshops Typically Offered in the late afternoon or evening**

Cardboard Models

Welding

Framing Models

Site Layout

Chainsaw Maintenance and Milling

Sharpening

Basic Tools