ARCHITECTURAL STRUCTURES I:
STATICS AND STRENGTH OF MATERIALS
ENDS 231
DR. ANNE NICHOLS
SPRING 2007

lecture
twenty eight

the semester
and beyond
Office Hours

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**RATIONALE**

- Inherently fire-resistant construction
- Simple, site-fabricated systems
- Systems without beams in roof or floors
- Precast-concrete systems without ribs
- Short-span, one-way, easily modified
- Quickly erected; avoid site-cast concrete
- Easily formed or built on site
- Highly prefabricated; modular components
- Lightweight, easily formed or prefabricated
- Precast, site-cast concrete; steel frames
- Strong; prefabricated; lightweight
- Capable of forming rigid joints
- Lightweight, short-span systems
- Systems without rigid joints
- Multipurpose components
- Systems that inherently provide voids
- Two-way, long-span systems
- Long-span systems
Structural Design Criteria

- components stay together
- structure acts as whole to be stable
  - resist sliding
  - resist overturning
  - resist twisting and distortion
- internal stability
  - interconnectedness
- strength & stiffness
Structural Design Sequences

- **first-order design**
  - structural type and organization
  - design intent
  - contextual or programmatic

- **second-order**
  - structural strategies
  - material choice
  - structural systems

- **third-order**
  - member shaping & sizing
Component Design Guides

Appendix A: PRELIMINARY DESIGN CHARTS

- Waffle Slab - Concrete
- Cored Precast - Concrete Deck
- Steel Beam
- Wood Truss - Flat
- Folded Plate - Wood
- Folded Plate - Steel
Final Exam Material

• my list:
  – equilibrium - $\Sigma F$ & $\Sigma M$
     • supports, trusses, cables, beams, pinned frames
  – materials
     • strain & stress ($E$), temperature, constraints
  – beams
     • distributed loads, tributary width, V&M, stresses, design, section properties ($I$ & $S$), pitch, deflection
Final Exam Material

- **my list (cont’d):**
  - **columns**
    - stresses, design, section properties \((I \& r)\)
  - **frames**
    - \(P, V \& M, P-\Delta\), connection design, tension member design
  - **design**
    - ASD
    - LRFD
    - wood peculiarities