Structural Design I

Philippe Block · Joseph Schwartz
Structural design I+II

1. Introduction
2. Equilibrium and graphic static
3.+4. Cables
5.+7. Arches
6.+8. Arch-cable-structures
9. Trusses
10.+11. Beams and frames
12. Materials and dimensioning
13. Cable-net and membrane structures
14.+15. Vaults, domes and shells
16. Spatial arch-cable-structures
17. Spacial trusses
16. Shear walls and plates
20. Columns

Structural design II

19. Bending

Course overview
Beams

- **Structural behaviour of a simple beam**
  - Reinforced concrete beam
  - Steel beam
  - Beam under concentrated and distributed loads
  - Cantilever under concentrated and distributed loads
  - Overhanging beam
  - Gerber’s beam (Hinged girder system)
  - Continuous beam
## Structural behavior of simple beam

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### Arch, cable
- Arch, cable, membrane, Schale
- Membrane action

### Arch-cable structures
- Arch-cable structures, truss, space truss
- Beam, beam grid, slab

- pre-stressed concrete
- steel/ wood
- cracked concrete
Structural behavior of simple beam

Form diagram
Scale 1 : 100

Force diagram
Scale 1 cm = 1 kN
Structural behavior of simple beam

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Pier Luigi Nervi: project, airport terminal, Rom, 1957
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Riccardo Morandi: Polcevera viaduct, Genoa, 1968
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Arnold Bürkli: Quai bridge, Zurich, 1884