

bmcs course

brittle/matrix cementitious
composite structures

roadmap, organization

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*oricrete: Yoshimura vault, RWTH Aachen
(2015)*

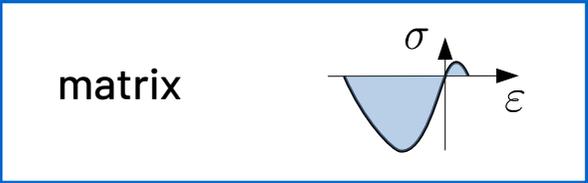
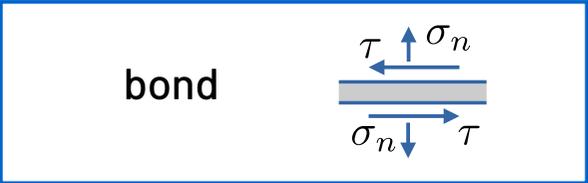


*Jena, Germany, Dyckerhoff-Widmann
(1922-1923)*

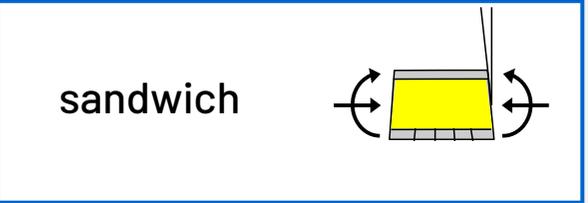
the roadmap

local - global

material

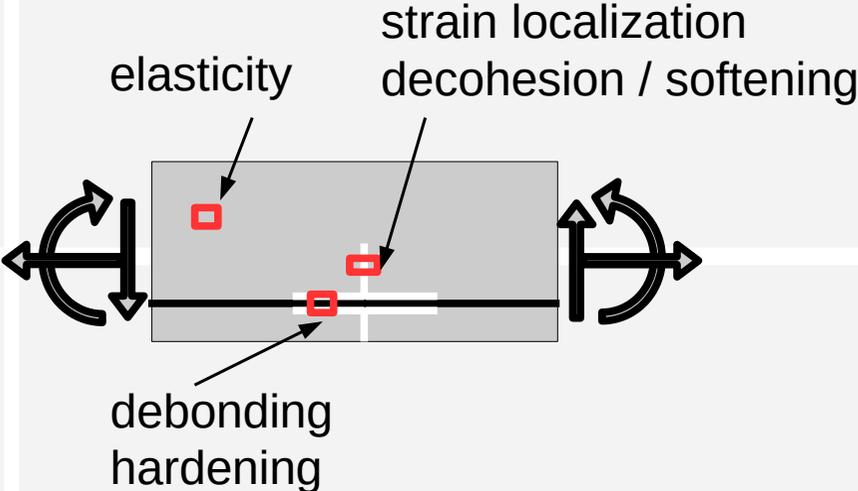
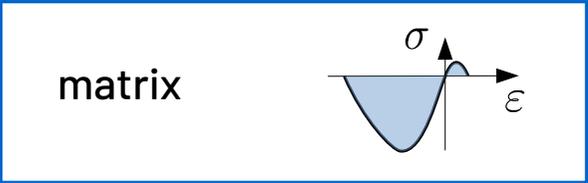
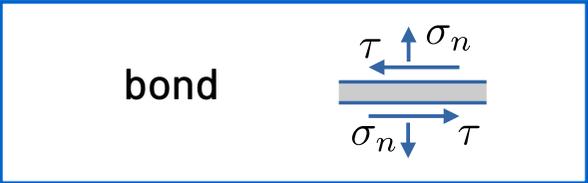


form

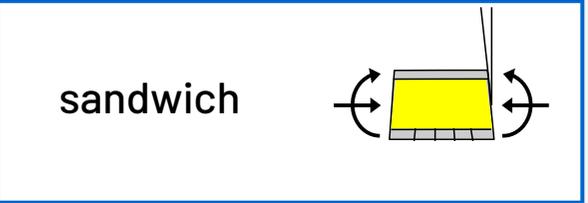


interaction of mechanisms

material



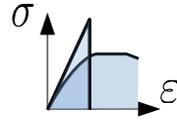
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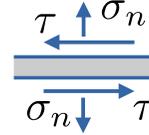
elementary - complex

material

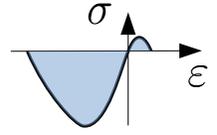
reinforcement



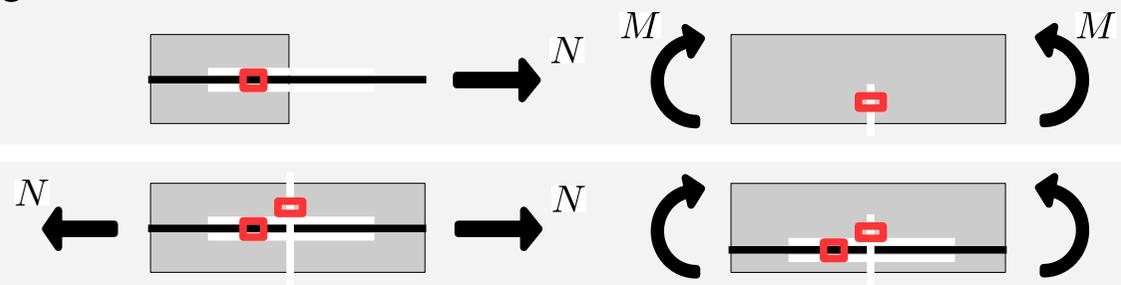
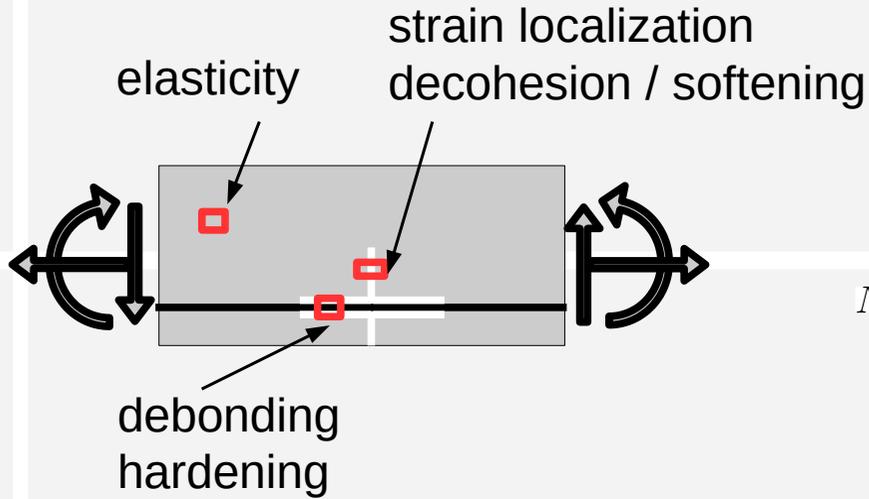
bond



matrix



cross section

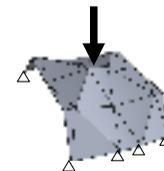


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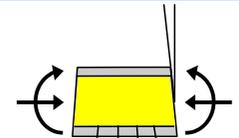
slab



folded shell



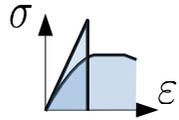
sandwich



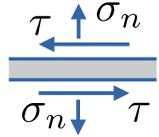
local - global

material

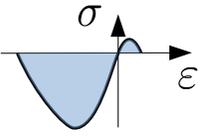
reinforcement



bond

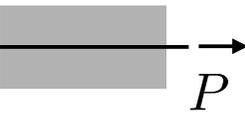


matrix



cross section

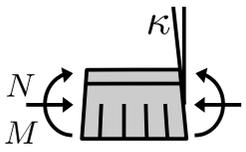
pullout



crack-bridge



moment-curvature

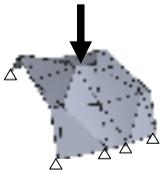


form

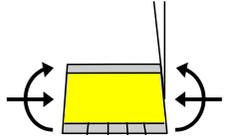
slab



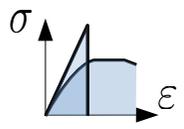
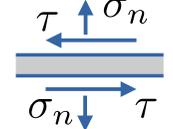
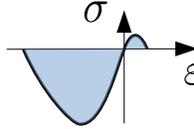
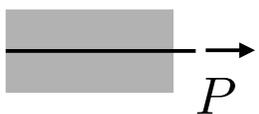
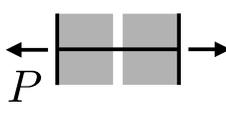
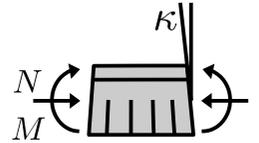
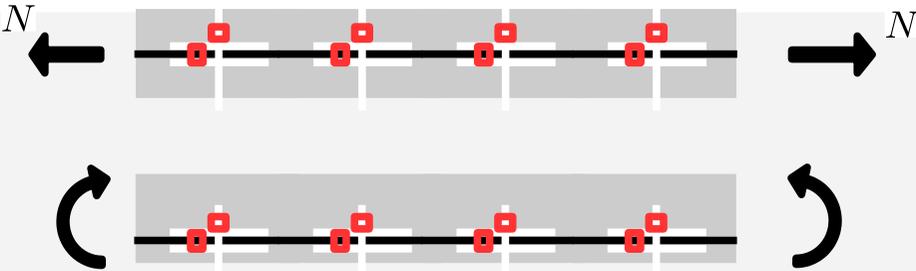
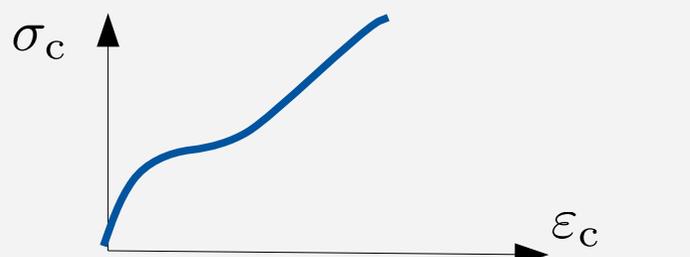
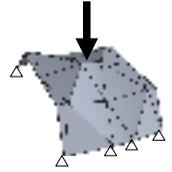
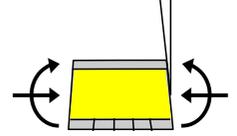
folded shell



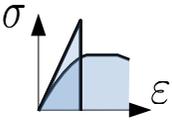
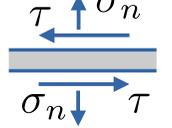
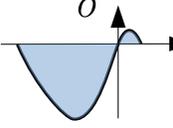
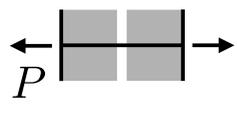
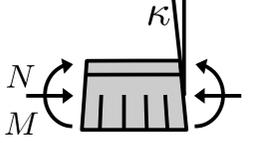
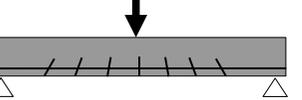
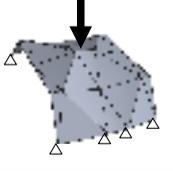
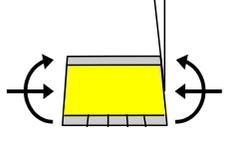
sandwich

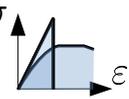
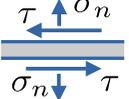
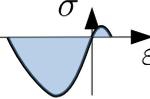
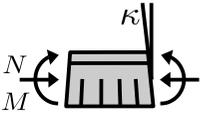
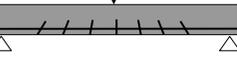


interaction of mechanisms

material	<p>reinforcement </p>	<p>bond </p>	<p>matrix </p>
cross section	<p>pullout </p>	<p>crack-bridge </p>	<p>moment-curvature </p>
zone			
form	<p>slab </p>	<p>folded shell </p>	<p>sandwich </p>

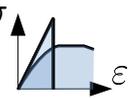
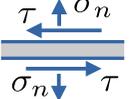
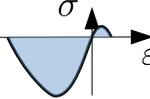
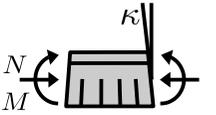
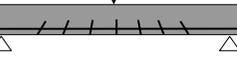
elementary - complex

material	<p>reinforcement </p>	<p>bond </p>	<p>matrix </p>
cross section	<p>pullout </p>	<p>crack-bridge </p>	<p>moment-curvature </p>
zone	<p>tension - fragmentation </p>	<p>bending </p>	<p>compression - stability </p>
form	<p>slab </p>	<p>folded shell </p>	<p>sandwich </p>

material	reinforcement 	bond 	matrix 
cross section	pullout 	crack-bridge 	moment-curvature 
zone	tension - fragmentation 	bending 	compression - stability 

guided tours

- Tour 1:** Mixture rule (effective composite stiffness)
- Tour 2:** Constant bond (friction, pull-out, crack-bridge, multiple cracking)
- Tour 3:** Nonlinear bond (hardening, softening -> failure modes: anchorage, cracking) |
- Tour 4:** Plastic bond behavior (irreversibility -> energy dissipation)
- Tour 5:** Damage bond behavior (2D sheet debonding)
- Tour 6:** Concrete cracking and yielding (bending of a cross section)
- Tour 7:** Beam deflection - comparison with EC2 and Model Code

material	reinforcement 	bond 	matrix 
cross section	pullout 	crack-bridge 	moment-curvature 
zone	tension - fragmentation 	bending 	compression - stability 

Explain → Observe → Exercise

- **Explain:** videos with slides
- **Observe:** virtual experiments
 - what happens if you change something?
 - what is the model validity = quality?
- **Exercise:** book of examples [relevant for exam]

Organization

- 3 SWS – 8 CP
 - homework assignment and colloquium – 2 CP
 - exam – 6 CP
- Hybrid lectures
 - Meeting every week with explanation of video content
 - Individual study using videos / jupyter notebook
- Consulting hours to exercise videos on a weekly basis

What counts

Seminar work

- read a scientific paper related to BMCS
- examine/validate/discuss particular issues described in the paper
- seminar work will be launched after the fifth lecture (6 weeks)
- reports either written or as a video presentation

Exam

- written exam at the last date of the course

