

EPFL-MSE 440 Composite Technology

P.-E. Bourban
Exercises 2025

- 1) The modulus of a UD composite is measured at 250 GPa. The fibres are carbon fibres with a modulus of 400 GPa and the epoxy resin has a modulus of 3 GPa. What is the amount of fibres in this composite ?
- 2) Propose 2 methods for determining the transverse module of a composite with 40% volume of continuous fibres (Modulus= 140 GPa) in an elastomeric polymer of 500 MPa modulus. Determine the 2 moduli with the 2 methods. Compare the 2 obtained values and explain the difference. Compare these transverse moduli with the longitudinal modulus of the same composite.
- 3) Glass fibres ($E=70\text{GPa}$) reinforce PP ($E= 1\text{ GPa}$) in a bumper ($V_f=0.3$) They have an initial length of 3 mm and a diameter of 20 μm . After injection in the mould the fibre length is 400 μm . What is the reduction of modulus induced by the processing ?
- 4) What is the modulus E_1 of the lamina of a (0/90) laminate, 1mm thick, having a A_{11} coefficient of $7.5 \cdot 10^{10}\text{ N/mm}$
Its transverse modulus and Poisson's coefficient are $E_2= 10\text{ GPa}$, $\nu_{12}=0.2$, $\nu_{21}=0.014$
- 5) Describe the deformation modes of a symmetric laminate loaded only by a torsion moment M_{xy} .
- 6) What is the effective dilatation coefficient of a kevlar /epoxy laminate containing 40 % of 45° plies, 10 % of 0° and 50% of 90° plies ?