Errata for the compendium "Viskøse væsker og elastiske stoffer"
Fall 2009

Coverpage: Change the course code to MEK3220.

Foreword: Change two course codes, ME102 to MEK1100, and ME115 to MEK3220.

Pages 1,2,3: Change "parantesene" to "parentesene", three times.

Page 3, first displayed equation, after first equality sign: Remove the dot: $\boldsymbol{A} \cdot \mathcal{P} = A_i P_{ij}$.

Page 4, last equation in chapter 1.2: Change $\boldsymbol{j}_j$ to $\boldsymbol{i}_j$, three times.

Page 5, exercise 4bc: It is not required to show that the two objects $A_{aj}B_{jb}$ and $A_{pq}B_{rq}$ are tensors, here it is only required to show that these tensors are obtained by the indicated matrix multiplications.

Page 12, second-last equation: In the parentheses the two terms P_{zy} and P_{yz} should be interchanged, or alternatively, add a minus sign to the entire right-hand side.

Page 13, figure 2.6:

First, the arrow that indicates positive rotational orientation should be reversed (should go against the clock) in accordance with using a right-handed coordinate system.

Second, there should not be any minus sign in front of P_{zy} and P_{yz}, below and on the left-hand side of the figure. This is because the arrows indicated outside the square are not meant to be vectors, but indicate the positive orientation of the shear stress acting on each side.

Page 17, last equation before (3.2): Change P_{zn} to P_{zx}.

Page 19, exercise 2b: Change "asken" to "aksen".

Chapters 4.1 and 4.3: The compendium does not state that there is an extremely important difference between the parallelepipeds applied in chapters 4.1 and 4.3. In chapter 4.1, the parallelepiped is supposed to move as a "particle", i.e. as a material volume, thus it always contains the same matter and no momentum flux can go through its walls.. In chapter 4.3 the parallelepiped is supposed to be held fixed, thus it will experience flux of matter through its walls.

Page 26, chapter 4.4: Change "inndirekte" to "indirekte".

Chapter 4.4: Again, the compendium does not state that it assumes the control volume moves as a material volume for the derivation of the equation of motion, while it assumes that the control volume is held fixed for the derivation of the continuity equation. A material control volume will not experience momentum or mass flux through its walls, while a fixed control volume will experience momentum and mass flux through its walls.

In particular, regarding the third equation from the top on page 27, notice that

$$\frac{d}{dt}\int_V \rho \boldsymbol{v}\, d\tau = \int_V \rho \boldsymbol{a}\, d\tau$$

only for a material volume. In order to carry out this derivative of a moving control volume it is necessary to employ Reynolds transport theorem,

$$\frac{d}{dt}\int_V \boldsymbol{f}\, d\tau = \int_V \frac{\partial \boldsymbol{f}}{\partial t}\, d\tau + \int_S (\boldsymbol{v}\cdot\boldsymbol{n})\boldsymbol{f}\, d\sigma$$

where S is the surface of the volume V, $d\sigma$ is an infinitesimal surface element with unit normal vector $\boldsymbol{n}$, and $\boldsymbol{v}$ is the velocity of the infinitesimal surface element. Wikipedia has a useful discussion of Reynolds transport theorem.

Page 30:

Change "forrrykningen" to "forrykningen" (a more modern Norwegian terminology may be "forskyvningen").

Change course code MEK102 to MEK1100, and update the date of the current compendium of that course.

Page 36:

Change "substrahere" to "subtrahere".

Change course code MEK102 to MEK1100.

Page 43:

Change "Hookes" to "Hooke's", two times.

Change "omvendt proporsjonal med avstanden" to "omvendt proporsjonal med kvadrated av avstanden".

Page 46: Wikipedia has a useful discussion on viscoelasticity.

Page 52: In the equation before (8.3) the single occurrence of ϵ_{ij} should be changed to $\dot{\epsilon}_{ij}$.

Page 54: In the second-last equation change $\boldsymbol{n}\times\boldsymbol{P}_n$ to $\boldsymbol{n}\times\boldsymbol{P}_n\times\boldsymbol{n}$.

Page 60, top: Change reference to Hooke's law from (7.12) to (7.13).

Page 62, top: Change "La vi" to "Lar vi".

Page 67: In the equation before (9.26), on the right-hand side, change ρ_1 to ρ_2.

Page 73: In the second-last displayed equation, on the left-hand side, change θ to $\ddot{\theta}$.