MatMod Project Evaluation

xavier

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Results per group

- There are 12 questions. The details for the grading for each group are given below.
- I chose group 1 and group 12 for the minimium and maximum value for rescaling. The rescaling is linear and such that the minimum and maximum values become 70 and 95.
- Espen: I have added points to Group 5 who got 9 out 13 votes for best presentation.

Group	total	after rescaling	Espen
1	73	75	
2	88	80	
3	84	80	
4	84	80	
5	117	90	94
6	92	80	
7	65	70	
8	63	70	
9	113	90	
10	104	85	
11	43	60	
12	125	95	
13	24	55	
min	63	70	
max	125	95	

Raw results per question Each question counts for 10 points. Extra points are given if answer is original.

Group	1	2	3	4	5	6	7	8	9	10	11	12	Total
1	10	10	10	0	10	0	0	10	10	10	3	0	73
2	10	10	5	10	10	10	5	3	7	10	7	1	88
3	7	10	0	10	0	10	6	15	10	8	5	3	84
4	10	10	7	4	10	5	10	5	5	10	3	5	84
5	10	10	10	10	10	10	10	15	10	10	10	2	117
6	10	10	7	10	10	10	10	5	7	7	5	1	92
7	10	10	5	5	10	7	5	5	7	1	0	0	65
8	10	10	10	7	0	7	5	5	7	0	2	0	63
9	10	10	8	15	10	10	15	5	10	10	10	0	113
10	8	15	0	8	10	10	10	15	10	10	8	0	104
11	8	3	8	7	10	0	7	0	0	0	0	0	43
12	10	10	10	10	10	10	10	15	10	10	10	10	125
13	5	3	4	0	0	0	0	5	7	0	0	0	24

Groups' composition

group number	Student numbers				
1	736142	494865	760446	998340	767893
2	485016	740077	750323	752074	741715
3	485682	750883	759087	759103	759124
4	759324	759318	741714	486340	758268
5	741645	741686	741665		
6	495026	759083	759082	753717	759158
7	741678	748322	750379	758325	752110
8	758270	759132	758339	758348	
9	759085	741674	486347	759134	759155
10	750325	750403	750372	486343	750366
11	713971	750388	724282		
12	750783	750040	998680	758334	
13	634997	750291	484345	742146	

Grade per student

Studentnummer	group	grade
484345	13	55
485016	2	80
485682	3	80
486340	4	80
486343	10	85
486347	9	90
494865	1	75
495026	6	80
634997	13	55
713971	11	60
724282	11	60
736142	1	75
740077	2	80
741645	5	94
741665	5	94
741674	9	90
741678	7	70
741686	5	94
741714	4	80
741715	2	80
742146	13	55
748322	7	70
750040	12	95
750291	13	55
750323	2	80
750325	10	85
750366	10	85
750372	10	85
750379	7	70
750388	11	60
750403	10	85
750783	12	95
750883	3	80
752074	2	80
752110	7	70
753717	6	80
758268	4	80

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Studentnummer	group	grade
758270	8	70
758325	7	70
758334	12	95
758339	8	70
758348	8	70
759082	6	80
759083	6	80
759085	9	90
759087	3	80
759103	3	80
759124	3	80
759132	8	70
759134	9	90
759155	9	90
759158	6	80
759318	4	80
759324	4	80
760446	1	75
767893	1	75
998340	1	75
998680	12	95

Group 1

General governing equations Very good.
Heat transfer using latent heat Very good. You could have computed some explicit values for the heat loss.
Gas motion generated by heat Good. The parabolic scaling is not really justified. Nice computation of the solution of the heat equation. It is not completely clear how the conclusions are obtained.
Interface mass exchange Good
Numerical simulation of simplified 2D model Very good. The boundary condition you impose for temperature leads to an ill-posed problem, because the solutions are defined only up to a constant. It would have been interesting to include a description of how this problem was tackled.
Shape of a meniscus Good. It would have been nice to include an approximate or numerical solution of the equation giving the shape of the

meniscus.

Derivation of Young Laplace equations very good

1D model with mass exchange and capillary pressure ok. Not that we do not have $Q_{in} = Q_{out}$ because some heat goes into work. did not compute m. Just explained the equations

Group 2

General governing equations Very good. Well written and well explained

Heat transfer using latent heat Very good. It would have been nice to compute some explicit values for the heat loss, for some chose parameter values

Gas motion generated by heat Good. The linearization of the equations is done correctly. An eigenvalue approach is proposed but not explained.

Heat transfer in steady gas flow It looks correct. It would have been nice to compute some values for the heat influx.

Interface mass exchange Good.

One-dimensional model with mass exchange Good. Again, it would have been nice to compute some values, here by using a Newton solver to solve the nonlinear system.

Two-dimensional model with mass exchange Ok. The linearized equations are derived correctly. The solution is not computed.

Numerical simulation of simplified 2D model Ok. The numerical method is explained but not implemented.

Shape of a meniscus Good. The method is understood. However, in this case, there was a non-fixed variation at the boundary, which enables us to compute the boundary condition of the ordinary differential equation.

Derivation of Young Laplace equations Very good.

1D model with mass exchange and capillary pressure Good. But it is not clear if you have enough equations for the number of unknowns in the problem. It would have been nice to compute the result for some chosen parameter values.

Numerical simulation of simplified 2D model including capillary pressure Ok. No implementation.

Group 3

General governing equations Good. Be careful on the position of the divergence operator when you apply the divergence theorem. It should operate over the whole term.

Heat transfer using latent heat Very good. Well-written.

Heat transfer in steady gas flow Very good. It would have been nice to compute some values for the heat influx.

One-dimensional model with mass exchange Very good. Same remark as before: It would have been nice to include some explicit computations.

Two-dimensional model with mass exchange Good. The linearized equations are correctly derived. The first order approximations are solved.

Numerical simulation of simplified 2D model Very good. You noticed the ill-posedness of the system you have set up and comment on that.

Shape of a meniscus The result is correct but details of the derivation are missing. Nice illustration produced using Matlab.

Derivation of Young Laplace equations Good. The last step of the derivation is not very clear.

1D model with mass exchange and capillary pressure Ok. Unfinished.

Numerical simulation of simplified 2D model including capillary pressure Ok. Convergence problem

Group 4

General governing equations Good. Some notation issues when using Reynold's theorem.

Heat transfer using latent heat Very good. It would have been nice to have computed the efficiency for some chosen parameter values.

Gas motion generated by heat Good. The expansion for the energy conservation equation is missing.

Heat transfer in steady gas flow Ok. Some notations are unclear.

Interface mass exchange Good.

One-dimensional model with mass exchange Ok. The temperature gradient is not constant.

Two-dimensional model with mass exchange Very good.

Numerical simulation of simplified 2D model Nice effort. It is not clear how the interface conditions are set up.

Shape of a meniscus Excellent. The explicit computation of an approximated solution was appreciated.

Derivation of Young Laplace equations Very good.
1D model with mass exchange and capillary pressure Ok. Again, you assume a constant temperature gradient.
Numerical simulation of simplified 2D model including capillary pressure Good. The coupling between the temperature and pressure comes from the interface conditions and it should not be necessary to introduce it artificially by using several zones.

Group 5

General governing equations Very good.
Heat transfer using latent heat Very good. It would have been nice to have computed efficiency values for some chosen parameters.
Gas motion generated by heat Very good. However, the explanations are difficult to follow.
Heat transfer in steady gas flow Good. IT would have been nice to integrate the equation for the pressure and get some qualitative results for some chose parameter values.
Interface mass exchange Good.
One-dimensional model with mass exchange Good.
Two-dimensional model with mass exchange Very good. The missing function p_0 at the end could have been set using the saturation pressure.
Numerical simulation of simplified 2D model Excellent. It is not possible to use a non-slip condition in this case because the Darcy approximation de facto excludes such boundary condition.
Shape of a meniscus Very good. A computation of an approximate or numerical solution of the resulting equations would have been appreciated.
Derivation of Young Laplace equations Good. The last step could have been better explained.
1D model with mass exchange and capillary pressure Good. Thank you for the exercise that you leave to the reader... It would have been nice to set up a Newton solver for these equations and obtain some numerical values.
Numerical simulation of simplified 2D model including capillary pressure Ok. Not imlemented.

Group 6

General governing equations Very good.
Heat transfer using latent heat Very good. It would have been nice to compute some explicit values for the heat loss, for some chose parameter values.
Gas motion generated by heat Good. The function f in the expansion of ρ_0 should not be used, or set to zero. An expansion for T_0 is missing.
Heat transfer in steady gas flow Good. The conditions you give for neglecting u^2 compared to T are not clear. It would have been nice with some explicit computed values.
Interface mass exchange Good.
One-dimensional model with mass exchange Very good. You suggest at the end the use of a Newton solver to compute the solutions. It would have been nice if you had followed this proposition and computed some values.
Two-dimensional model with mass exchange Very good. The expression of p_1 is not correct though, as you should use a Taylor expansion of the saturation function.
Numerical simulation of simplified 2D model Nice attempt.
Shape of a meniscus Good. The boundary condition is missing.
Derivation of Young Laplace equations Good. The derivation is taken from a reference.
1D model with mass exchange and capillary pressure Ok. The conclusion is not clear.
Numerical simulation of simplified 2D model including capillary pressure Ok. No implementation.

Group 7

General governing equations Very good. Clear presentation.
Heat transfer using latent heat Very good. It would have been nice if some values were computed explicitly.
Gas motion generated by heat Ok. Not finished.
Heat transfer in steady gas flow Correct. It remains to explain how the value of Q_l is computed.
Interface mass exchange Very good.
One-dimensional model with mass exchange Good. The missing boundary condition comes from the mass exchange relation.

Two-dimensional model with mass exchange Good. The linearized equations are derived but no attempt is done to solve them.
Numerical simulation of simplified 2D model Nice effort.
Shape of a meniscus Good. The boundary condition is missing.
Derivation of Young Laplace equations Ok. Not finished.

Group 8

General governing equations Very good.
Heat transfer using latent heat Very good. It would have been nice to have included some explicit computations for some given parameter values.
Gas motion generated by heat Good. Original approach.
Heat transfer in steady gas flow It looks good but the presentation is not always clear.
One-dimensional model with mass exchange Good. A description of how the values of m and T_{in} are obtained is missing.
Two-dimensional model with mass exchange The equations are linearized but not solved.
Numerical simulation of simplified 2D model Nice attempt.
Shape of a meniscus Good. The boundary condition is missing.
1D model with mass exchange and capillary pressure Ok. Not finished

Group 9

General governing equations Very good. Very clear.
Heat transfer using latent heat Very good. Explicit computations for some chosen parameter values would have been appreciated.
Gas motion generated by heat Good. The computation of the firt order expansion T_0 is missing.
Heat transfer in steady gas flow Very good. Nice illustration.
Interface mass exchange Good.
One-dimensional model with mass exchange Very good. Very clear presentation. Again, explicit computations would have been very nice.
Two-dimensional model with mass exchange Excellent.
Numerical simulation of simplified 2D model Good attempt.

Shape of a meniscus Very good. Excellent initiative to include a parameter study with the corresponding illustrations. Boundary conditions can be derived from the variational approach. With these boundary conditions, you would not have needed to introduce a reference level, that is, set $f(0) = 0$.
Derivation of Young Laplace equations Very good.
1D model with mass exchange and capillary pressure Very good and clearly presented. Again, it would have been very nice if you solved the nonlinear equations, for example using the function fzero from matlab.

Group 10

General governing equations Good. Unclear definitions of in- and out-fluxes. Note that the integrand for the fluxes has a sign (positive for out-fluxes and negative for in-fluxes).
Heat transfer using latent heat Very good. Explicit computations of the efficiency were appreciated.
Heat transfer in steady gas flow Good. The results are correct but the derivation is sometimes difficult to follow. It would have been nice to include some explicit computations using chosen parameter values.
Interface mass exchange Very good.
One-dimensional model with mass exchange Very good. Again, if you would have been nice to include explicit computations.
Two-dimensional model with mass exchange Very good.
Numerical simulation of simplified 2D model Excellent. you argue that there is no correlation between pressure and temperature so that some boundary conditions are missing. But the interface condition precisely couples pressure and temperature. Because of those, you cannot have a constant pressure if you have a temperature field with some non-zero gradient in the vertical direction.
Shape of a meniscus Very good. It would have been nice to solve numerically the ordinary differential equation that you obtain and include the result.
Derivation of Young Laplace equations Very good.
1D model with mass exchange and capillary pressure Good. It is not clear if, at the end, you have enough equations for the number of unknwons. An explicit computation would have helped to check that.

Group 11

General governing equations Good. The derivation of the Reynold's that you present is not clear.

Heat transfer using latent heat Ok. To compute Q_{in} and Q_{out}, one has to derive a local energy balance at the left and right interfaces.

Gas motion generated by heat Good. You present a thorough derivation of the solution of the heat equation. Later, the asymptotic expansion are computed correctly. To exploit them, you have to discard the higher order terms and solve for the remaining lower ones.

Heat transfer in steady gas flow Good. Details on how the integration constants are computed are missing. To set them, you have to use the boundary conditions.

Interface mass exchange Good.

Two-dimensional model with mass exchange Good. The linearized equations are derived correctly. Good attempts to solve them. The assumption that T_0 is constant prevents you from obtaining the correct solution.

Group 12

General governing equations Very good.

Heat transfer using latent heat Very good. Some numerical values computed for some chosen parameters would have been appreciated.

Gas motion generated by heat Very good. Very clear presentation. Again, some numerical values would have been appreciated.

Heat transfer in steady gas flow Very good and very well presented. Again, numerical values would have been appreciated.

Interface mass exchange Good.

One-dimensional model with mass exchange Very good. Again, you could have exploited more your results by computing some numerical values.

Two-dimensional model with mass exchange Very good.

Numerical simulation of simplified 2D model Excellent.

Shape of a meniscus Very good. Clear presentation. It would have been nice to see some numerical solution of the ordinary differential equation that you obtain.

Derivation of Young Laplace equations Very good.

1D model with mass exchange and capillary pressure Very good. Again, computation of numerical values would have been appreciated.

Numerical simulation of simplified 2D model including capillary pressure Very nice attempt. You should not have used that $p_l = p_r$ at the liquid-vapor interface, since there is a pressure jump there that you will therefore not be able to capture. In a remark, you discuss a pressure jump. But, from the figure, we cannot observe any pressure jump. However, we can observe a jump of the vertical derivate of the pressure.

Group 13

General governing equations Good. The derivation of the momentum and energy conservation equations are missing.
Heat transfer using latent heat Ok. The expression of Q_{out} is not correct
Gas motion generated by heat Ok. Several assumptions are made (Darcy's flow, incompressibility) to simplify the computations. However, a clear conclusion is missing.
Numerical simulation of simplified 2D model Good attempt.
Shape of a meniscus Good. The derivation is not always very clear.