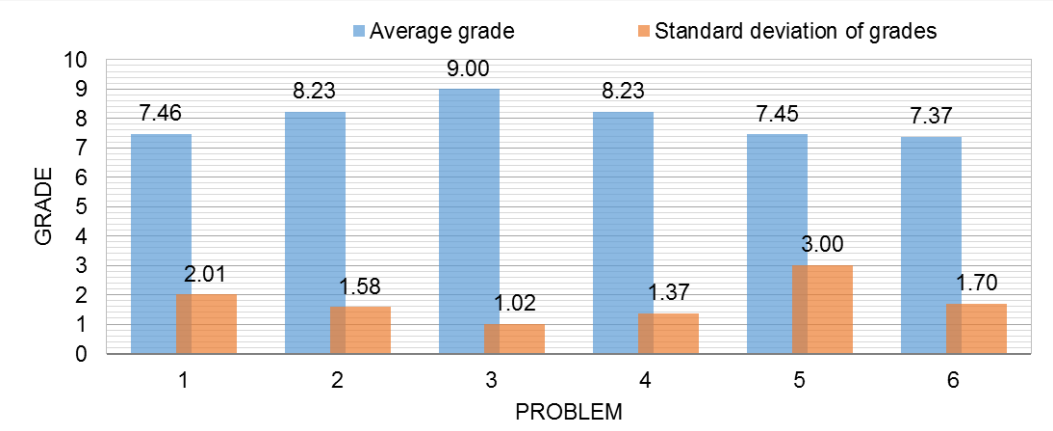
2015 Final – Report

General

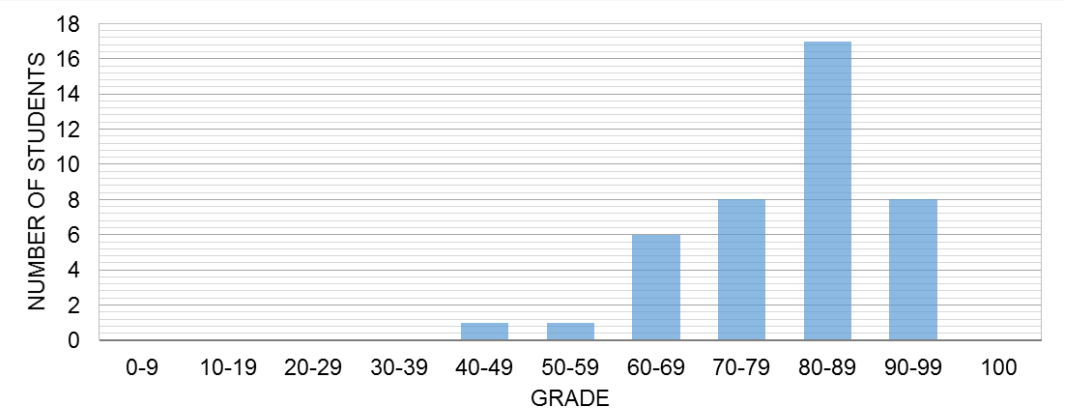
Total number of students	41
Attended	41
Missed	0
Number of problems	6
Average grade	79.57
Standard deviation of grades	11.57

Individual problem breakdown

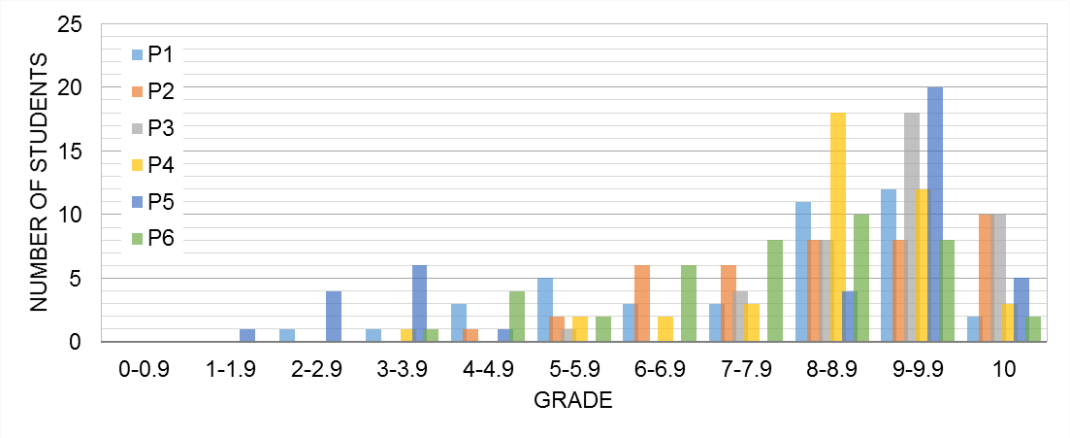
Problem	1	2	3	4	5	6
Average grade	7.46	8.23	9.00	8.23	7.45	7.37
Standard deviation of grades	2.01	1.58	1.02	1.37	3.00	1.70



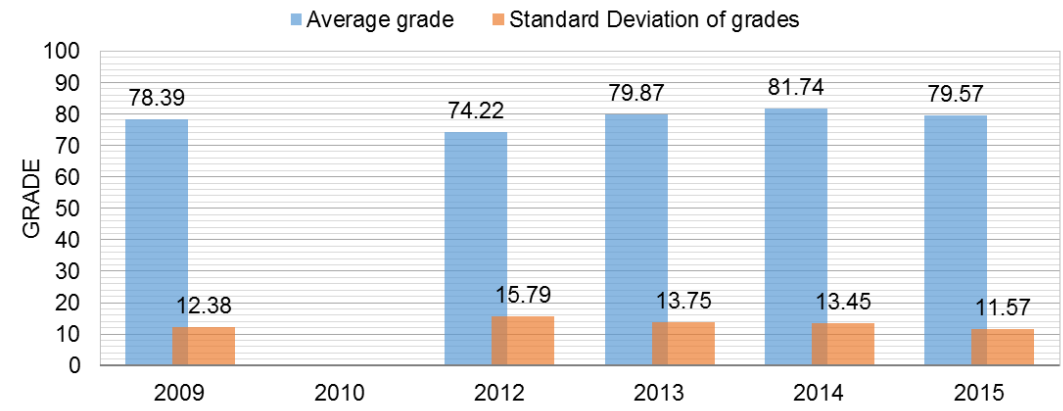
Grade distribution



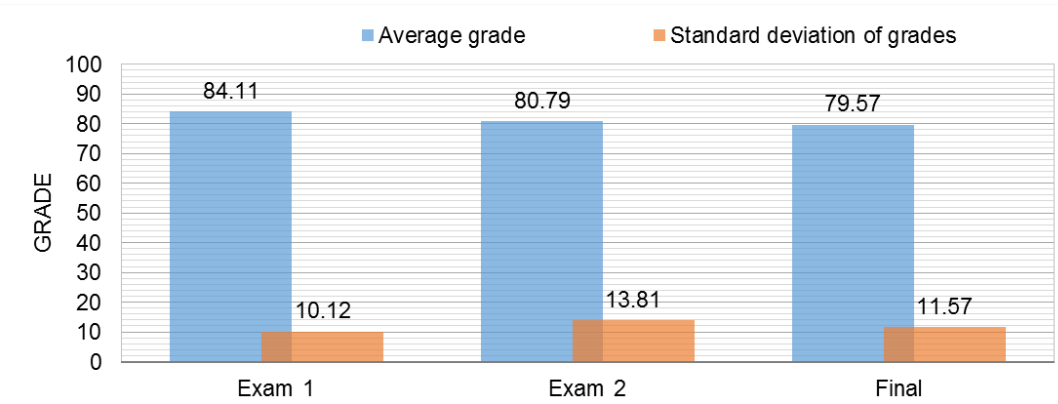
Grade distribution per problem



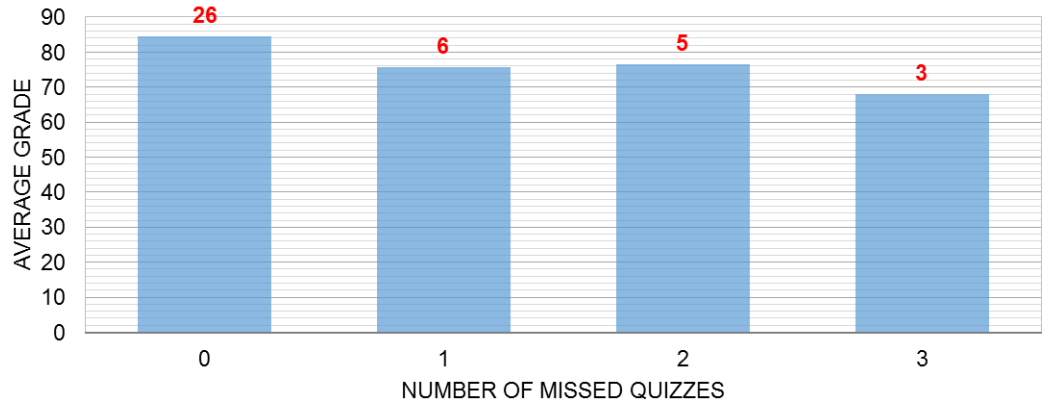
Comparison with past years



Comparison with Exam 1 and 2



Correlation between grades and number of missed quizzes



*The number in **red** is the number of students that missed the corresponding number of quizzes.
**The average grade is based on exam and quiz grades.

Common mistakes

PROBLEM 1:

- Many students didn't break down the momentum at the exit into two parts, which should be considered as the wake part and the outer side of the wake.
- Many students put wrong sign for the force acting on the body, which should be pointing in a direction that reduces the inlet momentum.
- Some students used energy balance equation to get the wake velocity, which does not give correct answer because wake exists.
- Few students used only pressure force to get the force acting on the body.

PROBLEM 2:

- Some students didn't know how to solve the ODE.
- Few students failed in simplify correctly the momentum equation leaving the pressure gradient term or not substituting $v = -v_0$.
- Few students used wrong a boundary condition for $y \rightarrow \infty$: the put $u = -v_0$ instead of $u = U$.

PROBLEM 3:

- Some students calculated velocity in one pipe and assumed it was same for other pipe.
- Some students did not make correct assumptions to simplify energy equation.

PROBLEM 4:

- Many students didn't calculate displacement thickness, which can be derived by dividing the boundary layer thickness by eight.
- Many students didn't calculating the scoop height of the viscous flow, which can be obtained by adding up the displacement thickness with the scoop height of the inviscid flow.

- Some students didn't use 6m, which is the length between the beginning of the flow and the inlet of the scoop, when they calculate the drag.

PROBLEM 5:

- Some students did not solve the problem using moment balance.
- Some students used incorrect drag coefficient.
- Some students used incorrect moment arms.

PROBLEM 6:

- Some students didn't understand that the bump is modeled by a streamline of the flow around a cylinder. They considered the bump as an additional body and compute the total stream function as $\Psi = \Psi_{cylinder} + \Psi_{bump}$.
- Some students computed the radial component of velocity instead of the θ-component, or tried to use both (part b).