Freshmen Physics Courses at the Istanbul Technical University
(FIZ 101, 101E; 102E; 106, 106E)

As is the case in all major technical universities, the Physics Department of ITU has the important task of providing training in elementary physics to non-majors in their first year at the university. Typically, over 3,000 students thus take a sequence of two courses. The first course (Fiz 101/101E) covers mechanics. The second course covers either electricity and magnetism (Fiz 102E), or the physics of continuous media (Fiz 106/106E), depending on the preferences of the home departments. FIZ 101 and 106 courses has Turkish and English versions. Almost all the courses are offered in both fall and spring semesters not to end up with even larger numbers of students taking the course at a time due to the low success rate.

The freshmen physics courses, in addition to systematizing previous knowledge and providing new knowledge in fundamental science, constitute an important new stage in the students' problem solving facilities and eventually provide a new maturity in academic and professional life. As such, especially for a student body of the magnitude and diversity here, these courses constitute learning and teaching challenges in any university.

Course syllabus is prepared prior to the start of the semester and announced on the web page of the department. The syllabus is revised almost every semester in the departmental academic commitee meeting, as sometimes revisions are required in the contents of the courses for the students to make the most out of the course. These are minor revisions though, as there are standard topics which have to be taught in a freshmen physics course just like everywhere else in the world. The syllabus is also announced at the classrooms by the lecturers. Hence the student knows what he/she is going to learn throughout the semester. The weight of the exams/final/homeworks in the final grade is also announced within the course syllabus at the beginning of the semester.

The examination dates are also specified at the beginning of the semester and announced within the course syllabus. The midterm exams and final are common to all of the sessions of the course and the midterm exams are held on saturdays. In this way the lecture hours during the week of the exam is not spent for the exam and mostly used as a review and problem solving session for the students to improve their problem solving skills.

The examination procedure is completely standardized. We have been doing the exams in multiple choice format in the last 5 years. The exam usually contains a total of 25 problems/questions. Around 10 of the problems are conceptual ones as to test the student's understanding of the basic ideas in the course. The rest is mostly problems to be solved. The students marks the answers on a optically readable form. The exams are then evaluated and announced on the web within a couple of days after they are conducted. At the end of the Semester, the letter grade demarcations on the numerical grade distribution histograms are determined jointly by the agreement of the instructors.

The lecturer is avaliable at his/her office 2 hours a week for the students to visit and ask questions about the course.

70% attendance to the courses is obligatory and the attendance of the students is kept track of by the lecturer. The student who fails to attend at least 70 % of the lectures gets a VF grade.

Homeworks are assigned every week through an online system which the students can access from any computer via internet. Homeworks contributes 10 % to the final grade. We also select and suggest a set of problems from each chapter of the textbook and announce these on the webpage of the department. Unfortunately, there is no correlation between the performance of the students in the homeworks and the exams.

Advisory system has been revised recently in order to improve the exchange of ideas between the student and the advisor. Starting with the 2017-2018 Fall semester, 2 hours a week is scheduled for the students to meet their supervisor. Students can also make arrangements with the advisor to meet at any other time. My experience as an advisor is of course limited to students whose major is Physics. But I believe that the deployement of this revised system may help the students and lecturers in freshmen physics courses as well.

Spring 2016-2017

Fiz 101/101E Physics I

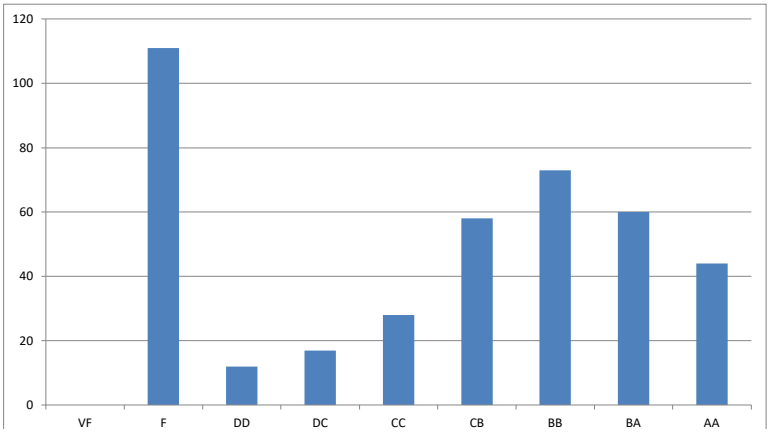
This course covers fundamentals of mechanics and the main textbook is the one by Young and Freedman [University Physics Vol. 1 and its translation to Turkish]. A total of approximately 1250 students took this course in spring 2017.

The statistics are given below. The average of total score in 101 is remarkably higher than that in 101E. Although we see exceptions to this in some semesters, we attribute it to be a result of the language barrier. The regular semester for 101/101E courses is the Fall semester. Thus most of the students who took this class in the spring semester are the ones who failed in the previous fall semester or semesters before, and whose schedules are irregular due to the fact that they spent only one semester in the English preparatory school.

2016-2017 SPRING - Physics I (FIZ 101) - STATISTICS

Number of Students:	403	
	Average	Std. Dev.
Homework: /10	0.7	0.3
Midterm 1 : /25	15.5	4.5
Midterm 2 : /25	13.2	3.9
Final: /40	22.2	6.5
Total: /100	**53.7**	**19.6**
(VF dahil)	**32.2**	**19.2**

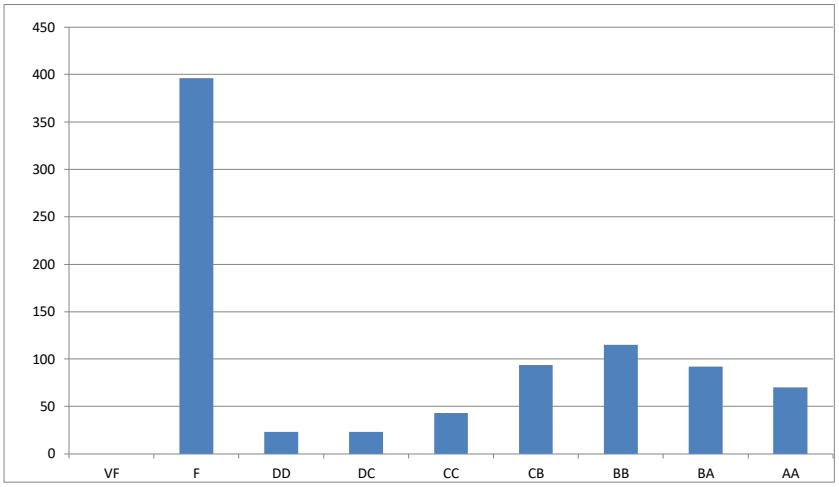
	2016-2017 SPRING			
	Interval		# of Stu.	%
AA	75.1	100.0	44	15
BA	66.5	75.0	60	21
BB	59.1	66.4	73	25
CB	53.5	59.0	58	20
CC	50.5	53.4	28	10
DC	48.9	50.4	17	6
DD	47.5	48.8	12	4
F	0.0	47.4	111	28
VF			0	0



2016-2017 SPRING - Physics I (FIZ 101E) - STATISTICS

Number of Students:	856	
2016-17 SPRING		
	Average	Std. Dev.
Homework: /10	0.7	0.3
Midterm 1 : /25	13.9	4.7
Midterm 2 : /25	11.3	4.1
Final: /40	19.7	7.2
Total: /100	**46.5**	**20.3**
(VF dahil)	**32.2**	**19.2**

	2016-2017 SPRING			
	Interval		# of Stu.	%
AA	71.7	100.0	70	15
BA	63.9	71.6	92	20
BB	56.6	63.8	115	25
CB	52.1	56.5	94	20
CC	49.9	52.0	43	9
DC	48.8	49.8	23	5
DD	47.5	48.7	23	5
F	0.0	47.4	396	46
VF			0	0



FIZ 102E Physics II

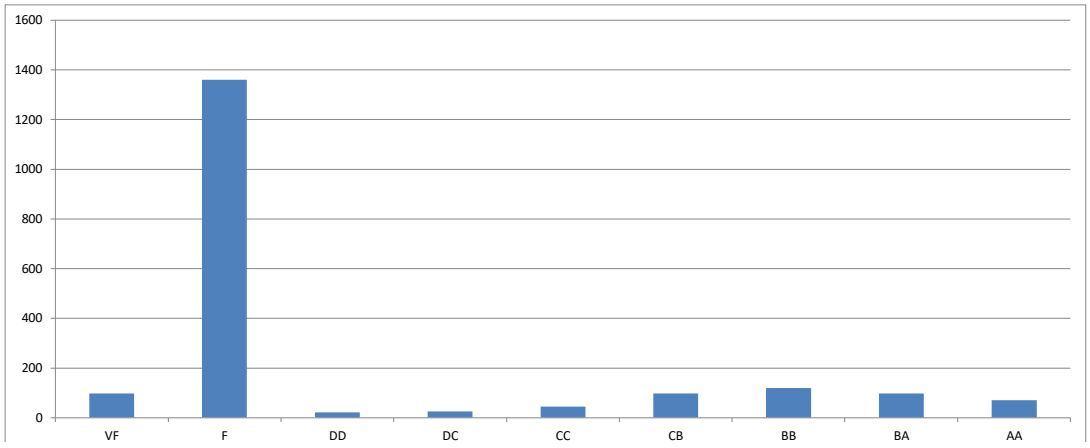
This course covers Electricity and Magnetism and was taught from the textbook by Young and Freedman [University Physics Vol. 2]. The course is taught in English.

Some statistics about the course are given below. In 2016-2017 spring semester 74 % of the students got FF and another 5 % obtained VF (not complying with minimum attendance of 70 %). Hence almost 79 % of the students failed. This is not a success rate which would make the students and the lecturers happy. Final score average was 33.6. The FF line was drawn at 48 out of 100. It may not look reasonable that average of the class fails a course. However, as physics faculty who are trying to match some standards in physics education we believe that there should be some minimum requirements to pass such a course. In that respect it is not unreasonable to expect a student to solve 1.5 problems out of 4 in order to pass the course. Especially given that homeworks which contributes 10 % (average of which is 7.0/10.0) and about 5 of the exam problems is very close to one of the homework problems (if not the same), this is not an unreasonable expectation. I have to, also draw attention to the lack of correlation between homework average and the exam averages. The bands for the letter marks differ from semester to another, but in general the failing line out of 100 is kept around 45.

2016-2017 SPRING - Physics II (FIZ 102E) - STATISTICS

Number of Students:	1929	
2016-17 SPRING		
	Average	Std. Dev.
Homework: /10	7.0	3.2
Midterm 1 : /25	9.4	5.0
Midterm 2 : /25	9.8	4.2
Final: /40	13.9	6.0
Total: /100	33.6	18.7
(VF dahil)	32.2	19.2

	2016-2017 SPRING			
	Interval		# of Stu.	%
AA	65.9	100.0	70	15
BA	58.2	65.8	97	21
BB	53.7	58.1	118	25
CB	50.3	53.6	97	21
CC	48.8	50.2	45	10
DC	48.1	48.7	25	5
DD	47.5	48.0	20	4
F	0.0	47.4	1360	74
VF			97	5



FIZ 106/106E Physics II

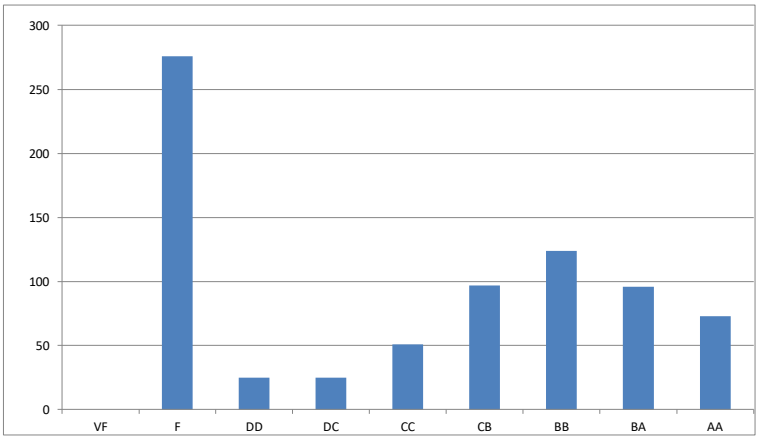
This course covers physics of continuous media and is taught to around 1100 students from various departments. The main text book is the one written by Young and Freedman [University Physics Vol. 1 and its translation to Turkish].

In 2016-2017 spring semester 36% of the students failed with FF. Final score average was 51.8 over 100 and the FF line was drawn at 47.4. The success/fail rates are similar to each other in Turkish and English sessions of the course.

2016-2017 SPRING - Physics II (FIZ 106) - STATISTICS

Number of Students:	767	
2016-2017 SPRING		
	Average	Std. Dev.
Homework: /10	0.8	0.3
Midterm 1 : /25	13.8	5.4
Midterm 2 : /25	16.0	4.7
Final: /40	21.5	8.0
Total: /100	51.8	24.2
(VF dahil)	32.2	19.2

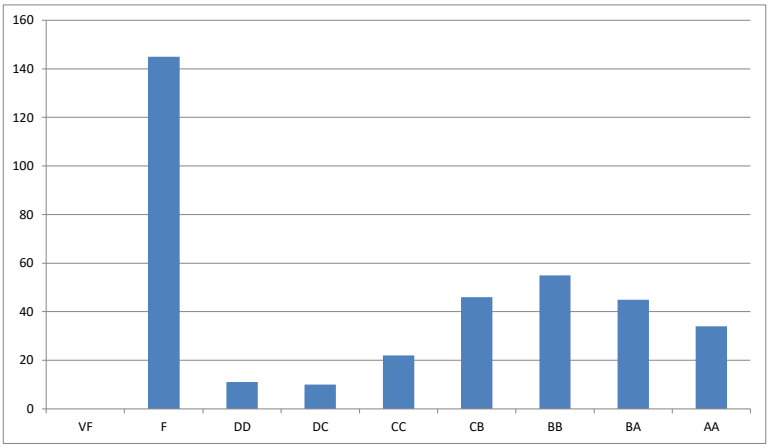
	2016-2017 SPRING			
	Interval		# of Stu.	%
AA	81.0	100.0	73	15
BA	71.3	80.9	96	20
BB	62.0	71.2	124	25
CB	55.6	61.9	97	20
CC	52.7	55.5	51	10
DC	50.9	52.6	25	5
DD	47.5	50.8	25	5
F	0.0	47.4	276	36
VF			0	0



2016-2017 SPRING - Physics II (FIZ 106E) - STATISTICS

Number of Students:	368	
2016-2017 SPRING		
	Average	Std. Dev.
Homework: /10	0.8	0.3
Midterm 1 : /25	13.1	5.9
Midterm 2 : /25	14.9	4.8
Final: /40	21.3	8.3
Total: /100	50.1	24.1
(VF dahil)	32.2	19.2

	2016-2017 SPRING			
	Interval		# of Stu.	%
AA	80.8	100.0	34	15
BA	69.1	80.7	45	20
BB	60.6	69.0	55	25
CB	53.3	60.5	46	21
CC	51.0	53.2	22	10
DC	49.4	50.9	10	4
DD	47.5	49.3	11	5
F	0.0	47.4	145	39
VF			0	0



Fall 2016-2017

Fiz 101/101E Physics I

This course covers fundamentals of mechanics and the main textbook was the one by Young and Freedman [University Physics Vol. 1 and its translation to Turkish] during the semesters of interest. More than 2500 students took this course in fall semester. Fiz101 and Fiz101E are the same courses except 101E is taught in English.

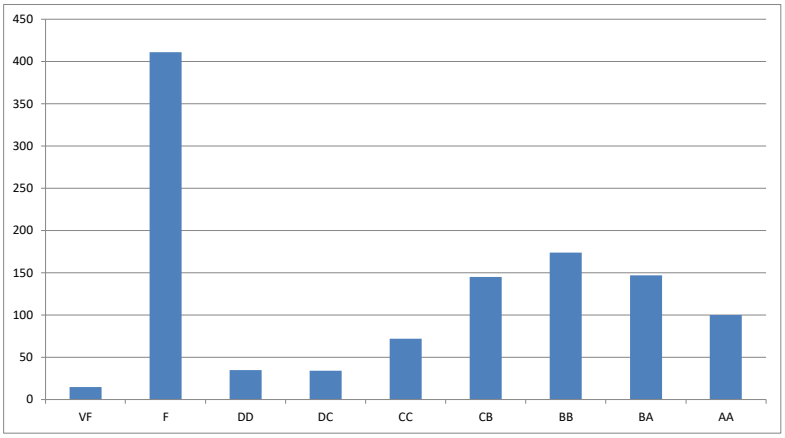
The statistics given in the tables below shows that in 2016-2017 Fall semester 37 % of the students failed with FF in Fiz 101, whereas the ratio is 49 % for Fiz 101E. Another 1% and less than 1%, respectively in Fiz101 and Fiz101E, failed with VF due to not complying with the attendance regulations. There is a considerable difference between the average final grades of FIZ 101 (50.7/100) and FIZ101E **(**43.5/100) sessions, although the examinations are the same. The obvious reason is the fact that understanding science in native language is easier than in any other language. When it comes particularly to long and descriptive questions which require some attention to understand the problem before attempting to solve it, the gap between the average score of Turkish and English sections get wider. This difference may not be solely attributed to the inadequate levels of knowledge of English among the students taking Fiz101E though. One needs to also take into account the spectrum of departments taking these courses as the students of some departments take the course in English while the others take in Turkish.

The high school curriculums to be modified every so often in Turkey seems to play an important role in the success rate of the students in these courses at ITU and as far as I know at other universities too. In particular, the inadequate background in mathematical tools such as ‘integration’ and ‘differentiation’ which are central to solving physics problems is a real concern. We, physics faculty, usually end up with trying to teach ‘integration’ in physics courses (particularly in Fiz101) before the student receives a proper session for that purpose in the Calculus course. This is not only taking time and effort on the lecturer’s part but also impeding the student’s effort to learn the physics concepts requiring such mathematical tools.

2016-2017 GÜZ - Fizik I (FIZ 101) - STATISTICS

Number of Students:	1133	
2015-2016 SPRING		
	Average	Std. Dev.
Homework: /10	7.3	3.0
Midterm 1 : /25	16.7	4.5
Midterm 2 : /24	13.8	3.3
Final: /40	16.3	5.5
Total: /100	**50.7**	**17.2**
Total: /100 (VFsiz)	**51.3**	

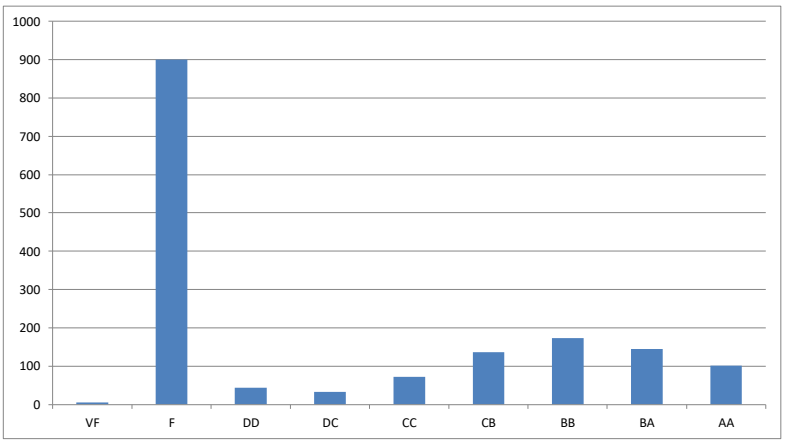
	2015-2016 SPRING			
	Interval		# of Stu.	%
AA	68.9	100.0	100	14
BA	63.6	68.8	147	21
BB	58.5	63.5	174	25
CB	54.3	58.4	145	21
CC	52.0	54.2	72	10
DC	51.0	51.9	34	5
DD	49.5	50.9	35	5
F	0.0	49.4	411	37
VF			15	1



2016-2017 FALL - PHYSICS I (FIZ 101E) - STATISTICS

Number of Students:	1609	
2016-2017 FALL		
	Average	Std. Dev.
Homework: /10	7.0	3.1
Midterm 1 : /25	14.6	4.9
Midterm 2 : /24	12.3	3.9
Final: /40	15.2	5.9
Total: /100	**43.5**	**19.6**
Total: /100 (VFsiz)	**43.6**	

	2016-2017 FALL			
	Interval		# of Stu.	%
AA	69.9	100.0	101	14
BA	62.9	69.8	145	21
BB	57.2	62.8	173	25
CB	53.6	57.1	136	19
CC	51.7	53.5	72	10
DC	50.6	51.6	33	5
DD	49.5	50.5	44	6
F	0.0	49.4	900	56
VF			5	0



FIZ 102E Physics II

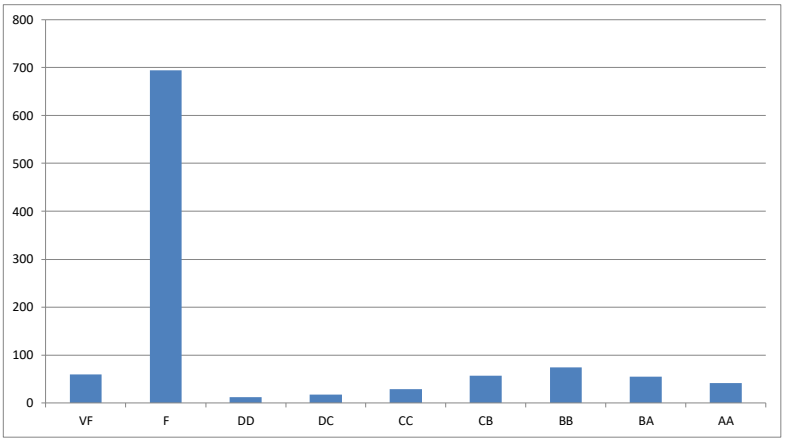
This course covers Electricity and Magnetism and was taught from the textbook by Young and Freedman [University Physics Vol. 2]. Total of 1039 students took the course.

Some statistics about the course are given below. In 2016-2017 Fall semester 71 % of the students got FF and another 6 % obtained VF (not complying with minimum attendance of 70 %). Hence almost 77 % of the students failed. This is not a success rate which would make the students and the lecturers happy. Final score average was 38.5. The FF line was drawn at 49.4 out of 100. It may not look reasonable that average of the class fails a course. However, as physics faculty who are trying to match some standards in physics education we believe that there should be some minimum requirements to pass such a course. In that respect it is not unreasonable to expect a student to solve 1.5 problems out of 4 in order to pass the course. Given that homeworks are contributing 10% and one of the exam problems is very similar to the homework problems (in order to motivate the students to work on the homeworks) the failing line was drawn around 45. The bands for the letter marks differ from semester to another, but in general the failing line is kept around 45 out of 100.

2016-2017 FALL - PHYSICS II (FIZ 102E) - STATISTICS

Number of Students:	1039	
2016-2017 FALL		
	Average	Std. Dev.
Homework: /10	7.6	3.1
Midterm 1 : /25	11.7	3.7
Midterm 2 : /25	10.1	3.9
Final: /40	11.8	5.2
Total: /100	**38.5**	**19.3**
Total: /100 (VFsiz)	39.9	

	2016-2017 FALL			
	Interval		# of Stu.	%
AA	70.7	100.0	41	14
BA	60.0	70.6	55	19
BB	54.1	59.9	74	26
CB	51.6	54.0	57	20
CC	50.3	51.5	29	10
DC	49.9	50.2	17	6
DD	49.5	49.8	12	4
F	0.0	49.4	694	71
VF			60	6



FIZ 106/106E Physics II

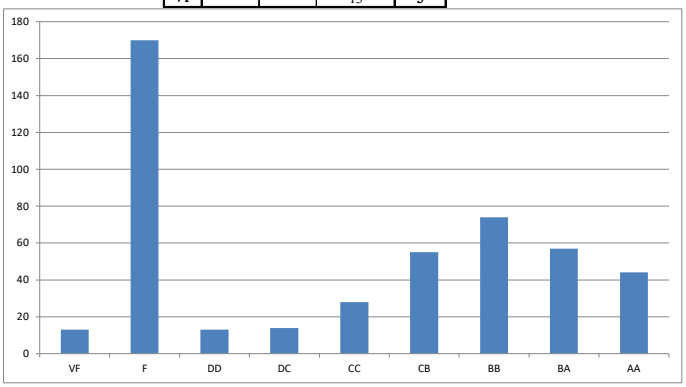
This course covers physics of continuous media and is taught to around 600 students from various departments.

In this semester 37 % failed with FF in Fiz 106 and 45 % in Fiz 106E. This is another example of the case where students in the Turkish session performed better than the ones in English sessions.

2016-2017 FALL - FİZİK II (FIZ 106) - STATISTICS

Number of Students:	468	
2016-2017 GÜZ		
	Average	Std. Dev.
Homework: /10	7.5	3.2
Midterm 1 : /24	10.6	3.6
Midterm 2 : /25	15.5	3.8
Final: /40	21.2	6.4
Total: /100	48.3	21.1
Total: /100 (VFsiz)	49.6	

	2016-2017 GÜZ			
	Interval		# of Stu.	%
AA	69.9	100.0	44	15
BA	64.4	69.8	57	20
BB	58.7	64.3	74	26
CB	54.6	58.6	55	19
CC	51.8	54.5	28	10
DC	50.4	51.7	14	5
DD	49.5	50.3	13	5
F	0.0	49.4	170	37
VF			13	3



2016-2017 FALL - PHYSICS II (FIZ 106E) - STATISTICS

Number of Students:	133	
2016-2017 FALL		
	Average	Std. Dev.
Homework: /10	7.5	3.1
Midterm 1 : /24	10.3	3.6
Midterm 2 : /25	13.3	4.0
Final: /40	22.6	6.6
Total: /100	46.6	21.0
Total: /100 (VFsiz)	46.6	

	2016-2017 GÜZ			
	Interval		# of Stu.	%
AA	72.0	100.0	12	16
BA	63.8	71.9	15	21
BB	57.7	63.7	18	25
CB	53.4	57.6	15	21
CC	51.2	53.3	8	11
DC	50.9	51.1	2	3
DD	49.5	50.8	3	4
F	0.0	49.4	60	45
VF			0	0