Course Syllabus for Spring 2023

Last Update: Thursday, January 19, 2023

Course Overview

Please be advised that Brightspace (BS) is used for this course!

This course intends to teach multiple methods for solving ordinary differential equations and systems of them in addition to presenting the basic ideas of constructing such equations. More specifically, the following topics will be covered during the semester:

1) First-Order Differential Equations
2) Mathematical Models and Numerical Methods
3) Linear Equations of Higher Order
4) Systems of Differential Equations
5) Nonlinear Systems
6) Laplace Transform Methods
7) Applications of Laplace Transform Methods for Solutions of ODEs

Textbooks

One of the following two is recommended (I will type HW problems and post them in Brightspace=BS):

1) Edwards and Penney (6th Edition, 792 pp, December 10, 2007): Elementary Differential Equations with Boundary Value Problems; Pearson Education, Inc. ISBN-13: 978-0136006138; ISBN-10: 0136006132
   Hardcover: $101.65-$186.72
   Kindle: $127.99
2) Deng (Second Edition, 572 pp, October 14, 2017): Lectures, Problems, and Solutions for Ordinary Differential Equations; World Scientific Publishing. ISBN-13: 978-981-3226135; ISBN-10: 9813226137.
   Please download the errata for this edition. In case you do not know how to get the URL from this PDF, cut-and-paste the following link:
   https://drive.google.com/file/d/19uQeXM3kalo0O3VKueE0wBhlCe-McwlN/view?usp=sharing

   To students: If you find three new math typos from the above Deng-2018 book, I will order you a copy of the book.

Specific Rules for This Course

(Wherever these specific rules conflict with the SBU guidelines, SBU guidelines prevail.)

(1) No one is allowed to take any exams without SBU ID.
(2) All exams will be in person.
(3) No late HW or late exams, or makeup for them, will be allowed (See general statements).
(4) HW may be submitted, to BS, as many times as necessary before deadline.
(5) Grade grievances must be submitted within 2 weeks of grades posting.

Basic Rules for Exams

- All exams are closed book, but self-prepared hand-written 8.5x11 formula sheets are allowed (any font size, on both sides if so desired, 1 page each for short tests and 3 pages for the final.)
- Electronics of any kind are not allowed.
- Collaboration of any kind is not allowed.
- Exam problems will be projected on the classroom screen at the time of the exam.
- Use of smart phones for photographing/submission at the last ~3 minutes is allowed.
- Solutions to exams in one PDF will be submitted to BS. One submission is allowed. After submission, students may leave the classroom quietly without asking for permission.

HW and Exams

The following grade distribution (red) to be finalized with class votes during Lecture-1 on 1/24/2023

1) 7-8 HW Sets (30%): Each set will contain ~4 problems and each problem may take 0.5-1.0 hours to solve. You have one week of working time on each set. Submission via BS. No HW assignment during the first week.
2) Three short exams (48%=3x16%): One per month with reasonable spacing (6-8 lectures) between exams; Doing any two of three problems for each exam and the best two will be credited if all are attempted.
3) One Final (22%): Doing any three of four reasonably large problems (Accumulative) and the best three will be credited if all are attempted.
4) Exact dates and locations:

Exam 1:	02/21/2023	Tuesday	6:30-7:50pm Classroom
Exam 2:	03/21/2023	Tuesday	6:30-7:50pm Classroom
Exam 3:	04/18/2023	Tuesday	6:30-7:50pm Classroom
Final:	05/09/2023	Tuesday	5:30-8:00pm TBD

Miscellaneous Items

- Instructor: Yuefan Deng (Check "Faculty Info" on BS)
  Text: 631-877-7979
  OH: Tue/Thu: 2:30-:4:30 pm
  Deng's Zoom Room: ID 820 361 1356 PW: deng4ams
  https://stonybrook.zoom.us/j/8203611356?pwd=NG9VUWJwZ255bGFMWHAyaDVabkNLZz09

  Instructor's Web: https://you.stonybrook.edu/yuefandeng/
- TAs: Junqi Huang (S 1&3, Head TA)
  OH: Mon 9:30am-11:30am Zoom for Huang
  Haochun Wang (S 2&4)
  OH: Wed 1-3 pm
- Recitations: Attend any one or more recitation sessions regardless of registration.
  No recitations during the first week.
  Four recitation sections:
  R01: Mo 11:45AM - 12:40PM Zoom for R01
  R02: Fr 11:45AM - 12:40PM
  R03: Tu 4:45PM - 5:40PM Zoom for R03
  R04: Th 1:15PM - 2:10PM
- Brightspace: The official source for course information
  HW/Exams: Check "Assignments"
  Grades: Check "Grades"
  Lecture Video: Check "Contents"
- Class Time: 6:30-7:50 pm Tue/Thu
- Laptops, smartphones, tablets use:
  Electronic devices should only be used during class for class purposes (e.g., taking notes, research, Brightspace, eTextbook, etc). Facebook, email, texting, or other social media that are not part of the course should wait till after class.
- Talking during lectures:
  Students are strongly encouraged to ask and answer questions. Other forms of talking/chatting are strictly prohibited. For urgent matters that one must talk on phone, please quietly walk out of classroom.

Lecture Plan

(The actual lecture pace may differ slightly)

Week	Tuesday 6:30-7:50 pm	Thursday 6:30-7:50 pm	Dates
1	Syllabus (Stony Brook Google Drive) Sec. 1.1 Definitions of DEs pp 1-7 See Lecture Notes in BS's "Contents"	Sec. 1.3 Separation of variables pp13-17	1/24, 26
2	Sec. 1.4 First order linear (PQ) DEs pp19-26 Sec. 1.5 Substitution methods, pp 27-30	1.5.1 Polynomial sub; 1.5.2 Homogeneous DEs.	1/31, 2/2
3	Sec. 1.5 Substitution methods	1.5.3 Bernoulli DEs, pp 30-37 Sec. 1.6. Riccati DEs pp38-42	2/7, 9
4	Sec. 1.7 Exact DE methods, pp 43-47 Sec 1.7 Exact DE methods and examples, pp 48-62	Ch. 2 Math Models. Sec. 2.1 Cooling law and Sec. 2.3 Population model, pp 79-91.	2/14, 16
5	Exam1	Sec. 2.3 Population model, pp 79-91. Sec 2.2 Draining DE, pp 68-76	2/21, 23. Exam1 on 21
6	Sec. 2.4 Acceleration-velocity model, pp 92-116 Sec. 2.6 Swimmer Problem	Sec. 2.5 Plane landing, pp 123-131 Extended swimmer's problem:	2/28, 3/2
7	Ch.3 Sec's. 3.1 & 3.2 Introduction to higher-order DEs pp. 149-153 Sec. 3.3 Homogeneous DEs pp. 164-175	Sec. 3.4 In-Homogeneous DEs pp. 187-200 (Sec. 3.4.2 variation of parameters pp. 197-206)	3/7, 9
8	Spring Break	Spring Break	3/14, 16
9	Exam2	Ch.4 Systems of DEs	3/21,23
10	Sec's (II). 4.1 & 4.2, pp. 211-219	Sec.4.3 The substitution method, pp. 222-226 Examples on Variational Principles;	3/28, 30
11	Sec's. 4.4 & 4.5 Eigen method, pp. 232-250	Sec's. 4.4 & 4.5 Eigen method, pp. 232-250 (examples)	4/4, 6
12	Sec's. 4.4 & 4.5 Eigen method, pp. 232-250 (more examples)	Ch. 5 Laplace transforms, Sec's. 5.1 Sec 5.2 basic transforms and properties, pp 262-284	4/11, 13
13	Exam3	5.3 Inverse Laplace transforms pp 285-289	4/18, 20
14	Sec. 5.4 Convolution Theorem, pp 290-294	Sec 5.5 LT applications, pp 295-307	4/25, 27
15	Sec 5.5 (continued) more LT applications	Review	5/2, 4
16	Final		5/9

Student Accessibility Support Center Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Student Absences Statement

Students are expected to attend every class, report for examinations and submit major graded coursework as scheduled. If a student is unable to attend lecture(s), report for any exams or complete major graded coursework as scheduled due to extenuating circumstances, the student must contact the instructor as soon as possible. Students may be requested to provide documentation to support their absence and/or may be referred to the Student Support Team for assistance. Students will be provided reasonable accommodations for missed exams, assignments or projects due to significant illness, tragedy or other personal emergencies. In the instance of missed lectures or labs, the student is responsible for review posted slides, review recorded lectures, seek notes from a classmate or identified class note taker. Please note, all students must follow Stony Brook, local, state and Centers for Disease Control and Prevention (CDC) guidelines to reduce the risk of transmission of COVID. For questions or more information click here.

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Additional comments on office hours

Communication: Course-related questions should be posted to the appropriate forum in the course discussion boards. For personal/private issues, please use email or my text. When

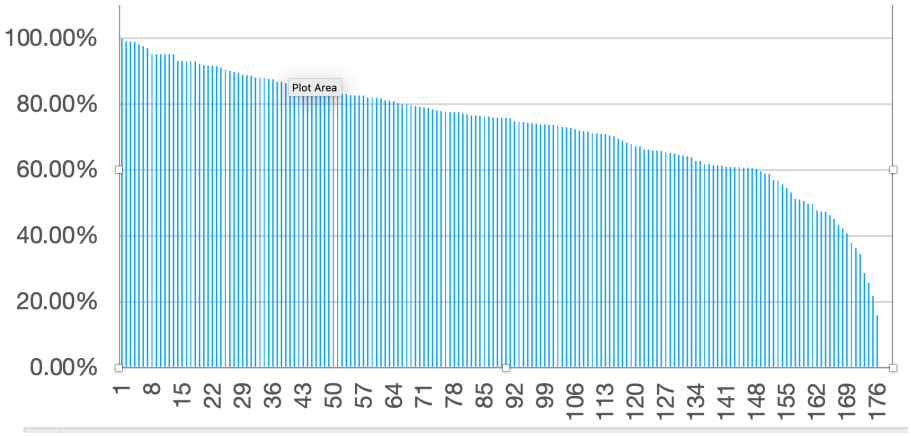
using Brightspace's Email Tool, you automatically include your full name, course name, and section. We (the instructor and TAs) strive to respond to your emails as soon as possible, but please allow 24-48 hours for a reply. Your Stony Brook University email must be used for all University-related communications. All correspondence will be sent to your SBU email account. Please plan on checking your SBU email account regularly for course-related messages. To log in to Stony Brook Google Mail, go to http://www.stonybrook.edu/mycloud and sign in with your NetID and password.

Past Letter Grading Cut Schemes (for Your Reference only)

The following are the grade distributions and letter grade scheme for several past semesters with various numbers of students. There is **no guarantee** this cutting scheme for assigning letter grades will be applicable to your class because of differences in HW and exam problems as well as the performance of your classmates.

*For **Fall 2022** with 177 registered students*

This semester, I'm super generous as many students did quite well. But it's super difficult to select the cuts for the letter grades despite huge efforts of analyses. Please **DO NOT** contact me for the cutting scheme. We love to correct grading errors if any. Please contact the head TA Dan for grading issues of the final before I post the letter grades to SOLAR on Monday 12/19/2022. Hope you did well. Before contacting him, do consult the posted final solution.



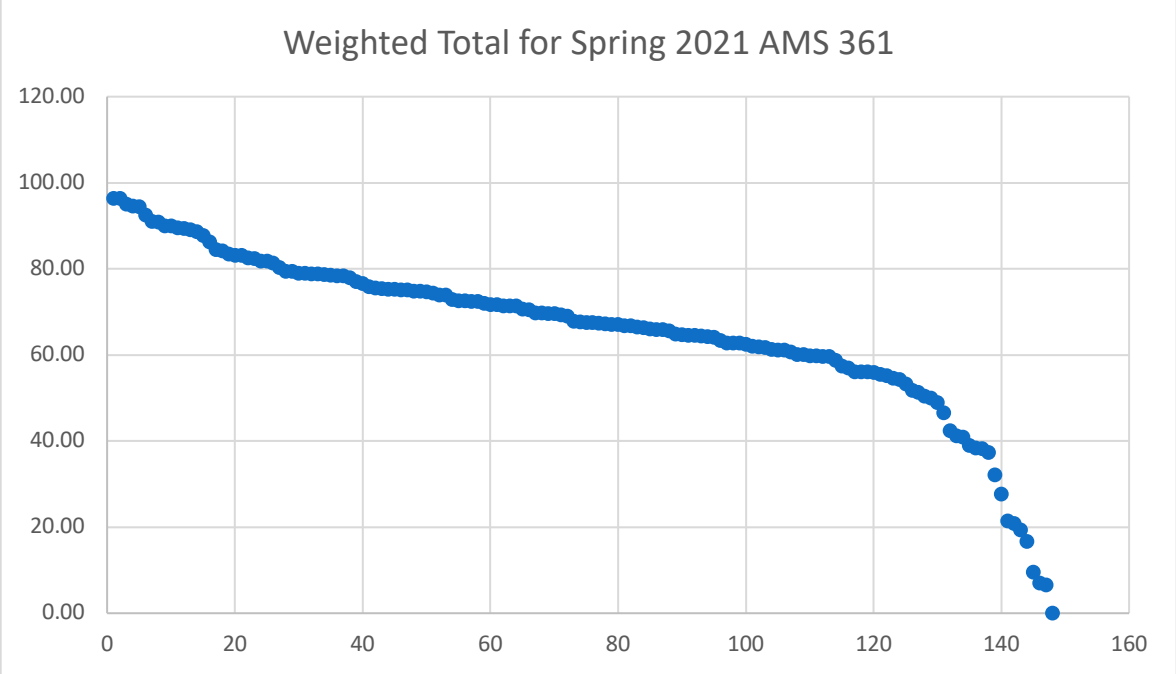
The numbers in [x1, x2] are the total weighted grades that you may find from BB.

A:	20.33%	[99.91,	87.54]
A-:	10.74%	[86.78,	82.58]
B+:	18.64%	[82.05,	75.71]
B:	16.38%	[74.88,	67.21]
B-:	06.77%	[66.23,	63.83]
C+:	10.17%	[62.77,	58.77]
C:	11.30%	[57.01,	34.47]
F:	02.83%	[28.78,	00.00]

Note: During the semesters of fall 2021 and spring 2022, I was on sabbatical and did not teach ams361.

*For **Spring 2021** with 150 registered students*

This semester, I'm again generous with only 2.7% failure (the 2nd lowest in history). Here is the breakdown: ~25% A/A-, ~58% B+/B/B-, 9% C+/C, and 2.7% F (4 students). It's difficult to select the cuts despite huge efforts of analyses. Please **DO NOT** contact me for the cutting scheme. We love to correct grading errors if any. I will post the letter grades to SOLAR on Tuesday 5/18/2021 at 11:59 pm. Contact the head TA for trivial grading issues during his added office hours 3:30-5:30 pm today (5/17/2021).

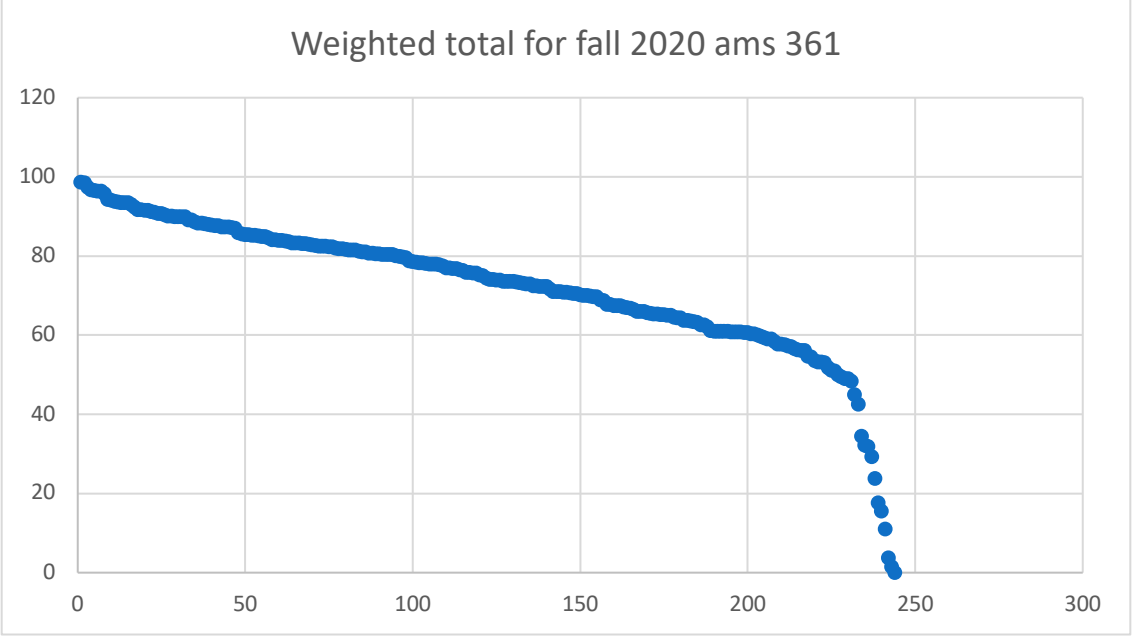


The numbers in [x1, x2] are the total weighted grades that you may find from BB.

A:	10.37%	[96.36,	86.22]
A-:	14.40%	[84.45,	77.91]
B+:	22.97%	[76.91,	68.92]
B:	27.33%	[67.77,	58.73]
B-:	10.00%	[56.89,	46.55]
C+:	04.67%	[42.27,	37.23]
C:	04.00%	[32.02,	16.61]
F:	02.67%	[09.42,	00.00]

*For **Fall 2020** with 250 registered students*

This semester's grade distribution is different from all others and the pandemic certainly has exacerbated the decorrelation of grades and learning. This is THE MOST GENEROUS semester in my history of teaching AMS 361 to more than 15,000 students. It is hard to give letter grades because of the smoothness of the grade distribution~39% A and A- (the highest in the class's history), 38% B+, B, B- and 20% C+ and C, 4.8% F (12 students). It's difficult to select the cuts despite huge efforts of analyses. Please **DO NOT** contact me for the cutting scheme. We love to correct grading errors if any. I will post the letter grades to SOLAR on Monday 12/21/2020 at 3 am.

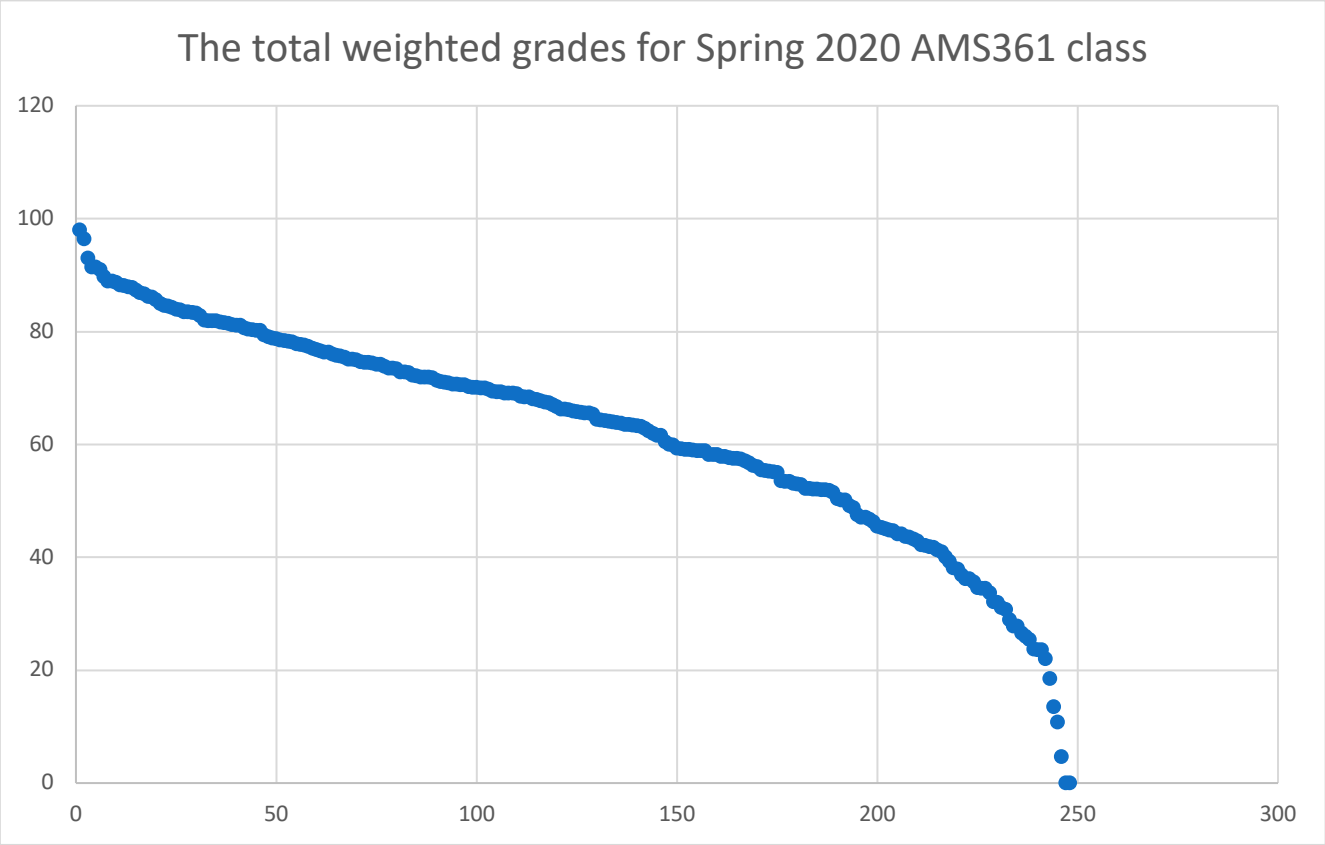


The numbers in [x1, x2] are the total weighted grades that you may find from BB.

A:	13.20%	[98.688,	89.844]
A-:	26.40%	[89.156,	79.469]
B+:	17.20%	[78.719,	71.625]
B:	06.40%	[71.000,	68.688]
B-:	12.40%	[67.719,	62.031]
C+:	11.60%	[61.063,	56.125]
C:	08.00%	[54.656,	29.281]
F:	04.80%	[23.719,	00.000]

*For **Spring 2020** with 250 registered students*
This semester is a pleasant surprise! Many students did fantastically in spite of the coronavirus distractions and harder exams.

It is hard to give letter grades because of the smoothness of the grade distribution: ~35.2% A and A- (one of the highest in the class's history), 32.8% B+, B, B- and 24.8% C+ and C, 4% F (10 students). It's difficult to select the cuts despite huge efforts of analyses. Please **DO NOT** contact me for the cutting scheme. We love to correct grading errors if any. I will post the letter grades to SOLAR on Monday 5/18/2020.

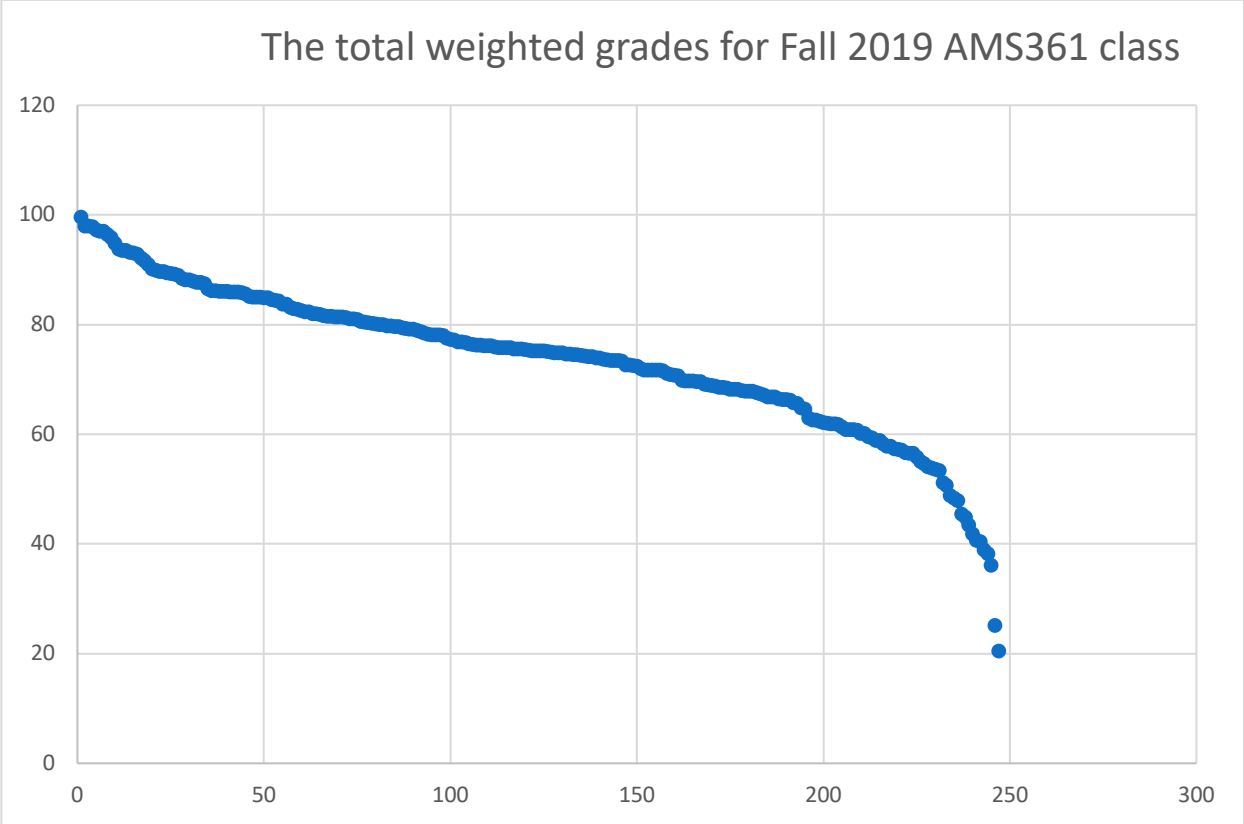


The numbers in [x1, x2] are the total weighted grades that you may find from BB.

A:	12.40%	[98.00,	82.86]
A-:	22.80%	[82.03,	71.86]
B+:	15.20%	[71.35,	65.32]
B:	06.40%	[64.46,	61.61]
B-:	11.20%	[60.53,	55.04]
C+:	07.20%	[53.54,	48.79]
C:	17.60%	[47.61,	25.43]
F:	04.00%	[23.75,	00.00]

*For **Fall 2019** with 249 registered students*

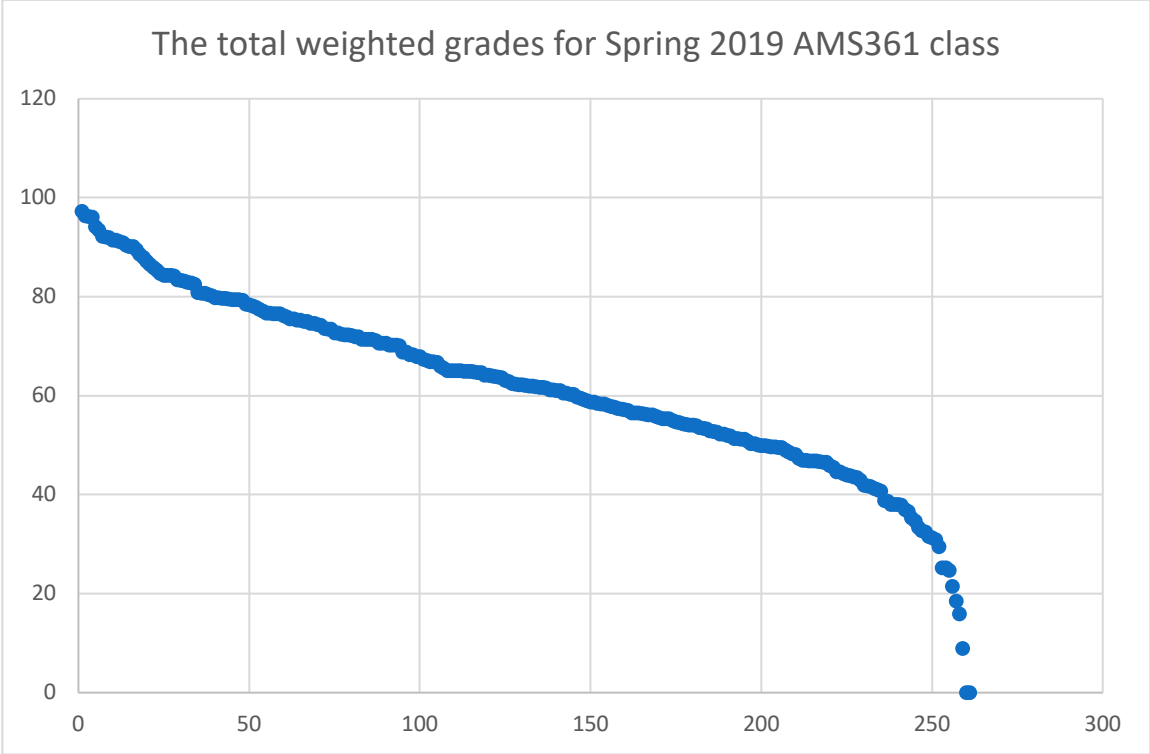
This semester is the hardest to give letter grades because of the huge clustering at the high-end and is also the luckiest for the entire class: ~39% A and A- (1st time ever in the class's history), ~38% B+, B, B- and ~21% C+ and C. I failed 3 students (who may have already dropped.) It's difficult to select the cuts despite huge efforts of analyses. Please **DO NOT contact me** for the cutting scheme. We love to correct grading errors if any. I will post the letter grades to SOLAR on Saturday 12/21/2019.



The numbers in [x1, x2] are the total weighted grades that you may find from BB.

A:	13.71%	[99.62,	87.44]
A-:	25.40%	[86.21,	78.00]
B+:	18.95%	[77.53,	73.41]
B:	05.65%	[72.71,	70.65]
B-:	13.30%	[69.82,	64.62]
C+:	15.72%	[62.97,	53.35]
C:	05.24%	[51.20,	36.18]
F:	01.61%	[25.18,	00.00]

*For **Spring 2019** with 265 registered students*
This semester is the most generous (grades are too continuous): ~32% A and A-, 45.6% B+, B, B- and 20.00% C+ and C. I failed four students (who may have already dropped.) It's difficult to select the cuts despite huge efforts of analyses. Please **do NOT contact me** for the cutting scheme. We love to correct grading errors if any. I will post the letter grades to SOLAR on Sunday 05/19/2019.

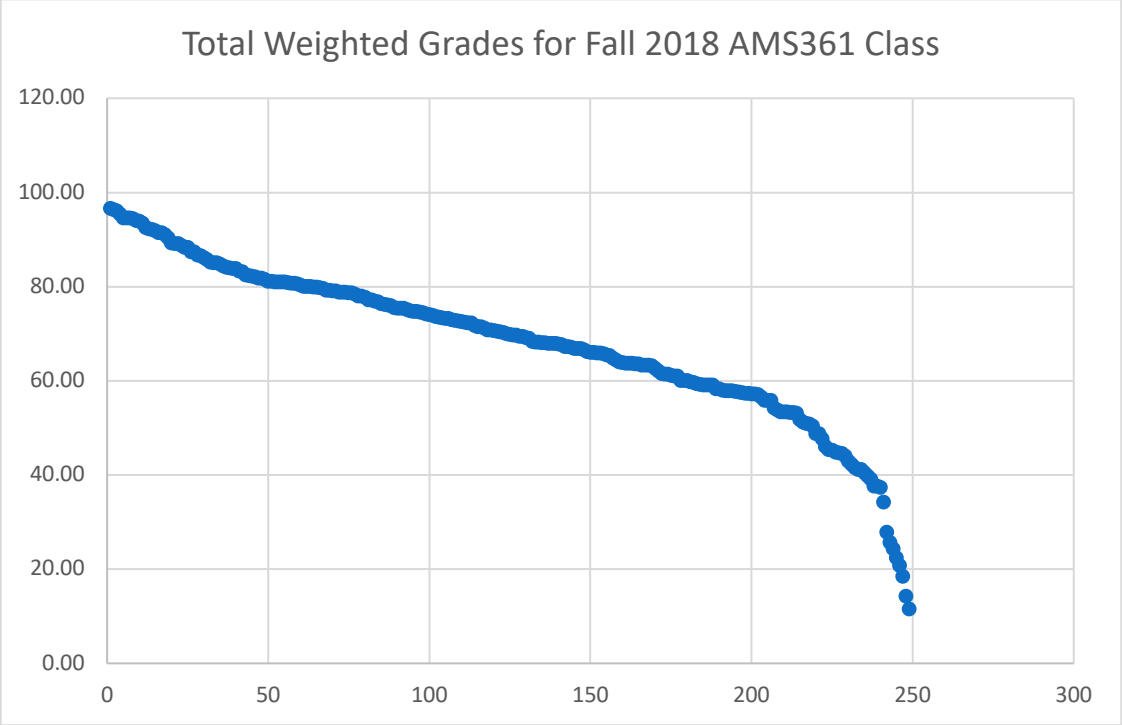


The numbers in [x1, x2] are the total weighted grades that you may find from BB.

A:	16.73%	[97.28,	82.56]
A-:	15.21%	[80.87,	73.46]
B+:	07.60%	[72.71,	70.11]
B:	17.50%	[68.82,	61.03]
B-:	20.53%	[60.55,	50.90]
C+:	12.17%	[50.36,	42.97]
C:	07.98%	[41.98,	29.53]
F:	03.00%	[25.30,	00.00]

*For **Fall 2018** with 250 registered students*

Congratulations on a great semester!
This is likely ANOTHER generous offer of 27.2% A and A- and a huge group of 48.00% B+, B, B- and 20.00% C+ and C. It's difficult to select the cuts despite huge efforts of analyses. Please do NOT email me for the cutting scheme. I love to correct grading errors if any. I will post the letter grades to SOLAR at 3 pm on 12/16/2018.

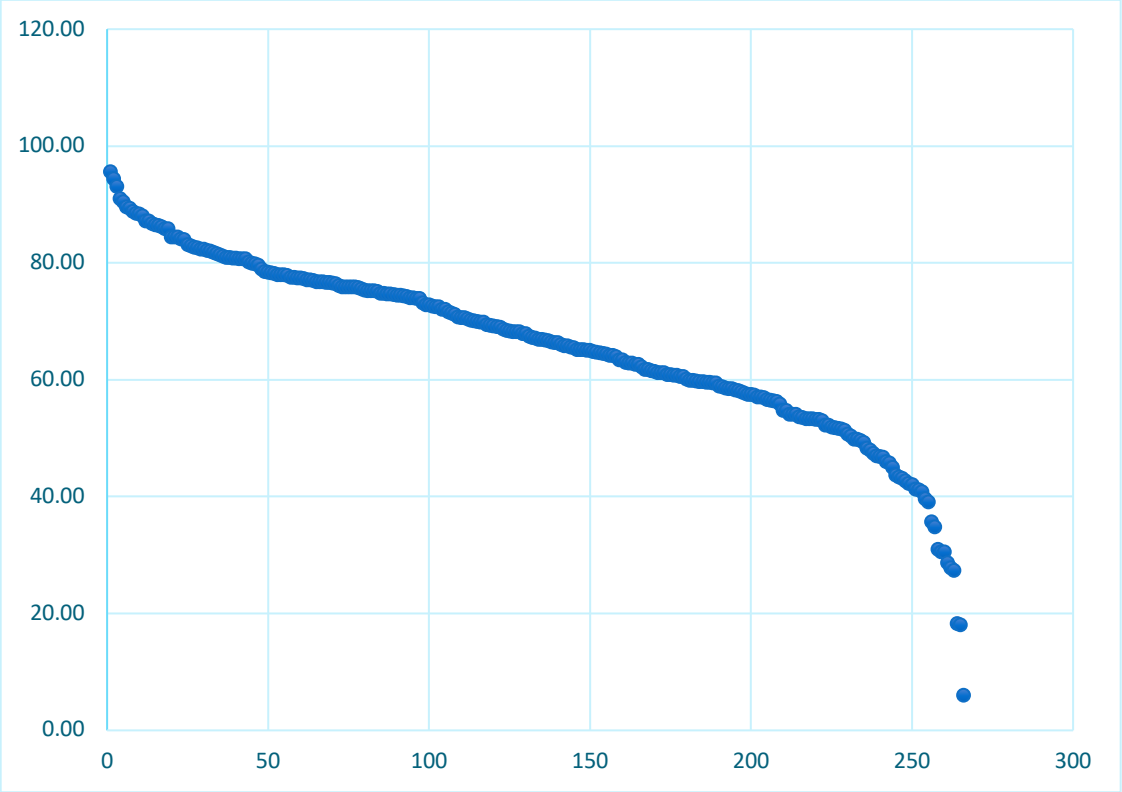


The numbers in [x1, x2] are the total weighted grades that you may find from BB. They are not the percentages I normally posted to suggest your class standing.

A:	16.00%	[96.61,	83.81]
A-:	11.20%	[83.33,	79.68]
B+:	18.40%	[79.22,	72.29]
B:	16.80%	[71.76,	65.38]
B-:	12.80%	[64.78,	59.04]
C+:	10.00%	[58.28,	53.06]
C:	10.00%	[51.71,	37.34]
F:	04.80%	[34.23,	11.50]

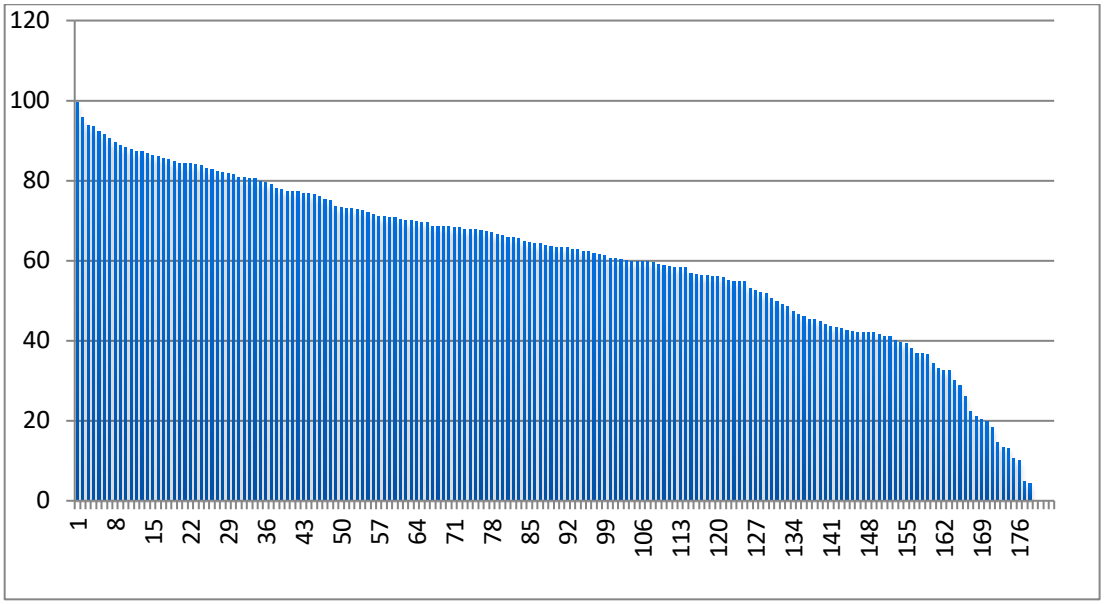
*For **Spring 2018** with 266 registered students*

This semester is likely the most generous one as 31.5% got A and A-. It's difficult to select the cuts in spite of painful analyses. Please do NOT email me for the cutting scheme. I love to correct grading errors if any. Remember our policy not to deal with any grading issues older than 2 weeks.



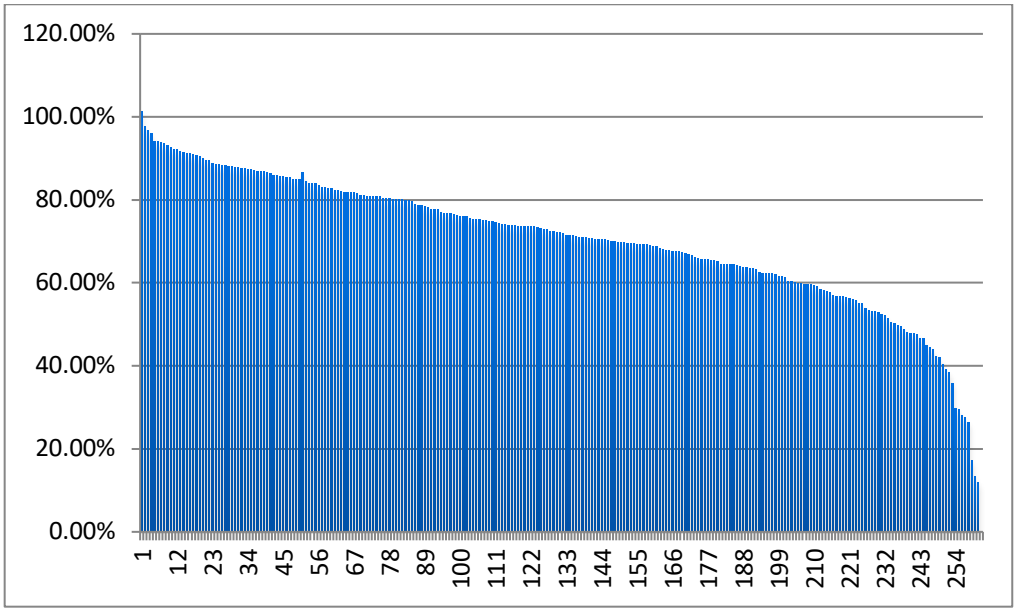
A:	16.16%	[95.61,	80.70]
A-:	15.41%	[80,23,	75.17]
B+:	17.29%	[74.84,	67.89]
B:	10.15%	[67.49,	64.03]
B-:	19.17%	[63.42,	55.92]
C+:	10.15%	[54.80,	49.28]
C:	07.89%	[48.28,	34.89]
F:	03.76%	[31.06,	06.02]

For fall 2014 with 182 students:



#1	(99.41)	through	#24	(83.88):	A	Total	24 (13%)
#25	(82.92)	through	#48	(75.04):	A-	Total	24 (13%)
#49	(73.47)	through	#66	(69.48):	B+	Total	18 (10%)
#67	(68.55)	through	#114	(58.21):	B	Total	48 (26%)
#115	(56.93)	through	#125	(54.83):	B-	Total	11 (06%)
#126	(53.17)	through	#159	(36.63):	C+	Total	34 (19%)
#160	(34.40)	through	#171	(18.30):	C	Total	12 (07%)
#172	(14.53)	through	#182	(00.00):	F	Total	11 (06%)

*For **spring 2015** with 255 students:*



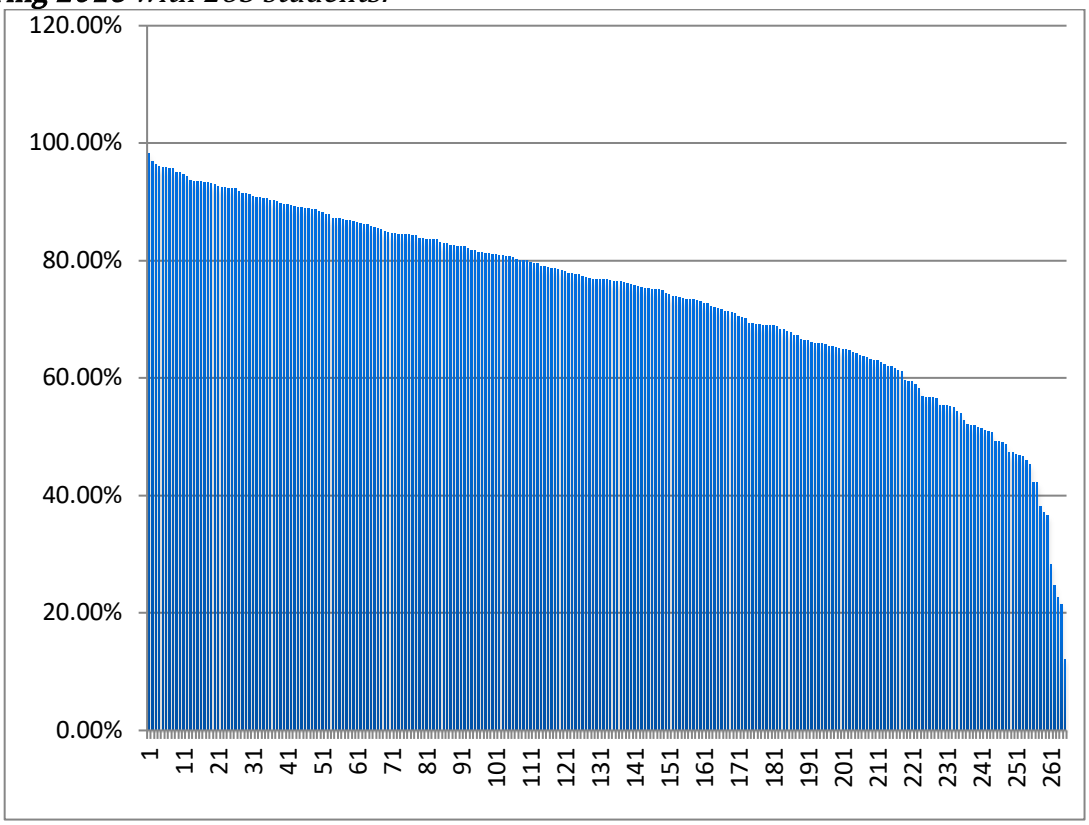
A:	15%
A-:	10%
B+:	06%
B:	28%
B-:	15%
C+:	10%
C:	11%
F:	05%

*For **fall 2015** with 266 students:*

Grade distribution chart went missing for this semester

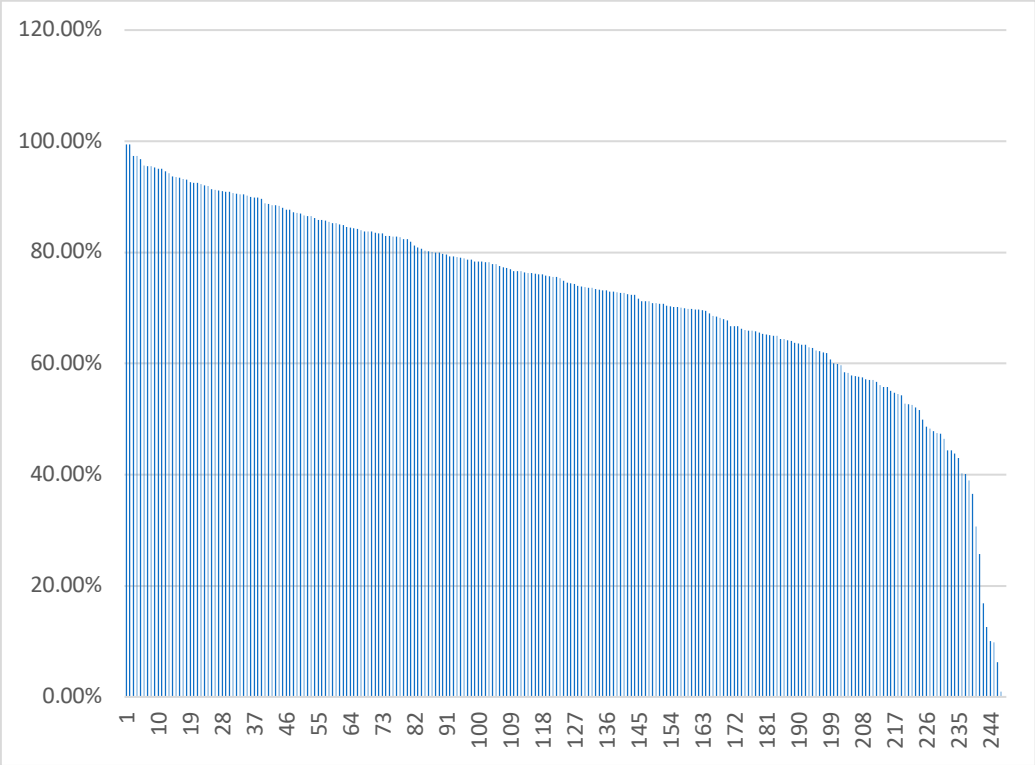
A: 13.53%
A-: 13.53%
B+: 16.16%
B: 16.17%
B-: 13.91%
C+: 14.66%
C: 08.65%
F: 03.39%

*For **spring 2016** with 265 students:*



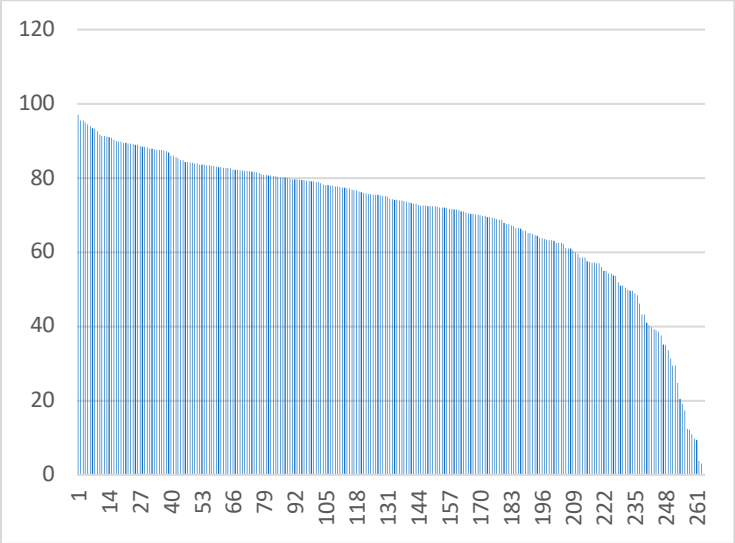
A: 18.11%
A-: 11.32%
B+: 10.19%
B: 11.70%
B-: 08.68%
C+: 16.23%
C: 13.96%
F: 03.77%

*For **fall 2016** with 250 students:*



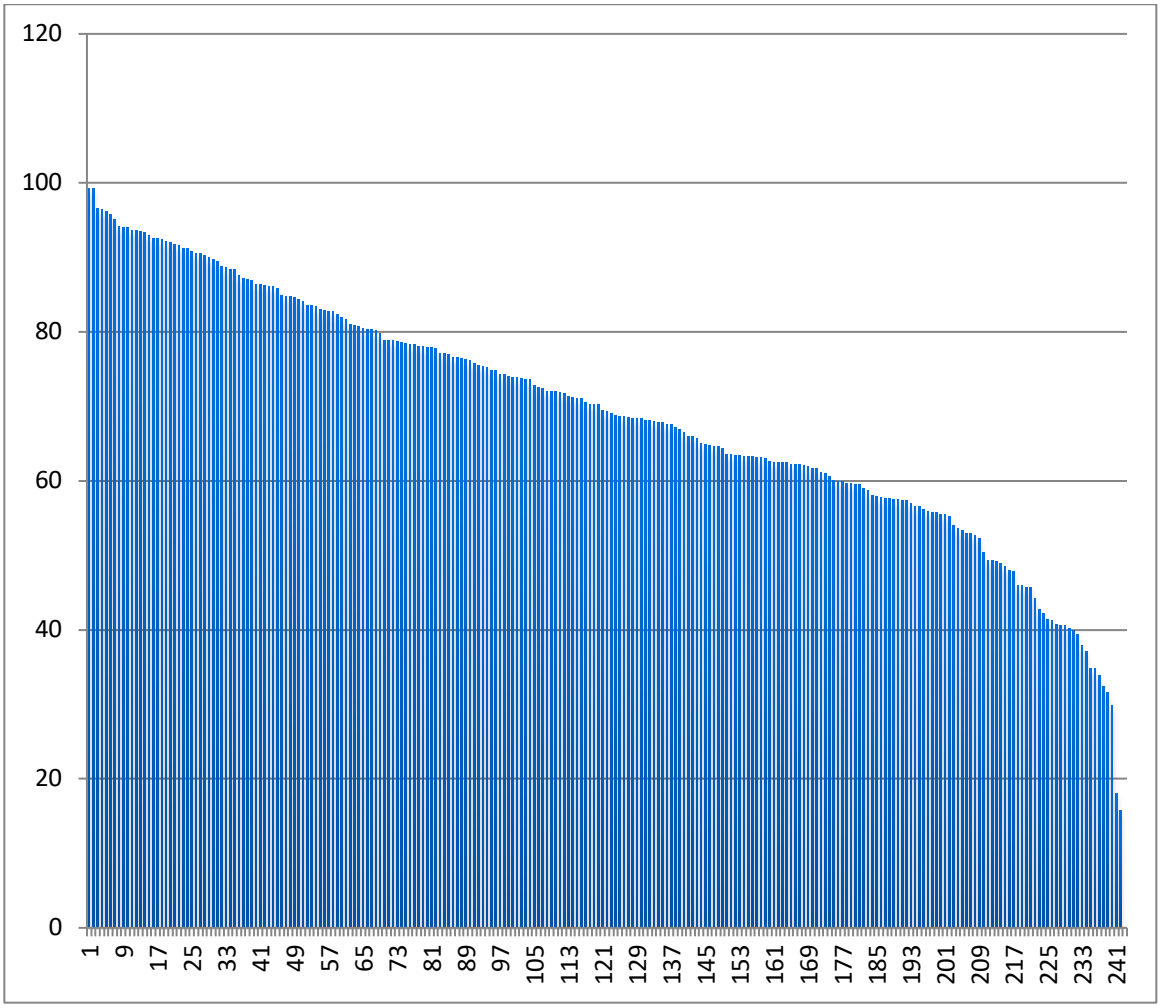
A:	15.79%	[99.43,	89.67]
A-:	16.19%	[88,79,	81.92]
B+:	16.60%	[81.21,	75.37]
B:	08.10%	[74.85,	72.36]
B-:	09.72%	[71.68,	68.23]
C+:	12.15%	[67.93,	61.90]
C:	16.19%	[60.68,	39.01]
F:	03.64%	[36.58,	01.00]

*For **spring 2017** with 266 registered students (with a record for 265 students)*



A:	14.72%	[96.97,	86.91]
A-:	13.96%	[86,02,	81.60]
B+:	20.75%	[81.31,	75.05]
B:	17.73%	[74.41,	68.73]
B-:	09.43%	[67.88,	62.17]
C+:	07.92%	[61.24,	53.54]
C:	09.36%	[51.81,	29.38]
F:	04.53%	[24.72,	00.00]

*For **fall 2017** with 247 registered students*



A:	14.34%	[99.3000,	88.3250]
A-:	13.93%	[87,5373,	79.8250]
B+:	20.90%	[78.8750,	70.2000]
B:	11.89%	[69.4250,	64.3375]
B-:	24.59%	[63.4875,	52.2500]
C+:	05.33%	[50.4000,	44.2000]
C:	04.92%	[42.6750,	37.1375]
F:	04.10%	[34.8500,	00.0000]