# STAT 213, SUMMER 2021: GRADING SYSTEM

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60% of the the final grade will be based on mastery of specific learning objectives as demonstrated on homework, quizzes, exams and projects.

20% will be based on demonstrating an ability to apply and integrate concepts and skills to solve real-world problems using professional quality tools, and to communicate analyses in writing to an untrained reader.

The remaining 20% will be based on good faith, timely completion of assigned work, irrespective of technical correctness

## A MASTERY-BASED GRADING SYSTEM

The 'Content Mastery' portion of the grade will be based on a modified version of "Standards-Based Grading" or "Specifications Grading".

In this system the learning objectives for the course are laid out in advance, and each assignment is associated with a some number of these objectives. Rather than receiving a numerical grade for an assignment as a whole, a grade is assigned for each learning objective based on how well mastery of that objective has been demonstrated by that assignment.

At the end of the semester, an overall level of mastery for each objective is determined based on the individual grades attached to that objective, generally using only the top two or three, and the overall mastery grade for the course is simply the average mastery level across all learning objectives.

This way, as you progress through the course, as particular content is revisited and your level of mastery increases, your course grade will primarily reflect your final level of mastery, rather than being an average of different mastery levels at different points in time.

You can think of this as being similar in spirit to dropping the lowest quiz grade and dropping the lowest homework grade, except that instead of dropping an assignment

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grade, the dropped grades are the lowest associated with each learning objective, which may come from different assignments.

Some advantages of this approach are that:

- **"key concepts and proficienies" are listed up front**, so it should be clearer as you go what the most essential takeaways are

- you will be able to **monitor your learning in terms of concepts and skills** rather than abstract "point totals"

- if a student has a slower start picking up on a particular concept, **early struggles need not impact the end grade** at all provided they get where they need to be in the end

- it incentivizes **engagement with mistakes** so you can learn from them, rather than focusing on content you already know well

- I can more easily track who needs work in what areas, and what topics are most difficult for the class as a whole (and allocate review time and extra homework or quiz problems accordingly).

Downsides are that

- the system is unfamiliar to most and takes some getting used to

- a snapshot of your apparent course grade at any given moment in time will tend to be lower than the final grade: since by design, the more assignments that are completed, the more low grades get dropped, and so there is expected to be an **upward trend** in the running average, as higher scores replace lower ones

I will provide you with periodic "grade reports" where the aggregating calculations have been done, where you can fill in "possible futures" to see how potential future grades might impact the course grade

### Summary of Grading System

- **Each graded item** (homework, quiz, exam, project) **is associated with one or more SLO** (Specific Learning Objective).

- For each SLO for each graded item, a grade between 0 and 8 will be assigned, based on the level of mastery of the concept/proficiency represented by the SLO (see the rubric on the following page)

- The SLOs are grouped into six content areas, each of which has 3-5 SLOs associated with it.

- **A mastery score is tracked for each SLO**, which is **the average of the highest quiz, exam or project grade** associated with that SLO and the **highest other grade from any source** associated with that SLO.

- **The final SLO grade** (60% of the overall course grade) is simply **the average of the 20 individual SLO grades**. Essentially, this means mastery of an individual SLO is worth 3% of the final grade.

- Another 20% of the course grade is based on your demonstrated ability to synthesize concepts and communicate about models in language appropriate for a general audience.

- The last 20% of the course grade is based on "good faith effort" to complete homework in a timely manner.

## Levels of Mastery

Levels of mastery for each learning objective are on an 8 point scale:

| | |
|---|---|
| **8** | demonstrated **comprehensive mastery** of the concept or skill, including subtle nuances and peripheral details |
| **7** | demonsrated of **mastery** of both the big picture and most of the details, with only minor errors either in inessential details or in the finest nuances of the concept. Basically, "A" level work. |
| **6** | demonstrated mastery of the **essential components** but with some details or stylistic elements missing. Solid "B" level work |
| **5** | **solid progress** toward mastery, but needs some further attention to firm up the ideas ("C" level work) |
| **4** | **elements of mastery** are present in the response, but don't yet form a coherent whole ("D" level work) |
| **2** | some evidence of a **superficial grasp of some ideas**. Not yet "passing level" work, but better than nothing |
| **0** | **no meaningful evidence of engagement** with the ideas in question |

## Final Grade Determination

The final Concepts and Content component of the grade is a simple average of the 20 individual SLO grades, on a 0-8 point scale.

In addition to assessing your understanding of specific concepts as outlined above, each of the two projects will be graded on the following four dimensions (each on the same 0-8 scale):

(1) **Overall technical soundness**: To what extent are the tools you apply appropriate to the questions you are trying to answer, and to what extent are the technical details correctly executed in the code?

(2) **Chain of reasoning**: How well are the decisions you make throughout your analysis motivated in terms of the research question and in terms of the results obtained so far?

(3) **Interpretation of results in context**: How well did you take the results of your analysis and connect it back to the real world context of the problem, in such a way that a reader not trained in statistics can take something away from your analysis?

(4) **Clarity of communication**: How easy is it to follow your writeup? This criterion comprises both the quality of the writing itself, the organization of the report (are text sections, graphs, etc. well placed for the reader to follow what is going on?), and the aesthetic quality of the report (have you suppressed unnecessary/distracting output, are your figures well labeled and visually appealing?)

The Completion component will be determined by recording a 1 for each assignment completed by the deadline, a 0.5 for each assignment which is complete but handed in late or on time but missing substantial content, and a 0 otherwise. The two lowest homework grades will be dropped and the remaining grades summed and converted proportionally to a score out of 8. I expect we will have between 8 and 10 problem sets, making basic completion of each worth somewhere between 2 and 2.5% of the final grade.

The three component grades on an 8 point scale are averaged together according to the weights given to yield a final grade, which is converted to a letter grade roughly as follows:

| A | 7.20-7.99 |
|---|---|
| A- | 6.80-7.19 |
| B+ | 6.40-6.79 |
| B | 6.00-6.39 |
| B- | 5.60-5.99 |
| C+ | 5.20-5.59 |
| C | 4.80-5.19 |
| C- | 4.40-4.79 |
| D | 4.00-4.59 |

## Grading Example

In reality there are 20 SLOs in the course, but for the sake of illustration, suppose there were only 6; call them Z1 through Z6.

Suppose the student Bo Sample has the following grades:

Lab 1:
- Z1: 4
- Z2: 5
- Z3: 7

Lab 2:
- Z2: 6
- Z3: 8
- Z6: 7

Quiz 1:
- Z1: 8
- Z2: 4
- Z3: 6

Quiz 2:
- Z2: 4
- Z3: 6
- Z4: 8

Project 1:
- Z1: 7
- Z2: 6
- Z3: 5
- Z4: 4

Project 2:
- Z1: 6
- Z2: 7
- Z3: 5
- Z4: 4
- Z5: 4

Final Project:
- Z1: 8
- Z2: 8
- Z3: 6
- Z4: 5
- Z5: 5
- Z6: 6

SLO Z1 appears a total of 5 times. The final project grade is 8. The two group project grades are 6 and 7, so the 7 is used. The two lab and quiz grades are 4 and 8, so the 8 is used. Therefore the final grade for Z1 is the average of 8, 7 and 8, or 7.67.

Bo has a 6, a 4 and a 6 on Z2 for Labs and Quizzes, so we use a 6. Their project grades for Z2 are 7 and 6 so we use the 7. The final project grade is an 8. So the final grade for Z2 is the average of 6, 7, and 8, which is 7.0.

Z3 appears on all four labs and quizzes; the highest mark is an 8. The group project grade is 5, and the final project grade is 6, for an average of 6.33.

Bo has an 8, a 4 and a 5 for Z4, for an average of 5.67.

Z5 only appears on Project 2 and the Final Project, so the grade is just the average of the 4 and the 5, for 4.5.

Finally Z6 only appears on the Final Project and Lab 2, for an average of 6.5.

All together, Bo's SLO grade is the average of 7.67 (Z1), 7.0 (Z2), 6.33 (Z3), 5.67 (Z4), 4.5 (Z5), and 6.5 (Z6), which is 6.28, putting them in "B" territory for that part of the grade.

Suppose Bo completes 16 out of 18 labs but turns in two of them late, both of the missed ones and one of the late ones are dropped, leaving them with a lab grade of 14.5 out of 15.

They miss two quizzes but do the other three and the optional quiz on time, their grade for quizzes is 4 out of 5.

Bo is an active participant in Project 1 earning full marks (2 out of 2) from their group mates, the draft project is rated 4/5 (or 0.8 out of 1) by the peer graders, and the final project satisfies all the requirements (for 2/2), then Bo's completion grade for Project 1 is 4.8.

Bo gets busy later in the semester and misses some group meetings for Project 2, earning a 1 out of 2 from their group members. The rest of the group picks up the slack, turning in both a complete draft and a complete final writeup on time. Bo's completion grade for Project 2 is then 4.0.

All together, Bo's completion grade is $14.5 + 4.0 + 4.8 + 4.0 = 27.3$ out of 30, which becomes 7.28 out of 8.

Meanwhile, Bo provides useful and timely feedback on another group's Project 1, but forgets to turn in any peer feedback for Project 2, thus earning a total of 5 out of 10 for that component, which becomes 4 out of 8.

So Bo's final grades are 6.28 for SLOs (weighted 60%), 7.28 for completion (weighted 30%) and 4.0 for peer feedback (weighted 10%), giving them a final grade of 6.35, which is a solid B.