

# MA22004 Course Design Plan

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## 1 Learning

*Wir shafften das.*

*Summary:* runs for 11 weeks (20 SCQF/10 ECTS) approx 200 hours student effort including 55 contact hours.

There will be 1 seminars of one-hour each (**timetabled, online**), 1 workshop of one-hour (**timetabled, face-to-face**), and 1 lab of two hours (**online, asynchronous**). The expectation will be that students access and engage with the lecture notes and curated digital content before participating in the seminar.

### Asynchronous content

All of this content will be available online.

**Course notes (ACQUIRING) needs to be prepared** (use of existing hand-written notes with some modifications), this content will consist of HTML and PDF notes generated using **Rmarkdown**.

**Interactive computer labs (PRODUCING, PRACTICING) needs to be prepared** (use of prepared labs with content converted to **Rmarkdown** and interactive elements added), this content will consist of interactive **R** computer labs coded using **learnr** and **gradethis**. **Digital need:** RStudio Cloud.

**Curated digital content (INQUIRING)** a collection of digital content for students to explore, e.g., online lectures by David Spiegelhalter, Hans Rosling, etc; spurious correlations, Datasaurus Dozen, etc. Shared via Blackboard or padlet.

## Synchronous content

This content must be **timetabled**.

### Face-to-face

**Workshops (PRACTICING, COLLABORATING, DISCUSSING)** In which students will meet together to work in small groups (5 or 6). The first couple of meetings will involve meeting outdoors, e.g., UoD Botanical Gardens or a park, to collect data (circumference of trees, heights of people, number of people crossing at a busy intersection, etc) that will later be discussed and analyzed. The students will utilize worksheet handouts that are already prepared.

### Online

**Seminars (DISCUSSING, PRODUCING, PRACTICING)** In which we will have a discussion of the main topics for the week, guided by student polling (using either mentimeter or itempool. Periodic quizzes will be given in seminars to assess student attainment. A portion of each seminar will involve a lab presentation given by one of the groups.

**Examinations (PRODUCING)** Midterm and Final examinations will need to be timetabled to lessen the chance of cheating. The Final Examination can also be given during the May diet.

## 2 Engagement

The active learning categorization for each teaching task are identified in § Learning

There are several points that can be measured to assess engagement, including:

- Students will be presented with a new collection of notes that will roll out weekly using a tool like perusall (or possibly Blackboard forums). They will be responsible for posting both questions and responses to the message boards for each new collection of notes.
- During seminars, students will be presented with **polls** to encourage reflection and discussion.
- During seminars, students will take turns giving a lab report **presentation** with their workshop groups. This will encourage students to challenge each others analysis.
- Students will be expected to hand-in assignments for continuous assessment.
- Students will be expected to sit Midterm examinations. The grades of these examinations will offer opportunities for intervention.

## 3 Attainment

## 4 Assessment

The module assessment will be weighted:

Assessment	Weight
Assignments	20%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	40%

Note: This is a modification from the previous split (60% degree exam, 20% two class tests, and 20% coursework). As the students will not be given a revision period, the Final Exam will need to be less cumulative in scope and therefore additional weight will be placed on the Midterm Exams.

## Examinations

The **Final Exam** will be a two-hour hand-written exam. Students will be given one additional hour to scan, code, and upload their manuscripts using gradescope. This process will be thoroughly discussed and practiced by the students with a dummy exam in advance of a real submission. The Final Exam will either be given in the last week of term (week 11) or during the May exam diet.

The **Midterm Exams** will either be hand-written or computer-assessed and will be one-hour in scope instead of two. These will likely be held in week 4 and week 8.

## Assignments

The assessed coursework will include 6 lab reports and 1 lab report presentation (group work).

## 5 NEEDS

### Digital needs

1. bringing computer lab into cloud: semester subscription to RStudio Cloud<sup>1</sup> (approx. 1000 USD)
2. polling: mentimeter or itempool

### Hardware needs

1. Better microphone
2. Tablet with stylus

## Rmarkdown Example

### Math

Here is an example page containing math markdown.

```
We can use inline math,  $f_X$ ,  $f_Y$ , and  $f_{X,Y}$ , as well as display math,
\[
  I(X;Y)
  = \iint_{\mathcal{X}} \mathcal{I}(\mathcal{Y})
  \log\left(\frac{f_{X,Y}(x,y)}{f_X(x)f_Y(y)}\right)
  f_{X,Y}(x,y) \mathrm{d}y \mathrm{d}x,
\]
```

to generate:

We can use inline math,  $f_X$ ,  $f_Y$ , and  $f_{X,Y}$ , as well as display math,

$$I(X;Y) = \iint_{\mathcal{X} \otimes \mathcal{Y}} \log\left(\frac{f_{X,Y}(x,y)}{f_X(x)f_Y(y)}\right) f_{X,Y}(x,y) dy dx.$$

### Plots

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<sup>1</sup>A better long-term solution would be to run RStudio Server Pro and RStudio Connect on in-house server running, licenses are available for free for teaching purposes.

```
x <- seq(-8, 8, length=1000)
y0 <- dnorm(x, -2, 1)
y1 <- dnorm(x, 2, 1)
df <- tibble(x, y0, y1)
df <- melt(df, id.var = "x", value.name = "y")

ggplot(data = df, aes(x = x, color = variable)) + geom_line(aes(y=y))
```

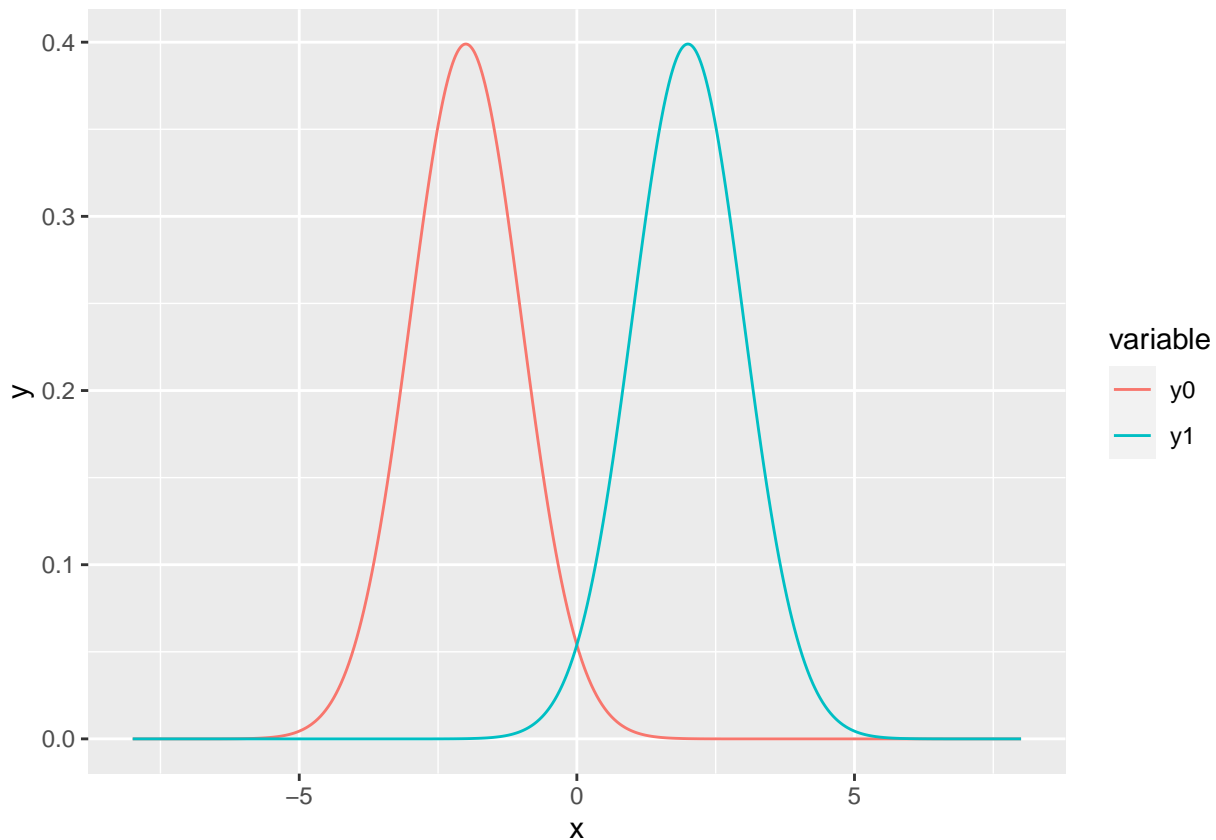


Figure 1: Two normal variates with different means and same variance. Note this figure is a scalable vector graphic — from what I understand, this is better from an accessibility standpoint.

The figure with caption caption is created by typing the code directly into the markdown document:

```
```{r normals-same-var, echo=TRUE, fig.cap="Two normal variates with different means and same variance."
  x <- seq(-8, 8, length=1000)
  y0 <- dnorm(x, -2, 1)
  y1 <- dnorm(x, 2, 1)
  df <- tibble(x, y0, y1)
  df <- melt(df, id.var = "x", value.name = "y")
  ggplot(data = df, aes(x = x, color = variable)) + geom_line(aes(y=y))
}```
```