Below is a guide that goes through all the project components. These are not split according to what unit you are doing. But, briefly, for research methods (semester 1) you need to do a feasibility study, which includes a literature review; and the rest of the project involves designing and making the product, as well as testing and evaluating it (semester 2) and producing a report about that.

The below is a guide to explain what the overall project will look like (semester 1 and 2 put together), but mainly focuses upon the feasibility study and the literature review. The components include:

* A Feasibility Study - includes a literature review/survey
* A Dissertation - documentation of design, implementation, testing and evaluation etc (more detail below); as well as the showcase (a demo of your product)
* A Product - the system you are going to develop.

Although the quality of the product often dictates the overall grade of the project, the project will not get a good overall grade if the report is not also of high quality; this is because the report is worth more marks.

As supervisors, our job is to ensure that you get working on this, that you put in work regularly and to check what you have written etc. Your job is to do the project. The final year is normally very busy and about half of students find themselves short of time towards the end of their projects, so it is good to make an early start on the project if you can.

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Product  
  
This is the project brief:

**Project Title:**

Carbon Footprint Application

**Level:**

L6

**Description:**

This project will provide a mobile or web application that can be used to help people log, visualize, understand, and take steps to reduce their carbon footprint. For this app/web app people should be able to register, login, and answer various questions to calculate their carbon footprint. Other features would include enabling users to visualize their carbon footprint compared to averages for their country and the world; as well as suggesting actions to reduce carbon footprint. It could be made just for use in the UK, or it would be possible to build in adaptation of units for other countries (users are likely to wish to input the cost of various carbon producing activities in their local currency).

There are many ways to calculate a carbon footprint. It can be done simply or using a more complex calculating algorithm (see references below). For more complex calculations students would need to look at areas such as: energy, transport, air transport, food, water/wastewater, recycling, and good purchases and find the best way to calculate footprints in each of these categories. Various things will alter depending upon location.

It is likely that you will want to store each user’s carbon use figures in a database and use the data held here to: calculate carbon footprint figures, produce visualisations, and suggest any actions to reduce carbon footprint (suggestions would only be relevant if certain actions have not already been taken); allowing such figures to be updated by re-takes of a carbon footprint quiz.

(Dealing with suggested actions is quite complex and you may not cover this area, as there is plenty to this project without that. But, if you do wish to cover suggested actions, will you hold suggestions separately from carbon calc? How will they interact with the carbon footprint quiz/calculation, if at all?)

**Requirements:**

* Systems modelling and creation skills
* Programming skills

**References:**

* Requirements gathering:
  + Kendall K., and Kendall J.: Systems Analysis and Design. 10th ed. eText ISBN: 9780134817361, 0134817362, 2019.
* Context:
  + <https://www.theguardian.com/environment/2023/nov/20/revealed-huge-climate-impact-of-the-middle-classes-carbon-divide>
* Example app with action suggestions:
  + <https://www.earthhero.org/en_GB/>
* Calculating basic carbon footprint:
  + <https://justenergy.com/blog/how-to-calculate-your-carbon-footprint/>
* Carbon footprint estimation (more complex):
  + Mulrow, J., Machaj, K., Deanes, J., & Derrible, S. (2019). The state of carbon footprint calculators: An evaluation of calculator design and user interaction features. *Sustainable Production and Consumption*, *18*, 33-40.
    - Note that this paper says the 3 best carbon calculators are:
      * <https://www.carbonindependent.org/index_v3.html>
        + lists methodology for each sector
      * <https://coolclimate.berkeley.edu/calculator>
      * <https://www.carbonfootprint.com/calculator.aspx>
  + Pandey, D., Agrawal, M. & Pandey, J.S. Carbon footprint: current methods of estimation. *Environ Monit Assess* **178**, 135–160 (2011). <https://doi.org/10.1007/s10661-010-1678-y>
* Carbon footprint application use research:
  + Biørn-Hansen, A., Katzeff, C., & Eriksson, E. (2022, October). Exploring the Use of a Carbon Footprint Calculator Challenging Everyday Habits. In *Nordic Human-Computer Interaction Conference* (pp. 1-10).

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This project involves creating either a web app or a mobile app.

A web app involves creating a database that is controlled through a web front end. This means creating a database using MYSQL or similar, creating a web front end, and using server side scripts to get the two to communicate with one another (you will need to decide what web frameworks/scripting language you will use).

When thinking about this you should do some research into web frameworks. There are LOTS of possibilities. But, if you would like to get a first then you should use an object orientated language to develop in. Again, there are various possibilities here. E.g.,

* PHP here you can use OO style programming in it so it is possible to get a first with this; various frameworks are available such as Laravel to aid development – modern systems will often make use of such frameworks and you would be advised to consider using them; you can even make the investigation of frameworks a major part of your project, i.e. you could research to compare 2-3 different frameworks before deciding upon using one of them to complete the product
* .NET framework (which you would normally program in C#, and use MYSQL for the DB)
* MEAN stack (using MongoBD - a NOSQL (non-relational) database), MERN (MongoDB, Express.js, React.js, Node.js), SERN (SQL, Express.js, React.js, Node.js), etc.
* or you could decide to create a mobile app for part/all of the solution etc.

If you want to make a mobile app, that generally involves a database (MySQL/SQLite) back-end. Typical software that might be used would be React Native, Phone Gap, Xamarin, Ionic or Flutter. You might also want to use an IDE such as Atom or VS Code. As regards your product, normally you would use the model view controller (MVC) architectural pattern, and to organise your code this way.

To help you decide on these areas you need to write a literature review, where you can discuss what's available and the alternatives.

Dissertation  
  
Consists of Feasibility Study (FS), Literature Review (including a current systems analysis), Design, Implementation, Evaluation, Conclusion. I've said something about the first two below. (Note the lit review is part of the FS, but they have been dealt with separately here.)  
  
Feasibility Study (FS)

Once your project proposal has been accepted you should start on the feasibility study. This lays out roughly what you are going to do in your project. It contains:

1. a cover sheet giving, name, degree and project title
2. a list of the course specific learning objectives (this can be got from your course documentation)
3. aims and objectives of the project
4. literature review giving the academic and technical background of your topic
5. a description of the evaluation techniques you intend to use (e.g., user testing using systems usability scale)
6. a list of required resources (data, software and hardware required)
7. a list of potential problems (risks relating to non-completion of the project)
8. a consideration of research ethics in the project
9. a list of references to suitable publications you have used
10. a time plan for completing each stage of the project​

When covering the aims and objectives, the project will have one main aim, the software product; but it is also helpful to list the report as an aim. So, for this project the aims will be:

* Completing a software product that can be used to help improve a person’s physical health through exercise planning, logging and progress tracking.
* Completion of a report documenting the process.

When covering objectives, it is helpful to cover both product and report objectives. Product objectives will just be the main functional and non-functional requirements for the product; you can refine and prioritise these later. Report objectives can be written in a way that summarises what is required for each chapter of your report. Doing this will help guide you (and help you produce your time plan). Yours should cover something like:

* Literature review – one bullet point/sentence on each area you will cover
* Analysis – review currently existing work and come up with functional and non-functional requirements for your own work
* Design document for game/experiment – give details of the diagrams you intend to include here (see below)
* Implementation and testing of the product – give details of the basic functions of the product you will include (you can prioritise these later)
* Evaluation and conclusion – here you will try to get some users (say 5) to use your software and, e.g., evaluate how easy it was to use; you will also evaluate the product according to your original aims and objectives (which you will finalise properly in analysis section); finally, you will evaluate your own performance as regards project management etc.

This last bullet can be brief as you also then need to give details of your evaluation (as in 5, above).

Literature review.  
  
One part of your FS is a lit review. This is a substantial piece of work in its own right and is important for two reasons. First, it is a record of your research into any tools/techniques /current practice you'll need to be aware of to complete the project, it will be useful to you by making you approach and record your research in an ordered way. Second, it is part of your assessment for Research Methods. The literature review generally sets the tone for the entire project: if you do it well, you'll be more likely to complete a good project report.

Your lit review should cover:

* Some background about mobile applications and the project in general.
* Some background about the area of carbon footprint calculations, the kind of people who would find an application like this useful.
* An investigation into technical aspects of your project (frameworks/language(s)/database/etc. you may use). Here you'll eventually be expected to justify the choices you make so it's good to consider a few alternative options. Justification happens in the physical design section. So, not yet. Just do a review of the options for now.
* Normally you would use the model view controller (MVC) design pattern, i.e. organise your code this way​. You should explain what MVC is somewhere (half a page perhaps with a diagram).
* A BRIEF look at usability issues (e.g. navigation/layout/colour/ heuristics/ accessibility): this should help your design.
* A VERY SHORT section (1-2 pages at most) on development methodologies (e.g. traditional waterfall vs a more agile method); so that you know about how to approach development.
* Something covering trustworthiness and ethics of the software. This is mainly robustness/security of software. For security, you will need to consider hash, and salt of passwords; encryption; protection from SQL injection and cross site scripting. Accessibility should also be covered (but you should be do that when you look at usability).
* An investigation of similar products, (i.e. those covering the kind of tasks that might be carried out by the product you've decided to create - if they exist), and a comparison of the features offered by each. From this you can derive a requirements specification. (Note that this last part can be part of an analysis chapter, that comes before your design chapter, and does not necessarily need to appear in your literature review.)

Make sure you reference it as you go along (or you'll forget where the refs came from), in Harvard format.

After the FS and literature review are complete, you produce a design document (e.g. perhaps including Use Case Diagram, Use Case Specs, ERD, Screen designs, Web site navigation map), and then implement and make a test and evaluation plan (we'll come to the details of them as we get there).

That should be more than enough information for now. Please contact the Computation Systems team if you have any questions or would like any further advice.