

Integrated Mechatronic Project

Executive Specification

“To design, build, demonstrate and document a wire-following autonomous vehicle that will elegantly follow a course faster than all other competitors. To demonstrate to an employer that candidates are successfully able to bridge-the-gap between the underlying science and academic content of all second year modules and a practical task. To play, have fun, take risks, impress: get-on-with-it.”

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Why?

- The integrated mechatronic project is designed to:
- Maintain the very high employability rating of our students by giving them the ability to discuss technical detail with an employer at an interview.
- To maintain the social bonding and discipline ownership fostered by the Coniston trip.
- To introduce a demanding technical task where students will be required to teach themselves a wide range of practical and academic skills without these being covered within lectures.
- To provide training in the conduct and technical presentation of a final year project type activity.

Digital Systems and Embedded Computing
PRA (20)
Finite State Machines and Programming Microprocessors in C

Analogue Electronics, Devices and Electromagnetism
ET & MG (20)

Electrical Power and Control
TJJ & ET (20)

Microprocessors & C Programming.

Wire guided electromagnetism and analogue inputs.

Power supply, DC motors and control.

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Wire-following vehicle:
Practical skills.
Coniston:
Social bonding and group problem solving.



Successful Innovation

Rigorous mathematical underpinnings.

Rigorous software design approach.

Signal extraction.

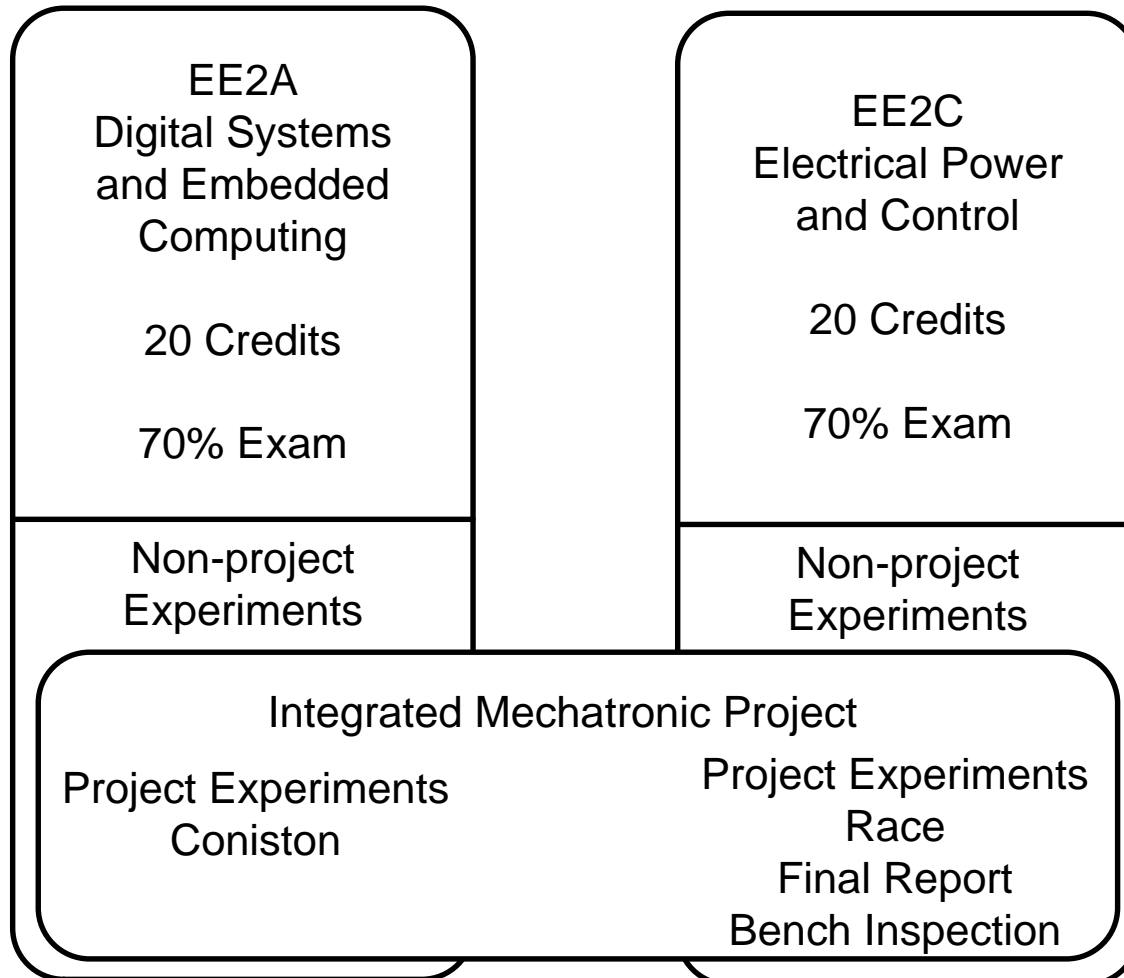
Engineering Mathematics
(20)

Software and Systems Engineering
NC (10)

Communication Systems
MA (10)

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Marks are returned into EE2A and EE2C modules



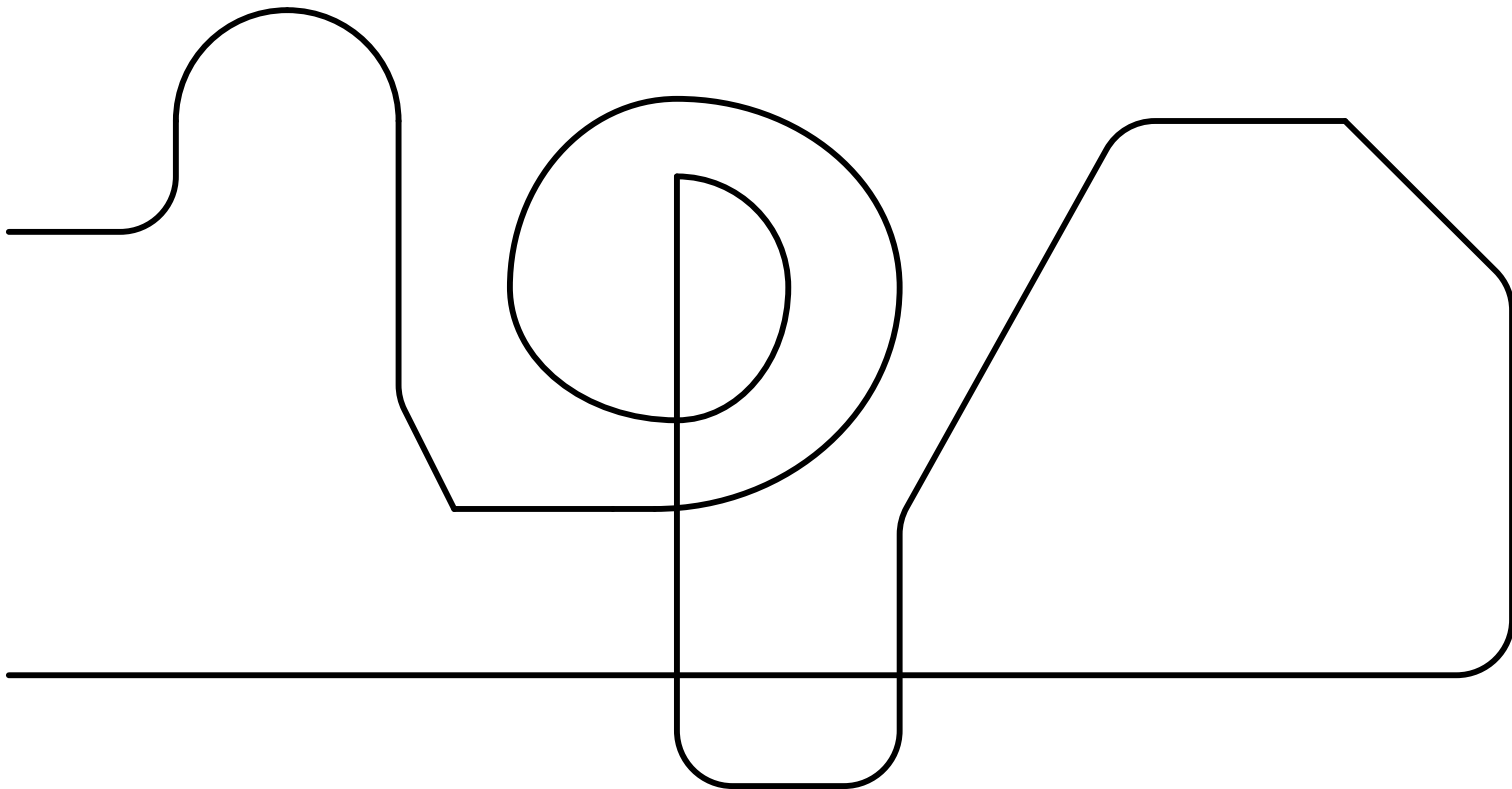
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Technical Detail

- The project must be conducted in a safe manner – this implies that no harm must come to yourself, others, or the reputation of the University of Birmingham.
- The vehicle must elegantly track a wire carrying a peak current of 10 mA of a dual-tone (1 kHz and 2 kHz sinusoidal signal) mounted up to 30 mm below the race track. The wire depth may vary such that the amplitude may change over a 10:1 ratio.
- If the wire crosses itself, it will always cross at ninety degrees.
- Power will be supplied via a 3-phase umbilical in the voltage range 15 – 50 Volts and 2 Amps. The power supply frequency will be chosen such that the harmonics do not coincide with the navigation wire frequencies.
- **Safety: At no point during the project may voltages greater than 20 V be exposed.** This will be policed by staff attempting to short connections with a 3 mm diameter screwdriver blade (box up your power supplies robustly).

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You will not know the course in advance – but it may be sneaky!



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Finer Detail

- Students should assemble themselves into self-selecting groups of three by half way through Week 3. These groups will be your EE2A laboratory groups throughout the year.
- Students should merge with a second group of three, to form an integrated mechatronic project group. This should be completed by the start of Week 5.
- You will attend Coniston in your group of six. You will be allowed to express a preference for the Monday-to-Wednesday, or Wednesday-to-Friday session.
- All students in a group will *normally* be awarded the same mark.
- In the Final Report, an Appendix will be included with one half-page per student. This must include a profile picture and a statement 'I did this'. Obviously, your group members may disagree with your claims!
- An interim Bench Inspection will take place on Thursday/Friday, Week 11, Autumn term. This is a formative, uncredited, internal progression requirement. Failure of a student to attend or contribute to this event will remove the ability to obtain the 10% associated with the final race.
- Failure of a student to attend or contribute to the final race will remove the ability to obtain all the marks associated with the integrated mechatronic project.

Coniston – The Raymond Priestly Centre

More details will be announced nearer the date (Week 7).

The whole 2nd year will go to the University owned Raymond Priestley Centre at Lake Coniston in the Lake District. In exceptional circumstances, this activity is replaced by five days of 0900 – 1700 assessed laboratory activity.

The outdoor pursuits centre typically covers:

- Group problem solving
- Social bonding
- Walking
- Climbing
- Mountain biking
- Gorge scrambling
- Sailing
- Canoeing
- Pub visit
- Self-reflection



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Related activities this week

- EE2A lectures at 1100 and 1200. More technical bits will be released ...
- Technical Speed Dating Session 1 – this afternoon (Monday) at 1400 in lab 216
- Technical Speed Dating Session 2 – tomorrow afternoon (Tuesday) at 1400 in lab 216
- Students should make every effort to get to know one another over the next few days.