Wolfson Individual Projects

Gateway 1

IMPORTANT - Use Adobe Acrobat Reader or Acrobat DC Pro to complete this form. Do not edit it in a web browser or any other non-Adobe PDF software including macOS Preview.

Purpose of the gateway 1 meeting

This Gateway 1 form is a record of the initial phase of an individual project. Please refer to the guidance outlined in the Projects Handbook. All of the sections should be completed as they provide important information for numerous colleagues. In particular where workshops are required failure to properly communicate requirements could result in delays to, or worse non-fulfillment of, your technical support requirements.

- After initial project discussions between the supervisor and student, the student will provisionally fill in this form.
- This should be be emailed to the supervisor prior to the Gateway 1 meeting.
- The form will be finalised during the Gateway 1 meeting jointly between the supervisor and student.
- The supervisor will validate the form and email it to the projects team.
- The project details will be checked to ensure compliance with the respective individual project modules intended learning outcomes. The team will be in touch ONLY if changes are needed.

Student Details

Student Name	Ben Bolton	Preferred given name and surname
Student ID	F223612	University ID including prefix letter
Supervisor Name	Toby Williams	Select your supervisor name from the list
Notes		Please note any essential details not covered

Project Definition

A brief specification of the project as agreed between supervisor and student. Click on the boxes for more information.

Project Title	Control system to balance a robot on a moving sphere.
Description	Marginally stable pendulums are not an uncommon occurrence in mobile robotic applications. This project is to modify and program an existing robot to balance on a sphere, including the control system required for it to remain stable despite instabilities and disturbances. The project will involve electronic design, software programming, and control.
Aim	Design and implement a control system to keep a robot balanced on top of a sphere.

Objectives	1) Conduct a state-of-the-art study and literature review, of the existing robot hardware and alternative balancing robot applications. (04/11/24). 2) Design and implement the basic control system to operate the robotic rig on a flat surface to define control structure. (02/12/24). 3) Research and develop a control theory for implementation into the balancing robot. (03/02/25). 4) Implementation of the control theory into the robotic rig to achieve a stable system
Deliverables	1) Presentation (09/12/24) 2) Annotated and commented code/software for operation of the robot (24/03/25) 3) A ball balancing robot (24/03/25) 4) Dissertation (05/05/25)

Project Elements

Produce an initial rough work breakdown structure for the project's major elements entering the approximate amount of percentage time you might need to spend on this element. Use this as a guide for a preliminary Gantt chart or similar planning tool.

Background	5%	Motivation, context, and potential impacts. Extensive review of previous work and approaches including methodology and methods.
Experiment	30%	Conduct initial experimental work to collect data to support or test initial research and/or test stages of designed elements.
Design	10%	Based on initial research and/or experiment, design of required elements.
Construction	0%	Construction where required of project elements
Software/Simulation	30%	Write code or create simulations using any software that is required.
Theory/Analysis	15%	Development of theory, models and analytical approaches
Miscellaneous	0%	Miscellaneous items. Please provide full details below of any major work components not covered
Details:		
Assessments	10%	Write reports, produce posters and presentations

Workshops and Facilities (Project Handbook Section 6)

40 hours of access to technical ‘consultation’ across all of the workshops is provided to all students, but only 30 of these hours can be used in Semester 2. Self-directed work in workshops is outside of this limitation. Indicate which facilities you need, and detail what will be built/done for you. Students must book meetings with the relevant workshop staff before END OF WEEK 7 to clarify plans and expectations. All facilities have risk assessments and students MUST follow all procedures and guidance for health and safety including the use of relevant PPE.

Mechanical services workshop	Not Required	Details	
Electronics services workshop	Required	Details	Motor driver boards/PCB's
Engineering applications workshop	Not Required	Details	
Mechatronics lab	Required	Details	Advice and loaning of equipment.
Materials	Not Required	Details	
Metrology	Not Required	Details	
Project Labs	Not Required	Details	
Optical Engineering and Laser	Not Required	Details	
Additive manufacturing/3D Printing	Not Required	Details	
Sport Technology	Not Required	Details	
Other Workshops	Not Required	Details	
Research Facilities	Not Required	Details	

Students with industrial sponsorship or employers may use off-campus research or other facilities. Please indicate below if you will use external facilities. Provide details for the arrangements for risk assessment. Supervisors must be made aware of this and satisfied appropriate procedures are in place.

Industrial Facilities	Not Required	Details	
Industrial Risk			

Ethics - Project Handbook Section 4.2

There are two aspects of ethical consideration, 1. ethical priniciples for engineers and 2. the University Ethical Policy framework, both covered below.

Statement of Ethical Principles for Professional Engineers from the Engineering Council - discuss these principles with your supervisor.

Statement of Ethical Principles	read

Loughborough University Ethical Policy Framework. The following checklist is designed to ascertain whether your project involves any of the given ethical concerns. If you answer 'Yes' to any concern discuss the next steps with your supervisor. Further guidance is in the Project Handbook. If required make the relevant application via Loughborough Ethics ONline (LEON) (www.leon.lboro.ac.uk).

Involves Secondary Data	No	Human secondary data requires an ethical review based on the 'Guidance Note: Studies Using Secondary or Pre-Existing Data' If Yes complete an ethics application via LEON
Involves Human Participants	No	If Yes, follow the Code of Practice on Investigations involving Human Participants. Complete an ethics application via LEON.
Involves Human Tissues	No	If Yes, follow guidance from the Human Tissue Act Licence Sub-Committee. If necessary, complete an ethics application via LEON
Involves Military Applications	No	If Yes, follow guidance in relevant Appendix of the Ethical Policy Framework
Involves Animals or Tissue	No	If Yes, complete an ethics application via LEON
Involves Security Material	No	Accessing security sensitive material (e.g. online terrorist content or material). If Yes complete an ethics application via LEON.
Involves other Ethical Aspects	No	There is possible conflict with ethical principles partially or wholly outside the above. If yes you will be contacted by the Projects Team.

I have discussed the above checklist with my supervisor and, if appropriate, followed the relevant guidance and will make/have made the relevant application.

Student Ethics Confirmation	Ben Bolton	Enter your name

I have discussed the above checklist with my supervisee and, if appropriate, requested that they follow the relevant guidance / make the relevant application.

Supervisor Ethics Confirmation	Toby Williams	Enter your name

Risk assessments (Project Handbook Section 4.1)

There are two aspects of risk for consideration in the project covered by the two sections below.

Project Delivery Risks
These are events which may hinder the progress of the project and the delivery of one or more (or all) intended outcomes. Provide a list of potential delivery risks and their mitigations.

Delivery Risks and mitigations	- A necessary component does not arrive in time to meet deadlines. - Order parts as soon as possible to account for delays. - Components on the robot stop working - Be careful with handling of the physical robot to mitigate damages and if needed, order replacement parts quickly to reduce further delays. Scope of project would be redefined to be focused on the control theory and simulation.

Operational Risks
These have health and safety implications. Any project that requires practical work will require a formal risk assessment (see Learn for details). List all practical activities and their risk mitigation here.

Operational Risks and mitigations	- The robot falls off the sphere and injures someone nearby - Wear hard capped shoes to protect feet and handle robot with care - The robot moves unpredictably in a dangerous manner - Have an emergency stop button ready to cut power to the robot and only operate in a controlled region.

Wolfson workshops or general computer-based work are covered by existing risk assessments - students must agree to abide by those. Indicate here if a bespoke H&S risk assessment is required for any aspect of this project

Assessment required	Yes

Logbook & Purchasing

Students must follow the process on Learn for making project purchases. PORFs are to be completed by the student, then checked by the supervisor who forwards them to shared.ws.finance@lboro.ac.uk. They are not to be sent to WS Projects or Admin. The student must keep a logbook for their project work, which is assessed at the end of the year by the supervisor. OneNote is suggested for this to enable remote working and sharing between the student and supervisor.

Purchasing Process	Read	Please check the student understands the purchasing processs
Format of the logbook	Online	Indicate the chosen format for the logbook

Students should complete as best as they can up to here prior to their Gateway 1 meeting with their supervisor. Save the PDF form and send it as an email attachment (not a link) directly to your supervisor in good time for your agreed meeting.

Do not use the create email or validate button below since this is for use by the supervisor when the form is complete.

Complete at Gateway Meeting (by Supervisor)

Please give feedback on anything the student needs to be aware of, to change or to improve on.
Below, please select subject areas that describe the project. This will be used to allocate a lead examiner.

Progress to date	Student has conducted preliminary research into existing systems and basic control theories.	Brief note on the progress to date
Agreed actions	Read existing documentation on the robotic rig. Become familiar with the electrical wiring and main component parts. Write a basic Arduino code to create motion and demonstrate understanding of the above tasks.	Short term actions
Subject area 1	Control system design and modelling	Project's primary subject area
Subject area 2	Mechatronics and Robotics	Project's secondary subject area
Subject area 3	Programming and software development	Project's tirtiary subject area

Completion

Supervisors must submit this form to the Projects Team following the steps below:
1. Enter your name as submitter to confirm your submission
2. Click the 'Validate the form' button to check the form has been completed correctly. If there are any issues, please correct them.
3. Save a copy of the document for your records.
4. Open your device's email application, e.g. Microsoft Outlook.
5. Click the 'Create Email' button. This should create an email with this form attached.
6. Click send to email the Projects Team the form (Acrobat will NOT send it automatically!)
7. Ensure the student also gets a copy for their records.

Do NOT copy in Projects Team staff or WSSupport. You will receive an acknowledgement confirming receipt of an attachment. You can send the form more than once but this will overwrite earlier submissions. In the event of failure

Submitter Name	Toby Williams	Enter the submitter's name
supervisor	Submitter	
Validate the form	Check you have correctly entered all the required data.	
Create Email	Automatically create an email with the form attached	

TROUBLE SHOOTING: If you cannot get your Acrobat software to create an email with an attachment the most common cause is you have used a browser PDF add-in, Preview on a mac or webmail. If you can't resolve the issue, save the document (you may have to choose 'save as') and send the form as an attachment using your Loughborough University email account to ws-individual-projects@mailbox.lboro.ac.uk using the email subject below.

Email Subject	24WSIP gateway1 F223612 2024-10-18-152945 supervisor V-20241008-1805 (PowerAutomate-2023)

Process Comments and Feedback - Optional

Please use this space to communicate any comments or contructive feedback for the project team you may have about any of the following:

► The use of this form.
► The guidance materials.
► The Learn page and handbook for projects.
► Is there anything specific we can do to improve the system?

Comments	

validation status success validated on 2024-10-18-1 form name gateway1 form Version V-20241008-1805 24WSIP