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Robotics Team Design Project M (ENG5325): Cyberphysical RoboCup Soccer Teams

Dr Euan McGookin



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Staff

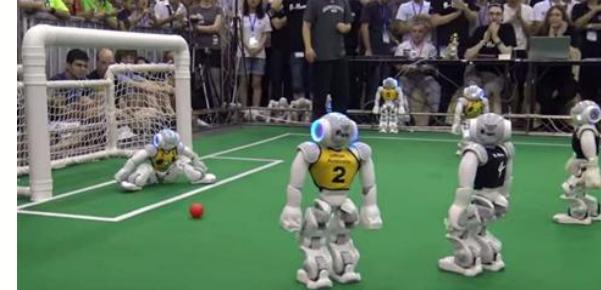
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RoboCup

RoboCup is an international series of competitions centred around robotics and robotic systems. Some examples of the competitions are given below:

- Soccer
- Humanoid Soccer
- Rescue Robotics
- Domestic Robots
- Simulation



Project Task

In teams you design and test the behavioural algorithms for 2 competing robot soccer teams and the playing environment.

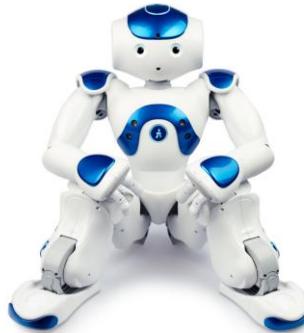
This will involve a two-stage process

1. Develop a simulation of your teams and their playing environment, and use this simulation to design and develop the behavioural algorithms for your team members
2. Test your behavioural algorithms on hardware (humanoid robots)

For this project we will follow the RoboCup Humanoid Kidsize Team rules

RoboCup Humanoid Kidsize Team

- <https://humanoid.robocup.org/>
- <https://robocup.org/league/29>
- Pitch Dimensions are 9m by 6m
- 4 Robots in Teams
- Strikers, defenders and goalkeeper



- NAO6 humanoid robot to be used
- Dimensions 574x 311x 275 mm

Stage 1: Simulation Task

In the initial stage of the project your team will create a **simulation of 2 competing robot soccer teams** and the playing environment.

For this project you are advised to simulate the robot soccer teams using Matlab software and associated packages (e.g. Simulink, Stateflow), or ROS.

Other software packages can be used but this has to be agreed with your supervisor.

This will allow **behavioural algorithms** to be developed and implemented for the different team members.

As well as developing simulated robots and implementing their behavioural algorithms, there should some visualisation of the pitch and players

Stage 2: Hardware Task

Once your team has developed the behavioural algorithms for the constituent members of your teams, you will have to implement these algorithms on hardware teams.

Your team will only be able to progress on to this second stage if the first stage is complete.

Your team will have to develop test schedules in order to request access to the hardware from your supervisor.

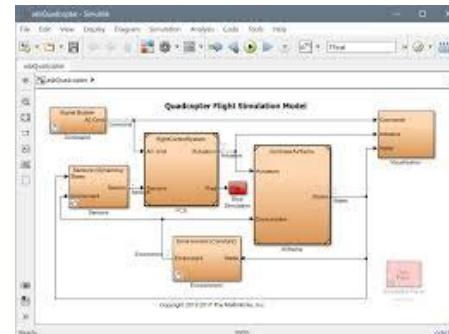
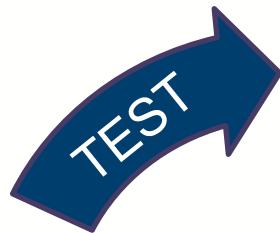
The NAO6 robots will be available for use in the second semester in the Robotics Teaching Lab (Room 401 in the Rankine Building).

Access to this facility will be arranged through your supervisor.



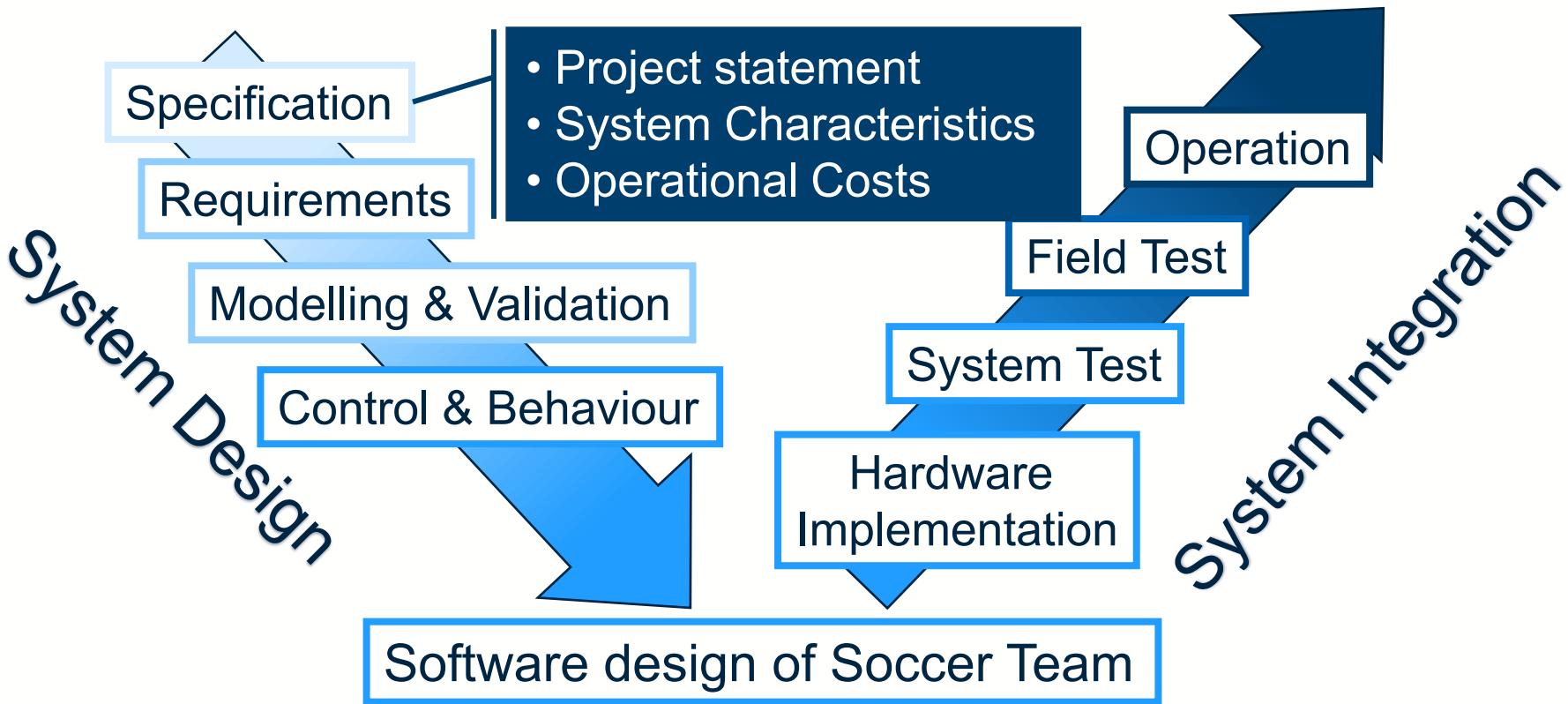
Project Design Task

In teams you will design a simulated RoboCup Humanoid Soccer Team to play within a simulated environment.



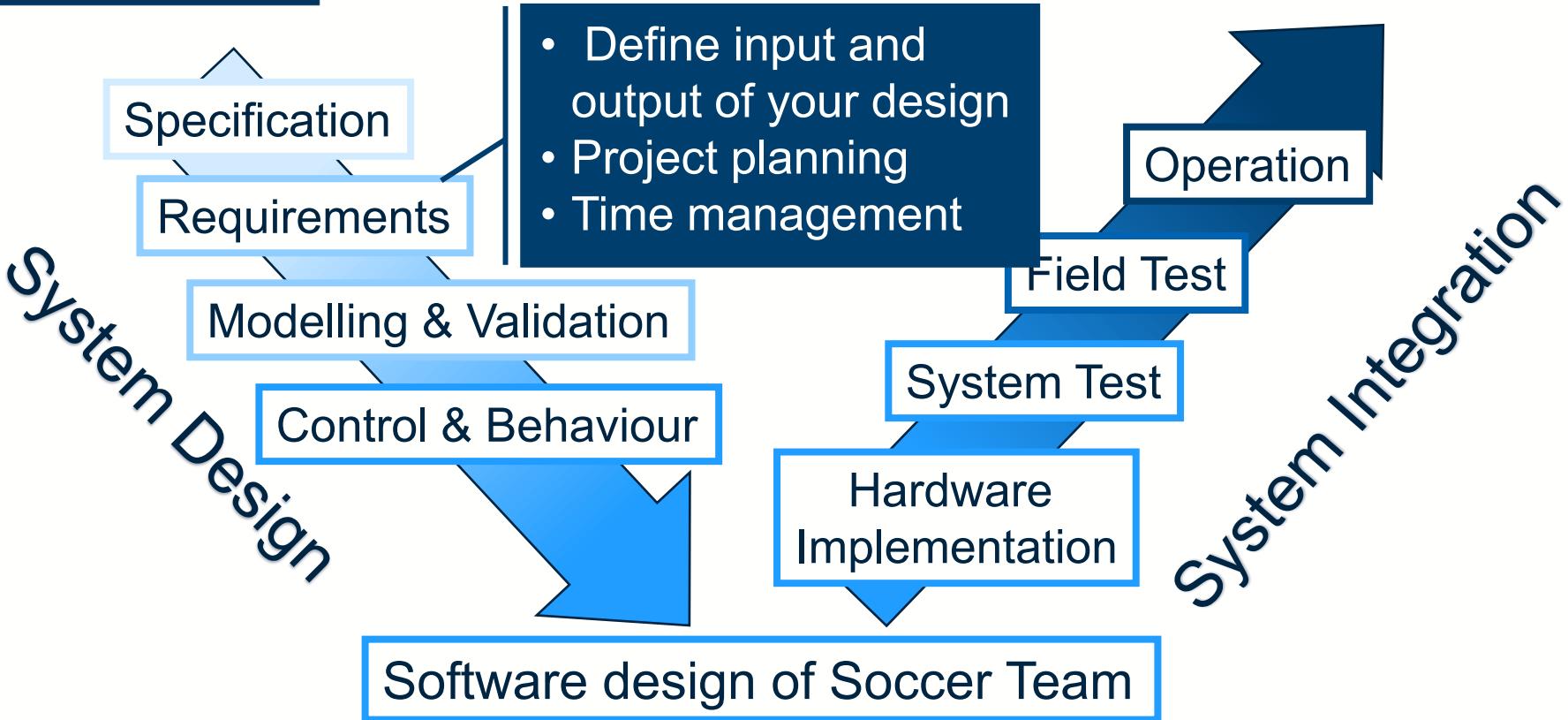


V Model Approach



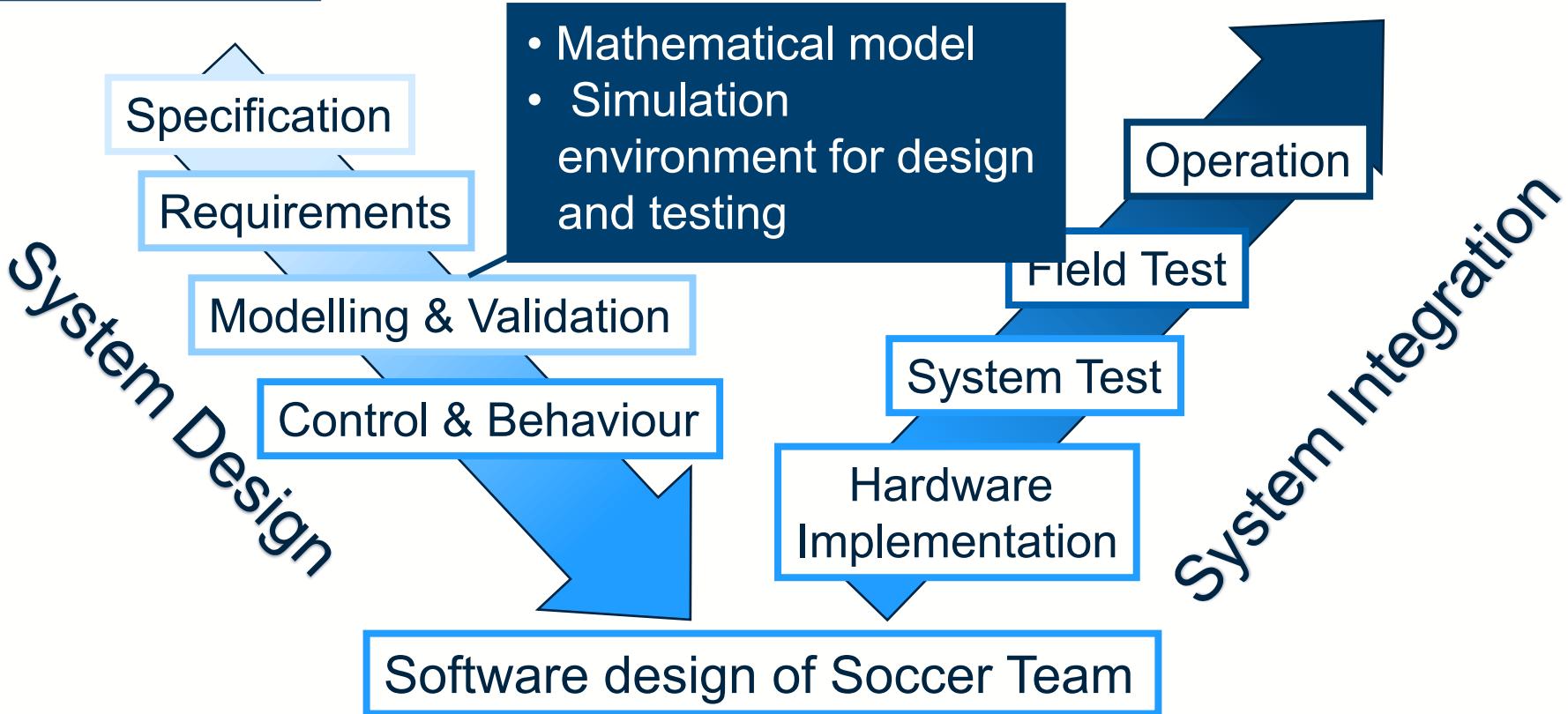


V Model Approach



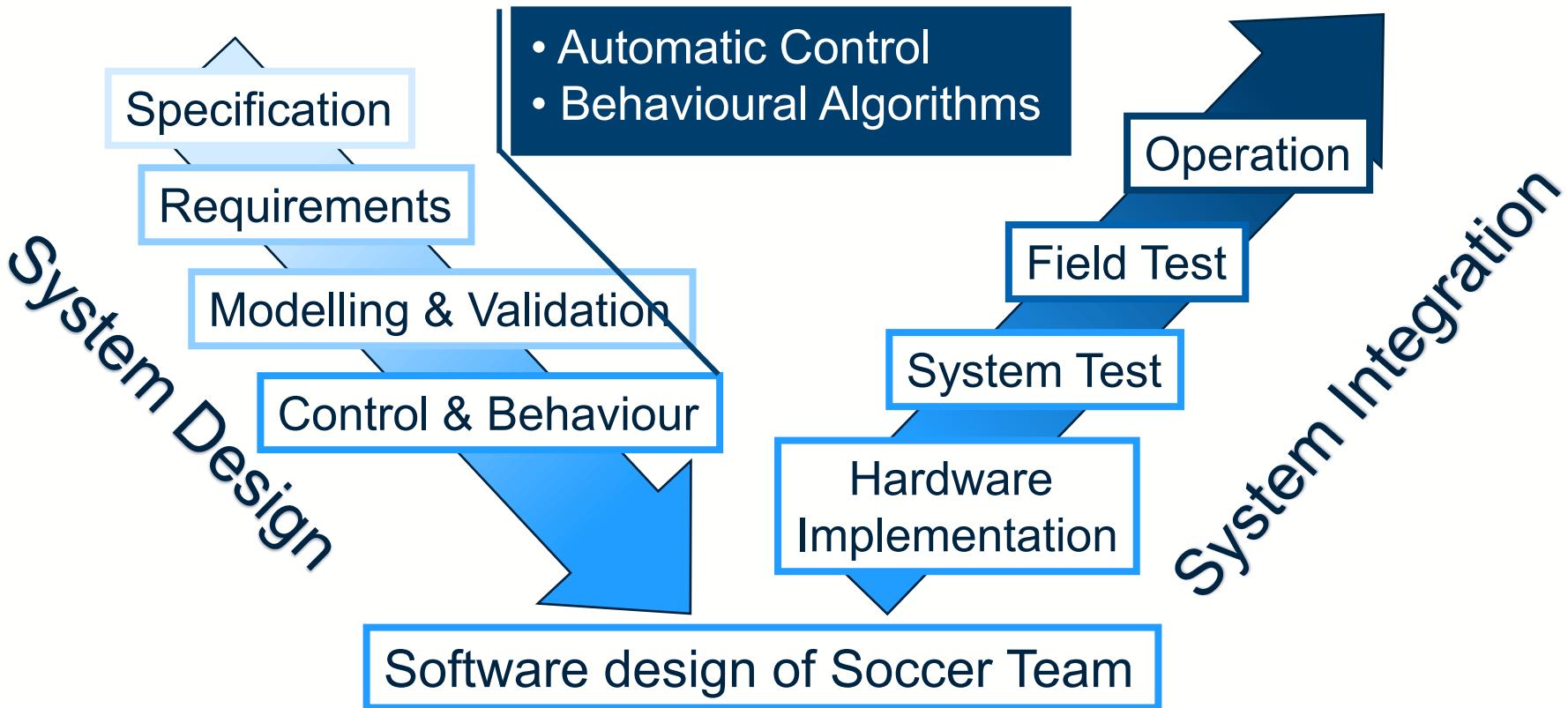


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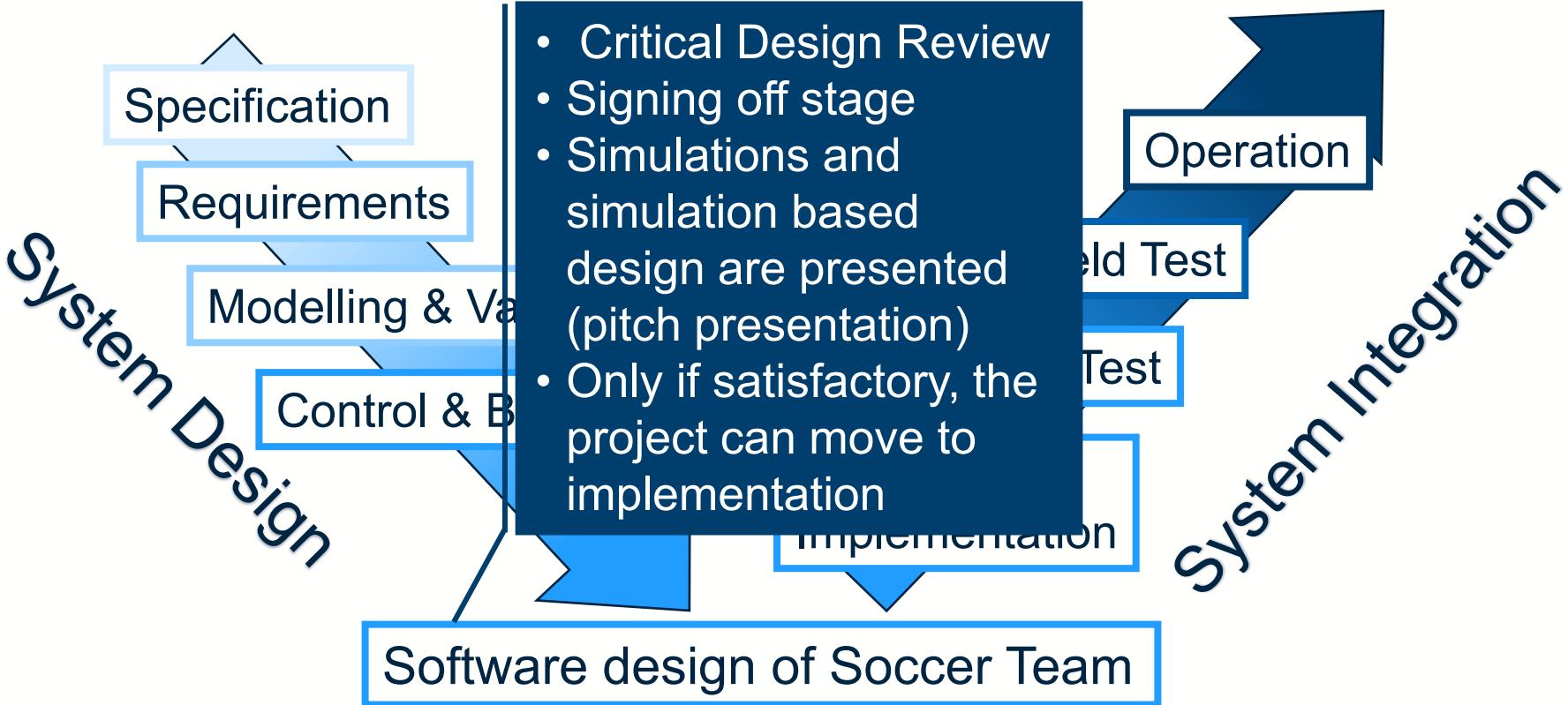


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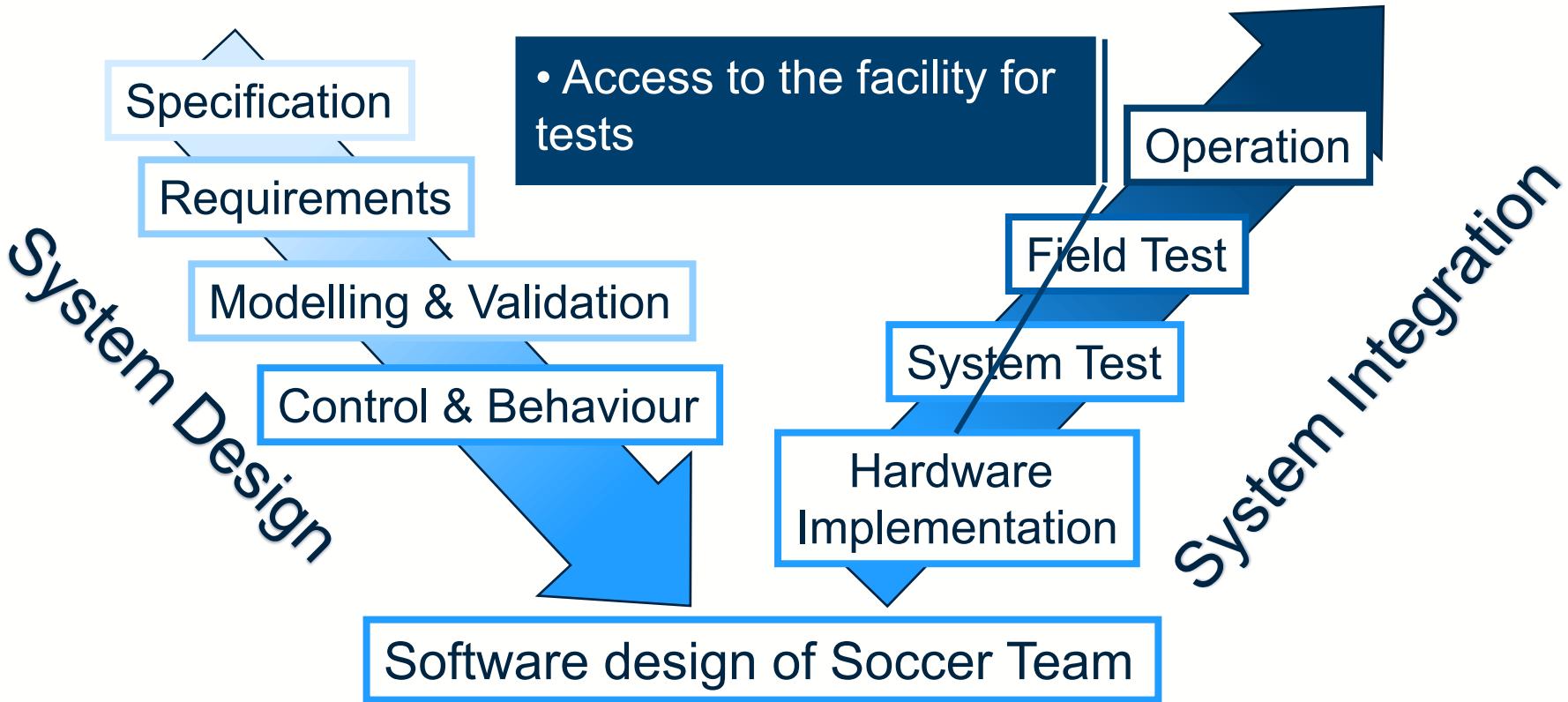


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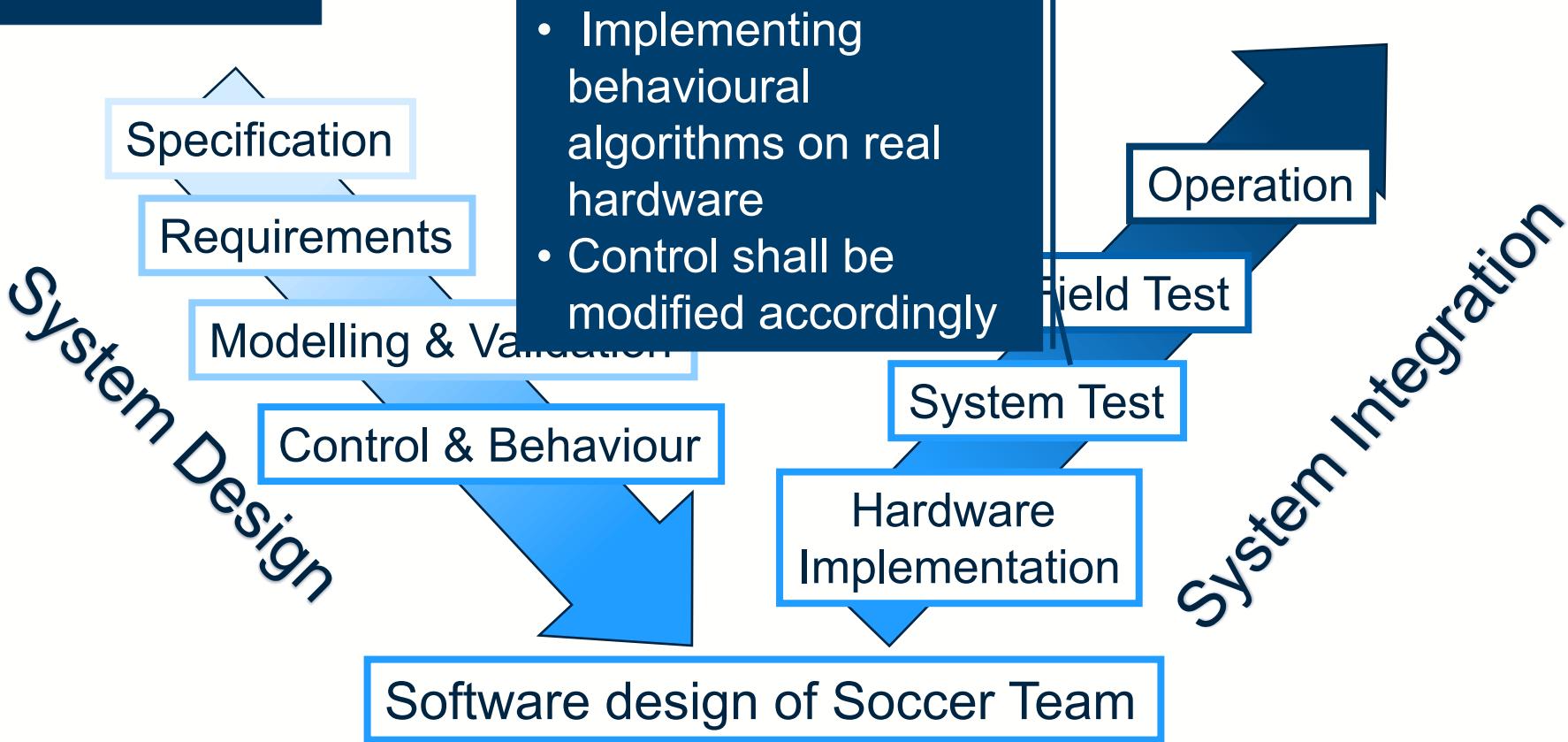




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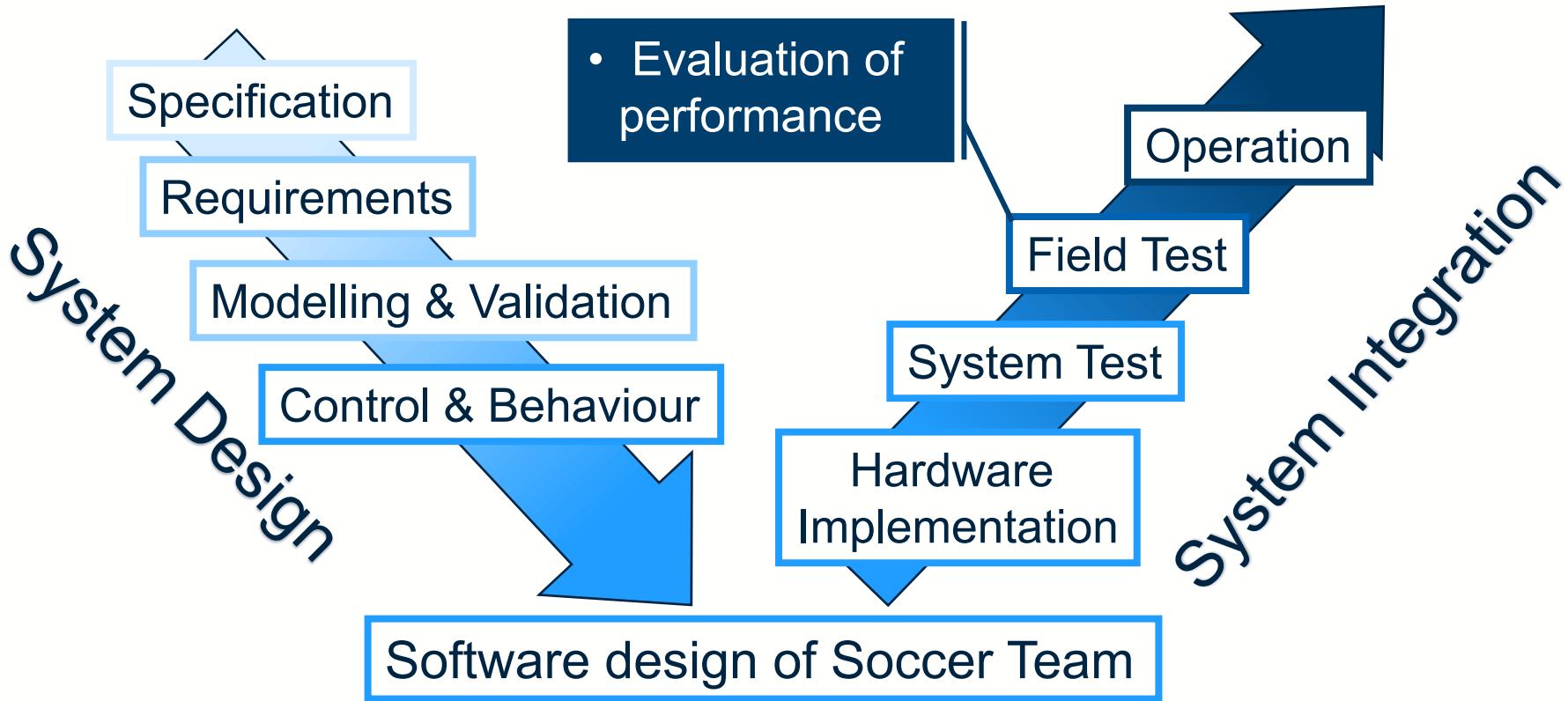


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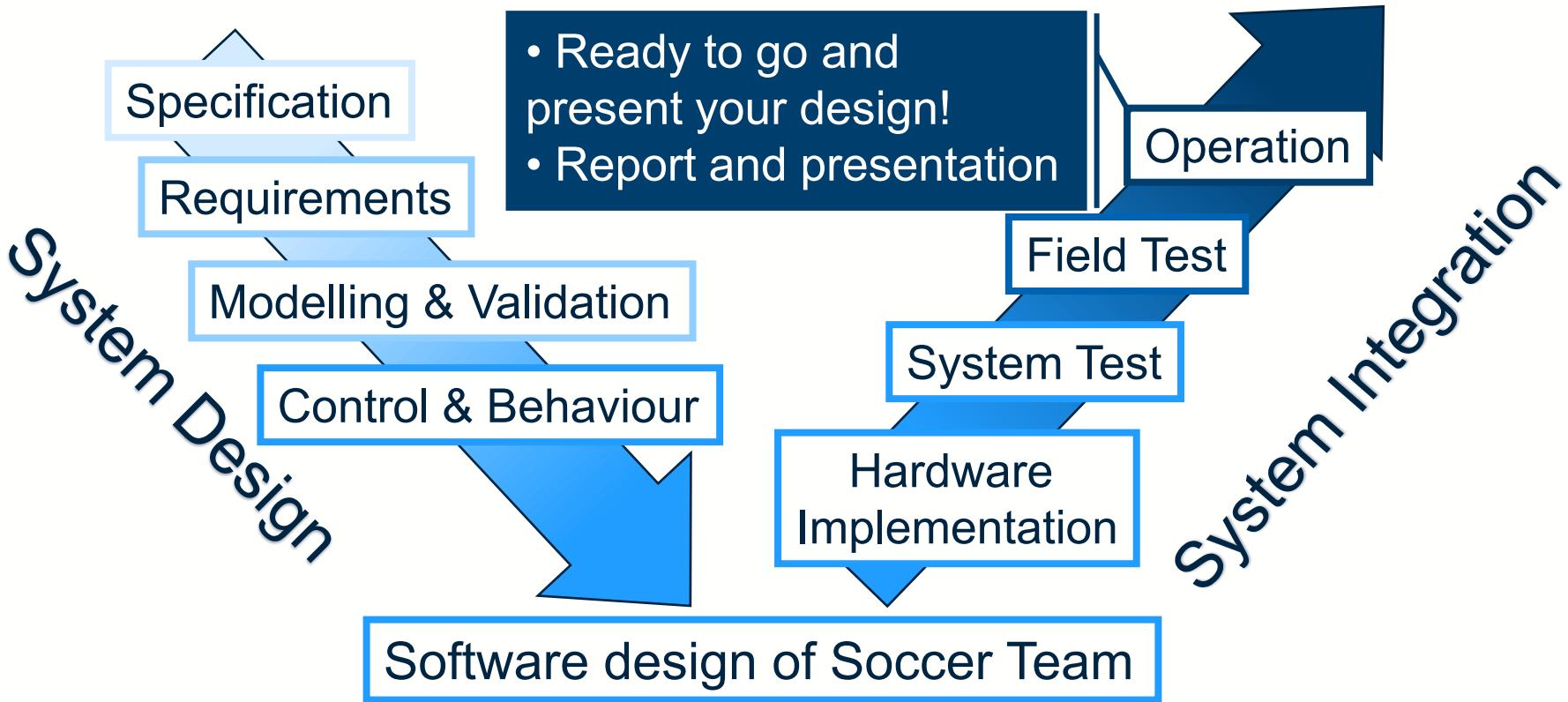


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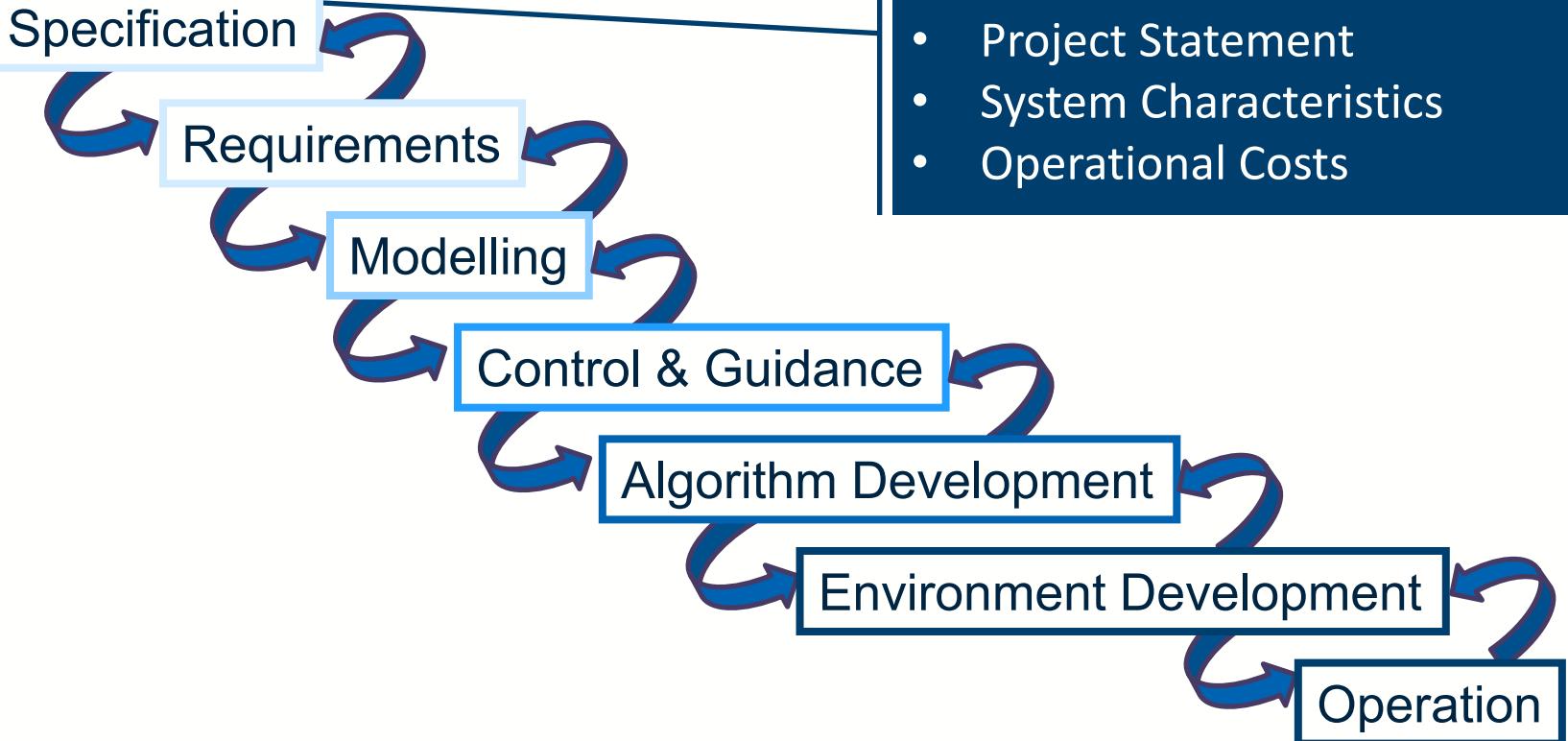


V Model Approach



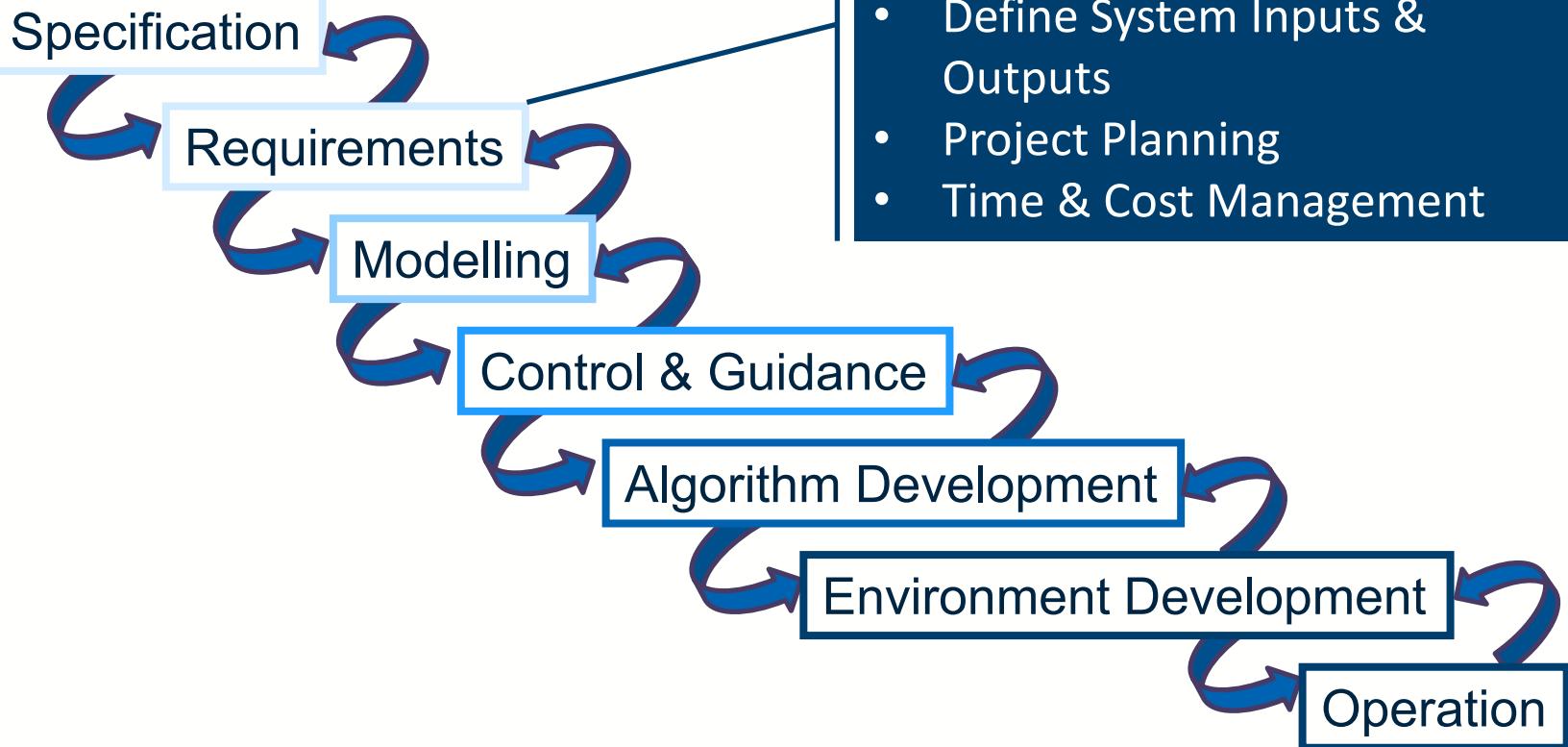


Waterfall Approach



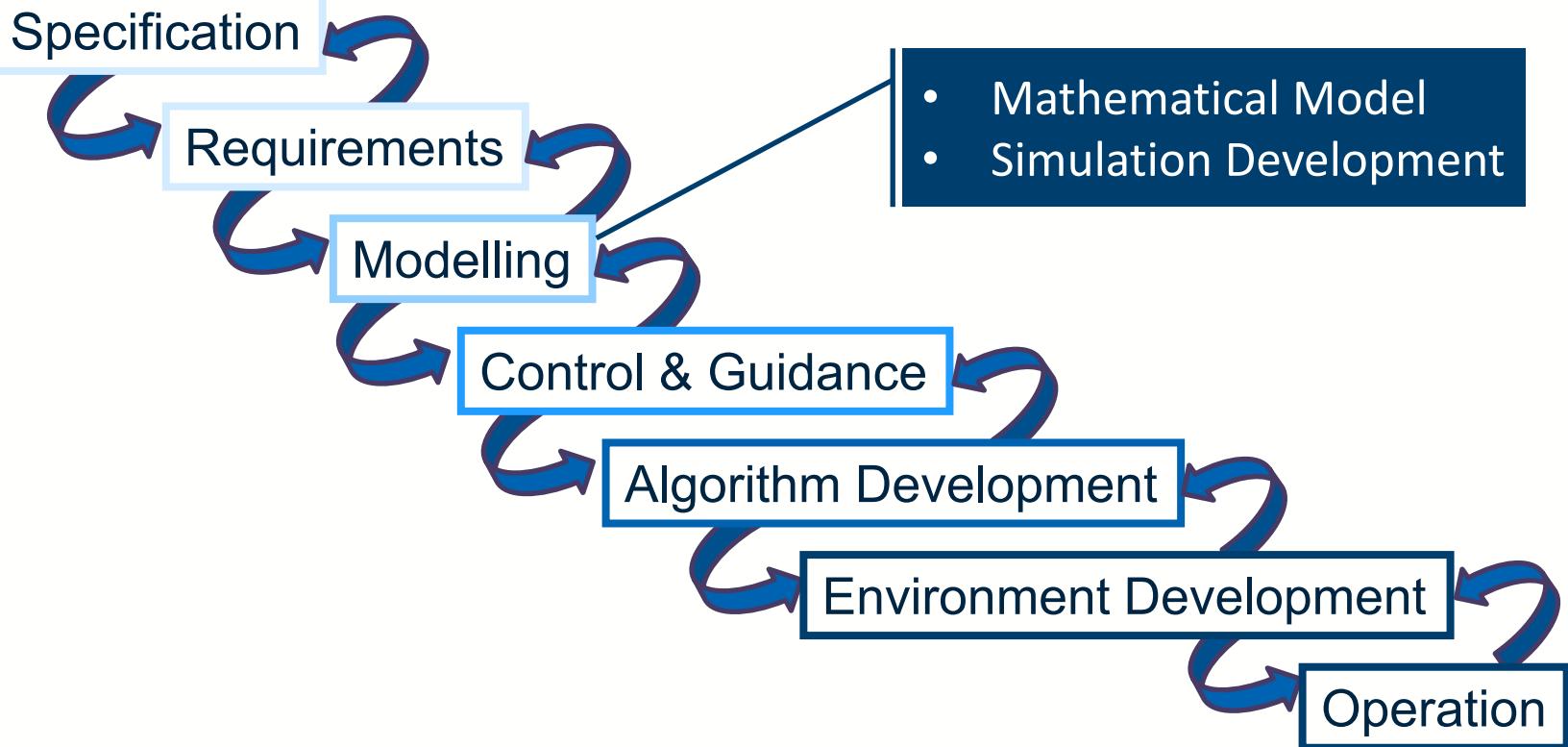


Waterfall Approach



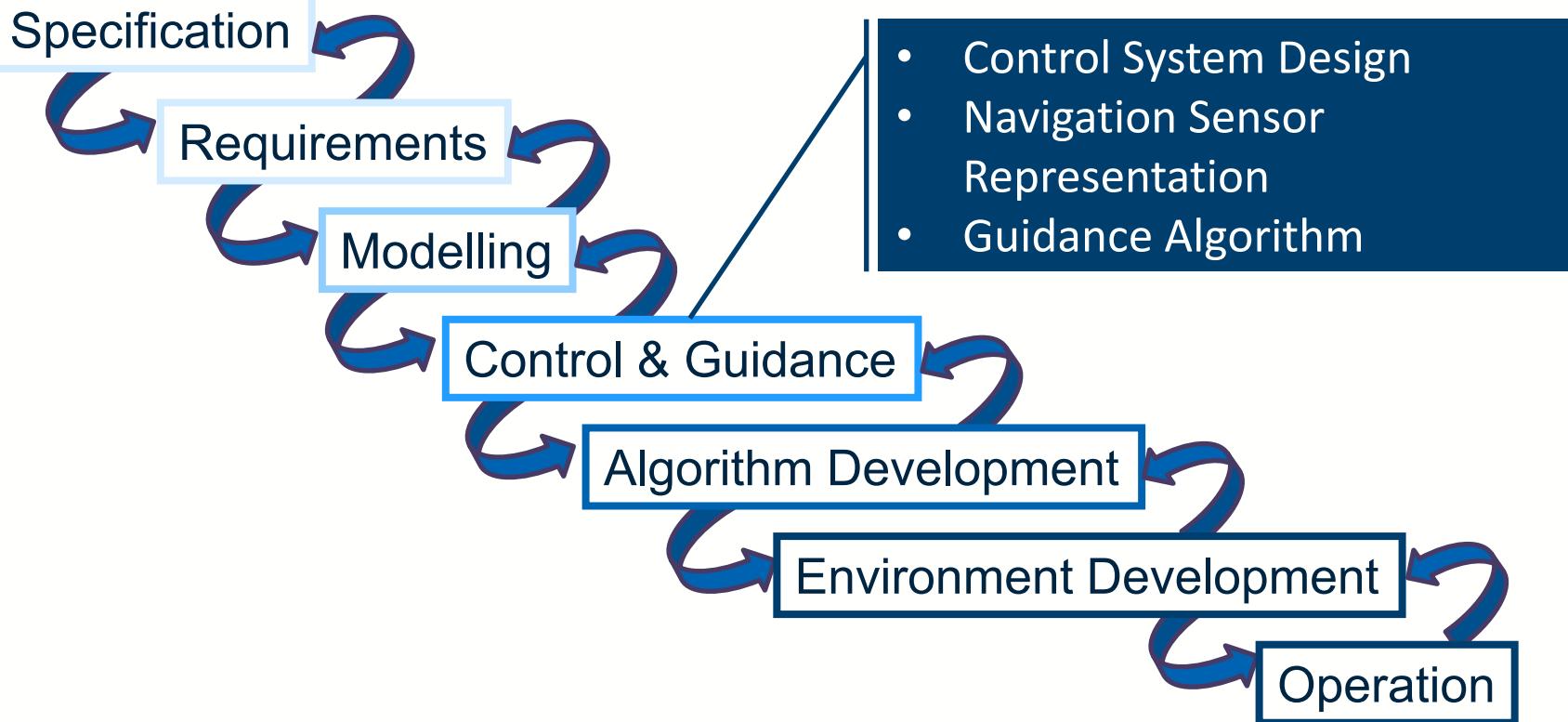


Waterfall Approach



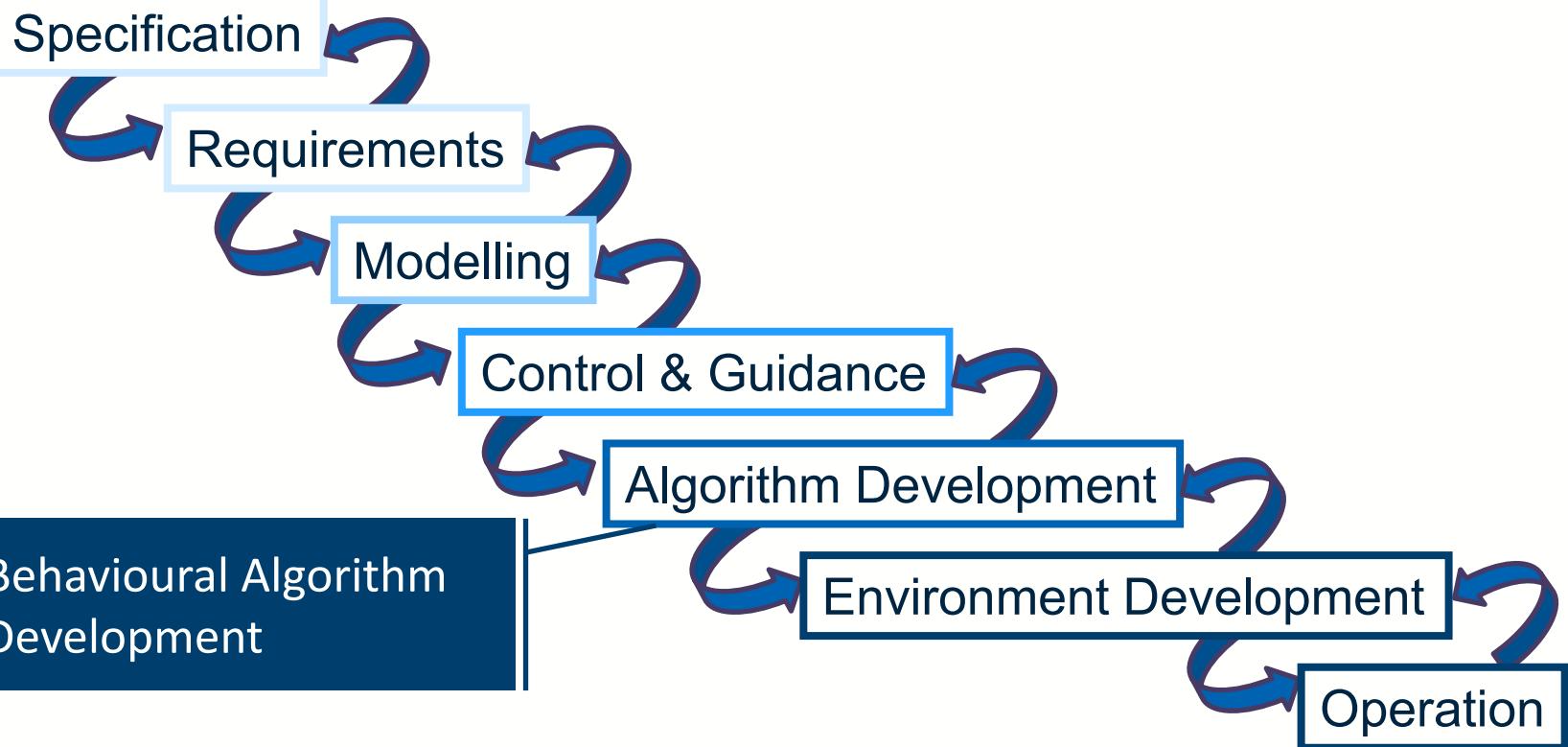


Waterfall Approach



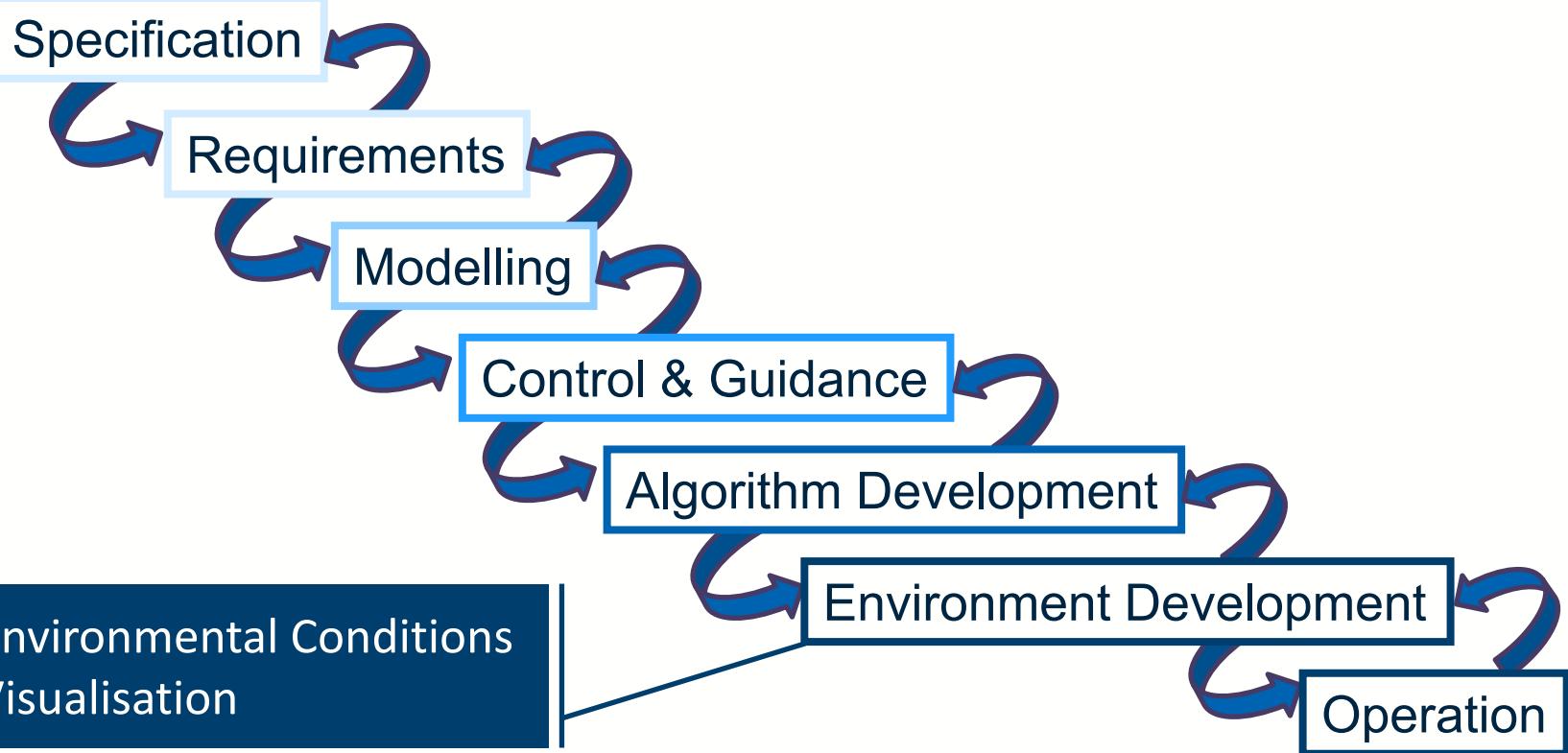


Waterfall Approach



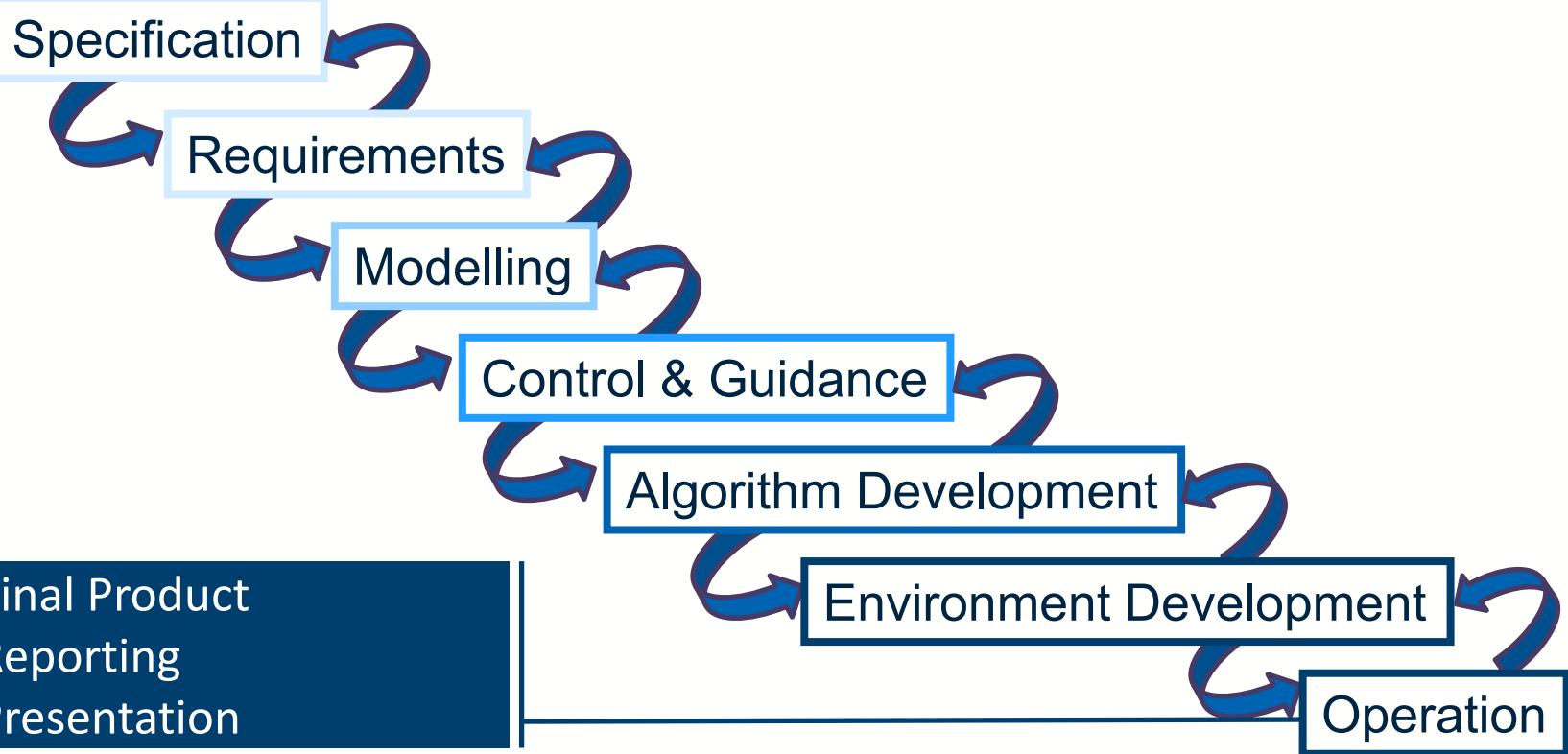


Waterfall Approach





Waterfall Approach



Design Schedule & Review

The project will consist of the following design stages:

- Development of a simulation of a humanoid robot for soccer based on the NAO6 robot
- Development of simulated environment for 2 teams of 4 robots to play soccer
- Develop a multi-agent simulation of the RoboCup Humaniod Kidsize Soccer Team
- Development of algorithms to implement playing strategies for each of the robot teams
- Evaluation of the simulated robot soccer teams
- Test your behavioural algorithms on hardware
- A Design Review (DR) will be performed at the end of the simulation stage

Project Management

Your team should consider the following:

- You will have a supervisor assigned to help supervise and monitor your team.
- The management structure for your team – every member has to contribute
- The division of workload – every member has to contribute
- Meeting times for your team with and without your supervisor
- One member of your team should be assigned as the communication officer who will email your supervisor
- The subject for all emails should begin “ENG5325 ...” so that your supervisor can safely filter your emails

Project Meetings

- Each team will have 1 scheduled meeting per week with your supervisor (take minutes!)
- These meetings will be used to provide help and guidance on the technical aspects of the project
- In addition, Technical progress and Team work will be assessed during the meetings
- Time Allocation Records (TARs) to be kept through project and presented at the supervisor meeting **every 2 weeks.**
- Additional meeting should be charged as *Expert help*
- Meeting with Manager every month
- Pitch Presentation in February
- Final report and final presentation are due at end of project

Time and costs

- Time and cost estimates will be made by each team at the beginning of the project
- Records of time spent on each element of the project will be kept and reported by each team – using the Time Allocation Record (TAR) provided
- Staff cost **£250** per team-member per hour
- Expert help cost **£1250** per hour (the weekly meetings are not to be considered as expert help)
- Time and costs figures have to be presented every 2 weeks at the meeting with supervisors using the TAR provided, which represent a formal declaration of how the team worked in the period.



Time Allocation Record (TAR)



Project Schedule

Semester	Week	Date	Time	Location	Activity	Category	Involves	Outcome	Deliverables/Milestones
1	2	02/10/2025	9-11am	Hunter Halls	Semester 1 Kick-Off Meeting	Meeting	All students; all supervisors; course lead	Project specification;	
1	3	wc 6/10/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 3 Supervisor Meeting	Meeting	All students; all supervisors	Requirements capture; timing diagram; team activities.	Initial project plan
1	4	wc 13/01/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 4 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 2&3	TAR 1 (signed)
1	5	wc 20/10/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 5 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
1	5	wc 20/10/2025	TBD (manager)	Rankine 401	Semester 1, Week 5 Manager Meeting	Meeting	All students; all supervisors; course lead	Project progress	
1	6	wc 27/10/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 6 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 4&5	TAR 2 (signed)
1	7	wc 03/11/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 7 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
1	8	wc 10/11/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 8 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 6&7	TAR 3 (signed)
1	9	wc 17/11/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 9 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
1	9	wc 17/11/2025	TBD (manager)	Rankine 401	Semester 1, Week 9 Manager Meeting	Meeting	All students; all supervisors; course lead	Project progress	
1	10	wc 24/11/2025	TBD (supervisor)	Rankine 401	Semester 1, Week 10 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 8&9	TAR 4 (signed)
2	1	15/01/2026	9-11am	Hunter Halls	Semester 2 Kick-Off Meeting	Meeting	All students; all supervisors; course lead	Project specification review; Timing Diagram review	Revised project plan
2	2	wc 19/01/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 2 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
2	3	wc 26/01/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 3 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 2&3	TAR 6 (signed)
2	4	wc 02/02/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 4 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
2	4	02/02/2026	4:30pm	Moodle	Peer Review pitch presentation	Submission	All students	Peer Review	Peer Review Document
2	4	wc 02/02/2026	Various (manager)	JWS 530	Pitch Presentations	Meeting	All students; all supervisors; course lead	Progression to Hardware Phase	Pitch Presentation
2	5	wc 9/02/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 5 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 4&5	TAR 7 (signed)
2	6	wc 16/02/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 6 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
2	7	wc 23/02/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 7 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 6&7	TAR 8 (signed)
2	8	wc 02/03/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 8 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
2	8	wc 02/03/2026	TBD (manager)	Rankine 401	Semester 2, Week 8 Manager Meeting	Meeting	All students; all supervisors; course lead	Project progress	
2	9	wc 09/03/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 7 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 8&9	TAR 9 (signed)
2	10	wc 16/03/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 7 Supervisor Meeting	Meeting	All students; all supervisors	Project progress	
2	11	wc 23/03/2026	TBD (supervisor)	Rankine 401	Semester 2, Week 7 Supervisor Meeting	Meeting	All students; all supervisors	Project progress; TAR for Weeks 10&11	TAR 10 (signed)
2	11	wc 23/03/2026	TBD (manager)	JWS 530	Final Presentations	Submission	All students; all supervisors; course lead	Project Presentations	Presentation
2	12	20-24/04/2026	4:30pm	Moodle	Final Reports Submission Window	Submission	All students	Project Report	Report
2	12	23/04/2026	4:30pm	Moodle	Final TAR Spreadsheet	Submission	All students	Full TAR	TAR Spreadsheet (signed)
2	12	24/04/2026	4:30pm	Moodle	Peer Review for entire project	Submission	All students	Peer Review	Peer Review Document

Initial Project Tasks

Your initial tasks are:

- Arrange a team meeting
- Arrange a meeting with your supervisor next week
- Get acquainted with your group members
- Determine your Team Management Structure
- Plan your project design activities in terms of time management using a suitable timing diagram (e.g. a Gantt Chart)
- Include the DR in your timing diagram
- Estimate the cost of your project based on utilisation of staff time (this will be compared against the actual time/cost recorded during the project) – this has to be determined in the first week of the project
- Present group capabilities, project plan, time schedule and cost estimate at the first meeting with your supervisor

Assessment

Assessment of the project will be through a team technical report, team presentation and continuous evaluation of teamwork throughout the project. The percentage for each component is given below:

Assessment Components

- | | |
|-------------------------|-----|
| • Report/technical work | 60% |
| • Teamwork | 30% |
| • Presentation | 10% |

In addition to indicating individual contributions in the report and presentations, each member of the team will complete a **peer review** assessment indicating the percentage contribution for their team members. This will be combined with the marks for report, teamwork and presentations.



Recommendations

- Manage your time efficiently
- Manage your costs efficiently
- Work as a team
- Do not cheat: the University's plagiarism and Student Conduct policies apply



- Start working now and get full advantage of this team activity
- Important!!!! There is no reassessment opportunity for this course!



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Thank you for listening –
time for your questions!

Contact:
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