

Preparing for the Systems Modules

Introduction

This document provides you with details on what and how you would need to prepare yourself for the Systems Architecture, Validation & Verification, and Systems Design modules in your study. It is entirely up to you about when you would like to engage in the recommended activities, as long as you complete them and feel ready for the module when they commence. Note also that the on-campus teaching week will be different depending on which instance of the modules you are assigned to. Make sure you check your timetable.

Key Contacts

Lecturing Team:

- Dr Siyuan Ji (s.ji@lboro.ac.uk) – Module Lead
- Dr Wenheng Zhang (w.zhang2@lboro.ac.uk) – Co-lecturing Systems Design only
- Mr. Hayato Ishida (h.ishida@lboro.ac.uk) – Teaching Assistant, PhD student
- Mrs. Amal Elsokary (a.elsokary@lboro.ac.uk) – Teaching Assistant, PhD student

Administrative Support:

- General support (wssupport@mailbox.lboro.ac.uk) – all enquiries related to coursework extensions need to be sent to this email address
- Apprentices dedicated support (apprenticeships@mailbox.lboro.ac.uk) – all other enquiries related to your study (apprentices only), please use this email

IT Support:

- IT Service (it.services@lboro.ac.uk) – for all trouble shootings in setting up your IT. Sometimes it is much quicker to give them a call, but an email needs to be sent first to create a service ticket.

Setting Up IT

It is essential that you set up everything related to IT first thing. Make sure you know how to do all of the following:

- ✓ Set up Multi-Factor Authentication with DUO Mobile. See instructions here: [MFA - Installing DUO | IT Services | Loughborough University](#)
- ✓ Connect remotely to the university network using VPN. See instructions here: [VPN | IT Services | Loughborough University](#)

- ✓ Access and understand your timetable. VPN connection is recommended. Link is here [Timetable](#).
- ✓ Access LEARN. VPN connection is recommended. Link is here: [My Modules | Learn](#). The modules you need to have access to are:
 - [Module: 25WS72META - Systems Architecture | Learn](#)
 - [Module: 25WS67META - Validation and Verification | Learn](#)
 - [Module: 25WSP66META - Systems Design | Learn](#)
- ✓ Access the key resources using the library catalogue:
 - Access via the link: [University Library | Loughborough University](#)
 - Search for the core textbook - *Essential Architecture and Principles of Systems Engineering* (abbreviated as EAPSE in the rest of this document), co-authored by Charles Dickerson and myself
 - Access the digital copy. You can download, but there are constraints.
- ✓ Access standards:
 - For standards, you would need to access it from the BSI website: [BSOL British Standards Online Login Selector](#). VPN connection is required.
 - For all ISO/IEC/IEEE standards, you can also access them directly from [IEEE Xplore](#). VPN connection is required. Simply search using the standard number and title.
- ✓ Connect remotely to a desktop on campus. See instructions here:
 - Step-by-step guide: [Student- Remote Desktop access instructions | IT Services | Loughborough University](#)
 - Software and PC Availability System: [Dashboard -- Lboro Uni](#)
- ✓ Launch **Magic Systems of Systems Architect**, the MBSE tool that we will use for the modules. To do this, follow the steps below:
 - Connect VPN (DUO Authentication will be needed)
 - Access the Software and PC Availability system using the link above
 - On the right, under 'Availability', select any one of the following rooms (in which the software is installed) when they are available
 - Pilkington Library
 - TW111
 - T210
 - WPL001
 - S006
 - Find '**Magic Systems of Systems Architect**', and launch it. A window may pop up requesting license. Ignore this and proceed by clicking on OK and selecting floating license.
- ✓ Launch MATLAB, the analysis tool that we will use for V&V and Systems Design modules. Follow the similar process above to do this. MATLAB is available on all machines. You can also download MATLAB to your personal computer, through creating an account and linking it to your university credentials (recommended). You can also access MATLAB through a web-

browser at [MATLAB Home](#) (recommended for learning the basics of MATLAB).

Systems Architecture Pre-requisites

The two instances of the Systems Architecture module will run in Semester 1, Week 10 (1st – 5th Dec) and Week 11 (8th – 12th Dec). Prior to these teaching weeks, you would need to have completed the following tasks to fully prepare yourself:

- Read Chapter 1 of EAPSE to understand the context of system architecture in twenty-first century engineering and some of the basic issues.
- Read Chapter 2 & 3 (pp.13-38) of EAPSE to go through the ADAS example and become familiar with key concepts and terminology.
- Watch [MagicDraw Basics](#), to familiarise yourself with the GUI of the software.
- Read Chapter 8, Sections 8.1 to 8.3 (pp.110-134) of EAPSE, to learn the Unified Modeling Language (UML) through practicing the exercises using **Magic System of Systems Architect** in each of the sections.
- Read Chapter 9, Sections 9.1 and 9.2 (pp.135-149) to continue learning UML through practicing the exercises using the software.
- Complete the **Belbin Questionnaire and Test** on Learn which will support me in organising you into **balanced groups** for the in-class case studies. **Email your results to Ji by 21st of November**. You will be randomly allocated if you do not provide your Belbin results.
- Read Clause 6.4.1 to 6.4.4 and 6.4.6 of ISO/IEC/IEEE 15288:2023 Systems and Software Engineering – System Life Cycle Processes.

There are also a few optional activities:

- Go through the 2024/25 Systems Architecture lectures slides.
- Read Annex D of ISO/IEC/IEEE 15288:2023.
- Browse the CameoMagic YouTube Channel at [CameoMagic - YouTube](#), and learn more about modelling with the software. The section '[Start Here – MBSE & SysML Foundations](#)' and '[Understand Every SysML Diagram Type](#)' are useful materials.

Validation & Verification Pre-requisites

The two instances of the V&V module will run in Semester 2, Week 2 (9th – 13th Feb) and Week 3 (16th – 20th Feb). Prior to these teaching weeks, you would need to have completed the following tasks to fully prepare yourself:

- Review Clause 6.4.1 to 6.4.4 and 6.4.6 of ISO/IEC/IEEE 15288:2023 Systems and Software Engineering – System Life Cycle Processes.
- Read Clause 6.4.8, 6.4.9 and 6.4.11 of 15288:2023.

- Review system modelling through revisiting EAPSE Chapter 8 to 10 of EAPSE and practicing Magic System of Systems Architecture.
- Study basics of MATLAB by using materials on the MATLAB site at [Self-Paced Online Courses - MATLAB & Simulink](#). How much you would like to study depends on your familiarity with the software. At the minimum, you should make sure you have gone through MATLAB Onramp, [MATLAB Onramp | Self-Paced Online Courses - MATLAB & Simulink](#), if you have not used the software before. For those who has, you can skip this part. Practice as you watch the videos is the best way to learn. Testing your understandings by going through the exercises in the lectures slides available under [25WSP66META: MATLAB | Learn](#). If you struggle to solve the problems, use Large Language Model to generate MATLAB code for you and see if you could understand.
- Go through mathematics for a pendulum by watching this [video](#). You are not required to be able to derive the equations, but needs to follow it through and understand the basis of the calculations.

There are also a few optional activities:

- Go through the 2024/25 Validation & Verification lectures slides.
- Read and enjoy the book by Avner Engel, *Verification, Validation and Testing of Engineered Systems*.

Systems Design Pre-requisites

The two instances of the Systems Design module will run in Semester 2, Week 8 (13th – 17th Apr) and Week 9 (20th – 24th Apr). Prior to these teaching weeks, you would need to have completed the following tasks to fully prepare yourself:

- Review Clause 6.4.1 to 6.4.4 and 6.4.6 of ISO/IEC/IEEE 15288:2023 Systems and Software Engineering – System Life Cycle Processes.
- Read Clause 6.4.5 of 15288:2023.
- Review system modelling through revisiting EAPSE Chapter 8 to 10 of EAPSE and practicing Magic System of Systems Architecture.
- Review MATLAB basics.
- Go through the MATLAB online course, [Explore Data with MATLAB Plots | Self-Paced Online Courses - MATLAB & Simulink](#).
- Go through basic mathematics for a radar by watching this [video](#). You are not required to be able to derive the radar range equations, but needs to follow it through and understand the basis of the calculations.

There are also a few optional activities:

- Go through the 2024/25 Systems Design lectures slides.

- Go through the MATLAB online course, [System Composer Onramp | Self-Paced Online Courses - MATLAB & Simulink](#).

Assessment

The three modules are assessed using the same mechanism, which includes two components:

1. **Group Case Studies.** Over the course of the on-campus week, there will be three group case study projects; one on each of Monday, Tuesday and Thursday respectively. For each project, the class groups will be given most of the afternoon to work collaboratively in a laboratory and prepare a presentation to be delivered the next morning. The presentations need to be uploaded to LEARN. Detailed instructions for submissions including deadlines and assessment criteria will be provided during the lecturing days. The group projects account for 40% of the overall module grade: counting for 10%, 10% and 20% respectively.
2. **Individual Coursework.** Instructions for this coursework will be provided on Wednesday, 8th November. Following the on-campus week, you will work on the individual project (coursework). You will have 7.5 weeks to work on this coursework. The exact deadline will be announced in class. This individual coursework contributes the remaining 60% of the module grade.