



	<p>L6 Apprenticeship Standard - <a href="#">Rail and rail systems senior engineer (integrated degree) / Institute for Apprenticeships and Technical Education</a></p> <p>L6 Apprenticeship Assessment Plan – <a href="#">ST0496 (instituteforapprenticeships.org)</a></p>	
<b>Reference points:</b>	Internal	<p>Corporate Strategy 2020-25</p> <p>Academic Quality and Enhancement Website</p> <p>School Strategy</p> <p>LSBU Academic Regulations</p>
	External	<p>Competitions and Markets Authority Guidance</p> <p>SEEC Level Descriptors 2021</p> <p>QAA -Subject benchmark statement Engineering, 2015</p> <p>Framework for Higher Education Qualifications (QAA, 2015)</p> <p>The UK Standard for Professional Engineering Competence and Commitment (UK-SPEC, 4<sup>th</sup> Ed., 2021)</p> <p>The Accreditation of Higher Education Programmes - UK Standard for Professional Engineering Competence (AHEP, 4<sup>th</sup> Ed., 2021)</p> <p>Institute for Apprenticeships and Technical Education, L5 Rail &amp; Rail Systems Engineer (2020) and L6 Rail &amp; Rail Systems Senior Engineer (2021) Standards and Assessment Plans</p> <p>Williams-Shapps '<i>Plan for Rail</i>' (Department for Transport, 2021)</p> <p>Network Rail Asset Management Policy (2018)</p>

### B. Course Aims and Features

<b>Distinctive features of course</b>	<p>Railway systems in the UK and internationally are aging with the need for the introduction of new infrastructure, technologies, and practices, to ensure that they are sustainable and that they continue to provide local, national, and international socio-economic benefits for the future. The combination of these factors requires 21<sup>st</sup> century railway engineers to have a systems approach to the construction, operation, and management of the railway, as highlighted by the Williams-Shapps plan for Rail (DfT, 2021) and the Network Rail Asset Management Policy (Network Rail, 2018).</p> <p>To achieve this aim, the LSBU <i>L5 FdEng</i> and <i>L6 BEng (Hons) Rail &amp; Rail Systems Engineering (Apprenticeships)</i> has been developed based on the findings of course management discussions of the needs of the UK railway industry and knowledge of the UK and international railway industries.</p> <p>The attached course structure (<b>Appendix D</b>) represents the learning pathways for students within the railway industry relating to the following disciplines:</p>
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	<ol style="list-style-type: none"> <li>1. Track;</li> <li>2. Civils;</li> <li>3. Electrical (Power);</li> <li>4. Electrical Installation;</li> <li>5. Traction &amp; rolling Stock;</li> <li>6. Signalling; and</li> <li>7. Telecoms;</li> </ol> <p>for whom this course has been designed.</p> <p>Within Years</p> <ul style="list-style-type: none"> <li>• 1-2, students undertake a shared multi-disciplinary approach to learning, building their understanding of the railway and developing their knowledge of the railway as a system;</li> <li>• 3-4, students' progress into discipline specific fields of study, based on their pathway (track, electrical (power), traction &amp; rolling stock, telecoms, signalling and control).</li> <li>• 4+, students have 6 months to complete their End Point Assessment to gain their Apprenticeship qualification and their BEng.</li> </ul> <p>Through this approach the course provides students with core quantitative and qualitative skills they need to address railway industry needs in the 21<sup>st</sup> century and beyond, which are beneficial to the railway industry and its supply chain in the UK and internationally.</p>
<p><b>Course Aims</b></p>	<p>The Rail &amp; Rail Systems Engineering Apprenticeship aims to:</p> <ol style="list-style-type: none"> <li>1. address current and future needs of the UK railway industry, including sustainability;</li> <li>2. provide students with the skills and knowledge they need to manage aging infrastructure as well as provide new design and build infrastructure;</li> <li>3. incorporate qualitative methods of thinking and reasoning within the quantitative topics of engineering;</li> <li>4. enable students to think of the '<i>bigger picture</i>' of the railway industry and its services to the UK, rather than just having a disciplinary focus;</li> <li>5. enable students to apply their existing railway-based knowledge and skills to their learning and vice-versa;</li> <li>6. address and surpass the requirements of the Apprenticeship Standards for L5 Rail &amp; Rail Systems Engineer and L6 Rail &amp; Rail Systems Senior Engineer;</li> <li>7. address and surpass the requirements of UK Spec and AHEP, 4<sup>th</sup> eds.</li> </ol>
<p><b>Course Learning Outcomes</b></p>	<p>Throughout the course, students will learn and develop methods and techniques for the following UK Spec and AHEP, 4<sup>th</sup> ed. requirements, which align with the requirements of Rail &amp; Rail Systems Engineer and Rail &amp; Rail System Senior Engineer Apprenticeship Standards (as represented by <a href="#">Appendix A</a>).</p> <p>A). Students will have knowledge and understanding of:</p>

A1 - selecting and reviewing appropriate techniques, procedures, and methods to undertake tasks (UK Spec A1);  
A2 - apply appropriate qualitative and/or quantitative approaches and a sound evidence-based approach to problem-solving to enable continuous improvement of the railway (UK Spec A2);

B). Students will develop their intellectual skills such that they are able to:  
B1 - identify problems and apply appropriate methods to identify causes and achieve satisfactory solutions, by applying knowledge of mathematics, statistics, natural science and engineering principles to broadly-defined problems (UK Spec B1);  
B2 - identify, organise, and use resources effectively to complete tasks, with consideration for cost, quality, safety, security, and environmental impact (UK Spec B2).

C). Students will acquire and develop practical skills such that they are able to:

C1 - plan the work and resources needed to enable effective implementation of a significant engineering task or project (UK Spec C1); through accepting, allocating and supervising technical and other tasks (UK Spec C3);

C2 - apply integrated or systems approaches to the solution of broadly defined problems (AHEP B6); recognising the need for quality management systems and continuous improvement in the context of broadly defined problems (AHEP B14).

D). Students will acquire and develop transferrable skills such that they are able to:

D1 - communicate effectively with others, at all levels, in English (UK Spec D1); enabling them to work effectively with colleagues, clients, suppliers, or the public (UK Spec D2); by presenting and discussing proposals, justifications, and conclusions (UK Spec D2);

D2 - understand the safety implications of their role and apply safe systems of work (UK Spec E2); whilst understanding the principles of sustainable development and apply them in their work (UK Spec E3).

### C. Teaching and Learning Strategy

Within the course shared thinking and discussion is encouraged, as appropriate, to enable a collective learning experience and to develop peer support, which also provides essential skills to achieve railway industry and supply chain needs (e.g., working collaboratively). **Appendix B**, contains workflows representing the *Learning overview* and *Approaches to teaching*, employed to achieve these aims.

#### Overview of Teaching

The teaching of the course includes:

- **Multi-pathway in class teaching** - where students attend shared pathway modules, enabling students to gain a holistic understanding of the railway industry and its needs, whilst enabling students to share and discuss their multi-disciplinary knowledge and experiences;

- **Disciplinary in class teaching** - where students attend pathway specific modules, enabling students to gain disciplinary understanding of the specific aspects of the railway industry and its needs, whilst enabling students to share and discuss their technical knowledge and experiences;
- **Laboratory sessions** – where students can develop their practical understanding of the theory they gained in the classroom, and advance their skills for application to their roles within the railway industry and its supply chain;
- **Use of specialist software** – that enables students to develop technological skills using a variety of specialist software enhancing students knowledge of the different types of software applications that can be used within 21<sup>st</sup> Century applications;
- **Projects** – where students apply their learning and professional skills to undertake:
  - a team project in Year 3, to propose solutions to a current challenge within the railway industry; and
  - an individual project for their apprenticeship end point assessment, to address a railway-based scenario of the students choice.

To encourage application of learning to the day-to-day roles of students, teaching includes:

- reviews of railway-based case studies;
- consideration of general and railway specific theory;
- application of technical, mathematical, and background theory;
- discussion of the theory, technical, mathematical, and background concepts;
- application of qualitative reasoning as to why topics are applicable to the railway industry.

An essential part of the course will be the requirement for students to undertake their own self-learning, enabling them to enhance their knowledge of topics discussed in lectures whilst building a greater appreciation of their application to the railway industry. This can be achieved by using the reading lists within the VLE or through students researching related materials.

Between Blocks, touchpoints are held to enable students to ask their module leaders for further clarification of contents or to expand on discussions held to further share and expand their knowledge of the topics. While these are voluntary, students are encouraged to attend.

### **Student/employer Consultation and Apprenticeship Support**

To ensure that the course is delivering effective learning to the students and their employers, the Course Management team work closely with the students, as individuals, with their student course representatives, and their employers.

### **Student and Employer Consultation**

Students are encouraged to approach their Module Leaders, the Course Director, or their Skills Coach to discuss any queries or issues they may have with their learning, as soon as they arise. These are either addressed directly, or the student is advised of the most appropriate contact within the University to discuss their query or issues (e.g., Student Support Services ([Section 3.6](#))). Additionally, the following are undertaken:

- Every 6 months an online survey of student satisfaction is held;
- Open ended Module Evaluation Questionnaires are available within Module Moodle sites;
- Every 6 months a Course Board, held by the Course Management team, with Student representatives and module leaders, is undertaken;
- Discussions are held once a month with employer Apprenticeship Scheme Managers;
- Consultation with students and their employers, as required, whenever there are intended to be substantial changes to delivery schedules, course, or module content.

## Apprenticeship Skills Coach

As the students are apprentices, they are required to undertake 3 monthly skills reviews with the Course Skills Coach and their Line Manager. Through the review, the Apprentice works with the Skills Coach and their Line Manager to identify and address:

- progression in their learning and their apprenticeship;
- student support needs from the course team, the University, or their employer;
- opportunities to undertake skills development in the workplace to address gaps arising in their professional practice to address the Apprenticeship Learning requirements;
- the students needs for gaining the Apprenticeship End Point Assessment.

## Equality, Diversity, and Inclusion

The course is run and managed in accordance with LSBU policies on EDI, and all staff and students are expected to abide by these, which can be found at [University information about EDI](#), and which states that:

*“We are clear that we must be an inclusive and welcoming Group, committed to eliminating all forms of discrimination. We are committed to eliminating discrimination based on age, race, religion/belief, sex, disability, sexual orientation, gender reassignment, gender identity, marriage/civil partnership, pregnancy/maternity, caring status, and social class. This means that we will pro-actively work to eliminate individual, institutional, and systemic inequalities that currently exist within the University and Group. We will strive to influence the wider world and to positively impact on the society around us. We believe that it is not enough just to eliminate discrimination but that we must speak out and act against inequalities wherever and whenever they occur. Our vision is to transform lives, communities, businesses and society through education and insight”.*

Additionally:

- The School has recently appointed a new EDI lead and an EDI committee which will have oversight of all our taught provision, including the rail apprenticeships; and
- The School has also started preparations for an Athena Swan Bronze Award application.

## Learning Resources

To help students in their studies a wide range of resources are available across the university.

The **LSBU Hub** is home to a number of new facilities including:

([LSBU - LLR Homepage - Library and Learning Resources at London South Bank University](#))

- The new and improved library;
- Social spaces;
- Updated gym and sports facilities;
- Food and drink outlets; and
- New teaching and lecture spaces.

There are also:

- 17 Group Study Rooms;
- 4 new Assistive Technology Rooms;
- 4 Training Rooms;
- State-of-the-art Digital Skills Centre;
- New Skills Hub room for one-to-ones and group appointments;
- University Archives Centre and Reading Room;
- Spaces for student-led outreach groups, exhibitions and events.

## Computer Labs

As well as the LSBU Hub, the School of Engineering has multiple computer labs for use by students,

totalling 90 computers; with an additional 177 computers within labs, for student use, in other parts of the University, other than the LSBU Hub. Mitigating their need to bring or use their laptops during their time at the University. There are also dedicated computers for the employment of specialist software such as MATLAB or AutoCAD, which the students may wish to use to undertake their assignments, where this is their preference.

### **Wide Range of Software**

Given the technical nature of the Rail & Rail Systems Engineering Apprenticeship, students have access to general (MS products) and specialist (MATLAB, AutoCAD) software to assist them in developing their skills and to complete assignments. These software can be accessed remotely and downloaded on to their personal devices through 'Apps Anywhere' (<https://appsanywhere.lsbu.ac.uk/>), which contains many and various software that they will find useful in their studies.

### **Students Union**

Students are encouraged to join the Students Union, to ensure they have independent representation at the University as well as to access a wide range of benefits that they may find useful. The Student's Union also provides support and guidance in areas such as Wellbeing and Academia, as well as activities that will make their student experience the best it can be. Through events such as sports clubs, societies, and other opportunities based on their course, interests or skills.

### **Skills for Learning Centre**

([Home - Skills for Learning - Library and Learning Resources at London South Bank University \(lsbu.ac.uk\)](https://www.lsbu.ac.uk/skills-for-learning))

The Skills for Learning Centre offers students a range of interactive workshops, one-to-one tutorials and drop-in sessions delivered by experienced learning developers. The Academic Practice and English Language team provide guidance to maximise students reading, writing and thinking and the Maths and Stats team deliver tailored support to refresh and improve students numerical, mathematical or statistical knowledge. In addition, it provides specialist study materials through the online Virtual Learning Environment (VLE) Moodle site.

### **Student Support Services**

([Student services | London South Bank University \(lsbu.ac.uk\)](https://www.lsbu.ac.uk/student-services))

Student support Services are available to students to provide advice on matters relating to their personal/work/study life balance, which are especially important to Apprentices who work full time and study part time. With services including:

- Disability & Dyslexia Support (DDS) ([Disability and dyslexia support | London South Bank University \(lsbu.ac.uk\)](https://www.lsbu.ac.uk/disability-dyslexia-support)) is a dedicated service for students who have a long term condition (has lasted or expected to last longer than 12 months). This includes conditions such as:
  - Specific learning differences including dyslexia, dyspraxia, dyscalculia, and attention deficit (hyperactivity) disorder (ADHD);
  - Physical or mobility difficulties;
  - Students who are blind or partially sighted, or are D/deaf or Hard of Hearing;
  - Mental health conditions;
  - A long term health condition such as diabetes, epilepsy, chronic fatigue syndrome, HIV, cancer and cancer survivors;
  - Asperger's and autistic spectrum condition (ASC);
  - Any student with a disability, including EU and International students, can register for support with DDS and have access to LSBU's assistive technology, equipment, and services.
- Mental health and wellbeing support ([Health and wellbeing | London South Bank University \(lsbu.ac.uk\)](https://www.lsbu.ac.uk/health-wellbeing)), provides support for you in looking after your physical, mental and emotional health and wellbeing; they are all connected and equally important, with services including:

- Existing mental health conditions (such as anxiety, depression, personality disorders and bipolar disorder)
- Stress and worry
- Life stressors
- Relationship difficulties (including difficulties with your friends, family, partner or children)
- Unhappiness, low mood and loneliness
- Bereavement
- Students who have been a victim of crime.
- A student life guide is also available online:
  - [Student Life Guide \(lsbu.ac.uk\)](http://lsbu.ac.uk)

### **School Administration Services**

To assist students and staff in the School of Engineering, the dedicated Administration team offers a help desk, where answers to students questions for their course can be addressed. Additionally, the Apprenticeship Administrator manages the coordination of students grades on completion of their end of year and staff in considering students progression or resits.

### **D. Assessment**

Summative assessments for the programme are designed to provide students with applicable skills that they will employ within their industry practice, including:

- small team or individual report writing;
- small team presentations;
- use of specialist software;
- writing of individual logbooks identifying learning undertaken and findings of laboratory experiments.

All coursework for a module will be allocated in the first block, with submission dates allocated as appropriate (**Appendix B**), to assist students in preparing the coursework over extended periods of time, given their full-time employment responsibilities.

Within the small team or individual reports and the small team presentations, students will be encouraged to provide example outputs from their use of specialist software and references to any lab logbooks they have prepared, which supports their reasoning, providing an extract of the logbook as an appendix, as appropriate.

To assist student learning and preparation for the summative assessments, and to ensure students have a good understanding of topics considered, formative assessments are also employed, including:

- block phase tests for technical modules, to ensure students understanding of core concepts;
- preparation of Log-books of lab work undertaken;
- think-pair-share concept and class discussions;
- verbal feedback on tutorial activities;
- observation and questioning to provide instant feedback as the student take part in learning activities;
- self and peer assessment.

To progress between years, students will need to pass all modules in any given year, due to the interconnected and interdependent nature of the learning pathways.

### **E. Academic Regulations**



The University's Academic Regulations apply for this course.

**At L6 performance in the EPA will count towards the overall degree classification. Apprentices cannot successfully complete the degree apprenticeship without successfully passing the EPA.**

### **F. Entry Requirements**

To be considered for entry to the first year of this course applicants will be required to have the following qualifications:

L3 Network Rail or equivalent Rail Apprenticeship;

L4 students will be considered for an advanced entry with benefit of few exemptions to modules already covered and similar in nature and content;

Apprentices who have successfully passed the L5 non-integrated FdEng in Rail & Rail Systems Engineering, will be able to apply for a 'top up' on a subsequent final year of the L6 integrated BEng (Hons) in Rail & Rail Systems Engineering, after completion of the L5.

- A Level BBB including Mathematics and/or Physical Sciences (120 UCAS points) **or**;
- BTEC National Diploma DDM, including Level 3 Mathematics and Physical Sciences (128 UCAS points) **or**;
- EAL Technical Extended Diploma in Engineering Technologies, D, including: Further Engineering Mathematics; and other options relevant to Electrical, Mechanical or Civil engineering **or**;
- Access to HE qualifications with 24 Distinctions and 21 Merits, with at least half the course in Mathematics and Physical Science subjects (122 UCAS points) **or**;
- Equivalent level 3 qualifications worth 120 UCAS points and including Mathematics and Physical Sciences
- Applicants must hold 5 GCSEs A-C including Maths and English or equivalent (reformed GCSEs grade 4 or above).

We welcome qualifications from around the world. English language qualifications for international students: IELTS score of 6.0 or Cambridge Proficiency or Advanced Grade C, **and** a Mathematics qualification equivalent to reformed GCSE grade 4 or above, as assessed by UK NARIC, **or**;

#### **Accredited Prior Learning/Transfer Credit**

Applicants may be considered for entry to the second year of the course with the following qualifications. Applicants will normally be interviewed and may be required to sit a Mathematics test to ensure their preparedness for direct entry.

#### **Part-time students**

- BTEC Higher National Diploma in Electrical and Electronic Engineering or a closely-related subject **or**;
- DipHE in a directly-relevant subject **or**;
- Transfer of 120 Level 4 credits from a directly-equivalent degree course and with the approval of the director of that course **or**;
- an overseas qualification assessed by UK NARIC as equivalent to at least BTEC HND in a closely-related subject **and** an IELTS score of 6.5 or equivalent.

#### **Application to the course**

Applicants to the course will be required to choose either the L5 non-integrated FdEng Rail & Rail Systems Engineering Apprenticeship, or the L6 integrated BEng (Hons) Rail & Rail Systems Engineering Apprenticeship on application to the University.

Part-time (apprenticeship route – Levy Funded): direct to the university, via a dedicated webpage.

## G. Course Structure(s)

### Course overview

The L5 Apprenticeship, to achieve the non-integrated FdEng, is for 3 years with an additional 3 months for the End Point Assessment (EPA); while the L6, to achieve the Integrated BEng, is 4 years, with an additional 6 months for the Apprenticeship End Point Assessment (EPA).

The course is delivered over the academic year, within Blocks, which contain the teaching of the modules ([Appendix C](#), represents the *indicative Module Schedule*).

Modules across the course are designed to be interconnected and interdependent with one another according to the students pathways, thus assisting students in relating topics from modules across the course to one another and to their application within the railway industry. ([Appendix D](#), represents an overview of the *Course Structure*, with [Appendixes E and F](#) showing the specific modules per pathway).

In Years 1 & 2, all students study the same (L4 & some L5) modules to build an understanding and knowledge of the railway as a system, through the application of qualitative and quantitative approaches.

In Years 3 & 4, students undertake discipline specific (L5 & L6) modules to further develop their knowledge of the fundamentals of engineering specific to their pathway and the principles behind their application to railway engineering. These have been arranged to reflect the interconnected and interdependent nature of disciplines into the following:

- Track, Civils, Electrical (Installation);
- Signalling & Telecoms;
- Electrical (Power); and
- Traction & Rolling Stock.

Additionally, three shared modules are also undertaken to:

- apply mathematics to railway specific needs and solutions (Year 3);
- undertake a Team Railway Engineering project to address a real-life railway industry challenge (Year3); and
- consider the essential nature asset data management holds within ensuring the safe presence and operation of railway-based systems.

For the L5 FdEng non-integrated Apprenticeship, the End Point Assessment, post year 3, is undertaken externally with the End Point Assessment Organisation (EPAO), *Open Awards*. For the BEng Integrated Apprenticeship, the End Point Assessment (EPA), post year 4, sees students undertake their own individual project to demonstrate their learning and practical knowledge, skills, and abilities as railway engineers. The BEng EPA is integrated into the Rail Engineering Project module, and the End Point Assessment Organisation (EPAO) for this is LSBU. The following tables represent the learning pathways for each discipline.

### Gateway Preparation Module

The Gateway is the entry point to End-Point Assessment (EPA). It is the point at which the apprentice has completed their learning, met the requirements of the standard, off-the-job (OJT) training (6 hours per week), and that they, alongside their employer and LSBU agree that they are ready to enter their EPA.

The Gateway Preparation module is a pass / fail, zero credit module designed to support apprentices to identify and work towards meeting the Gateway criteria from an early stage in their apprenticeship, particularly those that sit outside of an academic qualification. The module will be completed each year

throughout the duration of the apprenticeship up to passing the Gateway. A minimum record of 8% of OJT, contributing towards the final total of 6 hours per week is required to pass the module in each year.

IMPORTANT: Evidence of meeting the ALL knowledge, skills and behaviour detailed in the IfATE Standard Assessment Plan, must be covered in the e-portfolio prior to the final Gateway review i.e. apprentices must address each KSB on their respective apprenticeship standard with appropriate workplace evidence.

### Rail & Rail Systems Engineering – Block Release

Track, Civils, and Electrical (Installation) Pathways				
Semester 1 (Sep-Dec)		Semester 2 (Jan-May)		
<b>Level 4</b>	<b>Year 1</b>			
	Railway Industry Professional Practice	20 Credits	Project & Asset Management	20 Credits
	Introduction to Traction & Rolling Stock	20 Credits	Engineering Maths	20 Credits
	<b>Year 2</b>			
	Programming	20 Credits	Plotting & mapping the Railway	20 Credits
<b>Level 5</b>	Railway Reliability, Availability, & Maintainability	20 Credits	Adv. Engineering Maths	20 Credits
	<b>Year 3</b>			
	Mechanical Engineering Principles	20 Credits	Applied Railway Dynamics	20 Credits
	Track & Civils Structures	20 Credits	Team Railway Engineering Project	20 Credits
<b>Level 6</b>	<b>Year 4</b>			
	Asset Data Management	20 Credits	Railway Geotechnics	20 Credits
	Structural Mechanics	20 Credits	Adv. Track & Civils	20 Credits
<b>EPA</b>	BEng Rail Engineering Project ( <i>all pathways</i> - 60 Credits)			

Electrical (Power) Pathway				
Semester 1 (Sep-Dec)		Semester 2 (Jan-May)		
<b>Level 4</b>	<b>Year 1</b>			
	Railway Industry Professional Practice	20 Credits	Project & Asset Management	20 Credits
	Introduction to Traction & Rolling Stock	20 Credits	Engineering Maths	20 Credits
	<b>Year 2</b>			
	Programming	20 Credits	Plotting & mapping the Railway	20 Credits

<b>Level 5</b>	Railway Reliability, Availability, & Maintainability	20 Credits	Adv. Engineering Maths	20 Credits
	<b>Year 3</b>			
	Principles of Electrical Engineering	20 Credits	Applied Railway Dynamics	20 Credits
	Principles of Control	20 Credits	Team Railway Engineering Project	20 Credits
<b>Level 6</b>	<b>Year 4</b>			
	Asset Data Management	20 Credits	Power Engineering	20 Credits
	Electronics	20 Credits	Railway Electrical Systems & Operation	20 Credits
<b>EPA</b>	BEng Rail Engineering Project ( <i>all pathways</i> - 60 Credits)			

<b>Signalling &amp; Telecoms Pathways</b>				
<b>Semester 1 (Sep-Dec)</b>			<b>Semester 2 (Jan-May)</b>	
<b>Level 4</b>	<b>Year 1</b>			
	Railway Industry Professional Practice	20 Credits	Project & Asset Management	20 Credits
	Introduction to Traction & Rolling Stock	20 Credits	Engineering Maths	20 Credits
	<b>Year 2</b>			
	Programming	20 Credits	Plotting & mapping the Railway	20 Credits
<b>Level 5</b>	Railway Reliability, Availability, & Maintainability	20 Credits	Adv. Engineering Maths	20 Credits
	<b>Year 3</b>			
	Principles of Electrical Engineering	20 Credits	Applied Railway Dynamics	20 Credits
	Principles of Control	20 Credits	Team Railway Engineering Project	20 Credits
<b>Level 6</b>	<b>Year 4</b>			
	Asset Data Management	20 Credits	Power Engineering	20 Credits
	Electronics	20 Credits	Railway Signalling & Telecoms	20 Credits
<b>EPA</b>	BEng Rail Engineering Project ( <i>all pathways</i> - 60 Credits)			

<b>Traction &amp; Rolling Stock</b>				
<b>Semester 1 (Sep-Dec)</b>			<b>Semester 2 (Jan-May)</b>	
<b>Year 1</b>				

Level 4	Railway Industry Professional Practice	20 Credits	Project & Asset Management	20 Credits
	Introduction to Traction & Rolling Stock	20 Credits	Engineering Maths	20 Credits
	<b>Year 2</b>			
	Programming	20 Credits	Plotting & mapping the Railway	20 Credits
Level 5	Railway Reliability, Availability, & Maintainability	20 Credits	Adv. Engineering Maths	20 Credits
	<b>Year 3</b>			
	Mechanical Engineering	20 Credits	Applied Railway Dynamics	20 Credits
	Principles of Control	20 Credits	Team Railway Engineering Project	20 Credits
Level 6	<b>Year 4</b>			
	Asset Data Management	20 Credits	Power Engineering	20 Credits
	Electronics	20 Credits	Railway Electrical Systems & Operation	20 Credits
EPA	BEng Rail Engineering Project ( <i>all pathways</i> - 60 Credits)			

### Placement information

As the course is an apprenticeship, the student's and their employers are encouraged to gain/provide additional opportunities for the students to attend different working locations to gain greater experience within their chosen pathways.

### H. Course Module

All modules are compulsory for the pathway students follow as shown in Section G., above, and **Appendix D.**

Module Code	Module Title	Level	Semester	Credit value	Assessment
EEE_4_RIP	Railway Industry Professional Practice	4	1	20	2 x Coursework
EEE_4_PAM	Project & Asset Management	4	1	20	2 x Coursework
EEE_4_EMA	Engineering Maths	4	2	20	2 x Coursework
EEE_4_ITR	Introduction to Traction & Rolling Stock	4	1	20	2 x Coursework
EEE_4_PRG	Programming	4	1	20	2 x Coursework
EEE_4_PMR	Plotting & mapping the Railway	4	2	20	2 x Coursework
EEE_4_GW1	Gateway Preparation	4	Both	0	N/A

EEE_5_RAM	Railway Reliability, Availability, & Maintainability	5	1	20	2 x Coursework
EEE_5_AEM	Adv. Engineering Maths	5	2	20	2 x Coursework
EEE_5_MEP	Mechanical Engineering Principles	5	1	20	2 x Coursework
EEE_5_PEE	Principles of Electrical Engineering	5	1	20	2 x Coursework
EEE_5_GW2	Gateway Preparation	5	Both	0	N/A
EEE_5_TCS	Track & Civils Structures	5	1	20	2 x Coursework
EEE_5_PCO	Principles of Control	5	1	20	2 x Coursework
EEE_5_ARD	Applied Railway Dynamics	5	2	20	2 x Coursework
EEE_5_TRE	Team Railway Engineering Project	5	2	20	2 x Coursework
EEE_5_GW3	Gateway Preparation	5	Both	0	N/A
EEE_6_ADM	Asset Data Management	6	1	20	2 x Coursework
EEE_6_SME	Structural Mechanics	6	1	20	2 x Coursework
EEE_6_ELE	Analog & Digital Electronics	6	1	20	2 x Coursework
EEE_6_RGE	Railway Geotechnics	6	2	20	2 x Coursework
EEE_6_PEN	Power Engineering for Railways	6	2	20	2 x Coursework
EEE_6_ATC	Adv. Track & Civils	6	2	20	2 x Coursework
EEE_6_RES	Rail Electrical Systems & Operation	6	2	20	2 x Coursework
EEE_6_RST	Railway Signalling & Operations	6	2	20	2 x Coursework
EEE_6_GW4	Gateway Preparation	6	Both	0	N/A
EEE_6_RPR	BEng Rail Engineering Project	6	-	60	3 x Coursework

### I. Timetable Information

The course is taught in Blocks throughout the academic year ([Appendix C](#)).

Touchpoint sessions will be held between each Block ([Appendix B](#)).

Invitations for Block teaching and touchpoints dates will be provided in students MS Teams calendars for the subsequent calendar year, at enrolment and within 12 months of Blocks and Touchpoints for the remainder of the course (September-May).

Electronic timetables are available to students through MY LSBU for students to see module's to be taught, when, and where, in each block, prior to the commencement of each semester.

Changes to the above will be notified to students at the soonest opportunity, normally 2 weeks before Blocks, except in extenuating circumstances.

The EPA is undertaken outside of the University, but student's will be able to access the University and use University resources, in that period.

## **J. Costs and Financial Support**

### **Course related costs**

The course fee is the fee published by the university's fee office. Field trips and placement activities, where organised, may cost extra and are not compulsory to attend but students are advised to utilise the opportunities where possible.

Cost of books and other learning materials is also not included in the course fee. Learning resources are usually made available through VLE (Moodle) and the library holds copies of books recommended as core reading.

### **Tuition fees/financial support/accommodation and living costs**

- Information on tuition fees/financial support can be found by clicking on the following link - <http://www.lsbu.ac.uk/courses/undergraduate/fees-and-funding> or
- <http://www.lsbu.ac.uk/courses/postgraduate/fees-and-funding>
- Information on living costs and accommodation can be found by clicking the following link- <https://my.lsbu.ac.uk/my/portal/Student-Life-Centre/International-Students/Starting-at-LSBU/#expenses>

## **List of Appendices**

- Appendix A: Learning overview and Approaches to teaching workflows
- Appendix B: Curriculum Map
- Appendix C: Indicative Module Schedule
- Appendix D: Course Structure
- Appendix E: KSB Mapping
- Appendix F: Terminology

## Appendix A: Curriculum Map

This map provides a design aid to help course teams identify where course outcomes are being developed, taught and assessed within the course. It also provides a checklist for quality assurance purposes and may be used in validation, accreditation and external examining processes. Making the learning outcomes explicit will also help students to monitor their own learning and development as the course progresses.

The letters T for taught, D for developed and A for assessed should be added as appropriate to each Course Outcome.

Modules			Course Outcomes							
Level	Title	Code	A1	A2	B1	B2	C1	C2	D1	D2
4	Railway Industry Professional Practice		TD	TD	D	TD	TD	TD	TDA	TDA
4	Engineering Maths		TD	D	TD	TD		TD	TD	
4	Project & Asset Management		TD	TD	D	TD	TD	TD	TD	TDA
4	Introduction to Traction & Rolling Stock		D	D	TD	D	TD	TD	TD	TD
4	Programming		TD	D	D	D	TD	D	TD	D
4	Plotting & Mapping the Railway		TD	TD	D	TD	DA	TD	TD	TD
5	Railway Reliability, Availability, & Maintainability		TD	TD	D	TDA	TDA	TDA	TD	TDA
5	Adv. Engineering Maths		TD	D	TD	TD		TD	TD	
5	Mechanical Engineering Principles		TD	TD	TD	D	D	D	TD	TD



5	Principles of Electrical Engineering		TD	TD	TD	D	D	D	TD	TD
5	Track & Civils Structures		TD	TD	TD	TD	TD	TD	TD	TD
5	Principles of Control		TD	TD	TD	D	D	D	TD	TD
5	Applied Railway Dynamics		TDA	TDA	TDA	TD	TD	D	TD	TD
5	Team Railway Engineering Project		D	DA	DA	DA	DA	DA	DA	D
6	Asset Data Management		TDA	D	D	TD	TDA	TD	TD	TD
6	Structural Mechanics		TD	D	TD	D	D	D	TD	TD
6	Analog & Digital Electronics		TD	D	TD	D	D	D	TD	TD
6	Railway Geotechnics		TD	D	TD	D	D	D	TD	TD
6	Power Engineering for Railways		TD	D	TD	D	D	D	TD	TD
6	Adv. Track & Civils		TDA	TDA	TDA	TDA	TD	TDA	TD	TD
6	Rail Electrical Systems & Operation		TDA	TDA	TDA	TDA	TD	TDA	TD	TD
6	Railway Signalling & Operations		TDA	TDA	TDA	TDA	TD	TDA	TD	TD
6	BEng Rail Engineering Project		D	D	D	D	D	D	DA	D

## Appendix B: workflows representing the *Learning overview* and *Approaches to teaching*

### R&RSE Teaching Workflow

Our Rail students have diverse skills and knowledge within the railway industry. To assist their learning you are encouraged to employ the following approaches within your teaching of internationally accepted engineering best practice, science, and maths. You are asked, however, to provide potential supporting explanatory reference to how these may be applicable in railway applications. I.e., you do not need to tell the students how or why these are used within their specific disciplines, this is the responsibility of the student and their line manager as part of their apprenticeship, but you are encouraged to ask the students how they think that these

First Block	Touhpoint 1	Second Block	Touhpoint 2	Third Block	Touhpoint 3
Session 1	Q&A on Block Learning	Session 6	Q&A on Block Learning	Session 10	Q&A on Block Learning
Introduction to the module	Review of CW 1 Brief	Overview of previous topics	Review of CW 1/2 Briefs	Overview of previous topics	Review of CW2 Brief
Overview of Learning Objectives	Advice on addressing CW1 (theory from Blocks 1 & 2)	Interconnectivity of topics to other course modules	Advice on addressing CW2 (application of theory)	Interconnectivity of topics to other course modules	Q&A on CW2 Briefs
Interconnectivity of module to other course modules	Q&A on CW1 Brief	Within Sessions 6-9	Q&A on CW1/2 Briefs	Within Sessions 10-15	
Provision of CW 1 & 2 Briefs		Presentation of topic theory		Presentation of topic theory	CW2 Submission
Within Sessions 1-4		Explanation of theory to railway application	CW1 Submission	Explanation of theory to railway application	Due 3 weeks after the end of Block 3
Presentation of topic theory		Relate topics to Learning Objectives	Due 3 weeks after the end of Block 2	Relate topics to Learning Objectives	Marks & Feedback in VLE max 15 days post submission
Explanation of topic theory to railway application		In class discussion	Marks & Feedback in VLE max 15 days post submission	In class discussion	
Relate topics to Learning Objectives		Presentation of maths and science behind the theory		Presentation of maths and science behind the theory	
In class discussion		Relate theory, science and maths to other modules		Relate theory, science and maths to other modules	
Presentation of maths and science behind the theory		Summarise theory and its application		Summarise theory and its application	
Relate theory, science and maths to other modules		Lab/Software applications		Lab/Software applications	
Summarise theory and its application		Session 10		Session 15	
Session 5		Summary of Block		Summary of Block	
Summary of Block		Formative Assesment (as appropriate)		Formative Assesment (as appropriate)	
Formative Assesment (as appropriate)					

## Appendix C: Indicative Module Schedule

### Learning blocks and modules

The training and development of 21st century railway engineers requires them to have a diverse knowledge and understanding of railway-based system. To achieve this, their learning programme needs to provide them with an interconnected story of how topics within modules studies are directly related to their work and interfaces with other parts of the railway system.

Blocks	Track, Civils, Electrical (Installation), Traction & Rolling Stock	Power (Electrical), Signalling & Telecomms	Track, Civils, Electrical (Installation)	L5 FdEng
All	Power (Electrical), Traction & Rolling Stock, Signalling & Telecomms	Power (Electrical), Traction & Rolling Stock	Signalling & Telecomms	L6 Beng

Credits	Module/Year	Semester 1			Semester 2		
		Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
	<b>Year 1</b>	<b>Understanding the railway</b>					
20	Railway Industry Professional Practice						
20	Introduction to Traction & Rolling Stock						
20	Project & Asset Management						
20	Engineering Maths						
	<b>Year 2</b>	<b>Building knowledge of railway systems</b>					
20	Reliability, Availability, Maintainability						
20	Programming						
20	Adv. Engineering Mathematics						
20	Plotting & Mapping the Railway						
	<b>Year 3</b>	<b>Fundamentals of Railway Engineering</b>					
20	Mechanical Eng. Principles						
20	Principles of Electrical Engineering						
20	Track & Civils Structures						
20	Principles of Control						
20	Applied Railway Dynamics						
20	Team Rail Engineering Project						
	<b>3mths</b>	<b>L5 FdEng EPA</b>					
	FdEng Rail Engineering Project	<i>Self-study, post undertaking degree learning</i>					
	<b>Year 4</b>	<b>Engineering Principles</b>					
20	Asset Data Management						
20	Structural Mechanics						
20	Electronics						
20	Railway Geotechnics						
20	Power Engineering						
20	Adv. Track & Civils						
20	Rail Electrical Systems & Operation						
20	Railway Signalling & Telecomms						
	<b>6mths</b>	<b>L6 BEng EPA</b>					
60	BEng Rail Engineering Project	<i>Self-study, post undertaking degree learning</i>					



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Mapping Matrix	Degree Award	(BEng) Rail & Rail Systems Engineering Apprenticeship																						
	Learning Level:	Level 4 Modules				Level 5 Modules								Level 6 Modules										Post Gateway
	Year of Learning:	Year 1				Year 2				Year 3				Year 4										
	Module Title:	Railway Industry Professional Practice	Engineering Maths	Project & Asset Management	Introduction to Traction & Rolling Stock	Programming	Railway Reliability, Availability and Maintainability (RAMs)	Plotting & Mapping the Railway	Adv. Engineering Maths	Mechanical Engineering Principles	Track & Civils Structures	Principles of Electrical	Principles of Control	Applied Railway Dynamics	Team Railway Engineering Project	Asset Data Management	Structural Mechanics	Analogue & Digital Electronics	Railway Geotechnics	Adv. Track & Civils Structures	Power Engineering	Rail Electrical Systems & Operations	Railway Signalling & Telecoms	BEng Rail Engineering Project (integrated EPA)
Module Code:																								
Semester of Teaching:	1	1	2	2	1	1	2	2	1	1	1	1	2	2	1	1	2	2	2	2	2	2		
Credit Value:	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	60	
Knowledge, Skills and Behaviours (KSBs) as per Apprenticeship Standard	<a href="#">AHEP Criteria:</a>	B4, B5, B6, B8, B14	B2, B3			B3	B6, B14	B3, B6	B7, B12	B1, B2, B6, B9, B13	B7, B12	B1, B2, B6, B9, B13	B1, B2, B3, B6			B1; B3; B5; B6; B12	B1; B3; B5; B6; B12	B2, B3, B7, B9, B14		B2, B3, B7, B9, B14	B7, B5			

				D 1					B1 3	B1 3	B1 3								B1 2		B1, D1, D2, E4	
Knowledge	Description	Co o d e r e m e n t s	<a href="#">Eng Comp e tency State ment</a>	A1, A2	A1, B1, B2, C3, D2	B1, B2, C2, E2, E3	B2, B3, C1	A1, B1, E2	A1 B1	A1 A2	A2 B1	A2 B1	A1	A1, B1, B2, D1, D2	A2, C1, C2, D2, E2				B2, B3, C1, D2, E2	B2, E3	A1, A2, B2, B3	
SAFE AND PROFESSIONAL WORKING PRACTICES	including rail specific legislation, regulation [e.g., Common Safety Method Risk Assessment (CSM RA), CDM and Systems Integration and Requirements Management], industry procedures, safety and quality requirements, risk management and environmental impacts. A thorough understanding of the need for compliance with corporate policies including sustainability, ethics, equality, diversity, and human factors, and an ability to constructively challenge non-compliance	CK1		✓	✓			✓	✓				✓	✓	✓							✓
THE SCIENTIFIC, TECHNICAL, ENGINEERING, MATHEMATICAL AND DESIGN PRINCIPLES	and practices across the railway engineering discipline, and for one specific discipline a deep understanding of how the railway functions as an integrated, complex system. Aware of new technological developments in the sector and their impact on future rail operations.	CK2		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HOW TO EFFECTIVELY MANAGE THE DELIVERY OF ENGINEERING SOLUTIONS WITHIN A	and identify new innovations and ways of working and rail innovation, project management principles, asset, data, quality and risk management and assurance systems, and business improvement processes and techniques.	CK3		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓







MEANS OF COMPLIANCE.		ng - Workplace Projects																				
MANAGE VALUE ENGINEERING AND WHOLE LIFE COSTING.	evaluating information from diverse sources to develop, test and cost options: drafting rail specifications or detailed designs.	C S 3		✓		✓			✓	✓				✓	✓	✓						✓
DELIVER RAIL AND RAIL SYSTEMS ENGINEERING SOLUTIONS EFFECTIVELY	including planning, resource allocation and management and delivery to rail industry specifications. Manage change and risk, monitor work, and make decisions and complex critical judgements.	C S 4		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CONTRIBUTE TO AND ATTEND SENIOR MANAGEMENT AND EXECUTIVE MEETINGS	and report on both complex technical and financial issues both verbally and in writing.	C S 5		✓		✓			✓	✓				✓	✓	✓						✓





SAFE WORKING PRACTICES,	to approved rail industry standards and ensures others do likewise. Identifies and takes responsibility for own obligations for health, safety, and welfare issues. Always demonstrates safety leadership.	C B 4	CPD/ PDR Log		✓	✓		✓	✓				✓	✓	✓						✓			
COLLABORATIVE WORKING	and actively engages others in doing so. Is aware of personal actions and impact they may have on others, maintaining effective relationships with rail colleagues, clients, suppliers, and the public, often a key representative of the company.	C B 5	CPD/ PDR Log		✓	✓		✓	✓				✓	✓	✓						✓	✓	✓	
A QUALITY FOCUS,	promoting continuous improvement/different techniques [e.g., Lean].	C B 6	CPD/ PDR Log		✓	✓		✓	✓				✓	✓	✓						✓	✓	✓	
CONTINUOUS PROFESSIONAL DEVELOPMENT,	giving and receiving constructive feedback and willing to learn new skills and adjust to change. Identifies, undertakes, and records CPD necessary to maintain and augment railway competences. Maintains and extends a sound theoretical approach to the application of technology in rail engineering practice recognising technological, political, and economic developments affecting the industry.	C B 7	CPD/ PDR Log		✓	✓		✓	✓				✓	✓	✓								✓	
Specific Knowledge/Skills									✓															
Signalling and Control Systems																								
The requirements, methods and techniques and associated technologies including bespoke rail telecommunications for safe routing, spacing and control of train's e.g. Fail safe principles, signal point failure, degraded mode, fixed block signalling, and automatic train protection. Interface with track assets and bonding/connections.		S K 1 - S & C	Acad emic Modu les/ Appli ed Learn ing/ On- the- job Traini ng - Work place										✓	✓							✓	✓	✓	✓















## Appendix F: Terminology

<b>accelerated degree</b>	accelerated degrees (also known as two-year degrees) are full bachelor's degrees (undergraduate courses) you can complete in a condensed time period
<b>awarding body</b>	a UK higher education provider (typically a university) with the power to award higher education qualifications such as degrees
<b>bursary</b>	a financial award made to students to support their studies; sometimes used interchangeably with 'scholarship'
<b>collaborative provision</b>	a formal arrangement between a degree-awarding body and a partner organisation, allowing for the latter to provide higher education on behalf of the former
<b>compulsory module</b>	a module that students are required to take
<b>contact hours</b>	the time allocated to direct contact between a student and a member of staff through, for example, timetabled lectures, seminars and tutorials
<b>coursework</b>	student work that contributes towards the final result but is not assessed by written examination
<b>current students</b>	students enrolled on a course who have not yet completed their studies or been awarded their qualification
<b>delivery organisation</b>	an organisation that delivers learning opportunities on behalf of a degree-awarding body
<b>distance-learning course</b>	a course of study that does not involve face-to-face contact between students and tutors
<b>extended degree</b>	an extended degree provides a bridging route for students who don't meet the initial entry requirements for the undergraduate degree. The first year provides the necessary knowledge and skills before students begin the degree-level course.
<b>extracurricular</b>	activities undertaken by students outside their studies
<b>feedback (on assessment)</b>	advice to students following their completion of a piece of assessed or examined work
<b>formative assessment</b>	a type of assessment designed to help students learn more effectively, to progress in their studies and to prepare for summative assessment; formative assessment does not contribute to the final mark, grade or class of degree awarded to students
<b>foundation</b>	foundation year programmes are designed to develop skills and subject-specific knowledge to ensure a student can advance to a degree course. They may be offered as stand-alone one-year courses or integrated into degree programmes.
<b>higher education provider</b>	organisations that deliver higher education

<b>independent learning</b>	learning that occurs outside the classroom that might include preparation for scheduled sessions, follow-up work, wider reading or practice, completion of assessment tasks, or revision
<b>integrated</b>	an integrated Master's degree combines undergraduate and postgraduate study. In relation to Apprenticeships, integrated would usually mean that the End Point Assessment (EPA) is integrated with the academic award
<b>intensity of study</b>	the time taken to complete a part-time course compared to the equivalent full-time version: for example, half-time study would equate to 0.5 intensity of study
<b>lecture</b>	a presentation or talk on a particular topic; in general lectures involve larger groups of students than seminars and tutorials
<b>learning zone</b>	a flexible student space that supports independent and social learning
<b>material information</b>	information students need to make an informed decision, such as about what and where to study
<b>mode of study</b>	different ways of studying, such as full-time, part-time, e-learning or work-based learning
<b>modular course</b>	a course delivered using modules
<b>module</b>	a self-contained, formally structured unit of study, with a coherent and explicit set of learning outcomes and assessment criteria; some providers use the word 'course' or 'course unit' to refer to individual modules
<b>national teaching fellowship</b>	a national award for individuals who have made an outstanding impact on student learning and the teaching profession
<b>navigability (of websites)</b>	the ease with which users can obtain the information they require from a website
<b>optional module</b>	a module or course unit that students choose to take
<b>performance (examinations)</b>	a type of examination used in performance-based subjects such as drama and music
<b>pre-registration (HSC only)</b>	a pre-registration course is designed for students who are not already registered with an independent regulator such as the Nursing and Midwifery Council (NMC)
<b>professional body</b>	an organisation that oversees the activities of a particular profession and represents the interests of its members
<b>prospective student</b>	those applying or considering applying for any programme, at any level and employing any mode of study, with a higher education provider
<b>regulated course</b>	a course that is regulated by a regulatory body
<b>regulatory body</b>	an organisation recognised by government as being responsible for the regulation or approval of a particular range of issues and activities

<b>scholarship</b>	a type of bursary that recognises academic achievement and potential, and which is sometimes used interchangeably with 'bursary'
<b>semester</b>	either of the parts of an academic year that is divided into two for purposes of teaching and assessment (in contrast to division into terms)
<b>seminar</b>	seminars generally involve smaller numbers than lectures and enable students to engage in discussion of a particular topic and/or to explore it in more detail than might be covered in a lecture
<b>summative assessment</b>	formal assessment of students' work, contributing to the final result
<b>term</b>	any of the parts of an academic year that is divided into three or more for purposes of teaching and assessment (in contrast to division into semesters)
<b>top-up degree</b>	A top-up degree is the final year (Level 6) of an undergraduate degree course. It allows students to top-up an existing qualification to a full BA, BSc or BEng.
<b>total study time</b>	the total time required to study a module, unit or course, including all class contact, independent learning, revision and assessment
<b>tutorial</b>	one-to-one or small group supervision, feedback or detailed discussion on a particular topic or project
<b>work/study placement</b>	a planned period of experience outside the institution (for example, in a workplace or at another higher education institution) to help students develop particular skills, knowledge or understanding as part of their course
<b>workload</b>	see 'total study time'
<b>written examination</b>	a question or set of questions relating to a particular area of study to which candidates write answers usually (but not always) under timed conditions