



## South London Retrofit Shared Model Pilot

by  
University of Roehampton  
and  
South Thames Colleges Group

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## **Executive Summary**

The South Thames Colleges Group (STCG) and the University of Roehampton (UoR) have been commissioned to carry out a programme mapping exercise to identify career progression within the building retrofit sector.

According to the UK Green Building Council (UKGBC), two-thirds of the nation's homes have an EPC rating of 'D' or below, and around 85% of the nation's homes are heated by gas. The impact on the health and wellbeing is significant - common illnesses caused by cold homes in the winter currently costs the NHS about £1.4B every year.

In the UK 68% of domestic dwellings are rated below the recommended EPC rating of C. By raising the 19 million homes that currently have a D rating up to C, we could decrease the UK's demand for gas by 20%. The home improvements required to achieve this begin with an accurate evaluation of the home's existing condition and work required. Homeowners must understand their current energy use and have access to guidance on the changes required to save money, energy, and reduce carbon emissions.

According to LETI (London Energy Transformation Initiative), around 18% of our annual national CO<sub>2</sub> emissions come from existing homes that will still be standing in 2050. 80% of 2050's homes have already been built. It is also widely acknowledged that the retrofit challenge is monumental. Over one million homes every year for the next 30 years will need to be retrofitted and if we retrofit them well, we can enjoy many environmental, social and economic benefits in the future.

The programme mapping exercise has been carried out using a spreadsheet which identifies current and future course offers of both STCG and UoR. It highlights the synergies between these two institutions, the potential alignment of what is being offered in order to evaluate professional opportunities, and gaps that need to be filled.

The mapping spreadsheet, which is the most innovative element of this project, can be found [here](#).

## **Introduction**

Funded by The Department for Energy Security and Net Zero (DESNZ), the South London Partnership (SLP) have commissioned the University of Roehampton (UoR) and the South Thames Colleges Group (STCG) to work collaboratively on a shared HE/FE retrofit model.

This is the first of its kind retrofit pilot in South London, which includes Higher and Further education providers, designed to review and map the retrofit and sustainable engineering offer and identify opportunities for collaboration and new curriculum design. At the heart of it sits the desire to develop the skills needed by the industry and encourage progression into green careers.

Both UoR and STCG are launching new curricula in this field and have a strong strategic focus on the green construction and sustainable engineering skills agenda.

## **Key Terms of Reference**

- The South London Retrofit Skills Pilot explores and frames the current retrofit and wider (Green) built environment provision offered by STCG and UoR. The Pilot is conducted on behalf of the South London Partnership and funded by the Department of Energy Supply and Net Zero (DESNZ).
- This work supports the evaluation of the current offer across both organisations, to include: the pipelines between STCG (FE) and UoR (HE); the progression lines within STCG and UoR as discrete organisations; and how provision accommodates existing and future demand in the relevant occupation sectors.
- Recommendations will be made as a result of the evaluations referred to above and it is envisaged that these will support the sub-region's ambitions to reduce carbon emissions and attain carbon net zero for London by 2030. Such recommendations may also be of interest to the DESNZ and other key stakeholders outside of South London.

## **Report Structure**

This report begins with an in-depth contextualisation of retrofitting skills challenges in the construction sector, with specific reference to the South London sub-region. Within this, it provides a brief description of the current Retrofit accreditation framework and illustrates the steps taken in a typical Retrofit project (from inception to completion). Since many trades and professions are required within Retrofit processes, there is also wider consideration of the Construction and Built Environment (CBE) Sector.

In the next stages of the report, both STCG and UoR map out their current and planned curriculum offer as both apply to CBE generally, and Retrofit specifically. This descriptive mapping also appears as a spreadsheet via the following the [link](#). Within the consideration of course provision, there is evaluative commentary which includes suggestions around how STCG and UoR can align the separate offers, create more synergy and provide for more accessible progression.

Finally, the Report is brought together by a series of recommendations designed to support the sub-region's approach to addressing skills gaps within Retrofit and the key priority sector which is CBE.

## **Context: Construction and Retrofit**

### **South London Demand and the Retrofit Award Framework**

We know that in South London, there are workforce capacity challenges in the Construction and Built Environment Sector. The South London Partnership (SLP) has developed an annex to the London Local Skills Improvement Plan (LSIP) which covers sub-regional challenges and recommendations. It is notable for this Pilot, that one of the five priority sectors for South London is Construction and the Built Environment (CBE) and that Green Skills are seen as an important cross cutting theme, relevant to all occupational sectors. The rationale for such prioritisation is made evident in the South London LSIP; using Institute for Employment Research (IER) employment projections for 2020-2035, it forecasts that, "The construction and built environment sector is projected to experience rapid growth, with employment

increasing by 20% between 2020 and 2035, more than twice as fast as employment in London overall”. The LSIP goes on to show the strong interrelationship between Green Skills and CBE, whilst forecasting a sharp rise in job opportunities requiring skill sets from each. A report commissioned by SLP in 2021, and cited in the LSIP, expects green jobs to increase by 7% by 2030 (an additional 38,000 jobs). The same report found that three out of four green jobs are located in the following sectors: Power, Homes and Buildings.

Retrofit is seen as particularly important within the drive to ensure employers and providers work together to secure the requisite amount of skilled people to make Net Zero a reality and decarbonise the housing stock in South London. Another report, again cited in the South London LSIP, expects that, “55,000 person years [will be required] to fulfil retrofit requirements on domestic and non-domestic buildings across SLP”. When the SLP launched its Retrofit Skill Centre in February 2024, it had revised the requirement upwards, to 66,000+ person years.

Awarding bodies have already begun to respond, as the City and Guilds diagram (Figure 1: Retrofit Career Pathways) below shows.

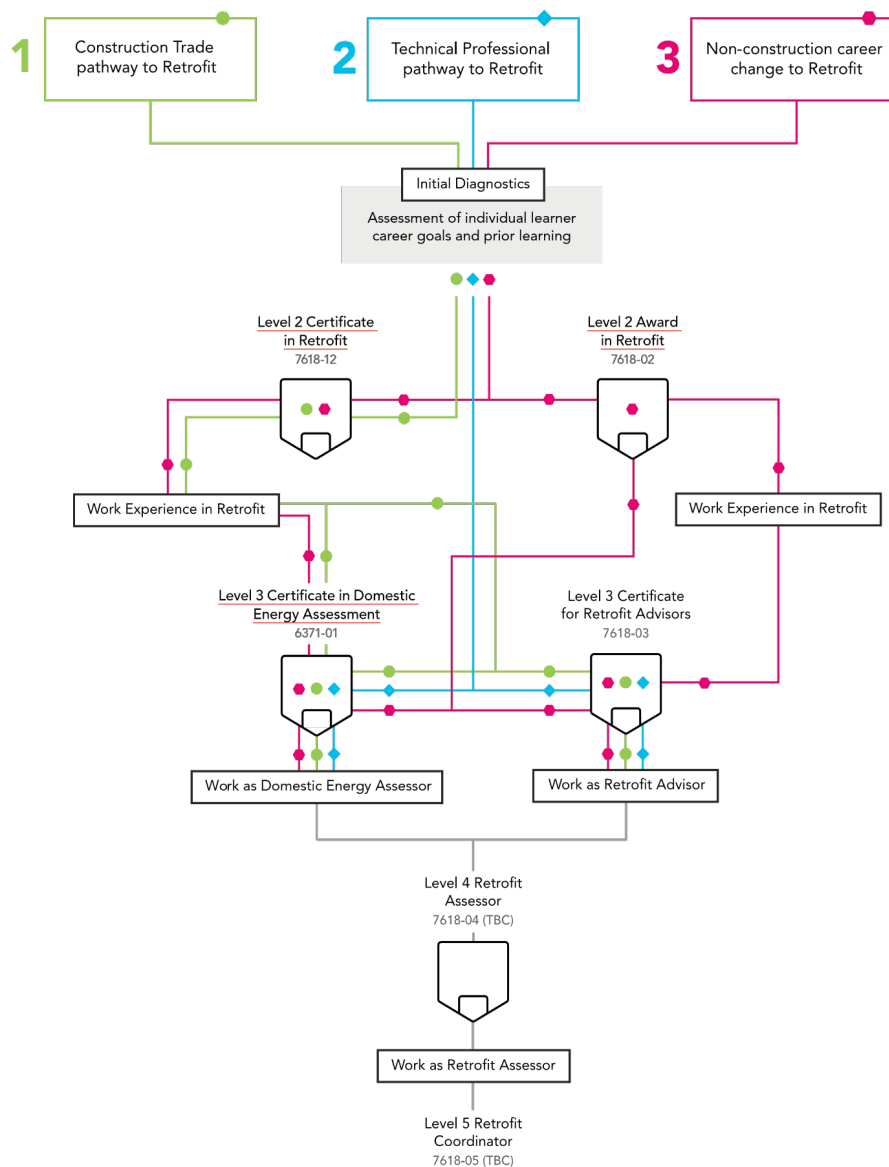


Figure 1 – Retrofit Career Pathways

The diagram (Figure 1) carefully maps out how, from three different starting points (career transition; upskilling from within CBE; technical professional), different learners can acquire the accredited skill sets needed for retrofit work

The diagram organises itself across levels:

- Level 2 Award in Retrofit
- Level 2 Certificate in Retrofit
- Level 3 Certificate for Retrofit Advisors
- Level 3 Certificate in Domestic Energy Assessment
- Level 4 for Retrofit Assessors
- Level 5 for Retrofit Coordinators

The Level 2 Award is a short (thirty guided learning hours (GLH)) introductory course. It is designed to raise awareness and develop knowledge, particularly of the requirements for PAS 2035. PAS 2035 is the framework for the energy retrofit of domestic housing, providing best practice guidance. All publicly funded retrofit projects for domestic housing must be PAS 2035 compliant, whilst it is strongly recommended for those which are unfunded.

The Level 2 Certificate is longer (120 GLH), adds detail to the Award and covers safe working practices as well as the communication skills required to organise a Retrofit project.

There are no entry requirements for either of the level 2 qualifications, although both presume that those with skilled trade qualifications may use them to become more familiar with how retrofit will be relevant to different specialisms. These would commonly be: electricians, joiners, plumbers, plasterers and bricklayers. Using the Standard Occupation Classification (SOC) system (Office for National Statistics, 2020), the target groups will fall within Major Group 5 (skilled tradespeople) and Major Group 9 (elementary occupations).

Both Level 2 qualifications are eligible for funding through the Government's Adult Education Budget (AEB) (£195 for the Award; £941 for the Certificate). In addition, the Construction Industry Training Board (CITB) levy payers are able to draw down up to £600 in grant funding for each qualification. The CITB grant funding is available for the majority of retrofit qualifications, whilst AEB funding is not.

At Level 3, the Domestic Energy Assessment Certificate is described as a 'professional qualification' (City and Guilds, 2017) for those wishing to be Domestic Energy Assessors (DEA). All homes to be sold or rented must be issued with an Energy Performance Certificate and these must be issued by a suitably qualified DEA. The Government has a target that all homes should be retrofitted to 'B' or 'C' standard by 2035 (scale: A-G). The Certificate is a pre-requisite for the Level 4 Retrofit Assessor qualification, whilst also providing entry into employment directly. It is a relatively short qualification (120 GLH) and has no formal entry requirements within the City and Guild framework

The Level 3 Retrofit Advisor qualification is new. City and Guilds first approved its qualification in February 2024. The Advisor takes on a customer service role within retrofit projects, providing advice across the life of a project and acting as a conduit between the client and other retrofit professionals. Interpersonal skills are seen as important attributes in the Advisor role. There are 110 GLH attached and, other than a background in CBE being advised, no prior qualifications are required by City and Guilds

The Level 4 Assessor and Level 5 Coordinator qualifications sit within major groups 2 and 3, using the Standard Occupational Classification (SOC) system. These would commonly require a degree or equivalent (group 2) or a high-level vocational qualification (group 3) and so involve retrofit work which could be considered associate professional or professional. Both qualifications, as indicated in Figure 1, are still under development by City and Guilds. They are, however, offered by private training providers, such as the Retrofit Academy, which uses the Aim Qualifications and Assessment Group as the certificating body for both levels. Specific minimum eligibility for the Assessor course is cited as the DEA qualification but, since the role involves carrying out a full property survey, a certain level and type of CBE experience will also be key. For the Coordinator role, the following minimum eligibility requirements are stipulated: to hold twelve Level 3 credits in a CBE subject; show professional competencies as defined in PAS 2035; and have at least two years' experience of related CBE work.

The Retrofit Academy also provides for a role which does not currently appear in the diagram above: Retrofit Designer. No level of study is given but it asks for significantly more advanced eligibility criteria when compared to the Level 5 Coordinator qualification. The expectation is that applicants will already hold a professional qualification in Chartered Surveying or Architecture, and two years post qualification experience.

The Retrofit Academy qualifications use mostly blended learning models and provide different window lengths for completion: six months for Assessors; twelve months for Coordinators and for Designers. The Coordinator qualification offers one pathway which is 100% on-line, although it consequently modifies the eligibility criteria, asking that applicants already hold a Level 4 (or higher) CBE qualification.

### **Retrofit Project – the 2035 Process**

Figure 2 (below) shows the typical steps taken during a retrofit project and suggests the points at which different retrofit professionals would become involved. The Coordinator is involved throughout all six steps and is ultimately responsible for PAS 2035 compliance. Considering how pivotal the Coordinator role is, it is worth noting Arden's (2022) findings that there are presently under a 1000 trained Coordinators whereas the expectation is that 50,000 will be required by 2030 (see also: CITB, 2021).

The Advisor is important when engagement advice is required within Step 1 and would be available throughout to support a client. The Assessor joins at Step 2 and is supervised by the Coordinator in preparation for carrying out the survey within Step 3. The Designer is significant within Step 4 but the diagram assumes that the role will involve liaising with other retrofit professionals across a project.

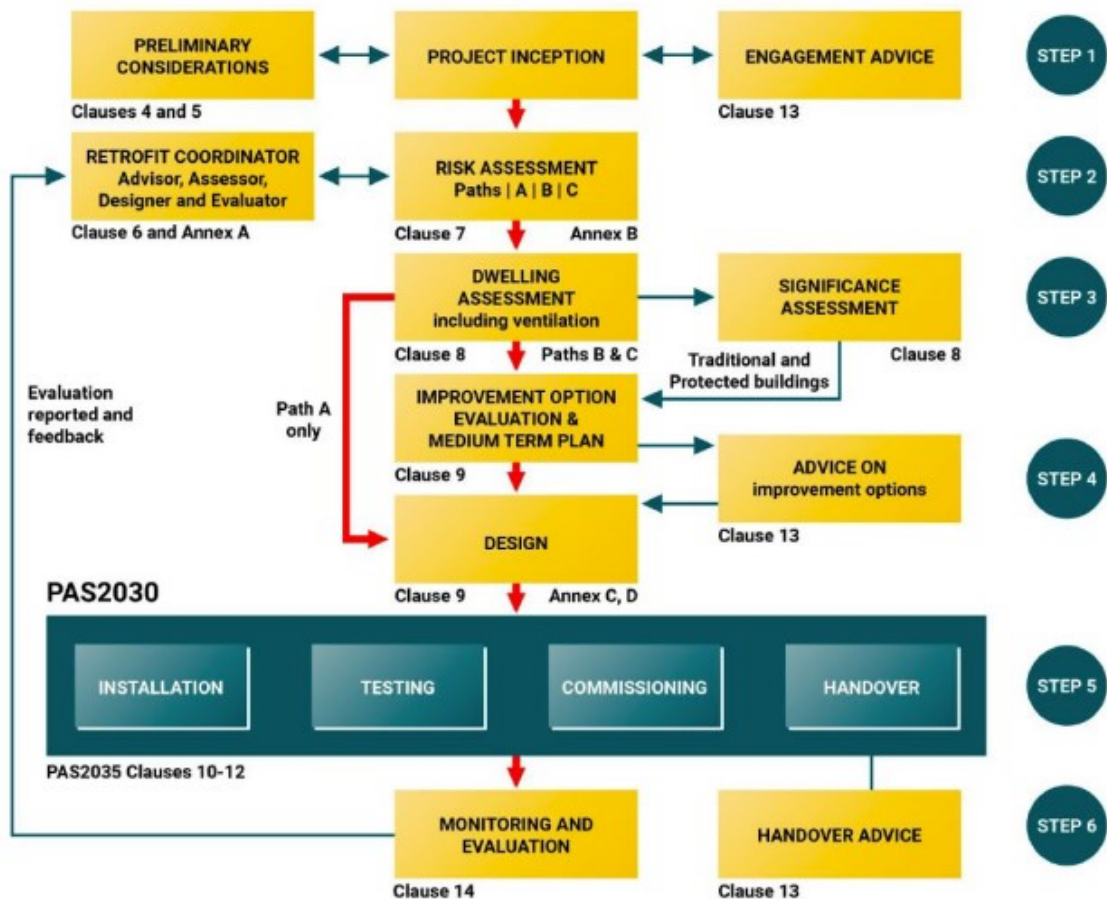


Figure 2 - Retrofit Academy – PAS 2035 Process

Step 5 in the above, involves actual installation, and is guided by the PAS 2030 Framework. Whilst PAS 2035 is the overarching Standards Framework for retrofit projects, PAS 2030 lays out the specific processes required within commissioning, installation and hand-over. The Retrofit Coordinator is the key retrofit professional at this stage, overseeing the testing and commissioning processes. Within publicly funded domestic retrofit schemes, it is a requirement that installers be PAS 2030 certified. PAS 2030 asks that installers have: a comprehensive quality management system in place; a Retrofit Coordinator employed to oversee projects; and a skilled workforce, qualified to carry out the processes involved. PAS 2030 covers a range of energy efficiency measures which inform these processes. Table 1 below itemises the measures and shows how relevant retrofit is within the broader CBE umbrella.

Table 1 - Energy Efficiency Measures (PAS 2030)

| Energy Efficiency Measures (PAS 2030)                                                 |                                                                                           |                                                                                                    |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Cavity wall insulation including that installed in party walls                        | Loft Insulation                                                                           | Heating system insulation                                                                          |
| Draught proofing                                                                      | Flue gas heat recovery devices                                                            | Heating, hot water system, air conditioning or ventilation system controls and components          |
| Energy efficient glazing and doors including replacement insulating glass units (IGU) | Pitched roof insulation                                                                   | Hot water systems                                                                                  |
| Solar blind, shutters and shading devices (internal and external)                     | Mechanical ventilation with heat recovery Domestic ventilation systems with heat recovery | Underfloor heating – hydraulic wet systems                                                         |
| External/internal wall insulation                                                     | Light fittings, lighting systems and lighting system control                              | Water efficient taps and showers                                                                   |
| Flat wall insulation                                                                  | Condensing boilers, natural gas-fired and liquefied petroleum                             | Electric storage heaters (including electric warm air heating units that incorporate heat storage) |
| Hybrid wall insulation                                                                | Warm air heating                                                                          | Internal Wall insulation                                                                           |

The point that Retrofit is pertinent to many skilled trades within the CBE environment is further emphasised by the Association of Colleges' (AoC) 'Green Skill Matrix' below (Table 2). It suggests that six skilled 'on-site' trades would benefit from the Level 2 Award and the Level 2 Certificate in Retrofit. For each qualification, brief detail is provided for the key modules studied.

It is of note that the Certificate addresses the distinctions between the PAS 2035 framework and that of the PAS 2038. PAS 2038 applies to non-domestic and commercial buildings of a certain size. For PAS 2038, the Retrofit Coordinator role is undertaken by a 'Retrofit Lead Professional'. Similarly, instead of a Domestic Energy Assessor, a Non-Domestic Energy Assessor (NDEA) is required.



Table 2 - Retrofit Green Skills Matrix

| Green Skills Embedded at Level 2 Award in Retrofit                                                                                       |                                            |                                                                                                                                                                                                                                                                                                                                                          |                                |                                                 | Green Skills Embedded at Level 2 Certificate in Retrofit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |                          |                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Substantial qualification at Level 2 (on-site trades)                                                                                    | On Site-Green Skills                       | Safe working practices for working in the Retrofit. industry                                                                                                                                                                                                                                                                                             | Beneficial factors of PAS 2035 | Impact of PAS 2035 on the Construction Industry | Communication, legislation, and regulation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Roles and responsibilities | Principles and practices | Level 3 Green Skills Progression opportunities                                                                                                                                                                                                                                                                                                                            | Green Skills Apprenticeship opportunities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Green Skills Employment opportunities                                                                                                                                                                                       |
|                                                                                                                                          |                                            |                                                                                                                                                                                                                                                                                                                                                          |                                |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |                          |                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                             |
| Bricklaying<br>Plastering<br>Painting & Decorating<br>Site Carpentry & Joinery<br>Bench Carpentry & Joinery<br>Multi Construction Skills | Building Installation & Insulation Process | Retrofit upgrading scheme relevant to current industry standards.<br><br>Hierarchy of trades as well as the roles and responsibilities within retrofit.<br><br>PAS 2035 and how these impacts on installing and preparing property retrofit systems.<br><br>Work as a team to rectify an issue with condensation on a recent thermal insulation project. |                                |                                                 | Requirements of safe working practices and behaviours in the retrofit upgrading scheme.<br><br>Knowledge of the legislation and regulations relevant to current industry standards and enable them to maintain effective working relationships for retrofit.<br><br>Meet customers' needs and expectations in retrofit.<br><br>Roles and responsibilities within retrofit PAS 2035/2038 requirements.<br><br>Benefits and interactions of the retrofit roles.<br><br>Core principles of PAS 2035 and PAS 2038 including the required safe practices and behaviors to work in the retrofit industry.<br><br>Variations between the PAS 2035 framework and PAS 2038 framework<br><br>Work as a team to rectify an issue with condensation on a recent thermal insulation project. |                            |                          | Introduction to Domestic Retrofit<br><br>Certificate for Retrofit Assessors<br><br>Domestic Retrofit Advice<br><br>Insulation & Building Treatments<br><br>Industrial Thermal Insulation<br><br>Energy Efficiency Measures for Older and Traditional Buildings<br><br>Sustainability in the Workplace<br><br>Insulation and Building Treatments<br><br>Thermal Insulation | Advanced Plasterer<br><br>Advanced Bricklayer<br><br>Advanced Painter & Decorator<br><br>Advanced Bench Joiner<br><br>Advanced Site Joiner<br><br>Spray Foam Insulation and Application<br><br>Insulation Building Treatments (External Wall Insulation Boarder and Finisher)<br><br>Thermal Insulation (Construction)<br><br>Insulation Building Treatments (Hybrid Wall Insulation)<br><br>Insulation Building Treatments (Insulating Framed Sections)<br><br>Insulation Building Treatments (Internal Wall Insulation)<br><br>Insulation Building Treatments (Room in Roof)<br><br>Insulation & Building Treatments (Construction) | Retrofit Installer<br><br>Retrofit Advisor<br><br>Onsite Plasterer<br><br>Onsite Bricklayer<br><br>On site Joiner<br><br>On site Painter & Decorator<br><br>Building Envelope Technician<br><br>Retrofit Professional roles |

The matrix also addresses the progression routes which candidates could follow, subsequent to Level 2 study. The Level 3 Green Skills and Green Skills Apprenticeships columns present a significant focus on insulation, suggesting that this is where there is high demand for installation skills. The Retrofit Academy confirms this in part, since ‘Insulation Specialists’ are named as one of the five skilled trades which the Retrofit sector requires ‘urgently’. The four others are: Door and Window Fitters; Heat Pump Installers; Ventilation Specialists; and Solar PV/Thermal Installers.

The AoC matrix has not incorporated plumbers and electricians, although, as the Retrofit Academy’s ‘urgently required’ list shows, providing both skilled trades with opportunities to upskill will be vital in meeting Retrofit demand. Arden (2022) makes the point, for example, that less than 5% of the heating and plumbing workforce has been trained to install air source heat pumps.

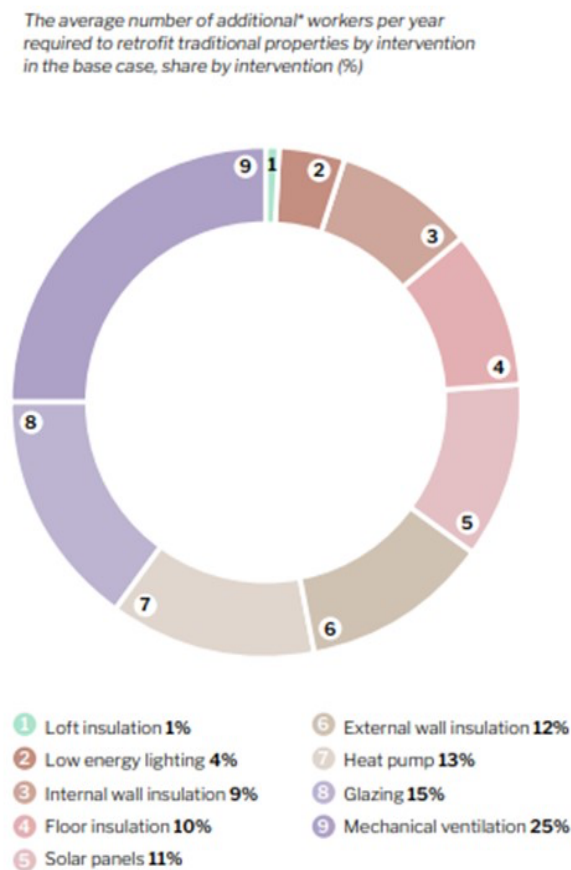


Figure 3 to the left, taken from the Grosvenor Report (2023) on ‘Heritage and Carbon’, helps to further clarify where the skills gaps are most acute. The Report considers what will be required to decarbonise heritage buildings (built before 1919). It calculates that one in five of all domestic buildings and a third of all commercial properties can be categorised as such. In total, the Report finds that 105,000 new workers will be needed each year, up until 2050, solely to retrofit historic buildings. The figure divides the retrofit interventions up to show where the new workers will be required. 32% of interventions are associated with insulation, confirming detail in the Green Skills Matrix above and that provided by the Retrofit Academy. Mechanical ventilation, however, at 25%, forms the largest single intervention and this will need to be factored in to provision.

Figure 3 - Heritage and Carbon – Retrofit Interventions

## **South Thames Colleges Group – 2024/25 Curriculum Offer**

The STCG is currently finalising a new curriculum strategy for 2024-2027. The strategy reflects the Government created duty for colleges to respond to the needs of the local economy and that there are significant skill shortages in London and limited supply of new entrants to the workforce across most sectors, as captured in the pan-London Local Skills Improvement Plan.

Currently, 17% of STCG's students are enrolled within the Construction and Engineering occupational grouping. During the life of the new curriculum strategy the Group expect this occupational grouping to continue to form a substantial part of its offer and to develop to include more adults. The LSIP notes that, within the SLP area, adult enrolments for Construction and Engineering courses amount to only 2.1% of the whole. The Group recognise, too, that provision within this occupational grouping will need to be dynamic and agile: it will need to adapt and respond to different skills needs and there will be calls for new provision as policy and demand develops.

As might be expected of an FE context, the Group's existing curriculum, as it relates to Retrofit, focuses on Major Groups 5 and 9 (Skilled Tradespeople and Elementary Occupations) rather than the Professional and Associate Professional roles available (Major Groups 2 and 3). Much of the provision is concerned with: 'raising awareness' via introductory qualifications; short upskilling courses for those already in skilled trades; and then skilled trade long courses where Retrofit skills and concepts can be incorporated. With the latter point, employer panels run by the Group have reported some frustration that awarding bodies are not acting fast enough to update syllabi so that they do actually produce plumbers, electricians, carpenters, and so forth, who are retrofit ready.

When the CITB (2023) produced a labour analysis for the City of London's 'Skills for a Sustainable Skyline Taskforce' (set up to identify skills needs and address skill gaps in relation to decarbonising commercial buildings in central London), it devoted a section to Further Education. Within this, it reported very little provision at Level 2 and above which was directly related to Net Zero requirements. The below is taken directly from the report:

*Looking within the range of further education learning aims being taken in London that would support net zero carbon work (Appendix A), in 2021/22 there were: • Two providers delivering the level 2 Diploma in Refrigeration, Air Conditioning and Heat Pump Systems, with a total of over [omission] enrolments on this learning aim; • One of those providers delivered the level 3 Diploma in Refrigeration, Air Conditioning and Heat Pump Systems, with less than 5 enrolments on this learning aim; • One provider who delivered the level 2 Award in Understanding Domestic Retrofit, with less than 5 enrolments on this learning aim; and • There were no learning aims that were linked to solar photovoltaic installation, insulation treatments or energy advice/energy assessment (CITB, 2023: p.20)*

The extract shows the disconnect (in 21/22) between demand and supply and is a useful framing point when considering what STCG intends to offer in 24/25.

As indicated earlier, full details of STCG's 24/25 curriculum offer and how it might articulate with UoR's intended provision is provided via this [link](#). (Retrofit Shared Model Map). In all,

STCG’s relevant planned provision for 24/25 includes around sixty courses across the four major sites within the Group (Wandsworth, Merton, Carshalton, Kingston). The share that different levels represent is captured in Table 3 below:

*Table 3 - STCG Green Skills/CBE Provision by Level*

| Level of Achievement | Proportion of whole |
|----------------------|---------------------|
| 1                    | 16%                 |
| 2                    | 30%                 |
| 3                    | 41%                 |
| 4 (HE1)              | 9%                  |
| 5 (HE2)              | 4%                  |

What follows is an organising overview which uses a number of sections to achieve this: Specifically Retrofit; Closely Aligned with Net Zero targets; Broad Construction/Skilled Trades; Design.

#### Specifically Retrofit

Three short Retrofit courses are offered: two Level 2 Retrofit Certificates (one at the Wandsworth site in the evening; one at Merton during the day) and one Level 3 Certificate for Advisors at Wandsworth (evening). The certificates are 120 GLH and are eligible for AEB funding of up to £941. GLH for the Level 3 are 110; funding is not available. For the Level 3 course, UoR has indicated possible progression onto degree courses associated with Architectural Technology and also Construction Management. Both courses take place within the University’s new Sustainable Engineering and Technology Education Centre (SETEC). There may also be an option in the future to progress onto a short UoR course (Passivhaus Principles).

One Domestic Energy Assessment (DEA) certificate (L3) is planned at the Wandsworth site. This is useful in its own right since homes for sale or rent require such assessment but it is also a prerequisite for the Level 4 Retrofit Assessor qualification. The course is run in the evening. The DEA GLH are 120 and it is funded up to £811. UoR note that there will be options to upgrade through groups such as Stroma which offers compliance and accreditation services for the CBE sector.

In addition, and not yet formally appearing in planning documentation, the Level 2 Retrofit Award will be offered as a bolt-on to 16-18 study programmes for Multiskills students at the Carshalton and Wandsworth sites. This bolt-on approach is designed to formally raise awareness amongst Construction students of Green Skill opportunities and issues in the Sector. GLH for the Award are 30 and funding is £195

## Closely Aligned with Net Zero Targets

### *Electric Vehicles*

- One short Level 3 Award is provided at Wandsworth for adults (Award in the Design and Installation of Small Commercial Electrical Vehicle Charging Installations). This is a short evening course and aims to upskill qualified (at Level 3) electricians. GLH are 16 and AEB funding available is £130.
- Kingston College has run a Level 3 Electric/Hybrid Motor Vehicle Maintenance course in previous academic years

### *Air Source Heat Pumps; Solar Thermal Hot Water (Plumbing)*

- Both Merton (day) and Wandsworth (evening) sites offer the Level 3 Introduction to Air Source Heat Pumps. The course is aimed at qualified plumbers (to at least Level 2) and, although the course is not accredited it can show competence for the Microgeneration Certification Scheme (MCS) with regards installation and design. MCS is a standards organisation and describes its role as follows:

Working with industry, MCS sets, defines and maintains the Standards for low-carbon energy technology products, contractors and their installations. This includes heat pumps, solar, biomass, small wind and battery storage. MCS is a mark of quality. Membership of MCS demonstrates adherence to these recognised industry Standards, highlighting quality, competency and compliance. MCS aims to decarbonise heat and power in the UK's homes by giving ... confidence in home-grown energy.

- The Merton site also runs a daytime L3 Award in Installation and Maintenance of Solar Thermal Hot Water Systems. GLH are 80 and funding is provided up to £585. It is aimed at qualified plumbers (to at least Level 2).

### *Solar Photovoltaic*

- The Wandsworth site offers a short L3 Award in the Installation of Small Scale Solar Photovoltaic Systems (evening provision). It is aimed at practising qualified electricians (at Level 3) who wish to upskill. There is AEB funding available for this course (£390). GLH are 50. The course can be seen as an entry level demonstration of competency under MCS.
- The Merton site runs the Level 3 Certificate for Solar PV Installers & Operators. This requires a full day of study, each week for twelve weeks, and so is a fuller commitment when compared to the Award. Again, it is aimed at qualified electricians but also asks for evidence of recent CPD and would like applicants to hold the 18<sup>th</sup> Edition (most recent iteration of the British Standard for Electrical Wiring Regulations). AEB funding is available (£585) and GLH are 80.

There may be UoR options to study on follow-up short courses such as 'Building Certification' (BREEAM applications).

### *Climate Change*

- Certificate in Understanding Climate Change and Environmental Awareness: this Level 2 course is offered to adults across three sites (Merton, Kingston, Wandsworth) and is funded up to £811 through the AEB. The focus is on raising awareness around Net Zero initiatives and rationales. It can be offered as a stand-alone on-line course or as a bolt-on to relevant larger programmes, such as Teaching Assistant provision.

### Broad Construction/Skilled Trades

#### *Multiskills*

- A 'Pathway to Construction' course is offered at Carshalton. It is linked to the CITB's Pathways into Construction initiative. It targets groups who are underrepresented in the Sector, including women and veterans.
- Levels 1 (Certificate) and 2 (Diploma) are offered at both the Carshalton and Wandsworth sites. These target 16-18 students who are in full-time education. They provide a broad introduction to a range of construction trades (Bricklaying, Carpentry, Painting & Decorating, and so forth) and offer progression into site work. The L2 Retrofit Award can be bolted onto these programmes. Many students tend to choose to specialise after taking the Multiskills courses and move into Level 2 Plumbing, Electrical or Brickwork.

#### *Electrical Installation/Engineering*

- There is significant ladder progression for Electrical Installation, with FE provision mostly focused on the Wandsworth and Merton sites. Kingston offers HE routes.
- The Level 1 and Level 2 Diplomas in Electrical Installation most usually target 16-18s in full-time education. The Level 2 Diploma can offer progression into work as a fully qualified electrician's assistant within contracting and maintenance. At the Merton site, a Level 2 is also offered in the evening; this will seek to recruit adults who may be looking to change career. There is AEB funding available for the Level 2 (£3,345). The amount of GLH expected (454) show that the commitment is likely to be two evenings a week for an academic year. The Group is working with the AoC on a Greener London project and, as a part of this, adds Green Issue Awareness Raising activities into 16-18 Construction provision
- At Level 3, 16-18s will study full-time for the new Technical (T) Level qualification in Building Services Engineering for Construction (Electrical Installation pathway). T Levels are equivalent to three A-Levels, take two years to complete and include 45 days of industrial placement. Adults have access to the Level 3 Diploma in Electrical Installations (Buildings and Structures). This is typically offered in the evening, twice a week, for an academic year. GLH are 480 and AEB funding is £3,345.
- Kingston delivers a Higher National Certificate (Level 4; HE1) and a Higher National Diploma (Level 5; HE2) in Engineering (Electrical and Electronic Engineering). Both would provide access to retrofit professional roles. Both have had units added which ask students to consider climate change and its impact on engineers.

### *Engineering*

- As with Electrical, the Group offers a strong ladder of progression for Engineering, from Level 1 through to Level 5.
- 16-18s, at the Kingston and/or Merton sites, are offered full-time BTEC qualifications from level 1 to 3. At Level 3, the most usual progression route would be an Engineering related HE course such as the BEng offered by UoR
- At Wandsworth, the focus switches to Civil Engineering. There is a Level 3 Civil Engineering Technician apprenticeship provided for adults in relevant employment. Higher Nationals are also offered at Levels 4 and 5. All of the civil engineering course provide good access routes to retrofit professional roles at varying levels. All levels could consider UoR's BEng degree courses within SETEC as a next step (point of entry would vary).
- Wandsworth also delivers a Level 3 Building Services Engineering Technician Apprenticeship for adults. Energy efficiency and environmental safeguarding are considered to be central to this course. Retrofit professional roles would be viable progression options. UoR will be offering a BSc In Architectural Engineering from 25/26 and this would offer possible progression

### *Surveying and Site Management/Supervision*

- These take place solely at the Wandsworth site and are for adult learners.
- Level 4 Construction Quantity Surveying Technician Apprenticeship. A three-year apprenticeship. The project management involved as well as the interpersonal skills required suggest a good fit with the Assessor and Coordinator Retrofit positions. There is a direct fit with UoR's Quantity Surveying BSc which is due to commence in the 25/26 academic year.
- Level 4 Construction Site Supervisor Apprenticeship. Another three-year apprenticeship and another suitable platform into Retrofit. There is good alignment here with UoR's Construction Management BSc within SETEC. The degree emphasises its attention to the 'development, conservation, and improvement of the built environment'. The CITB (2023) confirm there is demand in commercial retrofitting for supervisors, reporting that they represent 11% of all demand for low carbon projects

### *Bricklaying*

- The Carshalton site offers bricklaying diplomas at Levels 1 and 2. The target audience is 16-18s who will follow a full-time programme with a view to moving onto site work once Level 2 is completed. The Group is working with the AoC on a Greener London project and, as a part of this, adds Green Issue Awareness Raising activities into 16-18 Construction provision

### *Carpentry*

- The Carshalton site offers carpentry diplomas at Levels 1, 2 and 3. The target audience is mostly 16-18s who will study on a full-time programme with a view to moving onto site work once Level 2 is completed. The Group is working with the AoC on a Greener London project and, as a part of this, adds Green Issue Awareness Raising activities into 16-18 Construction provision.

Adults are more likely to be following the Level 3 (583 GLH) and have access to AEB funding (£3,345). UoR's Construction Technology module within Year 1 of its Architectural Technology and Construction Management degrees is a possible next step but this would depend on separate modules being accessed in and of themselves.

- Carshalton also provides for a two-year 16-18 carpentry apprenticeship at Level 2. As with the usual apprenticeship model, this will involve day release to college.

### *Plumbing*

- The Level 1 and Level 2 Diplomas in Plumbing (Carshalton and Merton sites) most usually target 16-18s in full-time education. The Level 2 Diploma offers progression directly into work in the sector, although further Level 3 qualifications are required to be 'gas safe'. The Group is working with the AoC on a Greener London project and, as a part of this, adds Green Issue Awareness Raising activities into 16-18 Construction provision
- Carshalton also runs the Level 3 Plumbing and Domestic Heating Technician threeyear Apprenticeship. The technicians produced by this apprenticeship are considered to be competent to install heat pumps, solar thermal systems, biomass boilers and water recycling systems. The qualification, along with CBE work experience, provides a good platform from which to consider retrofit professional roles.
- Carshalton is also an established Gas Safety Centre and runs various Accredited Certification Scheme (ACS) qualifications. The ACS is a mandatory entry route for all gas engineers and provides access to the Gas Safe Register. Competence must be re-established every five years.

### *Scaffolding*

- One three-day scaffolding course is planned at Carshalton. It is advertised as being part of the Construction Industry Scaffolders Record Scheme (CISRS). The CITB (2023) has reported that scaffolders represent 11% of the total demand for labour in commercial retrofitting in central London. As such, STCG's provision may need to be expanded

### Design

- The Group runs a selection of Art and Design courses at various levels. The UoR has noted that the Level 3 provision may offer pathways into the University's BSc in



Architectural Technology. Design is named as one of the four key themes of the programme and, as with all other courses within the University's SETEC, there will be a focus on green skills and sustainability (see later in this Report for more detail of the provision at UoR).

### **South Thames Colleges Group – 2024/25 Curriculum Offer – Summary**

The Group has good breadth to its traditional Construction offer and so is in a generally good position to address the growth in Construction employment predicted by the South London LSIP (see Figure 4 below and detail towards the beginning of the Report).

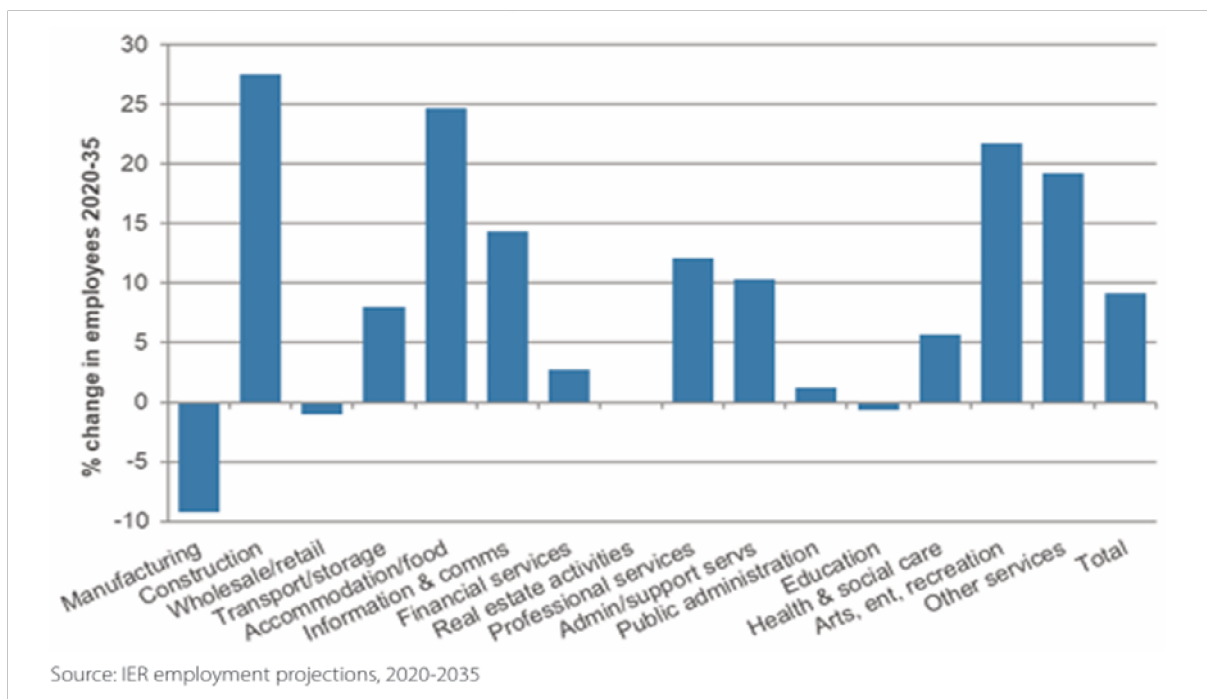


Figure 4 - Projected Employment Change by Sector 2020-2035

Whilst STCG is developing its specifically Retrofit and Net Zero offer, this aspect of the curriculum will need to continue to grow since there are significant gaps. Examples of such gaps include Insulation Installer training and Level 5 Retrofit Coordinator. Growth will need to be carefully nurtured and thoroughly informed by employers. It is likely that very specific short upskilling courses for adult students will be particularly important in supporting net zero ambitions.

The Level 4+ offer is also beginning to strengthen, although it is still a small proportion (13%) of the wider CBE offer. The new courses for 24/25, such as the Site Supervision qualification, are a response to reported role shortages reported in LMI data and by key sector agents (CITB). The Level 4+ offer can mature by extending links into UoR's SETEC undergraduate provision across a broad range of built environment disciplines.

## **University of Roehampton – Sustainable Engineering**

The UoR is investing in a new Sustainable Engineering and Technology Education Centre (SETEC) to deliver new programmes in Engineering, Architecture and the Built Environment. SETEC will offer industry-led programmes, and will provide a high-quality educational experience, offering interdisciplinary project-based teaching and learning, providing a real-life education experience for students and graduates who are industry ready.

Roehampton's 180+ year history of diversity in education, coupled with a track record in campus developments, ensures SETEC will be at the forefront of London's sustainable Higher Education provision, offering new Civil Engineering, Construction, Architecture and Surveying degrees and degree apprenticeships.

SETEC will provide the flexible infrastructure and specialist equipment (consisting of technology-rich engineering and fabrication workshops, flexible teaching and design studio spaces, environmental labs, digital labs and Computer Aided Design (CAD) labs) to support the establishment and growth of Engineering, Architecture and Built Environment education at Roehampton.

SETEC's focus on green skills and sustainability will address national and sub-regional priorities in design, construction, occupation, regeneration and urban development, in dialogue with the rapidly changing needs of employers, and their strategic priorities including green infrastructure, climate adaptation, and sustainable construction.

The new portfolio of programmes will address specific and specialist areas of knowledge, in line with the skills focus and educational frameworks of accrediting, validating and prescribing professional bodies, but also the needs of national and regional employers. The portfolio will promote alignment with the United Nation's Sustainable Development Goals (SDG) with a particular emphasis on those relating to requirements to 'build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation' and to 'make cities and human settlements inclusive, safe, resilient and sustainable'. The programme portfolio will place the sustainable development requirements of the professional bodies at the core of its curricula.

Curriculum and content development will prioritise multiple entry and exit points, within a coherent credit framework that fosters and protects flexibility through the accumulation of credits.

### **2024/25 Course Offering**

This section broadly sets out the programmes that are currently being offered at UoR. The Sustainable Engineering and Technology area is looking to expand and widen access to different disciplines to enhance its interdisciplinary approach.

Appendix A provides more details of the programme modules and their Learning Outcomes

### **Foundation Year**

**Entry Level: 64 UCAS tariff points**

This one new programme is the first year of a range of built environment undergraduate programmes, and provides a grounding in basic knowledge and skills required to progress into the level 4 first year of these programmes. It provides academic and practical experience, as well as fundamental skills required to ensure that students are equipped to successfully complete the degree programme.

The Foundation Year programme is currently offered for progression to degree level study in construction management, architectural technology, and civil engineering.

Although the entry tariff for the foundation year is 64 UCAS points (or equivalent), there is still a fundamental requirement that an applicant has achieved a pass in A-level maths if they wish to continue and progress onto the Civil Engineering degree programme. Otherwise, they would have to choose a different discipline where A-level maths is not a requirement.

### **Architectural Technology, BSc (Hons)**

**Entry level: 112 UCAS Points**

**Fee £9,250 (UK Students)**

**Level 4: Cert HE**

**Level 5: DipHE Level**

**6: BSc (Hons)**

The Architectural Technologists have a leading role in designing and managing projects and working with other professional to deliver a sustainable built environment. This course has been developed covering four key themes- mainly design, technology, management, and practice in the context of the role of an Architectural Technologist. The students will learn skills of design, using both manual and digital methods, as well as emerging technologies used in new buildings or adaptation of existing buildings covering building structures and systems, materials, and components, fabric, and services. The students will experience the studio practices that mirror the practices of working on architectural design organisations.

They will study a variety of subjects to be develop understanding and application of design principles, digital construction, building performance analysis, emerging technologies, materials, legislation, sustainability, and management skills to deliver architectural technology projects. Emerging digital and technical applications are integral to the course which build digital capability in the students, who on completion of the degree, can deploy and experiment with digital tools and technologies to produce informed solutions quickly and reliably.

Sustainability is central to all programmes that are delivered at SETEC which aims to address the green skills shortages in the built environment and the United Nations Sustainable Development Goals (SDG) are embedded within the curriculum.

The students will be able to plan and design buildings embracing social, technological, environmental, ethical, and cultural perspectives, meeting the client's requirements and expectations. The students will be introduced to design and detailing of low to high-rise, residential to commercial buildings, ensuring that the solutions result in buildings that are inclusive, resilient, sustainable and energy efficient. This course will prepare students to work as part of a project team administering procurement strategies and contract procedures and to interface with the construction team, providing support and co-ordination to turn the design into reality. On completion of the course, the students will be able to communicate their design and technology solutions effectively using the latest industry practices.

Students study mostly using project-based learning approach via lectures, workshops, labbased practical exercises, architectural studio practices, simulation and modelling of buildings that are designed around a workplace project scenario. The project-based coursework is the main form of assessment, which ensures students experience how to design and realise sustainable buildings in a manner like industry practice.

Widened access to Architectural Technology is a unique selling point of the provision at Roehampton, offering multiple points of entry to a suite of programmes, and multiple points of exit, and this is particularly relevant for our local community and for ethnic minority groups where current opportunities are limited.

Graduates from this course will be able to work with contractors, consultancies, local authorities, housing associations and other organizations in professional roles as Architectural Technologists, Building Control Officers, Building Information Modelling Managers etc.

### **Construction Management, BSc (Hons)**

**Entry level: 112 UCAS Points**

**Fee £9,250 (UK Students)**

**Level 4: Cert HE**

**Level 5: DipHE Level**

**6: BSc (Hons)**

Construction Management (CM) covers the development, conservation, and improvement of the built environment and it ensures the design, construction and operation of buildings and other built facilities meet business, client, and end-user needs, and operate within financial, environmental, and safety constraints. By working collaboratively with a broad range of stakeholders, construction management professionals maintain and enhance the quality of the environment and community. As the discipline includes a wide range of specialist services, the graduates of the CM programme undertake the roles of the site manager, assistant site manager, planner, quality assurance etc, and work with contractors, specialist subcontractors, and client organizations.

The CM course covers how to manage a team of built environment professionals and collaborate with other practitioners to ensure that buildings and other facilities including services are constructed on time and budget with desired quality, health and safety and sustainability considerations. Digital technologies are embedded in the curriculum and are a key part of the learning and teaching along with vocational skills. Design and construction methods are evaluated considering the social, ethical, legal, environmental, and economic factors relevant to the construction management discipline.

Sustainability is central to all programmes that are delivered at SETEC which aims to address the green skills shortages in the built environment and the United Nations Sustainable Development Goals (SDG) are embedded within the curriculum.

The learners will employ current and emerging technologies to produce innovative solutions for development, manufacture, and construction of the built facilities. Over the course of the programme, the process of learning will involve the use of industrial projects and case studies to develop analytical and problem-solving skills.

Widened access to Construction Management is a unique selling point of the provision at Roehampton, offering multiple points of entry to a suite of programmes, and multiple points of exit, and this is particularly relevant for our local community and for ethnic minority groups where current opportunities are limited.

## **Civil Engineering**

**Entry level: BEng 112 UCAS Points / MEng 120 UCAS Points**

**Fee £9,250 (UK Students)**

**Levels 4- 6: BEng (Hons)**

**Level 7: MEng**

Civil engineers embody the spirit of possibility, turning challenges into opportunities and blending science and art to create solutions and infrastructure. They address global challenges such as the Climate Emergency and the United Nations Sustainable Development Goals.

What distinguishes this programme from competitor programmes in civil engineering is the interdisciplinary mode of delivery and Project Based Learning (PBL) principles which are incorporated into the programme wherever possible. Every academic year, students on this programme will take part in large 40 credit design project modules which also involve students from other programmes and other disciplines. These opportunities allow students to work on significant projects as part of a interdisciplinary team, with each team member resolving their discipline specific element of that project. This means that students will have a unique experience of how things work in practice, making them more industry ready and more employable on graduation. Although there will always be a need for a minimum level of formal, structured, theoretical lectures, this programme is delivered, primarily in a flexible open plan environment with staff and students sitting round tables in a more formal seminar/tutorial scenario. The programme is designed to assess students across a broad range of assessment types in order that students gain experience of different methodologies for measuring academic performance, and in order to give students experience which will be valuable in terms of their employability and in terms of their future career.

There are a multitude of opportunities for graduates of Civil Engineering in the built environment sector, Internationally, nationally, and regionally. There are many Civil Engineering employers who offer opportunities in areas of design, consultancy, structures, railways, coastal, transport, water and infrastructure, among others.

Students are introduced to these global challenges and the necessary cultural changes needed at every level, including materials selection, design and construction thinking. The programme has several interdisciplinary design projects, where the students work with students of other built environment disciplines. There is hence a focus on buildings and structures and their impacts on the environment. The programme integrates structural engineering, environmental engineering (within and outside buildings), geotechnical engineering and transportation engineering. The focus is on sustainability and innovation, providing students with a well-rounded education and the skills necessary to address the complex challenges of the modern world.

In every design, every calculation, and every construction site, civil engineers are architects of progress, leaving an indelible mark on the world, one foundation at a time. Civil engineers are problem solvers, tackling challenges with ingenuity and resilience. With every design and calculation, they build pathways to progress.

Civil engineers focus on the design, construction, and maintenance of the physical and naturally built environment. Working in collaboration with architects, urban planners, environmental scientists, and other professionals, civil engineers create and maintain infrastructure that meets the needs of communities while safeguarding future generations. Within the context of sustainability, they consider carbon reduction, well-being, nature-based solutions, adaptation and resilience. They deal with ethics, safety, diversity, inclusion and

economic feasibility. They are responsible for planning, designing, and overseeing various infrastructure projects, including buildings, transport infrastructure, bridges, drainage systems, and water supply and disposal. They deal with new build, but now and even more so in the future, a focus is on adaptation and re-use of infrastructure, enhancing climate change resilience, replacing infrastructure that is already failing because of climate change with, for example, nature-based solutions, and infrastructure asset maintenance and management.

The strengths of this programme stem from the integration with associated disciplines, the core of sustainability and the project-based learning. The programme has been designed as part of a suite of programmes where, each year, students will work with other sustainable engineering and technology students on 40 credit interdisciplinary design projects, just as they would as professionals.

Inclusivity and inclusive practice is a central tenet of the SETEC community. We will ensure physical and digital accessibility on campus, including accessible buildings, teaching spaces, and online resources, and wherever practicable, activities taking place off-campus, for example site visits, will be sensitively organised to account for staff and students with disabilities. We will promote cultural awareness among our community and will integrate multicultural perspectives into our curriculum, having diverse voices and perspectives across all disciplines. We will provide robust pastoral care for our students and ensure that this is accessible to all students and we will implement policies against all forms of discrimination and bias. We will aim to recruit and retain a diverse body of students and academics and will ensure that we have inclusivity built into our admissions policies and also in staff recruitment. Community engagement is also central to our vision, and we will foster a connection between SETEC and our local community to ensure that the educational environment extends beyond the campus. This might involve community-based learning, outreach programmes, and partnerships with local organisations.

The BEng in Civil Engineering programme is designed to fully satisfy the educational base requirements for an Incorporated Engineer and to partially satisfy the educational base requirements (requiring appropriate further learning to Master's level) for a Chartered Engineer.

#### **Entry requirements (Level 4)**

A typical offer will require a UCAS Tariff score 112 points. A minimum of two full A-levels (or equivalent) will be required. GCSE in English and Maths grade 4.0 (C) or above is required. Every application is considered on an individual basis.

NC or NVQ in the appropriate subject areas at Level 3 will be considered.

Mature applicants without the above qualifications will also be considered for entry by interview and Accreditation of Prior Learning (APL) process.

For the applicant whose first language is not English or who has not been educated wholly or mainly in the medium of English, the minimum English Language requirements is IELTS (or recognised equivalent) of 6.0 overall with at least 5.5 in each component.

## Potential synergies between STCG and UoR

Within the retrofit and sustainability agenda, there are multiple career progression opportunities that students can take.

We have collectively created a mapping matrix between STCG and UoR in order to identify some of these career progressions. This includes, but is not limited to, progression from Level 3 to Level 4, attendance of partial modules and/or micro-credentials. An example of this career progression are illustrated in Figure 5

This matrix can be accessed through this [link](#).

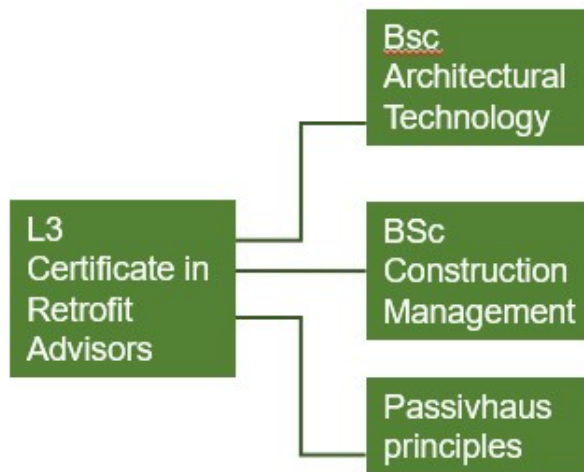


Figure 5 - Indicative example of progression from L3 Certificate in Retrofit Advisors

## 2025/26 Course Offering

A number of new built environment programmes are currently being developed for delivery from September 2025 onwards and build on the current programme offerings. The vision for SETEC is that it will provide interdisciplinary teaching in a Project Based Learning (PBL) environment which is unique in this sector.

From September 2025, we will be offering the following courses in addition to those that are described above:

### Architecture (RIBA Part 1) (BSc)

Our Architecture programme will provide a comprehensive education in architectural design, science and technology, art and architectural history and technical innovation.

This three-year FT undergraduate programme will be validated by the Royal Institute of British Architects (RIBA) and prescribed by the Architects Registration Board (ARB), and will be supplemented in future years with validated RIBA Part 2 and Part 3 programmes (or their equivalent).

## **Architectural Engineering (BEng)**

Our Architectural Engineering programme will offer a comprehensive education in engineering maths, science and technology, materials and environment and structures

Expanded access to Architectural Engineering is built into the curriculum through opportunities for study at Higher National Certificate and Diploma levels, and this three-year FT undergraduate programme which leads ultimately to membership of the Chartered Institute of Building Services Engineers (CIBSE) and the Association of Building Engineers (CABE)

## **Building Surveying (BSc)**

Our Building Surveying programme will provide a comprehensive education in surveying and inspection, building pathology, building services engineering, technology innovations, estate and asset management and legislation.

Extended access to Building Surveying is built into the curriculum through opportunities for study at Higher National Certificate and Diploma levels, and this three-year FT undergraduate programme leads ultimately to membership of the Royal Institute of Chartered Surveyors (RICS) and Chartered Institute of Buildings (CIOB).

## **Quantity Surveying (Bsc)**

Our Quantity Surveying programme will deliver a comprehensive education in cost and measurement, procurement and contracts, innovations in technology, financial management, and information management.

The Quantity Surveying provision at Roehampton will be professionally validated by the Royal Institute of Chartered Surveyors (RICS).

## **Micro-credentials or short courses**

Professionally validated built environment programmes offer significant opportunities for micro credentials, short courses and Continued Professional Development (CPD) from within existing modules validated modules. The format of delivery of these courses are still under review and development but some examples of potential opportunities are shown below:

### **Building Certification**

This course will explore different building certification methodologies around the world and focuses on BREEAM / LEED applications in several projects in the UK and Internationally.

**Learning outcomes:** knowledge in differentiating building credentials, their application, and benefits

### **PassivHaus**

PassivHaus is one of the most robust energy-efficient standards created in Germany in 1991. PassivHaus is applied for both new buildings and refurbishments (Enerphit).

**Learning outcomes:** Basic principles of PassivHaus



## **Renewable Energy**

This course explores renewable energy technologies and their integration with architecture – solar, wind, water, ground

**Learning Outcomes:** Knowledge of the application of different types of renewable energy technologies.

## **Recommendations**

The Report makes clear that both STCG and UoR are in the process of committing significant resources to the Green Skills agenda and the UK Government's net zero targets. UoR's new Sustainable Engineering and Technology Education Centre (SETEC) is particularly noteworthy in this respect, as is STCG's 'Net Zero Training Hub', which went live in the summer of 2024.

The Report has laid out the curriculum plans for both organisations, allowing a detailed roadmap to emerge. This mapping exercise – both descriptive and visual – has shown that the FE / HE offer is developing quickly in response to what is projected to be significant demand for Green Skills at all levels and across the broad CBE sector.

The Report has also enabled us to see that there are gaps in the provision, room for better alignment and aspects which need more emphasis. These are addressed in the following recommendations:

- STCG currently has recently created a specific Retrofit offer with a focus on Levels 2 and 3. In close collaboration with key stakeholders, it is recommended that it develop a ladder of progression through levels 2 to 5.
- STCG should look to add to its scaffolding offer to match predicted demand. Scaffolders, for example, are particularly important within solar panel fitting processes.
- STCG to consider how to provide for projected demand linked to mechanical ventilation (see the Grosvenor Report (2023))
- STCG to introduce insulation installation courses (Grosvenor Report; AoC Green Skills Matrix; CITB)
- STCG to expand air source heat pump installation training given the small proportion of existing plumbers trained to fit heat pumps
- STCG and UoR to formalise partnerships between Art and Design FE teams and SETEC team across all built environment disciplines identified in the mapping exercise to identify and strengthen alignment and support clear progression routes
- STCG and UoR to explore development of links between STCG's Engineering, Surveying and Construction Supervision HE levels and the University's degree programmes in these areas.

- STCG and UoR to provide some focus on the gaps that have been identified in this project and look at course design collaboration linked to, for example, Level 5 Retrofit provision where access to accreditation is still limited. These could be STCG / UoR branded or 'off the peg' and made our own through cross organisation expertise.
- This rapidly changing environment suggest that UoR / STCG should review the roadmap on an annual basis to account for ongoing curriculum development and policy initiatives / changes, particularly with a new Government in place.
- The SLP sub-region to undertake (or fund others to undertake) a similar roadmapping process. This will allow a broader evaluation of current provision and its positioning vis a vis the CBE / Green Skills sector
- UoR to develop relevant micro-credential / short courses / CPD provision in addition to the current offers. This can be part of a course module or a standalone course delivered in a condensed timeframe. These courses can be related to Sustainability certification, such as BREEAM, LEED, WELL and PassivHaus.

### **Recommendations: Time-lines and Funding**

Most priorities will require initial investment to buy the time and resource to design curricula, to market test provision, and to develop material for delivery. In many cases, this will then lead to funds being required for capital equipment and works.

#### **Short-term (one year)**

1. STCG curriculum recommendations will need to be tested with sub regional employer networks, as well as with other local stakeholders, such as local authorities. This will facilitate the supply / demand equilibrium referred to in SLP's 'Retrofit Roadmap' and inform where capital works investment is most needed.
2. UoR and STCG to schedule partnership events for the 24/25 academic year, to include: campus visits and exchanges by students; staff sharing expertise cross-provision; progression programmes (FE-FE and FE-HE) which focus on workforce diversity initiatives; and roadmap review in the summer term.
3. The partnership between STCG and UoR will offer immediate opportunities for knowledge and idea exchange in areas of curriculum development, employer engagement, sector trends and industry practice through shared Governance, for example membership of institutional Advisory Board committees.
4. The partnership between STCG and UoR will offer opportunities for progression agreements in order that opportunities for progression are maximised and aligned between the two institutions.

### Medium-term (one to three years)

1. UoR and STCG to co-design and co-deliver programmes which provide a cohesive overview of the part which the CBE sector will play in driving net zero forward. This can be for those with a general interest but also for adults looking to develop new careers (including from within CBE). The aim would be to unpack the different occupational roles (skilled trades and professional) within the context of net-zero and to raise awareness of the pathways and links which are being and will be formed over the next few years.
2. UoR will develop specialist short-course, CPD and micro-credential opportunities which articulate directly with STCG's curricula, offering particular upskilling opportunities. These courses will also provide progression opportunities linked to the broad programme described above.
3. Extend this UoR / STCG pilot project, drawing in all sub-region providers, to support the design of a broader roadmap for South London.

## References

Ashden (2022), *Retrofit: Solving the Skills Crisis*.

<https://ashden.org/sustainable-towns-cities/retrofit-solving-the-skills-crisis/>

Autonomy (2023), *Retrofit: The Workforce We Need*.

<https://autonomy.work/wp-content/uploads/2023/02/RETROFIT-March-23.pdf>

City & Guilds (2017). Qualification handbook: Level 3 Certificate in Domestic Energy Assessment (63610-1) – Version 3.4. [www.cityandguilds.com/-/media/productdocuments/built\\_environment\\_services/energy/6361/6361\\_level\\_3/centre\\_documents/6361-01\\_I3\\_certificate\\_qualification\\_handbook\\_v3-4-pdf](http://www.cityandguilds.com/-/media/productdocuments/built_environment_services/energy/6361/6361_level_3/centre_documents/6361-01_I3_certificate_qualification_handbook_v3-4-pdf).

City and Guilds: Retrofit Career Pathways

<https://www.cityandguilds.com/-/media/cityandguilds-site/documents/what-we-offer/retrofitcareer-pathways-pdf.ashx?la=en&hash=E2C79A278C0BA1091932C0E579CA14340B9AD0C4>

Construction Industry Training Board (2021)

[net-zero-and-construction-perspectives-and-pathways-november-2021.pdf](https://www.citb.co.uk/media/128226/net-zero-and-construction-perspectives-and-pathways-november-2021.pdf) (citb.co.uk)

Construction Industry Training Board (2023)

[skills-for-a-sustainable-skyline-taskforce-labour-analysis.pdf](https://www.citb.co.uk/media/130000/skills-for-a-sustainable-skyline-taskforce-labour-analysis.pdf) (citb.co.uk)

Grosvenor Report: Heritage and Carbon – Addressing the Skills Gap (2023)

[https://www.grosvenor.com/getattachment/77042425-b1cc-4c45-b338-5193a1c93d32/Heritage-and-Carbon\\_Final\\_Digital\\_DPS.pdf](https://www.grosvenor.com/getattachment/77042425-b1cc-4c45-b338-5193a1c93d32/Heritage-and-Carbon_Final_Digital_DPS.pdf)

Microgeneration Certification Scheme

<https://mcscertified.com/>

Office for National Statistics: SOC 2020 Volume 1: structure and descriptions of unit groups.

[SOC 2020 Volume 1: structure and descriptions of unit groups - Office for National Statistics](https://www.ons.gov.uk/methods/classifications-and-codes/soc/soc2020/soc2020-volume-1-structure-and-descriptions-of-unit-groups)

Retrofit Academy

<https://retrofitacademy.org/wp-content/uploads/2023/10/Level-3-Award-Skills-BootcampWestMids.pdf>

South London: Annex to the Local Skills Improvement Plan

[South London Skills Improvement Plan - South London Partnership](https://www.southlondonpartnership.org.uk/media/128226/south-london-skills-improvement-plan-annex-to-the-local-skills-improvement-plan)

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## Appendix A

### UoR Level 4 module breakdown.

#### Introduction to the Built Environment Semester 1

##### Architectural Technology

##### Construction Management

This module introduces a range of topics which are of particular relevance to the professional development of an undergraduate embarking on a professional career in the Architecture, Engineering and Construction (AEC) industry. The module introduces students to some of the important roles carried out by professionals in order to create the built environment. They will learn about the typical professional activities, professional code of conduct and explain how these integrate with all stakeholders, processes and practices in the built environment industry. They will research and discuss the structure of the industry, understanding the construction market and observing the importance of the construction industry to the UK and global economy.

The module introduces management theories, stages of development projects, management of design and construction processes and the different organisation structures, sizes and operations within the marketplace. The students will also explore legal aspects covering health & safety, quality, environmental systems and the importance of managing Equality, Diversity and Inclusion (EDI) on construction.

The main mode of delivery follows project-based learning and the project provided by a company. The lectures will be supported by interactive workshop sessions which will be facilitated by the tutors with industry input where appropriate. The students will take part in role play, scenario analysis and research in developing knowledge and understanding.

On completion of the module, students will be able to:

| Module learning outcome                                                                                                                                                                                                                                                                                    | Assessment                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <ul style="list-style-type: none"><li>Identify the typical professional activities associated with Construction Managers or Architectural Technologists and explain how these integrate with all stakeholders, processes and practices in the built environment and professional code of conduct</li></ul> | Portfolio                      |
| <ul style="list-style-type: none"><li>Explore and present the construction market information with reference to economic data, outputs, relationships with sustainable development goals, finance for construction businesses and their structures</li></ul>                                               | Portfolio                      |
| <ul style="list-style-type: none"><li>Show awareness of the key stages in a construction project, procurement, contract and quality management processes</li></ul>                                                                                                                                         | Group Presentation / Portfolio |
| <ul style="list-style-type: none"><li>Describe laws and regulations used in the management of construction health, safety, mental health and wellbeing, equality, diversity and inclusion (EDI) as applied to the design and management of construction projects.</li></ul>                                | Group Presentation / Portfolio |
| <ul style="list-style-type: none"><li>Apply aspects of management theories and practice to construction industry related problems</li></ul>                                                                                                                                                                | Group Presentation / Portfolio |

## Architectural Design 1

### Architectural Technology

The module aims to introduce the principles of architectural composition, design processes and how designers use creative architectural designs with technological, environmental, social and historical contexts. Students will develop design strategy for an architectural project by exploring design constraints and factors, aesthetics, space planning and organisation, form, function, and the essential integration between architectural design and construction technology.

This module will enable students to learn standard architectural graphic conventions, structuring the drawings and techniques used in production of architectural drawings and appreciate the relationship between representations in plan, elevation and section. The students will be given a project brief with the details of the development site, which will include a low rise domestic or commercial building.

The students will be provided with a project brief for domestic or a low rise building, and they will produce concept design with manual sketches and architectural drawings to a scale, using up to date information from textbooks, lectures, manufacturers and the Building Regulations using manual approaches. They will then use 2D or 3D CAD models using computer-aided-drawing (CAD) software and communicate these in a professional manner. The small group sessions will be held in the studio environment.

On completion of the module, students will be able to:

| Module learning outcome                                                                                                                                                                                                                                      | Assessment                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <ul style="list-style-type: none"><li>• <i>Identify and explain the principles and factors that influence the design of buildings in relation to historic developments in architecture, materials and technologies.</i></li></ul>                            | Design Strategy              |
| <ul style="list-style-type: none"><li>• <i>Outline design strategies that respond to the functional, technical, social, cultural, environmental and regulatory factors affecting the design, production and performance of low-rise buildings.</i></li></ul> | Design Strategy              |
| <ul style="list-style-type: none"><li>• <i>Use a range of sources to devise concept design recommendations that respond to a given brief</i></li></ul>                                                                                                       | Design Strategy,<br>Drawings |
| <ul style="list-style-type: none"><li>• <i>Identify and use a range of drawing conventions for architectural design drawings</i></li></ul>                                                                                                                   | Drawings                     |
| <ul style="list-style-type: none"><li>• <i>Present the concept design outcome using a range of media and visual communication tools.</i></li></ul>                                                                                                           | Drawings                     |

## Land Surveying, Drawing and Measurement Construction Management

This module has three distinct component parts: land surveying, drawings and measurement. In the first component, the students will develop an understanding of surveying equipment, conduct basic surveys, plot basic surveying diagrams, and set out simple geometries on the field. This will require students to use mathematical concepts such as trigonometry, and places emphasis on fieldwork and hands-on engagement with surveying equipment. They will be working in groups to carry out surveying activities.

The second component gives students an awareness of the skills required in drawing, manually using sketches and 2D/3D software and interpreting drawings. The third component will include learning fundamental techniques to accurately take-off from drawings and appropriately describe building elements and/or components in the take-off sheet. Basic concepts of Building Information Modelling (BIM) will be introduced using an existing model of a typical building/asset.

The drawing and measurement section will be delivered mainly via small group sessions where the underlying principles regarding building drawings and measurement will be presented. These sessions may include guest lecturers. The students will be supported by tutorial session, seminars and practical sessions, where students will work individually or in small groups. This will enhance student understanding of activities undertaken by quantity surveyors and construction managers.

The Construction Surveying is mostly delivered through fieldwork sessions, which are supported by lectures and tutorials. The correct utilisation of relevant technical instruments is a key component of the module, and emphasis is paid to the student gaining hands-on experience. Both individual and group work will be used in classroom and laboratory/field situations.

On completion of the module, students will be able to:

| Module learning outcome                                                                                                                                                                                                                  | Assessment                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <ul style="list-style-type: none"> <li><i>.Demonstrate an understanding of the mathematical knowledge required to solve a range of construction related problems.</i></li> </ul>                                                         | Group Surveying Report          |
| <ul style="list-style-type: none"> <li><i>Explain the use of standard land surveying equipment and demonstrate practical skill in levelling, angle measurement and setting out and produce report on surveying activities</i></li> </ul> | Group Surveying Report          |
| <ul style="list-style-type: none"> <li><i>Identify and apply a range of graphic conventions and terminology used in architectural drawings and produce simple drawings following professional practices, 2D or 3D CAD</i></li> </ul>     | Drawings and Measurement Report |
| <ul style="list-style-type: none"> <li><i>Take-off for building elements and components using standard method of measurement</i></li> </ul>                                                                                              | Drawings and Measurement Report |
| <ul style="list-style-type: none"> <li><i>Demonstrate understanding of presenting or using construction information using Building Information Modelling</i></li> </ul>                                                                  | Drawings and Measurement Report |



**Construction Science, Materials and Performance**  
**Architectural Technology**  
**Construction Management**

The module aims to introduce students to the composition and properties of materials used in buildings and structures. This module covers broadly inter-related areas namely: common engineering materials used in construction; laboratory measurement of physical properties of materials and science of the building in relation to its performance.

Students will develop knowledge and understanding of the properties of materials such as density, strength, ductility, hardness, toughness, thermal conductivity etc. Key materials covered will be timber, masonry, steel, alloys, concrete, glass and ceramics. Considerations will be given to the nature of materials in their finished state and their workability during construction processes.

Problem-based approach will be used in the delivery of learning and teaching, which includes the seminars, group work activities, and laboratory work. Students are expected to take part in several hands-on activities with consideration given to health and safety. This module also introduces students to the concept of environmental science in relation to the design and construction of built facilities. Students will learn about basic scientific application to buildings performance in heat, light and sound.

Students will be given case studies that are based on real industrial project and they will review the properties of materials through the literature resources and use of relevant research data. References will be made to international standards and trade literature for specifying materials.

Laboratory experiments will be used to develop the understanding of processes used for the measurement of properties of selected materials. Case studies and site visits, interactions with industry practitioners will be used to provide exposure of real-world situations for appropriate selection of materials. In class exercise will be used to calculate the environmental performance of the building fabric.

On completion of the module, students will be able to:

| <b>Module learning outcome</b>                                                                                                                                                                                     | <b>Assessment</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <ul style="list-style-type: none"> <li>• <i>Explain the mechanical and physical properties of materials commonly used in buildings and structures and how these properties influence their end use.</i></li> </ul> | Case study Report |
| <ul style="list-style-type: none"> <li>• <i>Use practical laboratory skills to assess material properties and behaviour</i></li> </ul>                                                                             | Portfolio         |
| <ul style="list-style-type: none"> <li>• <i>Prepare report using laboratory data and information from literature sources assessing the properties of materials used in construction</i></li> </ul>                 | Portfolio         |
| <ul style="list-style-type: none"> <li>• <i>Demonstrate knowledge of the health and safety legislation affecting the handling and use of construction materials.</i></li> </ul>                                    | Case study report |
| <ul style="list-style-type: none"> <li>• <i>Perform calculations to evaluate the performance of a given building components or systems in respect of its human comfort requirements</i></li> </ul>                 | Portfolio         |

**Interdisciplinary Design Project 1**  
**Civil Engineering (BEng and MEng)**  
**Construction Management**  
**Architectural Technology**

This is the first in a series of Interdisciplinary Design Projects that continue in each year of the programme. The module integrates the skills and knowledge acquired on the programme to date. However, it goes beyond that in terms of integration in as much as the students work within interdisciplinary groups from across the SETEC undergraduate programmes. Further, as the programme gains new cohorts, students will also work with students in 'vertical' cross-cohort disciplinary groups where students are given the opportunity for peer to peer learning.

The aim is to begin developing skills in design through a series of design tasks that require the development of a range of options that would satisfy the design problem, and introduce the ways that professionals work collaboratively in design. These projects will usually be related to one of the key contexts adopted by SETEC, e.g. the UN Sustainable Development Goals and industry collaboration. The modules, and the ensuing design modules provide the basis for a continuing process of self-reflection and personal development.

A design brief will be set that introduces students to challenges that provide context for design, construction and operation/maintenance of built environment artefacts. They will work in inter-disciplinary (and vertical cohort disciplinary where appropriate) teams, to identify and produce a concept design. Students will learn about creativity in design, effective processes for rationalising ideas and solutions, how to integrate and balance professional roles and perspectives, and effective teamwork and communication of possible design solutions.

It will involve elements of design including form, function, space texture, balance, rhythm, emphasis, proportion and unity. It will involve producing designs expressed in hand drawings and computer aided drawings and physical models. It will also require plain language concise descriptions of the problem, the design process and the outcome design.

There will be taught elements by either lecture or seminar/ workshops which include an introduction to ethics, equality and diversity, project planning, risk management, environmental assessment, Health and Safety management techniques, searching for relevant literature, summarising literature, writing of technical prose and critical thinking.

Students will begin their planning and recording of self-learning and development as the foundation for lifelong learning/CPD. This will be continued within each Interdisciplinary Design Project at each level of the course.

At the end of this module the student will be able to:

| Module learning outcome                                                                                                                                                                                                                                                                                                                          | Assessment                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| <ul style="list-style-type: none"> <li>Select and evaluate technical literature and other sources of information to address increasingly complex problems</li> </ul>                                                                                                                                                                             | Group Presentations and Individual Portfolio |
| <ul style="list-style-type: none"> <li>Develop multiple design and construction options that are ethically considered, including health and safety and risk assessments, resilient, sustainable and consider professionalism, including social aspects of diversity, inclusion and minimise adverse impacts meeting client objectives</li> </ul> | Group Presentations and Individual Portfolio |
| <ul style="list-style-type: none"> <li>Evaluate and select preferred design and construction options including the use of energy/carbon assessment methodologies</li> </ul>                                                                                                                                                                      | Final Group Presentation                     |
| <ul style="list-style-type: none"> <li>Communicate effectively on increasingly complex engineering matters with technical and non-technical audiences</li> </ul>                                                                                                                                                                                 | Group Presentations and Individual Portfolio |
| <ul style="list-style-type: none"> <li>Work effectively in collaboration with other built environment student professionals</li> </ul>                                                                                                                                                                                                           | Group Presentations                          |
| <ul style="list-style-type: none"> <li>Self-evaluate, plan and record self-learning and development</li> </ul>                                                                                                                                                                                                                                   | Individual Portfolio                         |

## Maths and Statistics

### Civil Engineering (BEng and MEng)

This module places emphasis the development of conceptual understanding of the physical world, including engineering artefacts and natural environmental processes, through the language of mathematics. It is tailored for Civil Engineering students and aims to reinforce and extend students' understanding of core mathematical concepts used in the solution of engineering problems and in the analysis of data. Through lectures, examples classes and practical applications, students will develop proficiency in mathematical methods critical for engineering analysis and problem-solving. Recognising the pivotal role of quantitative reasoning in engineering, this module is designed to provide students with the necessary tools to analyse, model, and solve engineering problems.

It deals with practical application of mathematical concepts. Real-world engineering examples will be explored to demonstrate how mathematical tools are employed to model and analyse various physical phenomena and engineering systems. The module integrates the use of relevant software tools for mathematical and statistical analysis. It introduces the potentialities of artificial intelligence in problem solving. Students will become proficient in utilising computational tools, enhancing their ability to tackle complex engineering challenges efficiently and with precision.

Students will be assessed through in-class tests and a short computer based practical project.

| Module learning outcome                                                                                                                                                                                                            | Assessment                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| At the end of this module the student will be able to: <ul style="list-style-type: none"> <li>• Select and apply appropriate techniques from linear matrix and vector algebra for the solutions of engineering problems</li> </ul> | In-Class Test             |
| <ul style="list-style-type: none"> <li>• Select and apply appropriate techniques from calculus to the solution of engineering problems</li> </ul>                                                                                  | In-Class Test             |
| <ul style="list-style-type: none"> <li>• Solve first and second order differential equations</li> </ul>                                                                                                                            | In-Class Test             |
| <ul style="list-style-type: none"> <li>• Analyze functions as the sum of simpler trigonometric functions</li> </ul>                                                                                                                | In-Class Test             |
| <ul style="list-style-type: none"> <li>• Select and undertake appropriate inferential statistical tests and perform simple statistical modelling</li> </ul>                                                                        | Individual Project Report |

## Engineering Principles

### Civil Engineering (BEng and MEng)

The aim of the module is to provide an introduction to the foundational principles of statics and dynamics. It explores the different types of stresses that materials undergo and how these materials respond under the influence of such stresses. The module extends its focus to statically determinate structures, and their behaviour under various stress conditions. Additionally, a crucial aspect covered is the concept of structural stability, exploring the factors that contribute to the equilibrium and robustness of structures.

Furthermore, the module goes beyond theoretical frameworks and introduces practical considerations by addressing a variety of commonly used structural forms. Both qualitative and quantitative analyses are employed to describe the behaviour of these structures. Emphasis is placed on understanding complex states of stress within solids, and the intricacies of how materials respond when subjected to diverse and challenging stress patterns.

A significant facet of the module involves an exploration of the failure mechanisms inherent in materials. This includes an examination of the failure modes exhibited by both ductile and brittle materials. By scrutinising these failure mechanisms, the module equips students with the knowledge necessary to design structures that not only withstand various stresses but also maintain their integrity and safety over time. The teaching will include real life example of failure. In essence, the module serves as a gateway to a profound understanding of the principles governing the behaviour of structures under different loading conditions, preparing students for the challenges of structural engineering.

Students will learn through lectures, seminars, examples classes, experimental laboratories and practical applications. Students will be assessed through in-class tests and laboratory activities. Students will be introduced to risk assessments for safe working practices in laboratories.

| Module learning outcome                                                                                                                                                     | Assessment                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| At the end of this module the student will be able to:                                                                                                                      |                              |
| <ul style="list-style-type: none"> <li>Identify and describe the principles of structural behaviour</li> </ul>                                                              | Lab Report                   |
| <ul style="list-style-type: none"> <li>State and apply physical laws to the solution of engineering problems that arise in the study of statics and dynamics</li> </ul>     | In-class test/<br>Lab Report |
| <ul style="list-style-type: none"> <li>Calculate stress and strain due to axial, bending, shear and torsion effects on various statically determinate structures</li> </ul> | In-class test/<br>Lab Report |
| <ul style="list-style-type: none"> <li>Apply the principles of statics to qualitatively interpret observed structural behaviour</li> </ul>                                  | In-class test/<br>Lab Report |
| <ul style="list-style-type: none"> <li>Apply the laws of Newtonian mechanics to moving objects</li> </ul>                                                                   | In-class test                |

## Civil Engineering Material and Soils

### Civil Engineering (BEng and MEng)

The primary objective of this module is to provide students with a comprehensive understanding of the intricate world of materials used in civil engineering and construction. The emphasis is on knowledge and understanding of embodied carbon in materials, and environmental and sustainable considerations relating to their source, manufacture, use and disposal. Delving into the composition and properties of a diverse array of materials, the module offers a holistic exploration of the building blocks that form the backbone of construction practices with a keen awareness of the environmental impact.

Students are introduced to the distinctive characteristics of various materials, ranging from traditional materials through modern materials to minerals, rocks, and geological structures. The exploration extends beyond a surface-level understanding, aiming to provide students with a nuanced appreciation of how each material contributes to the structural and functional aspects of civil engineering projects while considering their environmental footprint.

A significant component of the module involves hands-on experience through testing procedures, where students actively engage in experiments to evaluate the properties of materials. Importantly, sustainability metrics are integrated into these evaluations, ensuring that students gain insights into the environmental impact and life cycle considerations of the materials they study.

Moreover, the module goes beyond the static understanding of materials, considering their dynamic nature during construction processes. Emphasis is placed on the workability of materials in their finished state, with a focus on sustainable construction practices. This involves taking into account the challenges and considerations associated with the utilization of materials in real-world construction scenarios, fostering an understanding of how choices made in material selection and application can contribute to sustainable and environmentally responsible engineering practices. By intertwining sustainability principles with the study of

materials, this module equips students to make informed decisions that prioritize both structural integrity and environmental consciousness in the realm of civil engineering and construction.

Students will learn through lectures, seminars, examples classes, experimental laboratories and practical applications. Students will be assessed through project and laboratory activities. Students will be introduced to risk assessments for safe working practices in laboratories

| Module learning outcome                                                                                                                                              | Assessment                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| At the end of this module the student will be able to:                                                                                                               |                                                 |
| <ul style="list-style-type: none"> <li>Describe the composition and mechanical and physical properties of materials and soils used in construction</li> </ul>        | Group Presentation                              |
| <ul style="list-style-type: none"> <li>Explain how the composition of construction materials and soils and determines mechanical and physical properties</li> </ul>  | Group Presentation                              |
| <ul style="list-style-type: none"> <li>Explain the mechanisms of corrosion and factors which determine durability</li> </ul>                                         | Individual Report      Lab                      |
| <ul style="list-style-type: none"> <li>Explain the way the physical properties of soils vary with particle size</li> </ul>                                           | Individual Report      Lab                      |
| <ul style="list-style-type: none"> <li>Assess the engineering properties of construction materials and soils through laboratory testing and data analysis</li> </ul> | Individual Report / Group Presentation      Lab |
| <ul style="list-style-type: none"> <li>Assess the engineering properties of construction materials and soils by sourcing data from the literature</li> </ul>         | Group Presentation                              |
| <ul style="list-style-type: none"> <li>Demonstrate understanding of the environmental impact of material selection.</li> </ul>                                       | Group Presentation                              |

## Survey and Drawings

### Civil Engineering (BEng and MEng)

The aim of the module is to cultivate a diverse range of skills, equipping students with a robust set of skills centred around surveying, setting out, data analysis and drawing. The module encompasses both manual and digital aspects of surveying, providing a comprehensive skill set for aspiring professionals in civil engineering and related fields.

Students are immersed in the intricacies of data collection, mastering techniques that go beyond basic measurements. These include methods for handling data including digital models and GIS. The module covers understanding and implementing precise methodologies for setting out buildings, drains, and curves, amongst other construction features; crucial components in the preliminary stages of construction projects. The module places a strong emphasis on accuracy and attention to detail, ensuring that students develop the competency to contribute effectively to the execution of construction plans.

In the context of drawing, the module aims to cultivate a diverse range of skills. Hand-drawn sketching is introduced as a fundamental tool for communication and visualization in the early stages of design. This fosters the ability to convey complex ideas in a tangible and accessible manner. Additionally, students delve into the world of 2D and 3D computer-based data handling and presentation. This includes the utilisation of cutting-edge software to manipulate and represent survey data, enabling students to create visualisations that are not only accurate but also dynamic and interactive. The students are introduced to GIS as a tool for handling data within a mapping based context. This is linked also with the used of spreadsheets for effective and efficient data handling and calculation. The module discusses the potentialities of artificial intelligence in data handling.

Furthermore, the collaborative dimension of the module underscores the importance of effective teamwork in the engineering profession. Students engage in collaborative projects, where they apply their surveying and drawing skills in a team setting. This not only simulates real-world working conditions but also instils the interpersonal and communication skills necessary for successful collaboration on construction projects. The module not only imparts technical proficiency but also cultivates a holistic understanding of the role these skills play in the broader context of civil engineering projects.

Students will learn through practical demonstrations, seminars, and practical application in context. Students will be assessed through drawing, sketching, surveying and setting out tasks. Students will be introduced to risk assessments for safe working practices in the field.

| Module learning outcome                                                                                                                                        | Assessment                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| At the end of this module the student will be able to:                                                                                                         |                                       |
| Demonstrate practical skill in levelling, angle measurement and setting out.                                                                                   | Group Reports                         |
| Present accurate surveying field records and analysis to create reduced levels and angle measurements, estimating errors and understanding levels of accuracy. | Group Report                          |
| Demonstrate skill in the rapid presentation and graphic thinking using hand sketching diagrams and producing maps and charts using GIS.                        | Individual Drawings/<br>Group Reports |
| Present engineering information in 2D Computer Aided Design software and in 3D Building Information Modelling Software                                         | Group Reports                         |
| Make effective, efficient and accurate use of GIS systems and spreadsheets including the use of simple macros.                                                 | Group Reports                         |