

Engineering Tripos Part IIA, 3D9: Construction Management, 2026-27

Module Leader

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Lecturer

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Lab Leader

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Timing and Structure

Lent term, 16 lectures

Aims

The aims of the course are to:

- Familiarise students with core methods and principles for managing construction projects and businesses.
- Introduce planning, scheduling, monitoring, productivity, road earthworks, and risk techniques.
- Understand the fundamentals of Building Information Modelling and Digital Twins
- Explore procurement, contracts, health and safety, and sustainability in a construction context.

Objectives

As specific objectives, by the end of the course students should be able to:

- Grasp the key challenges associated with managing major construction projects.
- Implement lean construction and production management techniques effectively.
- Analyse various bidding strategies and procurement methods.
- Design appropriate organizational structures and ownership models tailored to different construction environments at local, national, and international levels.
- Utilize Building Information Modelling (BIM) and Digital Twins for planning, simulation, and project management.
- Grasp the significance of information management in the construction industry.
- Identify risks, explore organizational structures, and understand the implications of contract law.
- Learn the basics of health, safety, and wellbeing within the construction sector.
- Understand earthworks balancing and logistics for roadway projects.

Content

This module equips students with the essential concepts and tools for managing construction operations and companies. The content spans project scheduling, productivity, digital tools (BIM and Digital Twins), sustainability, procurement, safety, and legal aspects. Emphasis is placed on UK-based civil engineering and building projects, supported by expert industry lectures and lab-based digital simulations.

Project & information management (6L) 2 lectures/week, weeks 1-3

- Introduction, roles & responsibilities
- Project scheduling
- Project monitoring
- Productivity improvement, workforce motivation & agile management
- Building Information Modelling
- Digital Twins

Production management (6L) 2 lectures/week, weeks 4-6

- Lean & Sustainable Construction
- Earthworks Fundamentals
- Soil Excavation
- Rock Excavation
- Loading and Hauling
- Health, Safety, Wellbeing, and risk management

Business management (4L) 2 lectures/week, weeks 7-8

- Procurement & Partnering
- Construction contract law
- Estimating, tendering & competitive bidding
- Business methods, organisational structures

Examples papers

Three example papers related to the lecture course will be distributed by the end of each section of the module. Please check the 3D9 Moodle page for updates.

Coursework

Labs focusing on BIM-based planning and scheduling will take place in the DPO. The sign-up page (<https://teachapp.eng.cam.ac.uk/cuedle2/index.php?context=3D9sa2194> [2]) will be activated at the beginning of Michaelmas. Lab reports must be submitted on the 3D9 Moodle page within 15 days following the lab session.

Learning objectives:

To gain first-hand experience in applying BIM for construction planning and scheduling.

To simulate and visualise construction workflows using digital tools.

To understand the integration of design and schedule data through 4D modelling.

To evaluate construction sequencing, resource allocation, and project constraints in a virtual environment.

To develop skills in interpreting and manipulating project information in a digital format.

To recognise the practical benefits and limitations of BIM-based construction management systems.

Practical information:

Lab sessions will take place in the DPO.

This activity doesn't involve preliminary work, but it will be beneficial to read the handouts beforehand.

Full Technical Report:

There is no Full Technical Report (FTR) associated with this module.

Booklists

Please consult the Booklist for Part IIA Courses for references pertinent to this module, which can be accessed on the associated Moodle course.

The library booklist for this module includes:

Core Reading:

1. HARRIS, F., McCAFFER, R., BALDWIN, A., and EDUM-FOTWE, F. (2021)
MODERN CONSTRUCTION MANAGEMENT, Wiley Blackwell.

2. Nunnally, S. W. (2014)
Construction Methods and Management. 8th Edition, Pearson New International Edition.
ISBN: 9781292039350

3. Parn et al. (2024)
Twin Systems: Digital Twins of the Built Environment
ISBN: 9782634541210

4. Alavi H., et al. (2024)
Integrated Building Intelligence. 1st Edition. Springer Cham.
ISBN (eBook): 9783031688645

Further Reading:

1. Sacks R., et al. (2018)
BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers
ISBN: 9781119287537

2. Gransberg, D.D., Popescu, C.M., & Ryan, R.C. (2020)
Construction Equipment Management for Engineers, Estimators, and Owners. 2nd Edition. CRC/Taylor & Francis.
ISBN: 978-1498788502

3. Patricia T. et al. (2018)
Lean Construction: Core Concepts and New Frontiers
ISBN: 9781032919676

4. SEARS, S.K., et al., (2015)
CONSTRUCTION PROJECT MANAGEMENT, 6th edition, Wiley Blackwell.

Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [3].

UK-SPEC

This syllabus contributes to the following areas of the [UK-SPEC](#) [4] standard:

[Toggle display of UK-SPEC areas.](#)

GT1

Develop transferable skills that will be of value in a wide range of situations. These are exemplified by the Qualifications and Curriculum Authority Higher Level Key Skills and include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills. They also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD.

IA1

Apply appropriate quantitative science and engineering tools to the analysis of problems.

KU1

Demonstrate knowledge and understanding of essential facts, concepts, theories and principles of their engineering discipline, and its underpinning science and mathematics.

KU2

Have an appreciation of the wider multidisciplinary engineering context and its underlying principles.

D1

Wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations.

S1

The ability to make general evaluations of commercial risks through some understanding of the basis of such risks.

S3

Understanding of the requirement for engineering activities to promote sustainable development.

S4

Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.

E1

Ability to use fundamental knowledge to investigate new and emerging technologies.

E2

Ability to extract data pertinent to an unfamiliar problem, and apply its solution using computer based engineering tools when appropriate.

E3

Ability to apply mathematical and computer based models for solving problems in engineering, and the ability to assess the limitations of particular cases.

P1

A thorough understanding of current practice and its limitations and some appreciation of likely new developments.

P3

Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc).

US1

A comprehensive understanding of the scientific principles of own specialisation and related disciplines.

US3

An understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in engineering projects.

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Source URL (modified on 05-06-26): <https://teaching26-27.eng.cam.ac.uk/content/engineering-tripos-part-iiia-3d9-construction-management-2026-27>

Links

[1] <mailto:ib340@cam.ac.uk>

[2] <https://teachapp.eng.cam.ac.uk/cuedle2/index.php?context=3D9sa2194>

[3] <https://teaching26-27.eng.cam.ac.uk/content/form-conduct-examinations>

[4] <https://teaching26-27.eng.cam.ac.uk/content/uk-spec>