

# Learning Resources

## Module List



### Timber as a material

#### Introduction – why choose timber?

- Visual and tactile qualities
- Practical applications
- Other qualities (thermal insulation/stability, resistance to chemicals and fire, acoustic absorption, and workability)

#### The tree

- Types of tree
- Cellular or organic structure
- Heartwood and sapwood
- Hardwoods and softwoods

#### Moisture content and durability

- Moisture content
- Movement or shrinkage
- Durability

#### Wood-based materials

- Non-structural materials
- Structural panels: plywood, laminated veneer lumber, strand boards, glued laminated timber, cross-laminated timber, stacked planks (Brettstapel), wood-based composite components (I-beams)
- Advantages of engineered timber

#### NEW! Using the correct names when specifying timber

- Importance of the correct name
- How trees are named
- What is in a name

### Environmental aspects of wood

#### Timber as a renewable material

- Environmental benefits of timber
- Deforestation and replanting

#### Sustainable sourcing

- Sustainable management of forests
- Temperate deciduous forests
- Temperate hardwoods
- Tropical hardwoods
- Coniferous forests

#### Low carbon and timber buildings

- Carbon in association with buildings
- Sustainable timber production
- The contribution of timber to sustainable construction in service
- Thermal mass
- The contribution of timber to sustainable construction during manufacture and build
- Carbon sequestration

#### Introduction to decarbonisation

- What is decarbonisation?
- Low-carbon plan

#### Treatments and adhesives

- From tree to finished component
- Modern preservation techniques and natural durability
- Adhesives

#### Wood waste and reuse

- The significance of different disposal routes
- Reuse
- Recycling
- Final disposal

#### Reusing timber

- Sources of timber for reusing and recycling
- How timber is reused/recycled
- Carbon capture and release

#### NEW! Introduction to the Life Cycle Assessment of timber

- Life Cycle Assessment
- Carbon and timber
- Timber life cycle

#### NEW! Wood for Good lifecycle database

- Introduction to the Wood for Good lifecycle database
- Global warming
- The impact of timber on global warming
- Using the Wood for Good lifecycle database
- Summary of Wood for Good data

### Introduction to timber engineering design

#### Characteristic v design material properties

- Characteristic values
- Partial factor for materials
- Design values of strength properties

#### Structural detailing requirements

- Condition of timber members
- Moisture content
- Modifications
- Connections
- Protection of materials and components
- Handling
- Treatments

#### Moisture and humidity

- Wood and moisture content
- Service classes
- Guidance on calculating with service classes (BS 5268-2 and Eurocode 5)

#### The Eurocode system

- Origin/purpose of Eurocodes
- List of published Eurocodes
- Principles and application rules
- National Annexes
- Non-contradictory complementary information
- Eurocode design basis

#### Bolted and dowelled connections

- Sizes and other limitations
- Axially loaded bolts
- Dowelled connections
- Comparison of load capacities

#### Nailed connections

- Sizes and other limitations
- Axially loaded nails and withdrawal resistance
- Head pull-through resistance

#### Design life, design situations and load duration classes

- Design life
- Design situations
- Types of load (actions)
- Duration of loads and load duration classes

#### Limit state design

- Limit states
- Partial safety factors
- Expressions for design values of actions

#### Multiple fastener joints

- Factors affecting the strength of multiple fastener joints
- Unequal loading
- Splitting of the timber
- Design recommendations

#### Screw connections

- Sizes and other limitations
- Axially loaded screws – withdrawal resistance

### Further topics in timber engineering

#### Glued laminated timber (glulam)

- Design data
- Complex sections

#### Eurocode 5 and supplementary Standards

- Solid structural timber and related products: structural timber, glued laminated timber, laminated veneer lumber, wood-based panel products, plywood, particleboards, oriented strand board, fibre building boards, dowel-type fasteners

#### Wood-based panels

- Harmonised standard for wood-based panel products
- Plywood
- Particleboards
- Oriented strand board
- Fibre building boards
- Service classes and examples of exposure conditions

#### Glued joints

- Design method
- Adhesives

#### Moment-resisting joints

- Assumptions
- Design method

#### Creep

- Quasi-permanent values of action (loads)
- Instantaneous deformations
- Final (including creep) deformations
- Creep deformation factor,  $k_{def}$

#### Structural columns and buckling

- Stability of columns
- Design for combined bending and axial compression
- Stability of beams with axial compression
- Column deflection due to axial and lateral loads

#### Vibration

- Mechanics of vibration
- Vibration sources
- Structural response to vibration
- Acceptable levels of floor vibration

#### Structural timber – sizes and permitted deviations

- Target sizes for UK structural timber
- Machining and grade strength
- Permitted deviations
- Changes in size due to moisture content

#### Splitting and tension perpendicular to grain

- Calculation method



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Timber connections	Structural characteristics of timber	Construction principles, specification and design	Fire resistance and timber buildings
<b>Introduction to connections</b> <ul style="list-style-type: none"> <li>The evolution of timber structures</li> <li>Factors to be considered in connection design</li> <li>Fire resistance</li> <li>Connection durability</li> </ul>	<b>Choosing species</b> <ul style="list-style-type: none"> <li>Classification and strength grading: softwoods, hardwoods, modified woods</li> <li>Strength properties/density</li> </ul>	<b>Introduction to timber construction</b> <ul style="list-style-type: none"> <li>Timber construction</li> <li>Working within dimensional limits</li> <li>Wall thickness (cladding)</li> <li>Building orientation</li> </ul>	<b>Concepts and considerations</b> <ul style="list-style-type: none"> <li>Reaction to fire and fire resistance</li> <li>Smoke, fire spread and fire growth</li> <li>Fire safety, fire fighting and escape routes</li> <li>Compartmentation and fire doors</li> </ul>
<b>Carpentry joints</b> <ul style="list-style-type: none"> <li>Connection criteria for carpentry joints</li> <li>Different carpentry joints</li> </ul>	<b>Strength-reducing factors</b> <ul style="list-style-type: none"> <li>Growth features in timber</li> <li>Timber degradation</li> </ul>	<b>Principles of design with timber</b> <ul style="list-style-type: none"> <li>Structural considerations</li> <li>Timber movement</li> <li>Differential movement</li> <li>Resistance to abrasion and impact</li> </ul>	<b>Regulatory requirements</b> <ul style="list-style-type: none"> <li>History</li> <li>Current legislation</li> <li>Approved Document B</li> <li>Relevant European and British Standards</li> </ul>
<b>Dowel-type fasteners</b> <ul style="list-style-type: none"> <li>Different variations of dowel-type fasteners</li> </ul>	<b>Strength properties</b> <ul style="list-style-type: none"> <li>Timber structure</li> <li>Strength classes and grading</li> <li>Resistance to applied stresses</li> </ul>	<b>Designing for durability – Part 1: Preservative</b> <ul style="list-style-type: none"> <li>Preservative treatments</li> <li>Natural durability</li> <li>Heat treatment</li> <li>Chemical treatment</li> <li>Coatings</li> </ul>	<b>Timber materials and products</b> <ul style="list-style-type: none"> <li>Timber</li> <li>Engineered wood products</li> <li>Panel products and sheathing materials</li> <li>Coating and flame retardant treatments</li> <li>Certification and testing</li> </ul>
<b>Metal connectors</b> <ul style="list-style-type: none"> <li>Metal plate fasteners</li> <li>Connectors with bolts</li> </ul>	<b>Joints and connections</b> <ul style="list-style-type: none"> <li>Timber splitting</li> <li>Stresses induced by moisture changes</li> <li>Potential temperature effects in the event of fire</li> <li>Corrosion of fasteners</li> <li>Decay of timber</li> </ul>	<b>Designing for durability – Part 2: Principles of design</b> <ul style="list-style-type: none"> <li>Drainage and ventilation</li> <li>Protection</li> <li>Allowing for moisture content</li> <li>Protective coatings</li> <li>Shelter/shielding</li> <li>Chemicals</li> <li>Weathering</li> </ul>	<b>Building design – structural beams and columns</b> <ul style="list-style-type: none"> <li>Sacrificial timber method – columns and beams</li> <li>Insulation method</li> <li>Connections in fire</li> <li>Material properties</li> <li>Weathering</li> </ul>
<b>Special connectors</b> <ul style="list-style-type: none"> <li>Examples of special connectors</li> </ul>	<b>Drying and moisture content</b> <ul style="list-style-type: none"> <li>Timber drying</li> <li>Strength and moisture content</li> <li>Service classes</li> <li>Moisture content and connections</li> </ul>	<b>Designing for building performance</b> <ul style="list-style-type: none"> <li>Thermal performance</li> <li>Acoustic performance</li> </ul>	<b>Construction – wall and floor systems</b> <ul style="list-style-type: none"> <li>Material selection and specification</li> <li>Standard details</li> <li>Floors</li> <li>Walls</li> <li>Supporting structures</li> </ul>
<b>Connections with adhesives</b> <ul style="list-style-type: none"> <li>Resin-anchored bolts</li> <li>Splice plates and gusset plates</li> <li>Dowelled end joints</li> <li>Site glueing</li> <li>Types of adhesive</li> <li>Design criteria</li> <li>Safety precautions</li> </ul>	<b>Fire performance</b> <ul style="list-style-type: none"> <li>Reaction to fire</li> <li>Fire resistance</li> </ul>	<b>Introduction to off-site construction and construction sequence</b> <ul style="list-style-type: none"> <li>Introduction to off-site construction</li> <li>Types of modern off-site construction</li> <li>Limitations to off-site construction</li> <li>Designing for off-site construction</li> <li>Construction sequence for a two-storey detached house</li> </ul>	<b>Management</b> <ul style="list-style-type: none"> <li>Assessment of risk</li> <li>Construction stage</li> <li>Installation and maintenance</li> <li>End-user contributions and user awareness</li> </ul>
<b>Connections for various assembly forms – part 1</b> <ul style="list-style-type: none"> <li>Connections for beams</li> <li>Connections for round timber structures</li> <li>Connections for unbraced frames</li> <li>Connections for braced frames</li> <li>Connections for arches and portal frames</li> </ul>	<b>Engineered timber products</b> <ul style="list-style-type: none"> <li>Limiting factors of natural timber</li> <li>Engineered timber – the products: layered composites – glulam, cross-laminated timber, laminated veneer lumber, plywood; particle composites – parallel strand lumber, particleboards, oriented strand board; structural timber composites and structural assemblies</li> <li>Engineered products – the advantages</li> </ul>	<b>NEW! Introduction to timber cladding</b> <ul style="list-style-type: none"> <li>Purpose and uses of cladding</li> <li>Types of cladding: horizontal, vertical and diagonal boards, cladding on curved surfaces, charred wood</li> <li>Design considerations: ventilation and drainage, board sizes, fire protection</li> <li>Timber selection and fixings: choice of species, modified timber, environmental and certification aspects, fixings</li> <li>Protection and finishes: preservatives, surface protection</li> </ul>	
<b>Connections for various assembly forms – part 2</b> <ul style="list-style-type: none"> <li>Connections for trusses</li> <li>Connections for platform frames</li> <li>Connections for panel systems</li> <li>Connections for curved and double-curved lattices</li> </ul>		<b>NEW! Timber cladding – detail design</b> <ul style="list-style-type: none"> <li>Timber selection: natural durability, movement, choice of species, quality of timber</li> <li>Control of moisture: allowing for moisture movement</li> <li>Fixings: softwood, hardwood</li> </ul>	

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