

**NATIONAL COUNCIL FOR  
CURRICULUM AND ASSESSMENT**

**LEAVING CERTIFICATE  
ARCHITECTURAL TECHNOLOGY**

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**ORDINARY LEVEL AND HIGHER LEVEL**



# LEAVING CERTIFICATE ARCHITECTURAL TECHNOLOGY

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# **PREFACE**

## **TECHNOLOGY EDUCATION AT SENIOR CYCLE**

### **Introduction**

Technology education is an essential component of the curriculum. In a world where encounters with a wide range of technologies are part of the daily life experience of all people at work or at leisure, students should be equipped to face these encounters with the confidence which comes from learning about, through and with a range of technologies. It is equally important that they gain an appreciation and understanding of the complex interface between technology and society. As citizens they should have the capacity to enter discussion on, and make personal judgements on, issues related to the impact of technology on their own lives, on society, and on the environment.

Through technology education students grow in competence, grow in confidence, become more enterprising and are empowered in terms of their ability to control elements of the physical environment. These are important educational outcomes, which contribute significantly to the provision of a broad and balanced curriculum and illustrate why participation in technology education represents a valuable educational experience.

### **The nature of technology education**

Technology is a distinct form of creative activity where human beings interact with their environments, using appropriate materials and processes in response to needs, wants and opportunities. It integrates problem solving and practical skills in the production of useful artefacts and systems.

More specifically, the value of technology education comes from the use of the wide variety of abilities required to produce a drawing or make an artefact, leading to a sense of competence and a feeling of personal empowerment. The acquisition of manipulative skills is an important component of this sense of competence and can help to give students a feeling of control of their physical environment. In a rapidly changing global society, students need to appreciate that technological capability is necessary and relevant for all aspects of living and working. Many subjects can contribute to the development of a technological capability. However, the technology subjects, which incorporate the principles of design and realisation in a creative manner, are central to this development.

Technological capability includes

- the understanding of appropriate concepts and processes
- skills of design and realisation
- the ability to apply knowledge and skills by thinking and acting confidently, imaginatively, creatively and with sensitivity
- the ability to evaluate technological activities, artefacts and systems critically and constructively.

## **Leaving Certificate technology subjects**

Within the Leaving Certificate, technology education is provided through the subjects Architectural Technology, Engineering Technology, Design and Communication Graphics, and Technology, thereby providing progression with junior cycle. These subjects contribute to a broad, balanced and general education of students, with particular reference to their vocational, further education and training aspirations on completion of the Leaving Certificate.

At a more practical level, the technology subjects at senior cycle share a number of common features. The syllabuses:

- are constructed on the basis of core areas of study and optional areas of study, reflecting the different topics and sections within the subject area
- are offered at two levels, Ordinary and Higher
- have been designed for completion in 180 hours of class contact time
- place a strong emphasis on practical learning activity
- include a range of assessment components aimed at assessing student achievement in both practical and theoretical aspects of the subjects.

# **ARCHITECTURAL TECHNOLOGY**

## **INTRODUCTION AND RATIONALE**

The educational philosophy of the course will concern itself with developing the student's sensitivity to the visual impact of buildings on the Irish landscape, as well as an understanding of contemporary technologies and other influencing factors, which relate to buildings and the built environment. Through appropriate studies and reflection as well as practical experience and project work, participants will be encouraged to learn from the architectural past as well as endeavouring to appreciate and understand local and national building and crafts heritage and their influence on the present. As each architectural phase of the past tells of advances in engineering and technology and the use and availability of materials, so too will students learn to contextualise today's crafts, materials and technologies.

The learning atmosphere will encourage the student to explore technologies associated with architecture and the built environment. These will include materials technology, systems and services technology, control technology, CAD applications and environmental technology. This exploration will be pursued in the context of design principles associated with the general built environment as well as through specific areas addressing domestic scale building technologies. Students will be familiar with issues and principles relating to inclusive design. The learning will be underpinned by scientific principles and hands-on experience through experimenting, modelling and making. Analysis and evaluation of the various issues and elements relating to buildings and their components will encourage students to become informed and discerning consumers, able to discern between minimum standards and good practice. Students will address issues relating to sustainable architecture, conservation of natural resources, environmental and ecological issues concerning the selection and use of materials, disposal of domestic waste and the importance of clean water and air.

Practical project work of a design, exploratory and manufacturing nature will be central to the learning experience. The main project provides the ideal vehicle for the evaluation of learning outcomes not suitably accommodated by terminal examination. The main project will be spread across a broad range of technologies, architectural, craft and engineering heritage, as well as design of components, systems and furnishings. The teaching approach throughout the course will focus on learning by experiencing, observing and doing, all of which will find particular expression in the student's main project. The learning environment will be one of investigating, understanding and doing and will endeavour to nurture the attributes of creativity, enterprise and entrepreneurial skills i.e. "teaching to promote innovation". All activities, taught principles and project work should comply with contemporary regulations and be informed by best practice. Realised models; artefacts or design drawings should be skilfully executed.

# AIMS

## **General aims of technology education**

1. To contribute to a balanced education, giving students a broad and challenging experience that will enable them to acquire a body of knowledge, understanding, cognitive and manipulative skills and competencies and so prepare them to be creative participants in a technological world
2. To enable students to integrate such knowledge and skills, together with qualities of co-operative enquiry and reflective thought, in developing solutions to technological problems, with due regard for issues of health and safety
3. To facilitate the development of a range of communication skills, which will encourage students to express their creativity in a practical and imaginative way, using a variety of forms: verbal, graphic, model, etc.
4. To provide a context in which students can explore and appreciate the impact of past, present and future technologies on the economy, society, and the environment.

## **Aims of Architectural Technology**

5. To provide a learning environment in which students will explore the relationships between architecture, environment, technology, engineering and craft, and how they combine to improve human conditions
6. To give students a broad and challenging technological experience which has relevance to and currency for the students' general and technological educational needs
7. To provide students with the opportunity of investigating general and specific design considerations relating to the general built environment, as well as design as a problem solving mechanism
8. To provide an environment in which the students' creative, investigative, explorative and reflective thought will flourish
9. To stimulate the pursuit of excellence in cognitive and practical skills through the main project in the areas of architectural heritage, design, control and materials technologies, environment and craft
10. To encourage enterprise, initiative, innovation and entrepreneurial skills, through designing, modelling and making
11. To offer a meaningful progression from junior cycle technology education and provide a basis for further and advanced study in cognate areas as well as providing students with a platform for vocational opportunities.

# OBJECTIVES

## General Statement

The objectives set out below reflect the knowledge, understanding, skills, competencies, attitudes and sensitivities, which students should acquire as a result of their course of study.

At the end of their course of study, students will understand the contributing technologies, which combine in the design and construction of buildings and which make them safe and comfortable to occupy. They will have developed a critical aesthetic awareness of the design of buildings and their relationship with their surroundings. Participants will have knowledge of the components of buildings, their mechanical assembly, their internal environment and its control, as well as the general environment that buildings occupy.

In the context of materials processing through the execution of assigned tasks, projects and design briefs students will be able to process, assemble and finish a variety of materials. They will use hand and portable power-tools safely and efficiently as well as machines such as the morticer, lathe and other appropriate equipment to comply with safety standards and best practices.

The students should know how a variety of systems function in contributing to human comfort and in the control of the internal environment of buildings.

A knowledge of building and craft heritage will allow students to understand the evolution of building techniques and technologies and the appropriate use of available materials as well as how they contribute to the design and technologies of modern buildings. They will also appreciate the issues relating to conservation and restoration of buildings and structures of architectural merit.

All students will be capable of using a variety of media to communicate design concepts, ideas and solutions. These include sketches, working and detail drawings, use of CAD software and the modelling of buildings and components, and of design solutions and structural forms and concepts.

Consumer issues and considerations will inform the teaching of the course as opportunities arise and may be further investigated through task assignments and project work.

Students should be capable of making informed judgments on aesthetic and other considerations relating to buildings and the built environment and they should be equipped with an appropriate vocabulary to discuss issues relating to craft standards, visual impact of buildings, sustainability and environmental considerations and best use of space. They should be able make value judgments on general best practice relating to buildings and the built environment.

## Course Objectives

Students will:

- appreciate how the architecture and technologies of the past influence contemporary designs and the general built environment
- understand how the various professions and craftspeople combine and interact in the design and production of a building and its associated services
- have a knowledge of the various technologies which combine to produce a building which is comfortable and safe for all users and which will incorporate inclusive design considerations.
- understand and evaluate a variety of building types and systems in the context of design and aesthetics, architectural appropriateness, as well as their environmental and ecological impact
- identify, describe and model various structural forms and concepts relating to buildings and other appropriate architectural structures
- develop the skills associated with processing materials
- skilfully model, make and finish artefacts
- be discerning in the selection or specification of materials which are appropriately used and are environmentally friendly
- take a structured approach to project planning and critically analyse problems and their solutions in the context of design and project activities
- by successfully completing projects gain a sense of confidence, personal achievement and satisfaction
- develop the skills associated with sourcing and using information, decision making, time and task management
- understand the societal and environmental impact of building and architectural technologies
- apply design principles on a sound scientific basis and in the context of contemporary building and safety regulations
- be appropriately informed and discerning home owners/occupiers
- appropriately record and communicate architectural/building detail and design ideas and use CAD systems to model design ideas and solutions.
- appreciate the way in which good architecture enhances the quality of life of individuals and the community
- appreciate the difference between minimum standards and good/best practice.



- in the context of sustainability in the built environment, understand how the creative use of resources, impacts on design considerations for buildings.

## **Objectives – Specific to Optional Areas of Study**

### **Architectural Heritage and Design**

Students will

- appreciate the importance of the architectural past in influencing our contemporary built environment and attitudes to design and craft
- recognise the relevance and importance of elements associated with conservation and refurbishment of buildings and associated artefacts and furnishings
- model buildings and their components and/or restore or reproduce artefacts and furnishings
- appreciate the influence of available materials and technologies on both past and contemporary architectural design practices

### **Services and Control Technology**

Students will

- appreciate the functional and environmental requirements of various rooms and areas in a building
- understand how control systems may be designed to conserve energy requirements
- compare and evaluate alternative heating systems appropriate to domestic buildings
- be familiar with the fundamentals of electronic and pneumatic systems associated with the environmental and security control of domestic buildings
- build electronic and pneumatic control systems to specified functions of movement, control and security.

### **Materials Technology and Design**

Students will

- explore the properties of a variety of materials including wood, metals, plastics, ceramics and composites
- select and specify materials appropriate to a given application and environment
- understand considerations in designing for manufacture and multiple production
- demonstrate finishing skills and display a knowledge of surface and applied finishes appropriate to materials, their uses and their environment

- have a knowledge of design processes in the context of planning, development and realisation
- execute modelling and design ideas including their finish and presentation.
- be capable of skilfully processing an artifact or design through the various stages of manufacture to completion

## **The Built Environment**

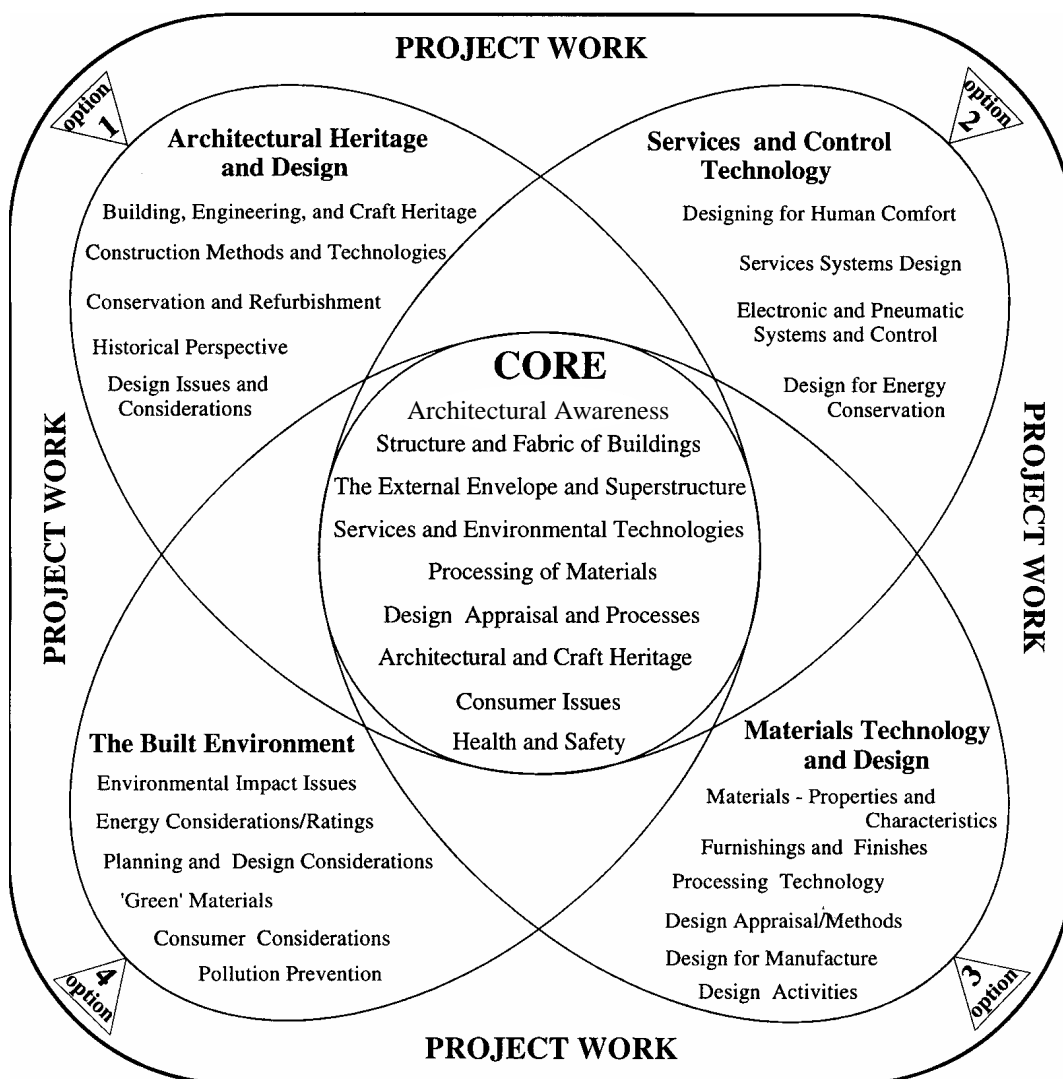
Students will

- have an awareness of aesthetic values and considerations relating to the built environment
- understand the principles of sustainable architecture in the location, design and construction of buildings
- understand the procedures and requirements in obtaining permission to build
- appreciate design considerations appropriate to various environments
- show discernment in the selection and safe use of environmentally friendly materials
- model real or imaginary rural and urban site layouts
- through appropriate investigation, derive solutions to environmental problems.

# SYLLABUS FRAMEWORK

## Syllabus Structure

The syllabus for Architectural Technology consists of a core area of study with four allied optional areas of study. Students are required to study the core and any two of the options. In addition, students will undertake a practical project, which may relate to the core or the options. The syllabus framework is presented in diagrammatic form below.



## Time Parameters

The syllabus is designed to be taught in 180 hours. Recommended time allocations for the various elements of the course are

- Core 70 hours
- Options 50 hours
- Main Project 60 hours

## **Differentiation between Ordinary and Higher levels**

Higher and Ordinary level studies will be differentiated by the range of material covered as well as the depth of treatment and the level of skills developed.

## **Health and Safety**

Health and safety issues and considerations permeate all appropriate topics and activities and will be addressed as the need and opportunity arises. Students will be made aware of potential hazards and will be familiar with the location and proper use of safety equipment and provisions. Safe practices in the use of materials, tools, machines and equipment will be observed for all practical activities in accordance with current approved standards and practices.

## **Presentation of syllabus**

The syllabus content is presented in terms of

- Teaching/learning context – contextualises the treatment of the topics
- Topics
- Learning outcomes

Throughout the syllabus, topics shown in *italics* apply to Higher level students only.

# ASSESSMENT

Students are required to study the core and two options. Achievement in this study will be assessed through two components

1. The main project
2. A terminal examination paper

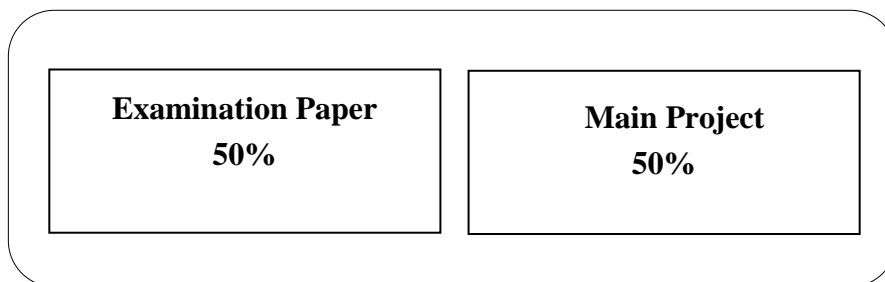
## The Main Project

Students are required to undertake a main, practical project. This project will derive from either of the options undertaken, or from the core. It will be based on a theme selected from the set of themes provided in any given year by the examining authority. The percentage of marks allocated to this project is 50%. Detailed parameters for undertaking the main project and the associated learning outcomes are described in the final section of the syllabus.

## Terminal Examination Paper

Students will undertake a terminal examination paper. The percentage of marks allocated to this assessment component is 50%. Within this overall allocation, questions on the core areas of study will be allocated 30% while those related to the optional areas of study will attract 20% (10% to each of the two options chosen). The examination will be of three hours duration at Higher level and of two and a half-hours duration at Ordinary level.

## Weightings



# **COURSE CONTENT**

## **CORE AREAS OF STUDY**

**Content or learning outcomes in *italics* apply to higher level only**

### **Presentation of content**

The boxed lead-in statements to each of the sub-headings provide the context for the teaching and learning considerations relating to the topics which follow.
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### **Core Topics**

The core topics of the syllabus will be studied by both the Ordinary and Higher level students. Some elements are identified as Higher level only and are denoted by *italics*. All design principles and considerations, as well as any details arising from such, should be in the context of current building and fire regulations and should be developed by the teacher as the topics of the course develop.

# 1. Architectural Awareness

## 1.1 Architectural Appreciation

### **Teaching/learning context**

Students will need to know that the human need for shelter has developed in many ways and with great diversity throughout the world. Climate, available materials, current technological developments and human ingenuity all contribute to the development of shelter and housing throughout millennia. Students will need to understand the evolution of building types and technologies. This will include a study of both vernacular architecture and formal architecture. They will study the relationship between buildings and landscape, how traditional buildings express an organic link with their surroundings and reflect local and regional variations. Students will be encouraged to develop a visual awareness of the aesthetic appeal of buildings as visual elements of the landscape.

The participants will engage with the grammar of design to enable them to criticise both traditional and modern building design. Students will study the development of urban architecture from the village and small town to the growth of larger urban centres and cities. They will be encouraged to examine the evolution of building types and styles in urban areas. This study will include a consideration of streetscapes and the challenges posed by the growth of urbanisation. The study will develop an appreciation for the history, scale, proportions and materials of existing buildings and the need for sensitive and sympathetic approaches to restoration, renovation, conservation and reuse of older buildings. The understanding of the building traditions of the past will inform the students' critique of the evolving architectural tradition of this country and will help develop their critical faculties as future home owners and occupiers.

### All students

Humans and shelter  
Historical development and diversity of solutions

### ***Vernacular Architecture:***

Evolution of Irish vernacular architecture traditions/ building for necessity  
Congruence of building and landscape – influence of climatic conditions, siting, materials, skills, economic constraints and considerations  
Elements of aesthetic appeal of vernacular buildings, scale, proportions, duality, fenestration, materials.

### Higher Level (HL) only

*Social, cultural and traditional aspects of providing shelter.*

*Awareness of formal architectural styles, Classic Gothic and Contemporary.*

*Current issues and themes relating to the organisation of urban spaces.*



***Formal Architecture/Conscious design:***

Design, scale and proportions of formal buildings

Streetscapes - Formal and organic planning

Conservation issues related to the renovation of existing rural and urban buildings

Development of a sustainable architectural tradition to meet changing requirements of modern day living.

*Accommodation types in urban areas - traditional and modern solutions.*

*Design considerations to optimise energy conservation.*

## 1.2 Planning to Build

### Teaching/Learning Context

Students will need to know that the human need for shelter has developed in many ways and with great diversity throughout the world. Climate, available materials, current technological developments and human ingenuity all contribute to the development of shelter and housing throughout millennia.

#### All Students

Building for shelter, historical development and diversity of solutions.  
Climatic influences  
Availability of materials  
Basic structural forms  
Technological knowledge and skills  
Economic constraints and considerations

#### H.L. Only

*Social, cultural and traditional aspects of providing shelter*

## 1.3 Choosing a Location for a House

### Teaching/Learning Context

Students should have an appreciation of the variety of influencing factors which contribute to the location of domestic buildings. They should be able to discuss the suitability of common subsoils as well as those which should be avoided. It would be appropriate to visit, survey and generally investigate a small site and demonstrate how outline planning permission may be obtained. In this context the local by-laws and land designation should be discussed along with other appropriate information. Layout drawings and three-dimensional models should be used to represent design problems and their solutions.

#### All Students

Influencing factors in site location  
Local development plans  
Obtaining permission to build  
Services, accessibility and orientation  
Siting considerations for people with special needs (inclusivity)  
Acquiring a home and providing finance

#### H.L. Only

*Environmental, ecological and safety considerations*

*Safety statements*

## 1.4 What is a dwelling?

### Teaching/Learning Context

The need for shelter, comfort and pleasant surroundings will be analysed and discussed. In the context of house design students should understand the functions of the various rooms within a house as well as how they interrelate and influence the comfort and social conditions of the occupiers. The principles of building and fire regulations should be understood as appropriate to the scope of the built environment under consideration. Students will model and be able to communicate appropriate outlines according to current drawing conventions (see the heading titled "Communication of design and details").

#### All students

The relationship of rooms  
Comfort and privacy  
Shaping the building space  
Sketching floor plans and  
Elevations  
Design for inclusion

#### H.L. Only

*Solar gain and energy conservation*  
*Solar discomfort*

*Basic fire regulations*

### Learning Outcomes - Planning to Build

All Students will be able to:

- model and sketch basic structural forms
- describe how geographic location and climatic conditions influence the design of dwellings
- describe the primary functions and requirements of a dwelling
- understand the processes of obtaining permission to build
- sketch, draw and model room layouts for a small dwelling
- appreciate how basic fire regulations apply in domestic buildings

## 2. Structure and Fabric of Buildings

### 2.1 Elements of Structure

#### **Teaching/Learning Context**

As part of the core studies all students should have a basic knowledge of structural principles associated with buildings and their components. They should appreciate why various types of loading need to be considered and how for example spans have increased as new methods, materials and technologies have developed. Terms such as stress, strain, tension, shear, strut, tie and centre of gravity should be explained, demonstrated and modelled. Local examples should be used where available. Natural forms and structures should provide a basis for the introduction of the topic.

#### All students

Natural forms and structures  
Basic structural forms and concepts  
Concepts of:  
    stress and strain  
    tension and compression  
    centre of gravity  
    stiffness and elasticity  
The development of beams and arches  
Struts, ties and triangulation  
Examples of significant structural forms  
Modelling of structural forms

### 2.2 Substructure

#### **Teaching/Learning Context**

Students will have a knowledge of common subsoils and foundation design principles associated with these. Load bearing capacities of subsoils and problems associated with frost heave and water erosion should be discussed as should the principles of steel placement and reinforcement. This area will address all underbuilding to d.p.c. level including subfloors and ground floors as well as appropriate environmental considerations.

#### All Students

Common subsoils  
Clearing the site  
Water tables, rising damp and capillary action  
Radon gas protection  
Strip foundations  
Concrete ground floors  
Damp proof courses and membranes  
Floating wood floors

#### H.L. Only

*Suspended timber floors*  
*Principles of foundation design*  
*Raft foundations*

Batten and strip floors  
Floor coverings and finishes  
Walls from foundation to d.p.c.

### **Learning Outcomes – Structure and Fabric of Buildings**

Students will be able to:

- Sketch, draw and model basic structural elements
- describe some structural forms and concepts and their design principles
- identify and describe basic foundation types
- describe and sketch the elements of concrete ground floors
- specify different d.p.c. materials and show their effective positions and requirements
- *draw sections through suspended timber ground floors*

### 3. The External Envelope and Superstructure

#### Teaching/Learning Context

Here students should be conversant with the reasons for enclosure, the types of materials used and the manner in which they are assembled in order to satisfy comfortable living conditions, contemporary building regulations and aesthetic considerations. Buildings in the locality should be considered as examples and the principles of timber and 'solid' construction should be understood. While structural calculations need not be made the general design principles for external openings should be in evidence.

#### 3.1 Wall Types and Construction

#### Teaching/Learning Context

Students should have a knowledge of materials and wall types which will form part of the external envelope as well as the building's superstructure. They should also be familiar with design considerations which relate to energy conservation and insulation methods and be capable of comparing solid construction with timber-frame buildings.

#### All Students

Principles of wall design  
Materials for wall construction  
Insulation principles and requirements  
Wall finishes  
Openings in walls  
Examples of details to meet regulations  
Fireplaces, stoves and chimneys  
–  
traditional and contemporary

#### H.L. Only

*principles of construction*

*Fireplaces and chimneys -*

*principles of construction,  
incl. sketching and drawing  
of details*

#### 3.2 Windows and Doors

#### Teaching/Learning Context

Students should be conversant with the necessity to balance aesthetic considerations with energy conservation, security and particular light requirements. Common window types and their materials should be discussed and compared including their cost factors and durability.

#### All Students

Window types and materials  
Glazing  
Treatment at jambs, heads and cills  
External door types

#### H.L. Only

*Ventilation and lighting requirements  
Aesthetics considerations  
Security considerations  
Fenestration requirements and  
passive solar gain*

### 3.3 Roofing Design

#### **Teaching/Learning Context**

Students will know the shapes, spans and pitches of roofs in the context of waterproofing, selection of appropriate materials and aesthetic considerations. An awareness of the impact of environmental and climatic conditions should be developed.

#### All Students

Roof terminology  
Principles of weather protection  
Structural concepts in roofing  
Tiled and slated roofs  
Roof insulations  
Eaves and ridge details for tiled roofs

#### H.L. Only

*Use of attic spaces*  
*Eaves and ridge details for slated roofs*

### 3.4 Internal Subdivisions

#### **Teaching/Learning Context**

Solid and timber frame constructions should be discussed in the context of sound insulation/transmission and flexibility of living spaces as well as being part of or separate from the superstructure. Intermediate timber floors should be considered in this section as should principles of stair design and related safety considerations. A general awareness of requirements for divisions between buildings or dwellings will be sufficient.

#### All Students

Internal walls and partitions incl.  
wall finishes  
Paints and painting  
Internal doors and screens  
Timber first floors  
Ceilings and finishes  
Floor spans  
Openings in floors and walls  
Straight stair flights  
Precast concrete first floors

#### H.L. Only

*Fire regulations internal walls*  
*Principles of sound insulation*  
*Party walls*  
  
*Methods of changing direction  
in stair flights*

## Learning Outcomes – The External Envelope and Superstructure

Students will be able to:

- know the basic principles relating to fireplaces and flues
- draw/sketch suitable details for external walls and specify appropriate materials
- sketch, describe and model structural concepts for common roofs
- describe the properties of materials suitable for external walls
- *discuss design considerations of walls for energy conservation*
- *Draw/ sketch methods of changing direction in straight stairs*
- *Model the mechanical assembly of appropriate building design details*
- *Understand security design considerations for basic window and door types*
- *Describe common fireplaces and chimney details*
- sketch/draw design details for openings in external walls
- list the principles of sound insulation
- describe and detail basic window and door types
- Detail one window and door type
- Describe straight stair flights



## 4. Services and Environmental Technologies

### 4.1 Services for Domestic Construction - Human Comfort

#### Teaching/Learning Context

Students will understand the importance of service elements which makes living more comfortable. They should consider conservation of energy as well as safety and hygiene. A general understanding of some elements will be sufficient, for example electrical and telecommunication services. However participants should have a more rigorous knowledge of the design principles of plumbing and heating. Criteria for safety and efficiency of the common systems should be discussed. In considering energy conservation, developments in alternative energy sources including solar and wind energy should be included. Comparative running costs should be discussed including issues relating to the ecology, the environment and upgrading of existing dwellings.

#### All Students

Conditions affecting human comfort  
Safe use of electrical services  
Earthing  
Positioning of electrical outlets and controls  
Water sources supply and distribution  
Domestic hot water distribution  
Principles of domestic heating and heat distribution  
Assembly of plumbing materials and components  
Energy sources and environmental considerations  
'U' values for common constructions  
Upgrading existing buildings to comply with contemporary U value standards

#### H.L. Only

*RCD's and transformers  
Controls for the internal environment*

*Calculation of 'U' values*

### 4.2 Drainage and Waste Disposal

#### Teaching/Learning Context

Students should understand the principles of water and waste disposal and how effluent affects the environment. They should be conscious of conservation issues regarding clean water and air.

#### All Students

Clean air and water.  
Surface water drainage  
Disposal of domestic waste  
Design principles of underground drainage systems  
Design principles of piping above ground waste

Drainage materials and components  
Inspection and access chambers  
Domestic effluent treatment systems  
Environmental considerations for  
effluent treatment

### **Learning Outcomes – Services and Environmental Technologies**

Students will be able to:

#### All Students

- understand primary conditions which contribute to human comfort in a dwelling
- describe how common services and systems work
- know the sources of clean water
  - *Calculate 'U values for basic*
- understand how clean water *constructions*
- needs to be conserved
- describe control systems relevant to the internal environment
- make layout drawings of a common domestic heating system
- describe issues which relate to clean air and water
- draw typical layouts for domestic waste disposal systems
- assemble common heating and plumbing components
- know common 'U' values

#### H.L. Only

- *Sketch control systems for the internal environment*

## 5. Processing of Materials

### Teaching/Learning Context

In addition to developing the psychomotor and body kinesthetic skills and intelligences, students should have a good knowledge of the commonly used materials in building. Their knowledge of materials properties and characteristics should allow them to select materials as appropriate to particular situations, e.g. for aesthetic reasons or in hostile or severe environments. They should be conversant with issues relating to sustainability and ecological factors. Safety in storing and handling materials should be of prime consideration. Materials safety in use and in situation should also be discussed. Students will develop processing skills and techniques through modelling and making in the context of assigned practical tasks.

### 5.1 Materials and Processing

#### All students

Properties and Characteristics of:

timbers

metals

plastics

ceramics

Classification of building stone

Glass, Bricks and Tiles

Bonding of bricks and blocks

Conservation and ecological issues

Basic materials processing skills  
and techniques

Finishing and protecting surfaces  
and materials

Mastics and adhesives

Concrete

Make simple artefacts

#### H.L. Only

*Concrete additives*

*Composite materials*

*Bonding methods for stone*

## Learning Outcomes – Processing Materials

Students will be able to:

- describe the properties and characteristics of materials
  - specify suitable finishing and preservative materials
  - sketch/draw bonding methods for bricks and blocks
  - mark-out, cut, join and assemble materials
  - apply suitable surface finishes to a variety of materials
  - undertake basic tests on cements and aggregates
  - perform and record concrete slump tests
  - make moulds for and cast simple concrete components
- *Evaluate test results*
  - *Select appropriate finishes*
  - *Specify concrete additives*
  - *Sketch bonding methods for stone*

## 6. Design

### 6.1 Appraisal and Processes

#### **Teaching/Learning Context**

A variety of design approaches may be addressed. However a structured approach should be taken in the solution of design problems, in writing a design brief and in defining the problem/situation. Communication of design ideas and details should be approached using a variety of media

#### All students

- Anthropometric and ergonomic considerations and their application
- Appraisal of design – considerations for inclusivity
- Design methodologies
- Interpretation of design briefs
- Compiling design briefs/defining the problem
- Aesthetic principles ( shape, form, proportion and texture)
- Development and evaluation of design ideas
- Time considerations and management
- Selection of appropriate materials
- Modelling of design solutions and concepts
- Realisation of design from task/design briefs
- Evaluation of design solution

### 6.2 Communication of Design.

#### **Teaching/Learning Context**

Freehand graphic techniques in representing design ideas and details and in graphic ideation will be encouraged. Modelling techniques and materials will be of particular importance to those students undertaking design projects or building heritage project work. In addition to producing basic working drawings, all students will be expected to have a working knowledge of 2D CAD but further studies and skills development in 3D CAD may form the basis for project work both as a modelling/presentation technique and as a mechanism for focus and analysis. Colour should be used where appropriate.

#### All students

- Freehand sketching of ideas and details
- Methods of representation/communication graphics
- Prepare design/working drawings to approved standards
- Modelling techniques
- Shading and rendering and colour
- Computer aided drawing and design fundamentals
- CAD layout drawings and detail design

## **Learning Outcomes – Design**

Students will be able to:

- discuss and evaluate design details
- analyse and interpret design briefs
- take a structured approach to solving design problems
- select and process materials appropriate to a given task
- select appropriate methods of communicating design information
- graphically communicate design information using traditional and current media
- make working drawings of selected components and details
- model design solutions and concepts
- make basic CAD drawings of details and components

## 7. Architectural and Craft Heritage

### **Teaching/Learning Context**

The students should appreciate how the past influences the buildings of today as well as how availability of materials and technologies are reflected in the buildings and furnishings of the past. Local examples, including their proportions and characteristics should, where possible, be considered. Students should understand the meaning and significance of architectural and craft heritage, including its environmental impact then and now.

#### All Students

Built heritage – what it means  
Explore, observe and record  
local heritage in architecture  
and craft  
Irish dwelling types:  
local and national  
materials and design styles

#### H. L. Only

*The builder as designer and artisan*  
*Environmental considerations*  
*and impact, then and now*

### **Learning Outcomes – Architectural and Craft Heritage**

Students will be able to:

- contrast past and present uses of materials
- record and model assembly methods of the past
- describe and sketch local examples of building heritage
- understand how materials, equipment and techniques influenced ancient building design
- have an appreciation of the work of the various artisans of the past

## **Additional Learning Outcomes - Across the Core**

In addition to the topic-specific learning outcomes of the core, students will benefit in a broader way from the totality of the core and should achieve the following general learning outcomes.

Students will:

### All Students

- have an enterprising attitude in their approach to tasks, projects and problem solutions
- outline key factors in relation to home ownership
- display an appreciation of design principles and aesthetics
- have a knowledge of issues relating to the built environment
- show a knowledge of health and safety issues relating to materials and structure

### HL Only

- *show discernment in relation to home owner/occupier consumer issues*



# **COURSE CONTENT**

## **OPTIONAL AREAS OF STUDY**

**Content or learning outcomes in *italics* apply to higher level only**

**Students will study any two of the following four options**

**Architectural Heritage and Design**

**Services and Control Technology**

**Materials Technology and Design**

**The Built Environment**

## Option 1 - Architectural Heritage and Design

### Teaching/Learning Context

Students will be encouraged to critically analyse and compare past and present examples of design, structure and technologies in the built environment as well as associated furnishings and artefacts. To accommodate this teachers should use appropriate resource material such as photographic slides, building, historical and craft books as well as video and other appropriate media. The prime source of examples for discussion and analytical evaluation should however be the locality of the learners and nearby appropriate places of interest.

The development of various styles of architecture has always been associated with available materials and technologies. The learner should understand the association between these developments and learn, not only how they influenced the designs of the past but also how they affect contemporary designs. Students should make site visits to places of particular interest as part of their studies and should compile reports with supporting illustrations. They should also have an appreciation of significant world styles and historical periods of architectural design, particularly in the Irish and European context.

#### All Students

Examples of building, engineering and craft heritage  
The work of various architects in Ireland  
Consideration of important examples of National and European heritage  
Principles of conservation and restoration  
Development of construction methods in Ireland  
Great houses of Ireland  
Modelling of examples and reproduction of appropriate elements  
Small scale architectural works

#### H.L. Only

*The influence of significant architectural styles; Classic, Gothic, Romanesque and contemporary*

*Characteristics of examples of works of architectural heritage.*

### Learning Outcomes - Architectural Heritage and Design

Students will:

- Reflect an appreciation of architectural heritage
- Have a knowledge of architectural developments and design styles especially in the Irish context
- Demonstrate a knowledge of issues relating to conservation of buildings and associated artefacts
- Have a knowledge of materials and technologies which influenced designs of the past
- Model examples of details and technologies

## Option 2 - Services and Control Technology

### Teaching/Learning Context

Students taking this extension should be familiar with issues relating to the design and control of the internal environment and will be expected to have a knowledge of systems relating to the various elements. The student should be able to optimise available resources relating to systems layout and control. A more thorough knowledge of domestic heating systems, than that required at the core is expected, including the layout of water supply and heating and distribution systems. They should have a knowledge of sources and distribution of clean water as well as its conservation. *Students should understand and use pneumatic circuits for control applications such as, open/close rotate, re-divert etc.* The participants should be familiar with electronic components and basic circuitry. *Higher level students should be able to design and assemble circuit layouts for particular control and functions.* The principles of electronic time control, beam and interference switches will be studied.

#### All Students

Ventilation, air changes  
Natural and artificial lighting  
Illumination standards for various activities  
Sound control in domestic buildings  
Electronic components  
Electrical ring main circuits  
Security systems design  
Design principles of heating systems  
Single switching  
Fossil fuel energy sources  
Gas heating - safety considerations

#### H.L. Only

*Principles of air conditioning*  
*Principles of electronic control*  
*Principles of pneumatic component and systems control*  
*Comparison of heating types*  
*Solar panels*  
*Two way switching*

### Learning Outcomes - Services and Control Technology

Students will:

- Describe the influencing factors associated with human comfort in buildings
- Demonstrate a knowledge of suitable heating system for domestic buildings
- Understand control systems for domestic buildings security
- Discuss the fundamentals of electronic control systems
- Understand basic electric circuits
- Build working models of electronic control systems
- *Understand temperature and distribution control for heating systems*
- *Discuss the fundamentals of pneumatic control systems*
- *Design and build pneumatic control systems*
- *Identify optimum illumination requirements*
- *Understand two-way switching*

## Option 3 - Materials Technology and Design

### Teaching/Learning Context

The students should understand the composition and characteristics of the main materials used in buildings and their furnishings and reflect this in appropriate choice and specification, *including the management of waste and recycling of materials*. Of particular importance is the student's ability to compare and choose materials for specific applications in the context of design criteria such as strength/weight ratio, durability, cost and environmental or ecological effects. Design for manufacture as well as appropriate tooling and prototyping should also be addressed. Students will be fully acquainted with all aspects of safety appropriate to the materials, tooling and design activities experienced and be skilled in the safe use of hand power tools and appropriate machinery. Selection criteria relating to surface and applied finishes appropriate to a range of materials should be understood and experienced through design execution and finishing. The students should, where practicable have a knowledge of the basic elements of computer aided manufacture.

### General:

All Students

H.L. Only

Design realisation  
Processing skills and techniques  
Safe use of hand tools and equipment  
Safe use of portable power tools and machines  
Safe use of materials  
Jigs and templates  
Design evaluation/appraisal and processes  
Communication of design including CAD and 3D modelling  
Design activities (e.g. furniture design, concrete components etc.)  
Presentation of design projects

### Materials

Wood:

Structure and properties of hardwoods and softwoods  
Manufactured boards  
Processing - shaping, forming and joining  
Protecting and finishing wood

*Renewability issues*  
*Bending and laminating wood*

Metals:

Standard sizes and sections  
Protecting and finishing metals

Plastics:

Types, properties and characteristics     *Molecular structure in plastics*  
Shaping, joining and finishing             *Pigmentation of plastics*  
   *Durability and cost*

Ceramics:

Design principles for                         *Environmental issues associated*  
moulding concrete                             *with the manufacture and disposal*  
   *of materials*

Composite Materials:

Types, properties and applications

## Learning Outcomes - Materials Technology and Design

*Students will*

- Display an understanding of design processes in the context of planning, developing and executing solutions to design problems
- Show a knowledge of processing technologies appropriate to materials and their end use
- Appropriately communicate design information and solutions
- Use acquired skills in the realisation of practical projects
- Consider the environmental impact of design solutions

## Option 4 - The Built Environment

### Teaching/Learning Context

Building on the general appreciation of this area in the core studies, students will be required to have a greater insight into matters relating to specific issues concerning the environment and the ecology. An appreciation of particular issues relating to urban and rural planning sensitivity will be expected. Scarce material/physical resources should be discussed in the context of (a) choice of materials and (b) diminishing natural resources as should eco-friendly and 'safe' materials. Students should have an appreciation of aesthetic issues in the built environment.

The participants should also have a knowledge of the principal considerations involved in the evaluation or survey of dwellings intended for occupancy or ownership. They should be familiar with safety considerations relating to the built environment.

#### All Students

The built environment  
The structure of the building industry  
Professional roles in building  
Safe siting considerations (e.g. radon gas, high voltage cables etc.)  
The social impact of buildings  
Occupier/owner survey considerations  
'Green' building materials  
Energy and resource conservation  
Renewable and non-renewable energy sources  
Principles of building design for sustainability  
Building types and energy ratings  
Water sources and pollution control  
Treatment of domestic effluent  
Recycling of building materials  
Building site safety fundamentals

#### H.L. Only

*Design issues relating to ecology and environment*  
  
*'Alternative' energy sources*  
  
*Fuels - efficiency ratings and costs*  
  
*Sustainability of materials*

## Learning Outcomes - The Built Environment

Students will

- Describe the elements which contribute to a safe and functional building and its surroundings
- Describe the structure and professional roles of the building industry
- Discuss essential elements of obtaining permission to build
- Describe elements which can diminish the built and general environment.
- List the criteria which impinge on the user-friendliness of buildings
- appreciate issues relating to sustainability
- *Discuss the elements which contribute to an aesthetically pleasing built environment.*
- *Issues relating to sensitivity to the proposed location and environment*
- *Identify and discuss various consumer issues relating to the domestic buildings including sustainability*





# **COURSE CONTENT**

## **MAIN PROJECT**

**Learning outcomes in *italics* apply to higher level only**

## The Main Project

### Teaching/Learning Context

The student's main project will be submitted to the examining authority for assessment and will have a weighting of fifty percent of the total marks. The examining authority will, annually, nominate a number of themes at each level (Higher and Ordinary) from which a student selects one. The student will then develop a brief for the project, based on the chosen theme, and this brief must be presented to the teacher for approval before embarking on the work involved. Each student is required to submit a unique and distinct folio and artifact. The project should demonstrate a range of research and manipulative skills.

The two options associated with any particular school will normally be the platforms from which most of the student's project work will derive. However, the student's main project may also emanate from the broader experience of the core. The chosen options should be reflected in the type and range of projects undertaken.

Projects should be limited in volume and, where reproduction of large building-design assemblies form part of a student's work, well-proportioned and accurate models are appropriate.

The projects should reflect a structured/design approach to the chosen theme. All projects should incorporate a tangible model/artifact. The models or designs etc. should be made to a high standard and should be presented for assessment using appropriate presentation techniques and media. The materials processing skills developed at the core (Section 5) of the course will find expression in the student's main project.

All main projects will be accompanied by a supporting design folio/report and all projects should include appropriate visual media. The use of appropriate ICTs such as word processors, databases, CAD graphics and computer models and presentation software is to be encouraged, as are appropriate neat, freehand, descriptive sketches and design/working drawings.

Higher and Ordinary level projects will have separate marking schemes, with specified criteria appropriate to the level. The weighting of the project work will be the same at both levels, fifty percent of the total marks.

#### NOTE

The learning outcomes/assessment objectives associated with project activity should form the guiding criteria for all project work undertaken.

## Learning Outcomes – Project Work

Students will be able to

- Successfully develop and complete the selected project
- Display a structured approach to the development and completion of the project
- Identify the principal elements, considerations, problems, etc. associated with the project
- Display investigative/research skills appropriate to the project
- Demonstrate a satisfactory level of making skills in the modelling, execution and finishing of a project
- Present appropriate graphics as part of the project report, e.g. photographs, sketches, drawing and CAD models
- Demonstrate appropriate presentation skills relating to the report/log book, model or executed design
- Demonstrate an appropriate level of technological/scientific knowledge
- Reflect a knowledge of safety and health considerations as appropriate
- Demonstrate aesthetic sensitivity in any design project undertaken
- *Produce a rationale associated with the selection and development of the project as well as an overall appraisal*
- *Demonstrate initiative, creativity and innovation as appropriate to the project*
- *Demonstrate where appropriate the importance of environmental, ecological considerations as well as inclusivity and sustainability issues as they relate to the chosen brief.*