

CIWEM Certificate and Diploma

A Guide to Course Structure and Administration

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CIWEM Certificate and Diploma.

1. Objectives

The Institution's Certificate and Diploma courses combine academic and professional approaches to post-graduate learning in the field of water and environmental management. They are presented through arrangements between the Institution and the participating universities and are managed by a Joint Examinations Board (JEB) chaired by a nominee of the Institution. The participating universities are course providers approved by the Institution's Accreditation Board. The Institution appoints an External Examiner to ensure the maintenance of high standards.

There are four overall objectives:

To equip graduates to further the aims of sustainable development by providing the opportunity to obtain qualifications in water and environmental management at postgraduate certificate and diploma level.

To support employers and their employees by providing courses covering the essential underpinning knowledge, practical awareness and holistic approach, needed for effective management by all engaged in the water and environmental management field.

To provide a route to the academic standard for Corporate Membership for those whose existing qualifications do not meet the requirements, but would allow them admission to postgraduate study at participating Universities.

To provide a comprehensive range of modular courses on water and environmental topics that may be studied separately for Continuing Professional Development (CPD) purposes.

2. Course Structure

The course is in two parts:

The **Certificate**, provides a common platform of knowledge at postgraduate level in the basics of water and environmental management through four compulsory modules:

The **Diploma**, provides specialist knowledge at postgraduate level by study of four modules selected from a range of carefully chosen optional modules.

The Certificate comprises the following four compulsory modules each normally requiring a total of 150 hours directed study over one academic year.

**Environmental Systems
Environmental Quality
Environmental Policy and Regulation
Environmental Management**

Certificate module outlines are at annex A.

Students may sit all the modules together or one or more modules at a time. The Institution will only award the Certificate when passes in all four modules have been gained.

The Diploma is open to those holding the Certificate. Four Diploma modules are chosen from the following. Each module will normally require a total of 150 hours-directed study over one academic year.

**Water Resources
Potable Water Treatment
Potable Water Distribution Systems
Sewerage Systems
Waste Water Treatment Systems
Water Pollution Prevention and Control
Wastes and Land Management
Air Quality Control
Conservation, Amenity and Recreation
Industrial Environmental Management
Operational Management and Customer Service
River Engineering
Coastal Engineering and Shoreline Management
Noise Control
Energy Management
Environmental Modelling
Sustainable Water Supply and Sanitation in Developing Countries**

Diploma module outlines are at annex B.

Note that the range of Diploma modules offered by participating universities is strictly subject to demand.

Students may sit all four modules together or one or more at a time. The Institution will only award the Diploma when all four modules have been gained and the Certificate has been awarded.

Note: Under normal circumstances candidates will be expected to complete all modules leading to the award of the Diploma within five years of initial registration with CIWEM for their first Certificate module course.

3. Assessment

Assessment at both Certificate and Diploma levels is through performance in a **written examinations paper, an assignment of 5000 words** (or equivalent) of original material and in **a Reflective Learning Log of 5000 words** (or equivalent) for each module.

Assignment procedures are at annex C and learning log procedures are at annex D.

The written examination carries 40% of the module assessment marks and 60% is split equally between the assignment (30%) and the learning log (30%).

To obtain a module pass students must achieve a minimum of 40% in each assessed component and an overall average mark of 50%.

The Institution may grant outstanding students Certificate or Diploma passes with Merit or Distinction. To achieve Merit the student must gain 60%, or above, in the first sitting of the exam (re-sits not included) in all modules taken and to gain Distinction the student must gain 70%+ in all the modules taken (re-sits not included).

In order to qualify for the award for Best Student, the student should have achieved Distinction at Diploma level.

In the event that circumstances outside the student's control unduly compromise performance on the course there is an appeals and mitigating procedure and details can be found at annex E.

4. Processing of Results

Normally, within 28 days of the final examination a meeting of the JEB will be held to moderate the results and produce a final pass list.

Usually, within 14 days of the JEB meeting, Certificate and Diploma Module results for the individual Candidates are forwarded by CIWEM to the recorded contact address of the Candidate and copied to a nominated representative at the appropriate University.

5. Course Provision

CIWEM Certificate and Diploma courses normally commence at participating universities in September of each year and examinations are usually held in June the following year. Module Assignments are completed to specified deadlines during this period.

The participating universities offer a wide range of study opportunities and welcome the opportunity to discuss individual student and employer needs.

The following Universities are currently accredited course providers.

Anglian Polytechnic
Peter Wynn
01245 493 131
www.enterprise.anglian.ac.uk

John Moores (Liverpool)
Rafid Alkhadder
0151 231 3627
www.livjm.ac.uk

University of Abertay
Chris Jefferies
01382 308 170
www.abertay-dundee.ac.uk

Bristol University
Alan Feest
0117 928 8859
www.vll.fen.bris.ac.uk

All participating universities provide courses for the Certificate modules and details of Diploma Module provision are available from the individual Universities. They also recognise module passes at Certificate and Diploma level obtained at any participating University.

6. Eligibility and course registration.

The courses for Certificate and Diploma Modules will be open to those with acceptable entry qualifications for postgraduate study at UK Universities.

All Candidates must register with the Institution, via the University, usually prior to commencing the Module courses.

7. Procedure for Accreditation of Prior Learning (APL)

The APL procedure allows Students enrolled on courses for CIWEM qualifications to receive appropriate recognition for the knowledge gained as a result of prior formal learning. Where it can be proven to be equivalent, in level and outcome, to Modules we offer as part of our postgraduate Certificate and Diploma courses.

Under the CIWEM APL procedure, students are entitled to make a claim against a maximum of two Modules at Certificate level and two at Diploma level.

Having enrolled on courses leading to CIWEM Certificate and Diploma, Students are advised to discuss their study pathway with the course leader and at that time to indicate to CIWEM any intention to apply under the APL scheme.

APL claims must be submitted to the Institution by no later than 30th November following enrolment to allow assessment to be made and Students to be notified of the outcome in the following January. Details of the claims process are given at annex F.

8. Course Fees

The Universities charge their usual course fees for post-graduate study and this will include the cost of taking the examinations and assignments for each Module studied.

A Module registration fee is payable to CIWEM for each Module to be taken and must be paid before studies commence.

In the event that the Student has not paid the course fees or the CIWEM module registration fees the award of the qualification will be withheld.

Students are strongly encouraged to become Members of CIWEM and the University will provide advice and Application forms. These should be sent with the Application fees to: -

The Membership Manager

CIWEM

15 John Street

London

WC1N 2EB

9. Continuing Professional Development

Endorsements to the Diploma will be awarded to those wishing to take further Diploma modules as part of career development.

CIWEM will award Module Certificates for success in individual Certificate and Diploma modules and a selection of modules may be gained for career development purposes without the commitment to complete the full requirements for the Certificate or Diploma. If the student subsequently wishes to complete the requirements for Certificate or Diploma module passes gained for CPD purposes will be credited against the requirements subject to the five-year rule above.

Most of the participating Universities recognise CIWEM Diploma as exception from the taught part of an MSc.

10. Structured Training

Structured training is a key stage in the training of Professionals and in preparation of Candidates for Professional interview for corporate Membership.

The Institution's structured training scheme is intended to assist employers when setting up their own training programmes. It identifies the competencies need to meet the Institution's requirements for Professional entry. CIWEM Certificate and Diploma is unique since it provides 'underpinning Knowledge' directly related to the structured training process. Employers may therefore integrate the Certificate and Diploma courses with their approved in-house structured training programme.

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For Candidates who complete the Certificate and Diploma courses before taking up employment in the field of water and environmental management, the subsequent employer may, at his/her discretion, approve the relevant assignments as part fulfilment of his structured training requirements.

Annex A

CIWEM Certificate:

Environmental Systems

Introduction and Rationale

This module provides an understanding of the impact of human activity on ecological process and systems and explores how these impacts influence human well-being. Following a review of the basic science of ecological systems, it assesses the impact of human activity on ecosystems and biomes and reviews the issues associated with resource allocation. The module concludes with a review of the implications for human health and well-being and the case for species and ecosystem conservation.

Summary of Aims

The module provides a thorough grounding in environmental systems and human impacts upon them. Its principal aims are.

1. To develop knowledge of environmental systems; in particular, ecosystems, resources and human impact on the global environment.
2. To provide understanding of the working of these systems and to enable the student to make technical and management decisions in the light of this understanding.
3. To use this understanding to critically review international, national and organisational policies with respect to sustainable development.

Anticipated Learning Outcomes

On completion of the module students should be able to.

1. Undertake a critical analysis of the environmental impact of human activities such as agriculture and industry.
2. Critically assess an environmental impact assessment and suggest improvements.
3. Apply a holistic environmental perspective to decisions in the workplace.

Indicative Content

Ecosystems

What is ecology; the individual and autecology; population dynamics and regulation. Ecological genetics. Behavioural ecology and socio-ecology. The physical and the ecological environment. Habitats and Niches; trophic levels; autotrophs, decomposers; herbivores and carnivores; food chains and webs; pyramids of numbers and biomass. Energy transfer; primary production; ecological efficiencies.

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Human Impact

Nutrient recycling and pollution; the carbon cycle; the nitrogen cycle; the phosphorus cycle; different forms of pollution and their effects. Communities and ecosystems; global diversity; species richness; stability-diversity relationships; the global cline; soils; wetlands and aquatic ecosystems. Succession and biomes; the causes of change; primary series; patterns of succession; human effects on succession; the world's major biomes; major UK habitats. The impact of human activities on these processes.

Resource evaluation and exploitation.

Sustainable use of resources: classification (renewable, non-renewable, exhaustible, recyclable), reserve life. The economic and environmental cost of resource exploitation (mining, drilling, processing). Life-cycle analysis. Energy resources: fossil fuels, renewable and replaceable energy sources. Forest exploitation, agriculture, urbanisation, transport, industry, tourism and biotic exploitation. The impacts of consumerism and of waste on the environment.

Human well-being

Holistic views of the environment; man in the environment, his present place and future generations. Impact of environmental degradation on human health and well-being; protection of the food-chain; consequences of over-exploitation of resources. The consequences of the over-exploitation of resources. Responsibilities to developing countries and indigenous peoples. North/South expectations and the reality of international environmental negotiation. The case for resource, ecosystem and species conservation, world and UK actions.

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CIWEM Certificate

Environmental Quality

Introduction and Rationale

This module builds on the understanding of environmental quality and provides a range of basic skills by which the quality of the environment may be described and defined. All major environmental aspects are considered – water, land, noise and air – in a variety of ranges and scales. This ensures a broad range of knowledge of environmental measurements upon which further modules are based.

Summary of Aims

The module provides a thorough grounding in environmental quality and introduces measures for its abatement. Its principal aims are.

1. To provide a knowledge of the physical, chemical and biological quality of water, land and air and appropriate standards for their management.
2. To provide a knowledge of the possible environmental pollutants, the effects of these pollutants on the physical, chemical and biological quality of water, land and air.
3. To examine ways of measuring pollution and measures to minimise its impact.

Last amended on 27.01.03

This document is subject to change.

Anticipated Learning Outcomes

On completion of the module the student should be able to.

1. Critically evaluate the relative impacts of various pollutants on each medium and the implications for cross media transfer.
2. Analyse and apply appropriate strategies for dealing with a pollution problem involving at least two media.
3. Assess the impact on the quality of the environment of activities at work or in the community.

Indicative Content.

Water quality management

The hydrological cycle: water sources, water quality parameters, the quality of water from the various sources, the nature and effects of pollution. The domestic, agricultural and industrial wastewater sources comprising urban wastewater: outline methods for their control and treatment. Quantitative and qualitative water quality assessment techniques. Fundamentals of self-purification. Water quality standards, UK and EU Directives. Setting quality standards for effluent discharges and quality objectives for receiving waters.

Quality of public water supply

Waterborne diseases: causes and elimination. Drinking water quality standards: UK, EU and WHO. Sources of raw water for supply use and methods of abstraction. Elements of the treatment of surface and ground waters for public water supply. Private water supplies. Quality aspects of potable water distribution. Microbial quality assessment. Aesthetic parameters and their amelioration.

Land pollution

Land use and effects of pollution. Sources of pollution: particularly agricultural, industrial, landfill and sewage sludge sources. The implications for human health. UK and EU regulatory control requirements and monitoring techniques. Introduction to contaminated land remediation. Landscape quality – urban and rural.

Noise pollution

The causes of noise pollution and their effects on humans and wildlife. Specific effects caused by transportation systems. The contributions of urbanisation. UK and EU standards and regulatory requirements: noise measurement: an introduction to noise control techniques.

Air pollution.

The structure of the atmosphere, stratosphere, troposphere: global movements, climate. Regional and global air pollution problems and their remediation: acid rain, greenhouse

gases, ozone depleting emissions. Sources and effects of local and sub-regional air pollution, emission inventories. Emission standards: their enforcement and control. Techniques for the detection and analysis of pollutants: an introduction to air pollution control technologies.

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CIWEM Certificate:

Environmental Policy and Regulation

Introduction and Rationale

This module develops a critical awareness of the issues behind policy and legislation. It examines the mechanisms for the development of international environmental policy, the development of environmental policy in the EU and the UK, the evolution of EU and UK environmental and water law and the reasons for the development of environmental policies for organisations. The module underpins the policy and legal aspects essential to modules at diploma level.

Summary of Aims

The module builds on the understanding of environmental policy and law at international, national and regional levels. Its principal aims are.

1. To provide a knowledge of the development of international, European and national policies for water and the environment.
2. To facilitate an understanding of the mechanisms by which the European Union and national directives, laws and regulations are developed.
3. To provide a working knowledge of national law on water and the environment and the organisations responsible for regulation and to understand the influence of these and other pressures on an organisation's environmental policy.

Anticipated Learning Outcomes

On completion of the module the student should be able to.

1. Understand the relationships between international, regional and national environmental policy, accords and legislation and the mechanisms by which they are monitored.
2. Critically review published national and/or organisational environmental policies and data in order to evaluate their appropriateness.
3. Develop an outline policy to meet legal and other requirements for an organisation:

Indicative Content

Although specific declarations, protocols, directives, etc., are indicated, the module will include changes as they are introduced.

International environmental policy.

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The role of the major international institutions in the development of environmental policy: UN, World Bank, WHO, etc. Major international conventions and declarations: including Rio, North Sea Conferences, Paris Convention, Montreal Protocol, Kyoto, etc. Environmental regimes established to monitor and implement international accords.

EU and UK environmental policy.

The EU Environment Programme: evolution of UK policy - 'This Common Inheritance'. Integrated Pollution Prevention and Control. Best Practical Environmental Option. BATNEEC. BAT. Sustainable Development, Agenda 21, etc.

European and UK environmental and water law.

The EU role in environmental law making and enforcement: EU law concerning air, land, water, conservation of natural resources, and integrated pollution prevention and control. Background to UK environmental and water law: the impact of EU law and its incorporation. The present day legal framework: the main statutes and regulations and their provisions including regional variations in the UK. Regulations governing the 'listed' dangerous substances and for radioactive wastes. Interaction between environmental and planning law, including provisions with regard to noise. The development of the regulatory management systems in England and Wales, Scotland and Northern Ireland: the roles of government departments, local authorities, environment agencies, Drinking Water Inspectorate, etc.

Development of an environmental policy for an organisation.

Why an organisation needs to have an environmental policy: influence of the city, banking, insurance, pressure groups, government, trades unions, etc. Statutory and voluntary data needs: gathering and monitoring systems, external reporting systems and the disclosure of information. Valdez Principles and ICC Charter. Environmental performance and efficiency gains: best practice and quality management. Environmental policy and organisational culture. Interactions between Health and Safety and quality management. Reference to individual company approaches to environmental policy management.

CIWEM Certificate:

Environmental Management Systems

Introduction and Rationale

This module uses the skills of environmental review, statistical analysis, environmental audit, environmental economics and environmental management systems to examine the way in which companies and other organisations impact on the environment in their day-to-day operations and when planning for the future. It also examines how organisations may address policy to reduce, minimise or even eliminate adverse impacts and so address the goals of sustainable development.

Summary of Aims

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This document is subject to change.

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This module builds on the understanding of the driving forces behind good environmental practice, the principles of environmental management and the management tools available. Its principal aims are.

1. To provide an understanding of environmental management systems and audit procedures in assessing the impacts of new projects and also the day-to-day impacts of organisations on the environment.
2. To critically review the culture and drivers which motivate an organisation to examine and reduce its impact on the environment.
3. To understand the wider impact of environmental economic policy in environmental planning.

Anticipated Learning Outcomes

On completion of the module the student should be able to.

1. Understand the ethical dimension of business decision-making and how the culture of organisations can influence attitude to environmental matters.
2. Appraise new projects on economic grounds whilst balancing these considerations against environmental considerations.
3. Undertake an environmental review of the organisation in which they work.

Indicative Content.

Exploring sustainability

Exploring sustainability in organisations and stakeholder pressures as precursors to environmental change and as drivers to industrial environmental management. Ethics and the environment

Environmental management systems

Environmental Management Systems, ISO14001 and EMAS: the role of environmental policies /plans /audits & corrective actions/the review process and continual improvement. Environmental review and the formulation of an environmental policy.

Environmental analysis

Life Cycle Analysis ISO14040: The role of life cycle analysis in benchmark activities.

Environmental Impact Assessment: Appropriate case studies are used to explore the application of each methodology e.g. wastewater treatment plant, industrial applications and service activities.

Environmental economics

Environmental cost-benefit analysis, risk assessment, the development of priorities for environmental improvement and the techniques for revenue and capital project evaluation. Control of pollution through economic means: waste generation and the concept of optimal pollution, Pigovian taxes and the costing of environmental damage, pollution control policies in mixed economies, the use of progressive tariffs. Economic regulation of the water industry: the roles of Ofwat and arrangements in Scotland and Northern Ireland.

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This document is subject to change.

Statistical methods.

The statistical basis for the design of sampling programmes, the setting of emission standards, and the assessment of standards compliance for air, water and land, including the interpretation of results and the presentation of data. The basis of statistical models used to assess air, water and land pollution and to set emission standards, including the analysis of variance.

Annex B

Diploma module outlines

CIWEM Diploma:

Last amended on 27.01.03

This document is subject to change.

Water Resources.

Introduction and Rationale.

This module provides a thorough grounding in the engineering and science of water resources management within the overall context of resource usage, conservation and environmental protection. It considers the availability of water, the demands and uses of water, the legal and institutional framework governing water resources, the allocation of water resources, water resource planning and water resources management

Summary of Aims

This module provides the skills necessary for the effective management of water resources and the measures necessary to balance user and environmental needs. Its principal aims are:

1. To provide a knowledge of the types of water resources and the influences on quality and quantity.
2. To provide understanding of the issues affecting resource development, utilisation protection and abstraction control.
3. To provide a context for the sustainable management of water resources within the wider aims of catchment management.

Anticipated Learning Outcomes

At the end of the module students should be able to.

1. *Critically appraise existing procedures for water resources management and suggest improvements.*
2. *Use engineering and scientific principles to develop proposals, and to undertake the critical evaluation of alternatives, for water resource development to solve demand or environmental problems.*
3. *Confidently liaise with other professionals and water users on water resource matters.*

Indicative Content

Availability of water.

The principal types of water resource; groundwater, surface water and rivers and the influences on availability and quality. Measurements of the water cycle, hydrology, water resource surveys, catchment areas, rainfall, stream, evaporation and percolation; drought and flood conditions. Artificial modifications to the natural cycle: abstractions, discharges, water resource developments. The principles of yield assessment and protection, etc. Problems caused by overabstraction. Interbasin water transfer. International water conflicts.

Demands , uses and reuse of water.

Human and environmental needs for water and water conservation. Drinking water, agriculture, industry, fisheries, etc. The conflicts and synergies between various water users at local, national and international levels. Current shortfalls and future needs, both human and environmental. Water reuse in the home, industry and agriculture.

Legal and institutional framework for water resources.

The development of water resources law in the UK: differences between England & Wales, Scotland and Northern Ireland including the influence of the EU and other international conventions. Current law in the UK and recent proposals for change. The institutional framework: the policy framework and its implementation including the role of economic, quality and quantity regulators.

Allocation of water resources.

Allocation for human use: the licensing of abstractions. Types of abstractors. Allocating resources between users and the environment, requirements of the licence, charging policy and practical application, policing abstractions, licence contravention and prosecution procedures, consultation and appeals procedures. Data management.

Water resources planning

Planning at national, regional and local levels: the context of catchment planning. Demand forecasting, source yield estimation, groundwater modelling, transfer schemes, resource protection. Environmental impact assessment and protection measures. Risk analysis, contingency planning. Cost/benefit, consultation, phasing implementation. Demand management ; leakage control, metering, efficient use, water reuse, role of economics and incentive charging. Regional water supply schemes: reservoirs, transfers, conjunctive use, artificial recharge, etc. Water company plans: levels of service, outage, headroom, balance between supply ,security and cost.

Water resources management

Implementation of water resource management plans. Operating rules and safety aspects for reservoirs and other water resource assets. Licence enforcement. Drought management and use restrictions: orders and permits. Economic operation of resource/ supply systems. Pumping and pump efficiency. Bulk supplies and agreements. Pollution protection measures. Groundwater protection policy: vulnerability and the threats to aquifers - transport of pollutants, responsibilities and liabilities; Nitrate control and Nitrate Protection Zones. Measures to protect surface water quality: restrictions to land use in the catchment of reservoirs for public water supply. The use of risk assessment models for the pollution of surface waters: on-site protection measures. Emergency procedures related to resource pollution incidents.

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CWEM DIPLOMA:

Potable Water Treatment.

Introduction and Rationale.

The module provides a thorough grounding in the engineering and science of potable water treatment systems within the overall context of public water supply. This is achieved by considering the legal and institutional frameworks governing water supply, the types of water

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sources, the planning and design of water treatment facilities and the operation of treatment systems to meet water quality and customer service standards.

Summary of Aims

This module provides the skills necessary for the effective management of water supply and the measures necessary to meet quality standards and customer expectations. Its principal aims are.

1. To provide understanding of the legal and institutional framework governing public water supply.
2. To provide an understanding of the design, selection and operation of treatment processes to produce potable water to meet drinking water quality standards.
3. To provide a context for context water treatment within the overall management of public water supply.

Anticipated Learning Outcomes

At the end of the module the student should be able to.

1. Critically appraise existing arrangements for potable water treatment management and suggest improvements.
2. By the use of engineering and scientific principles, develop and undertake the critical evaluation of alternative proposals and designs for the treatment of raw water to meet potable water quality standards.
3. Liaise with water users on the measures taken to meet potable water quality standards, to meet customer expectations, and to protect public health

Indicative Content Study Guide

Legal and institutional framework for water supply

A global overview of the provision of water supply services. European and UK policy on water supply. An outline of the historical development of UK water supply law, the modern legal framework governing water supply management, the responsible organisations and interaction with interested parties including the variations between England and Wales, Scotland and Northern Ireland. Measures to protect the quality of water resources. Drinking water quality standards and the standards to be achieved by water treatment.

Water sources.

Relationship to water resource planning, licensing, drought control and to water pollution prevention and control issues. The types and characteristics of water sources and the extent of treatment required. The quality of water for abstraction for use in public water supply. Potential pollution of water sources: measures for the protection of surface waters, rivers and groundwaters. Reservoir and raw water aqueduct management: quality issues arising from the recreational use of reservoirs.

Water Treatment Processes

An introduction to the historical development of water treatment. The influence of WHO, EU and national legislation and regulations on water treatment processes. Current process science and engineering as applied to the selection and design of waterworks: raw water

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storage, control and protection; screening and pumping of raw waters entering treatment works; coagulation and flocculation; settlement and flotation processes; filtration systems; adsorption processes (eg. activated carbon); ion exchange; biological treatment (eg. nitrate removal); oxidation and disinfection; chemical correction and conditioning of water; chemical storage, preparation and dosing; process mechanisation, automation, monitoring and control; treatment and disposal of treatment by-products; final water modification to meet distribution system needs. Private and industrial water supplies: outline of the treatment for small potable supplies. Process flowsheet selection as a function of the quantity and quality of raw water to be treated and the final water quality to be achieved.

Water treatment plant management.

Key operational and maintenance tasks, their scheduling and implementation. Water supply hygiene procedures and emergency procedures to protect water quality. Water sampling and examination: physical, chemical and biological. The interpretation of the results and their application to process and final water quality control. Plant control data and records: the calculation of throughput, chemical dose rates, retention periods, etc., necessary to plant control.

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CIWEM DIPLOMA:

Potable Water Distribution Systems.

Introduction and Rationale.

The module provides a thorough grounding in the engineering and science of water distribution system management within the context of water supply services and public health protection. This is achieved through consideration of the hydraulics of pipeline systems, their design, construction, rehabilitation, the modelling of their behaviour, system control, their operational requirements and the legal and institutional framework under which they are provided.

Summary of Aims

This module provides the skills necessary for the effective management of water supply and distribution systems and the procedures necessary to meet customer service, public health, quality and environmental standards. Its principal aims are.

1. To provide a knowledge of the design and characteristics of water distribution systems and their influence on quality and customer service.
2. To provide an understanding of the issues affecting the management of water distribution systems.
3. To provide an understanding of the planning and execution of pipeline rehabilitation programmes.

Anticipated Learning Outcomes

At the end of the module students should be able to.

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1. Critically appraise the existing procedures for pipeline services management and suggest improvements.
2. Using engineering and scientific principles, develop and undertake the critical evaluation of alternative proposals and designs for pipeline development or rehabilitation.
3. Confidently liaise with operators, engineers, customers and regulators on water distribution matters.

Indicative Content

Legal and institutional framework for water distribution.

European and UK policy as it affects water distribution: modern framework of UK water distribution law, including variations in regions of the UK. The responsible organisations: interaction with interested parties. Drinking water quality standards and the standards to be achieved at the customers tap. The roles of DWI and local EHO's. Water bye-laws. Highway responsibilities; notification, reinstatement. Fire hydrants.

The operation and maintenance of potable water distribution systems.

Types of water distribution systems; their operation, maintenance and their influence on water quality and customer service: treated water aqueducts, trunk mains and terminal reservoirs: service reservoirs, mains and services: pumping plant: levels of service, reference standards, the measurement of system performance: distribution system zoning and control: mains and service laying: pipeline materials selection: ingress of pollution: faulty installations. Job management: aqueduct maintenance; mains and service laying and repair; highway reinstatement; metering; leakage detection; pumping station operation and maintenance; fire hydrants; customer complaints and service levels; system management; bye-law enforcement. Sampling and analysis of water in distribution, interpretation of results, remedial action; notification procedures for quality failures; Cross-contamination, Hygiene Code and enforcement.

Distribution system hydraulics

Flow characteristics of water in pressure pipelines; head loss and carrying capacity; the sizing of water mains to meet demand. Pumping plant, pump efficiency and pumping head and the characteristics of pumping mains. The measurement and control of flow in water mains.

Distribution system design

Methods of assessing water mains capacity requirements; domestic and industrial demand forecasting; seasonal demand; leakage losses, etc. The materials commonly used in water mains and services construction. The influence of the duty, water characteristics, ground conditions, etc., on the selection of pipeline materials; special requirements for materials in contact with drinking water. The principles of design and construction for aqueducts, trunk mains, service reservoirs and overflows, distribution mains and services and associated pumping installations. Design of sampling points. Discharge consents for water distribution overflows.

Mathematical modelling of distribution systems

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This document is subject to change.

GIS: advantages and disadvantages; water mains records; paper and digital systems.. Network analysis and the mathematical modelling of water distribution systems; interactive models and their use in system design and operation. Monitoring and control of water distribution systems; real-time modelling and system management.

Distribution system rehabilitation

Water distribution system zoning: identification of rehabilitation priority zones by; demand and flow measurement, network modelling, leakage assessment, performance against customer service and drinking water quality standards.

Selection of mains rehabilitation method: replacement or re-lining and the associated techniques. The selection of pipeline and relining materials. Justifying rehabilitation alternatives, prioritising schemes, rehabilitation programme management.

Service pipe rehabilitation and boundary box replacement; service pipe materials, boundary box duties.

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CIWEM Diploma:

Sewerage Systems

Introduction and Rationale.

The module provides a thorough grounding in the engineering and science of urban sewerage system management within the context of wastewater services and public health protection. This is achieved through consideration of the principles of sustainable urban drainage, hydraulics of pipeline systems, their design, construction, rehabilitation, the modelling of their behaviour, system control, their operational requirements and the legal framework under which they are provided.

Summary of Aims

This module provides the skills necessary for the effective management of urban drainage systems and the procedures necessary to meet customer service, public health, quality and environmental standards. Its principal aims are.

1. To provide knowledge of the design and characteristics of sewerage systems and their influence on river quality and customer service.
2. To ensure an understanding of the issues affecting the management of sewerage systems.
3. To provide an understanding of the planning and execution of sewer rehabilitation programmes.

Anticipated Learning Outcomes

At the end of the module students should be able to.

1. Critically appraise the existing procedures for sewerage system management and suggest improvements.

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2. Using engineering and scientific principles, develop and undertake the critical evaluation of alternative proposals and designs for sewerage development or rehabilitation.
3. Confidently liaise with operators, engineers, customers and regulators on sewerage system matters.

Indicative Content.

Legal and institutional framework for sewerage.

European and UK policy as it affects sewerage systems. An outline of the historical development of UK sewerage law, the modern legal framework governing sewerage system management, the responsible organisations and interaction with interested parties including the variations between England and Wales, Scotland and Northern

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Ireland. Discharge standards for sewer overflows, levels of customer service. The roles of the Environment Agency and local EHO's. Highway responsibilities; notification, reinstatement.

Sustainable urban drainage.

Importance of quantity, quality and habitat in drainage design. Principle of the treatment train – source control, site control, regional control. Description, design, operation and maintenance of various SUDS devices. Environmental benefit, maintenance/adoption issues.

Sewerage system hydraulics

Flow characteristics of sewage in pressure pipelines and in open channels; head loss and carrying capacity; the sizing of sewers to meet demand. Pumping plant, pump efficiency and pumping head and the characteristics of pumping mains. The measurement and control of flow in sewers.

Mathematical modelling of sewerage systems

Hydraulic and quality modelling as required for river, lake, estuary and marine impact assessment; Urban Drainage Manual approach; methods and models: Mike II, ISIS. Flood modelling: Micro-FSR, HEC-RAS. Use of GIS systems for data handling.

Sewerage system design

Assessment of sewer capacity requirements: domestic and industrial demand forecasting; seasonal demand, etc. The materials commonly used in sewer construction. The influence of the duty, sewage characteristics (including trade effluent), ground conditions, etc., on the selection of sewer materials.

The principles of design and construction for trunk sewers, local sewers; sewage retention tanks and overflows; sewage pumping stations: Discharge consents for sewer overflows.

The operation and maintenance of sewerage systems.

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Introduction to the types of sewerage systems: separate and combined sewers: trunk and local sewers; sewer overflows; screening; retention tanks; pumping stations and rising mains; levels of service; reference standards; the measurement of system performance; pipeline materials selection: infiltration and leakage.

Sewerage system job management: sewer cleansing; sewer laying and repair; utilities and highway reinstatement; pumping station operation and maintenance; customer complaints and service levels; system management.

Health and safety: hazards in sewers; confined spaces; flammable, asphyxiating and toxic atmospheres; safe working codes. Trade effluent discharges: exclusions; spills; routine hazards.

Hygiene code: Weil's disease.

Sewer rehabilitation

Designation of 'critical sewers'. Drainage area studies: flow measurement and data gathering, flow modelling and future capacity estimation. Assessment of sewer condition (CCTV, visual inspection). Performance against reference and customer service standards and discharge consent requirements. Criteria for the selection of sewer rehabilitation method: replacement, re-lining and lining techniques. Costing alternatives, prioritising schemes and rehabilitation programme management.

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CIWEM DIPLOMA:

Wastewater Treatment Processes.

Introduction and Rationale

This module provides a thorough grounding in the engineering and science of the operational management of wastewater treatment systems in the context of customer service and environmental protection. This is achieved by considering the legal and institutional framework governing wastewaters, the nature of the wastewaters to be treated, the physico-chemical and biological treatment processes at a variety of scales, the application of these techniques to the treatment of urban and industrial wastewaters and to the treatment, the disposal of by-products management and the associated operational and maintenance tasks.

Summary of Aims

The module provides the skills necessary for the effective design and management of wastewater treatment systems and the measures necessary to meet environmental standards and customer expectations. Its principal aims are.

1. To provide knowledge of the issues involved in the management of wastewater discharges to sewer and to watercourse.
2. To provide the skills necessary for the selection and design of systems for the treatment of wastewaters and associated by-products.

3. To provide knowledge essential to the effective operational management of wastewater treatment systems to meet environmental and customer service needs.

Anticipated Learning Outcomes

At the end of the module the student should be able to.

1. ***Critically appraise the existing procedures for urban wastewater treatment and suggest improvements.***
2. ***By use of engineering and scientific principles develop and undertake the critical evaluation of alternative proposals and designs for wastewater treatment and sludge treatment systems to meet environmental standards and customer needs.***
3. ***Confidently liaise with environmental regulators and customers on the control measures needed to meet environmental standards.***

Indicative Content.

Legal and institutional arrangements for wastewaters.

EU policy on wastewater and sludge management. UK policy and law on wastewaters, including regional variations. The environment agencies: statutory powers and duties, consents to discharge, monitoring, control, audit and reporting. Effluent quality reporting: public registers of effluent quality. The control of trade effluent discharges to sewers; charging for discharges; statutory powers.

The nature of wastewaters to be treated and the standards to be achieved.

Types of trade effluent: agriculture: food manufacture, industrial processes, prescribed processes, toxic and biodegradable effluents. Factors involved in the determination of consent conditions for discharges to sewer. The nature of sewage. The influence of the sewerage system: diurnal flow variation, presence of inhibiting substances. Statutory water quality objectives: the determination of consent conditions for the discharge of treated trade effluents, storm sewage and treated sewage effluents to watercourses and marine environments.

Physico-chemical and biological treatment processes.

Basic hydraulics of treatment systems. Flow measurement. Storm sewage separation. Screening. Maceration. Comminution. Grit removal. Sedimentation. Flotation. Chemical precipitation. Filtration. Disinfection. Sludge dewatering and incineration. Microbiology, bacterial physiology and growth. Activated sludge. Thin film reactors and variants. Microbial digestion, aerobic and anaerobic. Nutrient removal: physico-chemical and biological techniques. Small scale treatment units: natural systems, septic tanks, package units (RBCs, SBR, extended aeration plants, etc).

Wastewater treatment flowsheets.

Determination of treatment objectives: scale of treatment, nature of wastewater. Discharge consent conditions – discharge to sewer, watercourse, and marine environments.

Development of process flowsheet; selection of treatment processes and disposal provision for by-products. Process control provision. Evaluation of flowsheet options.

Treatment and disposal of by-products.

Sewage sludge treatment options: sludge thickening, digestion, mechanical dewatering, and incineration processes. Disposal options: agriculture; land reclamation; landfill; incineration and residuals disposal. Process flowsheet selection Associated environmental standards and customer relations. Methods of application of sludge to land; soil sampling and application registers.

Wastewater treatment management.

Plant control data: measurement of flows, loadings, chemical dosing rates, etc. Sampling and analysis of process waters and sludges, the interpretation of results and remedial actions. On-site process control tests. Wastewater treatment plant job management: scheduling routine operational and maintenance tasks, use of fixed and mobile gangs. Health and safety: confined spaces and hazardous atmospheres. Emergency procedures.

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CIWEM Diploma:

Water Pollution Prevention and Control

Introduction and Rationale.

The module provides a thorough grounding in the management of water pollution prevention and control in the overall context of water use, conservation and environmental protection. This is achieved by considering the legal and institutional framework governing water pollution prevention and control, the natural quality of groundwater, surface water, estuarine and coastal water, water use and the related quality standards, pollution sources, impacts and pollution prevention, pollution control and the determination of discharge consents, catchment management.

Summary of Aims

This module provides the skills necessary for effective management of water pollution prevention and control and the measures necessary to balance user and environmental needs. Its principal aims are.

1. To provide a knowledge of the types and sources of water pollution and their influence on the quality of inland, estuarine and coastal waters.
2. To provide understanding of the issues involved in water pollution measurement, prevention and its control and management to achieve quality and environmental objectives.
3. To develop the concepts governing pollution prevention and control measures, and the determination of discharge consents, for the sustainable management of water quality.

Anticipated Learning Outcomes

At the end of the module students should be able to.

1. ***Critically appraise the existing procedures for water pollution prevention and control and suggest improvements.***
2. ***Critically evaluate alternative proposals for water quality for a water body and design a scheme of prevention and pollution control to meet environmental standards.***
3. ***Liaise effectively with other professionals, water users and other interested parties on water pollution control matters and on measures necessary to achieve water quality and environmental objectives.***

Indicative Content.

Legal and institutional framework for water pollution prevention and control.

European and national policy on the control of the pollution of groundwater, surface water, estuarine and coastal waters. The legal framework and supporting regulations to enable the control of water pollution, its variants in England, Wales, Scotland and Ireland. The responsibilities of government departments and environment agencies. Prosecution policy. International agreements, EU and national policy to reduce the input of dangerous substances to rivers, estuaries and seas. The 'polluter pays' concept and charging for discharges.

Water use and related quality standards.

Use-related water quality criteria for groundwater, surface waters, estuarine and coastal waters for:

public water supplies, agricultural use, industrial use, fisheries - fresh and saline, bathing waters,

conservation and SSSIs, other recreational use, amenity and navigation. Water quality classification. Statutory water quality objectives. Shellfish and Bathing Water standards. Special needs, for example dangerous substances.

Pollution sources, impacts and pollution prevention.

The natural variations in the quality of groundwater, surface, estuarine and coastal waters: geological, climatic and other environmental effects. Sources and types of water pollution and their potential impact on groundwater, surface waters, rivers, estuaries and coastal waters, for example: urban surface and wastewaters; landfill leaching; industrial discharges; agriculture; mineral extraction; deep mining; diffuse sources such as contaminated land; forestry; acid rain. Diffuse and point pollution sources. Pollution causes, effects and mechanisms: fate of pollutants in the aquatic environment; 'self-purification' and the determination of the 'assimilative capacity' of rivers; effects of organic pollution on watercourses, 'oxygen sag'; nutrient enrichment and eutrophication; Impact of toxic substances: Pollution prevention measures: spillage avoidance and clean-up; advice to farmers; industrial surveys; groundwater protection measures; nitrate sensitive areas, etc.

Pollution control and the consenting of discharges

Current policy for discharge consenting to ground water, surface waters, estuaries and coastal waters: the process of application, consideration, consultation and granting of

consents to discharge. Simple mass balance, empirical and mathematical modelling approaches to discharge consent determination. The 'Urban Pollution Management' approach to the planning assessment, modelling and implementation of wet weather discharge control. Consenting non-sanitary contaminants and aesthetic pollutants, including radioactive substances. The authorisation of 'listed substances' present in effluents. The consenting of discharges to sewer, including radioactive substances. Quality monitoring and reporting; the design of sampling programmes for physical, chemical and biological quality assessment; sampling techniques; statutory sampling procedures. The statistical interpretation of results; consent compliance; river surveys; bathing water compliance, etc. Statutory and voluntary reporting; statutory registers; EU reporting requirements. .

Catchment Management

Water pollution prevention and control and its relationship to water resource, land drainage and flood defence, fisheries, and recreation and amenities provision for the sustainable management of river catchments, estuarine and coastal waters. Catchment management planning: scope of the plan; consultation procedures; benefit assessment; cost/benefit analysis and trade-offs; public participation; expenditure priorities. Programming and implementing the plan; agreeing timetables and action plans with water users.

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CIWEM Diploma:

Wastes and Land Management

Introduction and Rationale

This module provides a thorough grounding in the engineering and science of waste and land management in the context of environmental protection. This is achieved by considering the legal and institutional framework governing waste and land management, waste minimisation and recycling, waste collection, transport and storage, landfill management, waste treatment and contaminated land remediation.

Summary of Aims

This module provides the skills necessary for the effective management of waste and land and the measures necessary to meet environmental standards and customer expectations. Its principal aims are.

- 1. To provide a knowledge of the issues involved in the management of wastes so as to minimise the quantity generated, transported and disposed and the impact on the environment***
- 2. To provide an understanding of the characteristics of wastes, and associated arisings, and the selection, process design and operation of treatment and disposal works to meet environmental standards.***
- 3. To understand the factors influencing the selection of land remediation techniques and the operational management implications for existing and new sites.***

Anticipated Learning Outcomes

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At the end of the module the student should be able to.

1. Critically appraise the existing procedures for waste and land management and suggest improvements.
2. By use of engineering and scientific principles, develop and undertake the critical evaluation of alternative proposals and designs for waste treatment and disposal facilities to meet environmental standards.
3. Liaise with environmental regulators and customers on the control measures needed to meet environmental standards.

Indicative Content.

Legal and institutional framework governing waste and land management.

European and UK policy on waste and land management. The legal framework governing waste and land management in the UK: variations in England, Wales, Scotland and Ireland. The local authorities and the environment agencies' roles in land and waste management. Sustainable development - The UK Waste Strategy: the waste hierarchy and waste management options; waste arisings by type, quantity and disposal route; the definition of waste; 'Controlled' and 'Uncontrolled' waste, 'Special' and 'Hazardous' waste. Government guidance relating to planning and pollution control, waste local plans, planning and licensing. .

Waste Minimisation and Recycling

Environmental benefits of waste minimisation, re-use and recycling; reducing the pollution potential of waste: reducing raw materials consumption including non-renewable resources, energy savings and disposal costs. DTI waste minimisation case studies. Policy and initiatives designed to reduce waste. Producer responsibility for waste. Government recycling targets and local authority recycling plans. Waste segregation, separation and treatment options. The economics of recycling: the value and quality of recovered materials, collection and separation costs, and economies of scale. Fiscal measures including recycling credits and landfill tax.

Waste Collection, Transport and Storage

Transport options and the use of transfer stations. The regulations governing trans-frontier shipment of wastes and special wastes, transport regulations, driver training and 'Duty of Care.' Spillages and emergencies: contact with emergency services and regulatory bodies and remedial action.

The economics of waste collection, transport and storage: local disposal and regional schemes.

Landfill Management

Site selection criteria: geology, hydrogeology and proximity to potential receptors. Planning requirements including need, amenity effects and risk assessment of pollution potential. Landfill or landraise. Landfill type: containment, disperse and attenuate, mono, joint and co-disposal of wastes. Environment agency policy and practice for the protection of groundwater. Waste management licensing requirements: pollution control measures,

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working plan, fit and proper persons and technical competence. Engineering design, construction and the operation of landfill facilities. Waste degradation processes, determining factors, methods of enhancement to achieve stabilisation. Waste degradation products, leachate management, landfill gas and its utilisation. Landfill restoration and post closure use. Sustainable landfill and Certificates of Completion Environmental monitoring programmes: their design and execution during operations and post closure. Environmental data: collection, reporting and publication.

Waste Treatment - Incineration and other Technologies.

Destruction or reduction of pollutants: waste suitability for incineration - household, clinical, and hazardous. The design, construction and operation of incinerators to meet environmental standards. Control of incinerator emissions: emission standards, thermal degradation and time/turbulence effects. Gas cleaning technologies. Combined heat and power. Alternative solid waste treatment options: anaerobic digestion, composting, waste derived fuel and wet pulverisation. Disposal of residues from waste treatment: fly ash, bottom ash and other materials. Planning considerations. Cost comparisons between landfill, incineration and other means of waste treatment and disposal; the impact of waste recycling.

Contaminated Land Remediation

Land re-use: planning policy and suitability for purpose. Remediation standards based on after-use and risk assessment. Identification of contaminated land: desk and field studies. Ground investigation techniques. Assessment of hazards and risks. Remedial methodologies: encapsulation, microbial degradation, stabilisation, washing techniques, chemical treatment and removal to landfill, etc.

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CIWEM DIPLOMA:

Air Quality Control.

Introduction and Rationale.

The module provides a thorough grounding in the engineering and science underlying the management of air quality within the context of environmental protection and public health. This is achieved through consideration of the legal and institutional framework governing air quality, the nature and effects of air pollution, the sources and control of outdoor and indoor air pollution, the sources and control of odours and air quality monitoring

Summary of Aims

This module provides the skills necessary for the effective control of air quality and the measures necessary to meet environmental standards and public expectations. Its principal aims are.

- 1. To develop knowledge of the principal sources of air pollution, their effects, and the methods used for air quality monitoring.***

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- 2. To provide an understanding of the design and operation of mechanisms and facilities for air quality control.**
- 3. To examine the international and national policy options and the regulatory framework to control and improve air quality.**

Anticipated Learning Outcomes

At the end of the module students should be able to:

1. Critically appraise the existing procedures for air quality management and suggest improvements.
2. Using engineering and scientific principles, develop and undertake the critical evaluation of alternative proposals and designs for emission or odour control, or for other air quality improvements.
3. Liaise with air quality, health and safety regulators and environmental health regulators on local air quality problems and measures to resolve them

Indicative Content.

The legal and institutional framework governing air pollution control.

International conventions on atmospheric pollution: acid rain; global warming; ozone depletion, EU and UK policy for air quality and their implications for emission control. The UK legal framework and regulations governing air quality management, including regional variations. The role of government departments and the responsibilities of the environment agencies and the local authorities: statutory powers and duties, authorisation of emissions, monitoring, control, audit, and reporting. International, EU and UK standards for air quality and emissions. Economic measures to reduce energy use and so reduce air pollution.

The Nature and Effects of Air Pollution

Historical review of outdoor and indoor air pollution, its link to public health, the development of controls. Characteristics of the major air pollutants: smoke, particulates, oxides of nitrogen and sulphur, carbon monoxide and dioxide, methane, volatile organics, fluorocarbons, gas leaks, heavy metals, lead, radioactivity, bacterial aerosols, etc. Interactions in the atmosphere; photochemistry and photochemical smog, acid rain, ozone depletion, global warming, etc. Point, line and area sources. Dispersion modelling: the use of mathematical modelling in the design of chimneys

Sources and Control - Outdoors

The selection, operation and maintenance of plant to meet emissions standards from: domestic appliances, power generation and large steam raising plant, incineration, internal combustion engines, furnaces, refineries, solvent, chemical and other industrial processes, agriculture and other sources. Methods of emission control and stack gas cleaning: electrostatic precipitation, cyclonic precipitation, gas scrubbing, de-sulphurisation, etc.

Sources and Control - Indoors

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An understanding of what is meant by 'sick building' syndrome. Factors leading to poor air quality in the buildings: construction materials and finishes, building use, furnishings, machinery, combustion, ground emissions, aerosol formation, damp, smoking and poor ventilation. The effects of these factors on human health. Methods of improving air quality. COSHH regulations. Protection against legionella.

Odours and Odour Control

The nature of odours; common odoriferous chemicals. Sensitivity to odours and objectivity in assessment.

Major sources of odours: industrial processes, brewing, food preparation, agriculture, refuse disposal, sewerage systems, sewage treatment and sludge disposal, etc. Odour nuisance surveys: population sensitivity, source location and the effect of wind patterns, inversion, affected areas. Odour control: elimination at source, containment, filtration, odour destruction, odour masking, etc.

Air Quality Monitoring

National, regional and local air monitoring strategies, the Enhanced Urban Network (EUN). The statistical design of air quality monitoring programmes. The available range of air sampling and monitoring devices, their operation and maintenance. Telemetry and alarm systems. On-line and laboratory methods for the determination of the principle air contaminants: quality of results, accuracy and confidence limits. Interpretation of air quality data and reporting of results: action limits for point sources, the concept of air quality inventories, air quality modelling and predictive studies.

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CIWEM Diploma:

Conservation, Amenity and Recreation.

Introduction and Rationale.

The module provides a thorough grounding in the management of water-related, conservation, amenity and recreation within the overall context of public access and environmental protection. This is achieved by considering the legal and institutional framework governing these activities, concepts and conflicts of conservation, amenity and recreation, catchment management planning, water quality and environmental aspects, fisheries and fishing regulation, conservation and amenity and water based recreation.

Summary of Aims

This module provides the skills necessary for the effective management of water-related conservation, amenity and recreation activities and the measures necessary to balance user and environmental needs. Its principal aims are.

- 1. To provide a knowledge of the types of recreation, conservation and amenity activity and their environmental impact.**
- 2. To provide understanding of the issues affecting facilities development, utilisation, protection.**

- 3. To provide a context for the sustainable management of recreation, conservation and amenity within the wider aims of catchment management and water related policies.**

Anticipated Learning Outcomes

At the end of the module students should be able to.

- 1. Critically appraise the existing procedures for recreation, conservation and amenity management and suggest improvements.**
- 2. Undertake the critical evaluation of alternative proposals for recreation, conservation and amenity developments to meet customer demand and environmental criteria.**
- 3. Confidently liaise with other professionals, organisations and the general public on the provision and management of water related conservation, amenity and recreation.**

Indicative Content.

Legal and institutional framework governing conservation, recreation and amenity.

EU and UK policy on conservation, amenity and recreation the context of international and national commitments to the environment. The framework of law and regulation in England and Wales, Scotland and Northern Ireland. Regulatory bodies: the environment agencies and government departments. Responsible bodies: National Heritage, the Wildlife Trusts, British Canoe Union, etc. Interfaces with county and district local authorities: planning and environmental issues.

Concepts of conservation, amenity and recreation.

Concepts of nature conservation within the wider concern for the environment. Outline of historic development of conservation principles: .The US and UK approaches to the establishment of national parks. Concepts of amenity and their application: aesthetics and facilities. Concepts of water-related recreation: indoor and outdoor: formal and casual. Potential conflicts between conservation, amenity and recreation objectives and practice.

Catchment management

Water recreation, amenity and conservation planning and its relationship to water pollution control, water resources management, land drainage and flood defence. Elements in the catchment management process: scope of the plan, liaison with planning authorities, interested parties and the public. Cost/benefit assessment of alternatives. Expenditure priorities. Public participation. Programming and implementing the plan: agreeing timetables with users, planning bodies, abstractors, dischargers, etc.

Water quality and environmental aspects.

Water quality standards for marine waters and recreational beaches. Water quality objectives for inland waters and the, conservation, amenity and recreation requirements. Natural water quality, monitoring and the impact of different pollutants on water use.

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Measures to protect waters used for public water supply: water-related diseases and their respective influence on conservation and recreation.

Fisheries and fishing regulation

Marine, coarse and game fish ecosystems and habitat protection. Fish diseases and the influence of water quality and pathology. Economics of fishery management in still and running waters . Benefit analysis applied to recreational fisheries. General aspects of freshwater fisheries management: fish populations and stocking, licensing and policing.

Conservation and amenity.

The developing pressure for conservation, resources and biodiversity. Structures of conservation management in the UK. Examples from coastal and inland waters. Social change pressures upon amenity space; the evaluation of amenity requirements and their benefit analysis. The influence of the town and country planning system. Examples of joint needs for conservation, amenity and recreation, and the resolution of conflicts.

Water and recreation.

The range of water-related recreational activities. Competing pressures on water, related land requirements, health and safety and financing. Navigation and other legal rights and responsibilities. Implications of the development of water-related recreation for conservation, amenity and financial and social benefits.

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CIWEM Diploma:

Industrial Environmental Management.

Introduction and Rationale.

The module provides a thorough grounding in practical industrial environmental management within the overall context of customer service and environmental protection. This is achieved by considering the legal and institutional framework governing industrial environmental management, principles of industrial environmental management, manufacturing processes, supporting activities, transport, energy and water use management, raw materials and suppliers.

Summary of Aims

This module provides the skills necessary for industrial environmental management and the measures necessary to meet environmental, organisational and customer expectations. Its principal aims are.

1. To provide a knowledge of the types of industrial activities and the measures to minimise their environmental impact.
2. To provide understanding of the issues affecting industrial environmental policy and its implementation.

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3. To provide a context for the sustainable management of industrial activity within the wider aims of environmental protection.

Anticipated Learning Outcomes

At the end of the module students should be able to.

1. ***Critically appraise the existing procedures for industrial environmental management and suggest improvements.***
2. ***Undertake critical evaluation and make decisions regarding industrial environmental management options, taking into account both environmental and business benefits.***
3. ***Confidently liaise with other professionals, regulators and the general public on industrial environmental management matters***

Indicative Content.

Legal and institutional framework.

EU and UK industrial environmental policy and the modern legal framework for governing its management, the responsible organisations and interested parties: the legal and regulatory framework in England and Wales, Scotland and Northern Ireland. Voluntary codes of practice, quality assurance systems and green labelling schemes. Environmental monitoring, analysis and reporting: statutory and voluntary.

Principles of Industrial Environmental Management

The principle methodologies for industrial environmental policy development, implementation, audit and reporting: objectives, statutory compliance, waste minimisation, costs and benefits. Tools for assessment or indicators of environmental performance. Impact on the environment 'as a whole': life cycle analysis and green labelling schemes. The development, maintenance and reporting of environmental policy.

Manufacturing Processes, IPC and Clean Technologies

Manufacturing processes, their environmental impact, emission control and regulation, end of pipe solutions and clean technologies. Process selection for optimum production and environmental performance: measures to optimise existing process performance, process control measures - production vs. environmental protection, emission control - selection of processes. Prescribed substances and processes and their control: the IPC process. Integrated Pollution Prevention and Control (IPPC).

Supporting Activities

Supporting activities, their environmental impact and measures to improve performance and working environment: optimisation of supporting activities to the production process. Avoiding raw material and finished product wastage. Good housekeeping and quality control. Staff training and its impact on environmental performance. The use of best practice reviews to improve profitability and environmental performance.

Transport, Energy and Water Use Management

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The efficient use of energy, water, transportation and packaging to minimise costs, environmental impact and meet regulatory requirements. Transport optimisation: vehicle specification, journey planning, vehicle maintenance. Industrial energy use, energy/cost auditing, energy saving technologies, energy management programmes, tariff negotiation, plant efficiency. Water management programmes: water use efficiency, recovery and recycling, trade effluent minimisation.

Raw materials and Suppliers

Sustainability and the selection of raw materials and services, the environmental management of supplier chains, contracts and contractor responsibilities. Sustainable resource management: renewable resources and recycled materials. Supplier and contractor chain: management of environmental responsibilities through purchasing power.

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CIWEM Diploma:

Operational Management and Customer Service.

Introduction and Rationale.

The module provides a practical understanding of operational and customer service management in the field of water and environmental management. This is achieved by considering strategic business management and human resource management, financial management, quality audit and customer service, the management of operational assets, project management and operational management techniques. The module is complementary to the technical and operational skills obtained through other optional Diploma modules.

Summary of Aims

This module provides the skills necessary for effective operational management and customer service as they relate to the fulfilment of business, customer and regulatory needs. Its principal aims are.

1. To provide an understanding of the business environment in which operational management and customer service delivery is undertaken.
2. To develop understanding of the critical success factors for effective and efficient management and the role of support services in achieving them.
3. To provide a context for the practice of operational management and customer service delivery within the areas of water and environmental management.

Anticipated Learning Outcomes

At the end of the module students should be able to.

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1. Critically appraise the existing procedures for operational management and suggest improvements.
2. Undertake the critical evaluation of alternative proposals for operational and customer service development to solve business, customer, shareholder and regulatory problems.
3. Confidently liaise with other professionals, customers and regulators on operational management and customer service issues.

Indicative Content.

Strategic business management and human resource management.

The nature of business organisations. The development of business strategy through analysis of markets, competitors, suppliers, human resources and company resources, environments, opportunities and critical success factors. Management style, cultural influences, organisational design, managing change, effective communication.

Financial Management

The financial structure of business: owner equity, shareholders and their influence, share price and related indicators, other sources of funds, gearing. Costing business activities: breakeven analysis, office costs. Budgets: the components of a budget, budget compilation, sources of funding, physical data, budgetary control and variances, reporting. Project appraisal techniques: cost benefit analysis, discounted cash flow, revenue and capital option analysis, decision making. IT decision support systems.

Quality audit and customer service.

Understanding markets and customers through: analysis of customer data, market research, opinion forming and tracking, internal and external benchmarking and best practice review process. The TQM approach to business process improvement. Business excellence assessment and recognition. Use of IT support systems

Management of Operational Assets

The effective and efficient management of assets through the understanding of processes, operational and support tasks, process capacity and the deployment of human resources. The effective and efficient maintenance of operational assets through the understanding of the criticality of plant items; maintenance tasks and resources. Assessment of asset condition, asset lifespan, the development of asset management plans. Health and safety responsibilities.

Project management.

Project participants: roles and relationships, principal and secondary parties, external influences, the project manager. Project procurement: client's role, comparison of alternatives, bidding strategies, the basis of contract law, contract forms. Project execution:

resource procurement, inventory control, cost monitoring and control, change management, health and safety, information management.

Operational management techniques.

Operational research: linear programming, simulation, transportation and assignment problems. Advanced planning and scheduling. Manual and computer applications.

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CIWEM Diploma:

River Engineering.

Introduction and Rationale

This module provides a thorough grounding in river engineering within the overall concept of catchment management. This is achieved through consideration of the legal and institutional framework governing river engineering, river hydrology and modelling, flood warning and defence, lowland drainage and navigation, the design of river structures and river maintenance planning.

Summary of Aims

This module provides the skills necessary to effective river engineering and measures necessary to satisfy various river uses, environmental standards and customer protection. Its principal aims are.

1. To provide knowledge of the factors involved in managing the development and operation of land drainage and river engineering works to meet flood defence, river use, environmental standards and customer expectations.
2. To provide an understanding of river hydrology/hydraulics and modelling processes and their input to scheme design, operation and maintenance.
3. To understand the basis for planning and appraisal, design and construction of land drainage and river engineering and maintenance works.

Anticipated Learning Outcomes

At the end of the module students should be able to.

1. Critically appraise the existing procedures for river engineering management and suggest improvements.
2. Identify the key criteria required for implementation of flood defence measures.
3. Develop and undertake a critical evaluation of alternative proposals and designs for river engineering works.
4. Confidently liaise with operators, engineers, contractors, customers and regulators on river engineering matters.

Indicative Content.

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This document is subject to change.

Legal and institutional framework governing river engineering.

European and national policy regarding river engineering: the role of government departments in developing policy. The legal framework governing river engineering and its variants in England, Scotland, Wales and Northern Ireland. The role and responsibility of the environment agencies. Statutory consultation. Relationships with local authorities, government departments, other interested parties and the general public. Catchment management planning: concepts, scope, benefit assessment, public participation, expenditure priorities. The interaction of pollution control, resources and river engineering activities. The justification of river engineering works: cost/benefit analysis, discounted cash flow and whole life costing.

Hydrology and Hydraulics.

Data requirements: acquisition and management. Review of basic hydraulics and hydrology: hydrology, including precipitation, run-off, peak flow estimation, risk and design standard: channel hydraulics - including open channel flow; sub- and super- critical flow. Flow profiles. Physical and mathematical modelling techniques and the interpretation of results.

Flood Warning and Flood Defence

Flood warning: essentials of flood warning schemes and schemes currently in operation, flood forecasting models, tidal surge and wave forecasting, national storm tide warning service. Flood alleviation: causes of flooding, design principles and standards, regime stability, properties of open channels, types of flow, energy dissipation, flood plains, channel design, modelling, environmental considerations. Options to be considered and appraisal techniques. Bank protection: planning and selection of appropriate measures, causes of bank failure, design principles, environmental considerations.

Navigation and Lowland Drainage

Historical background to navigation on inland waters and their changing role. Feasibility studies and design considerations for modern waterways, including environmental requirements. Historical development of land drainage. Design considerations for arterial drainage, lowland channels, pumped systems, field drainage including environmental considerations. The financing of river, land drainage, navigable waters, estuarine and coastal engineering works. Regulations governing navigable waters.

River Structures

The appraisal, design, construction, maintenance and operation of river structures including structures for: flow control and flow measurement; dams, spillways, barrages and barriers; gates for river control, inverted siphons, culverts and bridges; intakes, screens and outfalls; fish passes; pound locks and reservoirs; flood storage; pumping stations; control and telemetry installations. Construction: risks, temporary works, coffer dams, floating plant.

Environmental Considerations.

Environmental policy in the EU and UK and its impact on river engineering: the concept of sustainable development. Legal requirements for the protection of habitats and designated sites. Rivers as natural resources: habitats in eroding and depositing rivers, inland wetlands.

CIWEM Version 3

Environmental assessment procedures. Inclusion of migration and other enhancements. River restoration schemes: use of geomorphology. Input from other disciplines and the incorporation of environmental improvements during scheme selection and engineering design. Protection of sites and habitats during construction works. Minimising the impact of river engineering on the environment. Weed control. Bank and floodbank protection - including the use of 'soft' bank methods. Maintenance dredging and associated works. Tree clearance/ preservation/ planting. Development of adjacent land. Precautions during capital works.

CIWEM Diploma:**Coastal Engineering and Shoreline Management.****Introduction and Rationale**

This module provides a thorough grounding in coastal engineering and shoreline management within the overall concept of integrated coastal management. This is achieved through consideration of the legal and institutional framework governing coastal engineering and shoreline management, estuarine and coastal processes, historical aspects and climate change, geomorphology, coastal structures and the coastal environment, shoreline management plans and flood warning and monitoring systems.

Summary of Aims

This module provides the skills necessary to effective coastal engineering and shoreline management to permit sustainable use of coastal waters by competing users. Its principal aims are.

- 1. To provide an understanding of estuarine and coastal hydrodynamics, sediment transport and coastal geomorphology, and the application of this to the development of coastal defence strategies and schemes.**
- 2. To provide an appreciation of the many factors and issues to be considered in shoreline management, taking account of the environment in its broadest sense, natural coastal processes and the impact of climate change, the need to justify expenditure, the need for coastal defence and the relevant legislation;**
- 3. To give an understanding of the procedures for planning, appraisal, design and construction of sustainable coastal works.**

Anticipated Learning Outcomes

At the end of the module students should be able to.

1. Critically appraise the existing procedures for shoreline management and coastal structures, and suggest improvements:
2. Use engineering and scientific principles to design and undertake the critical evaluation of alternative proposals and designs for sustainable coastal works:
3. Liaise confidently with other professionals and interested parties on coastal engineering and shoreline management issues.

Indicative Content.**The legal and institutional framework governing coastal engineering and shoreline management.**

The EU and UK framework of policy and legislation governing estuarine and coastal waters and shoreline management including environmental and water quality issues, including variations in England, Scotland, Wales and Northern Ireland. Agencies responsible for the coast and the extent of their powers. Sources and procedures for obtaining funding for coastal defence: economic evaluation (benefit assessment for flood and coastal defence, discounting, non conventional benefit assessment, economic parameters), use of appraisal to optimise defence options.

Estuarine and coastal processes

Wave generation, shallow water transformation, wave diffraction, generation of tides, surges, currents, hydrodynamics, sediment transport, methods of modelling sediment transport.

measurement of waves, tides, tides, currents and other hydrographic techniques. Short term wave statistics, eg Rayleigh: introduction to spectra, determination of characteristic wave parameters. Long term wave statistics: extreme value distributions - Gumbel, etc. Analysis appropriate for assessing different climate situations, eg. typhoons, tsunamis, surges, joint probability. Derivation of tidal constants and their use.

Historical aspects and climate change.

Historical development of the coast in the UK and other countries: development of ports, resorts, reclamations, etc. History of erosion and flooding: sources, reliability, value and use of historical data, managed retreat. Sources of wave and tide data. The importance of meteorological surges and other non-tidal effects on water level, including data sources. Possible direct impact of climate change on aspects such as storminess, rainfall and sea level: climate change and shoreline management. Changes in weather patterns.

Geomorphology

Evolution of the coast: different coastal types, long term changes including the possible impact of climate changes: historical aspects, development of the coast, sources and uses of historical data. Forms of coasts, coastal features such as dunes, lagoons, cliffs, raised beaches, etc. relationship with, and relevance to, shoreline management.

Coastal structures and the coastal environment

The environmentally sensitive design of schemes for sea defence. Coastal structures such as groynes, breakwaters, artificial headlands, sea walls, tidal gates: the use of such structures in shoreline management and their effects on the coast. The coastal environment: water quality, dredging, ecology, recreation, designation, planning, design of sea outfalls. The environmental importance of the coastal features: natural, human and built. Environmental assessment processes and integrated coastal zone management, consultation and monitoring including sources of data.

Shoreline management plans and design

The case for managed retreat, beach, mudflat and salt-ware marshland protection, the balance between hard and soft defences. The evolution of SMP's in the UK and the parallel initiatives in other countries such as the US and Australia. The importance of statutory and non statutory SMPs. Design procedures for hard defences, soft defences, harbours, jetties, outfalls, slipways and other coastal structures. Modelling in the design process, eg. wave disturbance in harbours, overtopping models, littoral transport, impact on coastal evolution, breakwater stability tests, plume dispersal. Wave and current kinematics and derivation of design loads. Consideration of construction aspects/design for buildability and maintainability.

Flood warning and Monitoring Systems

Flood warning systems and the involvement of the emergency services: the purpose of flood warning and its effectiveness as opposed to flood defences. Parameters to be monitored: tides, waves, currents, environmental, beach profiles, seabed levels, etc. Systems for the gathering, storing, displaying and the analysis of data.

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CIWEM Diploma:**Noise Control.****Introduction and Rationale.**

This module provides a thorough grounding in the engineering and science underlying the practical management of noise within the context of environmental protection, public health and nuisance avoidance. This is achieved through consideration of the legal and institutional framework governing noise abatement, the nature and effects of noise, the sources of noise and the control of noise outdoors and indoors. It provides methods to monitor noise, to quantify its effects and to specify measures needed to control it.

Summary of Aims.

This module provides the necessary skills for the effective control of noise and the methods necessary for its abatement to meet environmental standards. Its principal aims are.

1. To develop a knowledge of the principal sources of indoor and outdoor noise pollution, its environmental and public health consequences, and the methods used for noise measurement and reporting.
2. To provide an understanding of the characteristics of noise, and the types of noise abatement measures available.
3. To ensure a knowledge of national policy and the regulatory framework for noise control.

Anticipated Learning Outcomes.

At the end of the module the student should be able to.

1. Critically appraise the existing procedures for noise control and suggest improvements:
2. By use of engineering and scientific principles, develop and undertake the critical evaluation of alternative proposals and designs for noise control:
3. Confidently liaise with noise, health and safety and environmental health professionals on local problems and measures to resolve them.

Indicative Content.**Legal and institutional framework governing noise control.**

EU and UK policy, law and regulation relating to noise control. Noise control and the planning system. Legislative control of noise from various sources: aircraft, construction, industry, roads, railways. Noise control provision in the building regulations: relevant standards: BS5821/4142/5228, ISO1996. Noise control aspects of the Health and Safety at Work Act. Common law: nuisance, negligence.

The nature and effects of noise.

The response of humans to noise: the audible range of frequencies, noise induced hearing loss, stress, interference criteria, rating curves: the effects of noise on other animals. Sources of noise both indoor and outdoor: understanding of background noise levels. Noise instrumentation, sound level meters, effective use of meters. Noise measurement: the decibel scale and weightings: use of noise indices including Leq and L10 and L90: octave band analysis. Noise propagation and attenuation with distance and other factors in the atmosphere, or in the indoor environment: addition of sounds: directivity.

Sources of noise.

Indoor and outdoor: domestic: industrial: leisure industry: traffic: aircraft: construction: machinery: alarms, etc.

Noise control – outdoors.

The effects of different methods of noise attenuation, including case studies of the use of these methods: barriers; active noise control; silencers; vibration isolation; enclosures; road design for noise control.

Noise control – indoors.

Principles of reverberation: transmissivity. Acoustic performance of materials. Enclosures. Use of hearing protection

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CIWEM Diploma:**Energy Management.****Introduction and Rationale.**

This module provides a thorough grounding in the engineering and science underlying the selection of energy sources and practical energy management to meet business and environmental objectives. This is achieved through considering the legal and institutional arrangements governing energy and its use, uses of energy, conventional energy sources, renewable energy sources and energy management.

Summary of Aims.

This module provides the necessary skills for the selection and the effective management of energy in the business environment and the methods necessary for its economic use to meet business and environmental objectives. Its principal aims are.

1. To provide an understanding of energy use in the context of science, technology, business and the environment and the financial and environmental case for energy management:
2. To provide knowledge of the factors essential to the selection of energy sources, equipment and control systems.
3. To consider the factors involved in energy management and the successful achievement of energy saving goals.

Anticipated Learning Outcomes.

At the end of the module the student should be able to.

1. Critically appraise the existing procedures for energy management and energy source selection and suggest improvements:
2. By the use of engineering and scientific principles, develop and undertake the critical evaluation of alternative proposals and designs for energy provision and management in a business environment.
3. Confidently liaise with other professionals on matters associated with energy source selection and energy management.

Indicative Content.Legal and institutional framework governing energy and its use.

International, EU and UK policy, law and regulation governing energy and its uses, and its impact on the environment. UK government targets for emissions of CO₂ and standards for SO_x and NO_x, etc. Regulatory bodies including the role of government departments, the environment agencies and local government. Incentives to promote alternative energy source development. Statutory regulation and competition. Energy regulators and their roles.

Uses of energy.

Use of energy in domestic, commercial, industrial and transport situations: range of energy sources used: applications of energy such as space heating, motive power, communications, industrial plant and machinery, office equipment, communications, etc. Influence of the use of energy on source selection.

Conventional energy sources.

Primary and secondary fuel sources. Primary sources: the fossil fuels: coal, oil, gas and thermonuclear energy. Secondary sources: gas and electricity. Processes of conversion to useful energy: process efficiency, transmission losses. Economic and environmental considerations influencing selection of energy source.

Renewable energy sources.

Solar radiation its nature and availability: day-lighting, active and passive solar heating. Principles of photovoltaics, silicon, thin film PV, electrical characteristics, grid connection PV systems. Biomass, farm residuals and refuse: direct combustion, gasification, anaerobic digestion, landfill gas. Energy crops: wood, ethanol, vegetable oils. Hydroelectric generation and tidal power: types of systems, turbine design, small and large-scale applications. Wave energy: physical principles, wave technology. Wind energy: turbine design, visual and aural impact. Geothermal energy: geothermal processes, high-pressure steam feeds, hot dry rock technology.

Energy management.

Role of the energy manager: objectives, strategies and priorities. Energy surveys and audits for industrial, commercial and domestic applications. Pump efficiency testing. Energy costs and tariffs selection. Plant control optimisation and compensation control: use of energy management systems. The thermal environment: degree-days and other energy related weather data. Minimising energy use in transportation. Reducing the energy content of products. Developing the financial case for energy management schemes: cash-flow statements, financial appraisal, risk and sensitivity analysis. Case studies on the application of good energy management practice in domestic, commercial and industrial situations. Maintaining energy efficiency and savings.

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CIWEM Diploma:**Environmental Modelling.****Introduction and Rationale.**

The module provides a thorough grounding in the use of mathematical modelling as an aid to the engineering and scientific resolution of environmental problems. This is achieved through considering the nature and characteristics of pollution, the mathematical and statistical basis of modelling, the nature of environmental systems and applications of mathematical modelling techniques.

Summary of Aims.

This module provides the necessary statistical and mathematical skills to enable the effective evaluation of problems and the efficient design and monitoring of measures to meet quality and environmental objectives. Its principal aims are.

1. To provide an understanding of physical dispersion, the degradation of aquatic and atmospheric pollutants, the propagation and attenuation of noise, and the principles and techniques used to predict them:
2. To introduce the use of statistical techniques and mathematical models in the analysis of such environmental systems;
3. To provide practical experience of the application of environmental systems modelling to environmental systems including the modelling of pollution dispersion, treatment processes, land contamination, river quality, air quality and noise pollution.

Anticipated Learning Outcomes.

At the end of the module the student should be able to.

1. Critically appraise the existing procedures for the modelling of environmental systems and make suggestions for their improvement:
2. By use of engineering and scientific principles, develop and undertake the modelling studies to aid the understanding of environmental pollution and support proposed solutions:
3. Confidently liaise with other professionals and water users on environmental modelling issues and the outcome of environmental modelling studies.

Indicative Content**The nature and characteristics of pollution.**

The nature and characteristics of pollution of air, water, land and noise, their impacts on the medium, transport in the medium and transfer between media. The critical factors in the planning of successful data gathering and modelling studies.

Mathematical and statistical basis of modelling.

The mathematical and statistical basis of mathematical modelling: a critical introduction to current modelling techniques. The various approaches to modelling: empirical, mechanistic, stochastic, deterministic, finite differences, convective diffusion, reactor kinetics.

Nature of environmental systems.

The nature of environmental systems with reference to air, land, water, noise, treatment processes and the relative success of the techniques used to model them. The regulatory use of environmental modelling in studies of air quality and discharges to watercourses, including the development of emission standards.

Applications of mathematical modelling techniques.

Practical experience of the use of mathematical modelling techniques in areas such as pollution dispersion, treatment processes, land contamination, air quality, water quality including rivers, lakes and estuaries, and in noise pollution. A student orientated case study relating to the use of statistical techniques and mathematical modelling associated with other modules chosen for study at Diploma level.

CIWEM Diploma:**Sustainable Water and Sanitation in Developing Countries.****Introduction and Rationale.**

This module provides a thorough grounding in the practical operational management of water supply and sanitation systems within the overall context of low and middle-income countries and environmental protection. This is achieved by considering the socio-cultural-economic factors that influence the planning, design and operation of sustainable water and sanitation systems. It provides methods for choosing technologically, socially, economically and environmentally sustainable water supply and sanitation systems. It ensures awareness and understanding of the institutional framework necessary for the management of such systems in developing countries.

Summary of Aims.

This module builds on the understanding of the principles of conventional water supply, wastewater and waste management systems and the measures necessary to meet public health, environmental and community standards and expectations. Its principal aims are.

1. To provide awareness of the relationship between water, sanitation and health in low and middle-income countries.
2. To gain understanding of sociological aspects of these issues and to study the institutional framework necessary to the effective planning and execution of water and sanitation projects.
3. To provide understanding of the economics of the provision of water and sanitation facilities in low and middle-income countries and of the selection of the appropriate means of providing them.

Anticipated Learning Outcomes.

At the end of the module the student should be able to:

1. Appreciate the relationship between sanitation and health and understand the complex factors affecting water and sanitation management in low and middle-income countries.
2. Critically appraise the existing procedures for the planning, design and implementation of wastewater and refuse management systems and suggest improvements that are socially, economically, technical and environmentally sound.

3. Develop and undertake the critical evaluation of alternative proposals and designs for water supply and sanitation systems and liaise with those benefiting on the measures taken to meet quality standards and customer expectation.

Indicative Content.

Water, sanitation and health.

Global view of levels of provision of water supply and sanitation services. Water, waste and health relationships. Water and waste related infections. Water and sanitation use patterns. Urban sprawl and environmental degradation. Cultural attitudes, impacts and taboos on water and sanitation practices. Womens' participation in water supply and sanitation programmes. Health and environmental education and communication. Importance of socio-economic studies and data collection. Projection of water supply and sanitation demand.

Institutional and organizational framework.

International standards for water and sanitation. Models for the organization of water and sanitation at national, regional and local government levels, including the planning, design, operation and maintenance of facilities and the training of operatives. Town planning implications for water and sanitation systems management. Financing water and sanitation projects, cost recovery and private sector participation. Requirements of international financing bodies such as the world bank.

Water supply systems.

A review of water supply systems in the context of low and middle-income countries including: water quality standards, design water demand, components of supply systems, system selection and typical facilities provision , surface and groundwater sources and their protection, water transportation and distribution systems. Drinking water treatment processes.

Wastewater collection and transportation systems.

A review of wastewater sewerage systems in the context of low and middle-income countries including: classification and description of wastewaters, sustainable integrated drainage systems management, drainage and sewer planning, design, construction and maintenance, management of emerging or unconventional sewerage systems for 'unplanned' urban sprawls.

Wastewater minimisation, treatment, reuse and disposal.

Objectives of wastewater treatment. Hierarchy of wastewater management options appropriate to low and middle income countries. Wastewater and sludge treatment and disposal methods including unit operations, the layout of treatment plants and upgrading considerations. The potential for treated water and sludge reuse – irrigation and soil conditioning – associated health and safety issues.

Basic sanitation systems.

Pit, VIP and communal latrines. Pour flush toilets. Vault toilets and cartage. Aqua privies. Septic tanks and soakaway systems. Lagoon and land treatment. Reed bed and related treatment methods. Sullage disposal. Nightsoil and sludge reuse and disposal. Health and environmental impacts and user education.

Municipal refuse and solid waste management systems.

A review of municipal refuse and solid waste systems in the context of low and middle-income countries and the needs of public health and environmental protection including: definitions and constituents of municipal solid wastes, types and components of solid waste management systems, hierarchy of options for waste management, waste minimisation and recycling, waste collection and transportation, transfer stations and depots, appropriate waste treatment and disposal processes and systems including waste recovery and reuse potential, solid waste master plans.

Annexe C

Assignment procedures.

Assignments will be based on the syllabus for each module.

Assignments are designed to assess the ability to apply the knowledge gained from the taught component of a module to the types of situation, which occur in practice.

Assignment reports must be submitted in appropriate binder and will include:

- An executive summary not exceeding 300 words.
- Main text not exceeding 5000 words (or equivalent).

The marking of assignments should be seen as part of an interactive process between the assessor and the student. It is important that the assessor gives feedback to the student on the work both within the general text and as an overview. Time does not permit extensive annotation but even a short note of a few words can point to errors or omissions, which offer vulnerable guidance. The end result for the students should be a clear understanding of why the final mark has been allocated. The student can then take action on these comments and improve achievement level.

Report style assignments will lead to many forms of answer and to different interpretations of the depth or focus required. The assessor has considerable freedom of interpretation when marking and the student should receive guidance where there has been a mismatch between the Students interpretation and that in the assignment.

Annex D

Learning log procedures

The Marking Scheme:-

1. **Presentation (10%).** The log should be presented in a clear way such that the reader is rapidly able to pick out the salient and the logical structure of the discussion etc.
2. **Analysis (65%)**
 - a) Studies (10%). Part of the requirements of the course and the log are that the student should import elements from outside the course. Presence on a study day or conference or simply watching a television programme if this relates to the course or influences the way in which the Student is thinking can be more useful to the Student if they explicitly express those influences and changes.
 - b) Description (25%). It is important in reviewing learning that a careful and succinct account is given. In this descriptive phase ideas will be generated by the precise exercise in that the simplification required leads to a further connections and conclusions. The student should present a review of the pertinent points that have arisen during their studies (they may not necessarily relate to the taught content but to a discussion that has occurred or similar experience.
 - c) Critical Analysis (30%). Critical analysis of the presented teaching material is necessary to form judgements as to its importance, connections, accuracy, logicity, reliability, objectivity etc. Examiners will be looking for a sceptical point of view to complement an ability to project forward the implications of their learning.
3. Reflection (25%)
 - a) Changes (15%). Examiners will be looking for evidence of changed thinking and attitudes as new ideas and knowledge are examined and reflected upon. Without change then the reflection does not work as a learning tool and improve performance. These changes can be slight or great but should result in the feeling that the student is 'making progress'! The Student might say that a particular item of new knowledge or understanding detailed above is very important. If this is the case then how does it affect their activities/attitude/advise/ethics etc. If it is important then it should have an effect be that immediate or sometime in the future.
 - b) Initiatives (10%). This is the most difficult bit. If the student acknowledges the importance of some learning what are they going to do about it? What part of your life will they approach in a different way? It sounds like we are trying to turn them into activists but really we are looking to turn them into 'awkward customers' who always ask why something is done in a certain way. In what way should they or their organisation be thinking and acting in response to knowledge and understanding revealed by them in this course and their reflection?

Annex E

Appeals and mitigating circumstances.

1. Grounds for Appeal

An appeal against the decision of the CIWEM Joint Examination Board (JEB) can be made on the following grounds:

- That a Candidates performance may have been adversely affected by extenuating circumstances that were not know to the JEB at the time that it made its decision.
- That there has been a material administrative error.
- That the assessments were not conducted in accordance with the institutions current procedures.
- That some other serious irregularity occurred during the assessment process.

APPEALS MUST BE SUPPORTED BY APPROPRIATE DOCUMENTARY EVIDENCE.

Disagreement with the academic judgement of the JEB in agreeing marks, progression and awards cannot itself constitute grounds for appeal.

The procedure of the submission of appeals is given at annex E.

Submission of appeals

A candidate wishing to appeal on any of the grounds listed above, must do so in writing to the Chairman of the Institution's Professional Development Committee within 14 days of the date of publication of the decision, against which an appeal is being made.

The Chairman of the Professional Development Committee shall decide in 30 days of receipt of the appeal, after consultations if necessary, on the admissibility of the appeal in relation to the grounds set out above.

If the appeal is ruled to be admissible the next scheduled meeting of the Joint Examination Board will discuss the matter and review the original decision. The decision of the JEB at this stage is final.

If the appeal is ruled to be inadmissible and the Candidate does not accept this ruling, on the grounds that not all the evidence was considered or that procedures have not been properly followed. A request may be made to the Executive Director of the Institution who will arrange for a review of the decision on admissibility. The decision of this review will be final.

Appeal should be sent to:

Chairman Professional Development Committee
CIWEM
15 John Street
London WC1N 2EB

2. Mitigating Circumstances

If failure to attend an exam or meet a deadline is due to mitigating circumstances then the appropriate form is to be filled in (see above) with evidence to back statement of circumstance.

Annex F

Accredited prior learning procedures.

The Claims Process

This guide aims to assist Students to make a clear and coherent case for accreditation of prior learning. The onus is on the Student to convince CIWEM that the knowledge the Student has gained is relevant and is at the appropriate level.

Making a Claim

Students can only make an APL claim against the modules as they appear in the course handbook. Students have to be able to demonstrate that as a result of their prior learning formal or informal. They have achieved the learning outcomes at the appropriate level as specified in the Module outlines.

Types of Evidence

The case must be made on the basis of the Student having attained an equivalent qualification at postgraduate level, which fulfils the requirements of the CIWEM Module for which the claim is being made:

Independent written evidence of the achievement claimed is essential. All evidence will be carefully scrutinised and verified by the APL Assessor.

Examples of the range of evidence to be submitted are as follows: -

- Course Certificates, with details of awarding bodies, syllabus course content, level and type of assessment;
- Summaries of research or project work associated with a particular course;
- Full reference of any publications of conference papers;
- Summaries of practice work associated with the course;
- Testimonial evidence from a former course tutor.

Whilst every effort will be made to ensure that evidence forwarded to CIWEM is returned to the owner following assessment, Candidates submit information at their own risk.

Preparing Evidence.

All the evidence presented by the Student should be: -

1. Verifiable – Students must be able to prove and to demonstrate that their prior learning is equivalent to a CIWEM Module.
2. Accurate – Students must check their facts. They must be able to prove that all the information presented in their portfolio is correct in every detail.
3. Salient – There is no room for ambiguity – Students must state clearly on what grounds they are making a claim and to support it, provide up to date evidence.
4. Focused – The claim must be clearly focused on the learning outcomes of the Module for which the Student seeks accreditation – nothing else is relevant.
5. Succinct – With the right type of focused evidence the Student can make a succinct claim.

Testimonials

Testimonials from course tutors associated with the qualifications submitted may provide useful supporting evidence.

The Student should brief the provider of the testimonial on the type of claim he/she is making against which module and level (Certificate or Diploma) and advise the person that he/she may receive further enquiries from a CIWEM APL Assessor. Testimonial evidence is accepted on the basis that it is: -

- Freely given and without payment
- Open to examination by an APL Assessor

Presentation of an APL Claim

The claim should be typed and structured as follows: -

Cover Page:

Name
 Address
 Daytime Telephone Number
 Level of Course on which the Student is enrolled for with CIWEM
 Certificate/Diploma
 University Providing the Course
 Module(s) the Student is seeking accreditation for
 Date of Submission.

Section 1: Background details

Qualifications
 Current Position

Section 2: Claim(s)

Title and level of the Module.
 Evidence to support the claim.

Claimants should ensure that: -

- The pages are numbered properly;
- The claim is hole punched and secured in a clear fronted plastic wallet with a two pronged filing clip;
- A copy of the claim is retained by the Student for reference;
- A cheque for £400 is enclosed to cover the cost of considering the case for each Module claimed. The cheque should be made payable to CIWEM. This fee is non-returnable;
- The claim is forwarded in an A4 envelope endorsed APL Claim to: -

**The Professional Development Department
CIWEM 15 John Street
London
WC1N 2EB**

APL Assessment

On receipt of a claim the Professional Development Department will arrange for an APL Assessor to examine the claim. The Assessor will consider the following: -

1. Is the claim relevant – is it equivalent to the standards and Learning outcomes of the Module in question?
2. Has the claim been substantiated – is the evidence sufficient to merit the claim? Does any part of the claim require further investigation or evidence? Has the claim been exaggerated? Is the claim untruthful?

THE APL PANEL WILL CONSIDER FRAUDULENT CLAIMS AS SERIOUS ATTEMPTS TO CHEAT AND MAY FEEL IT NECESSARY TO INVOLVE THE INSTITUTIONS DISCIPLINARY PROCEDURES.

3. Does the claim reflect the ability to think and work at postgraduate level on subject matter relevant to the Module considered? The Assessor will use the Module rationale, learning outcomes and syllabus against which to make judgement.
4. Can the Assessor recommend that an award be made? If the evidence is verifiable, accurate, salient and focused the assessor may recommend exemption from the Module for which exemption sought.

APL Panel

The panel will consider the Assessor's report and the associated claim. The panel comprises the Chairman of the Institutions Joint Examination Board, the APL Assessors and the Director of Professional Development. It will meet in January of each year to consider recommendations for exemption.

Accreditation

Recommendation for exemption will be made if the APL Panel agrees that his/her knowledge and understanding, derived from the prior learning is equivalent in level and outcome to specific Modules of the Institutions Certificate or Diploma.

Successful claims will be awarded from the relevant Modules and will be notified immediately following the decision.

Appeals

The work of the APL Panel is regularly monitored by the Institution. Appeals are only permissible in respect of the conduct of the claim handling; no appeal will be allowed against the professional judgement.