# MODEL COURSE

# C2000
# LEVEL 2 – TECHNICIAN TRAINING
# MODEL COURSE OVERVIEW

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**International Organization for Marine Aids to Navigation**
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# DOCUMENT REVISION

Revisions to this document are to be noted in the table prior to the issue of a revised document. The latest edition of the Model Course is the only version in force unless the Guideline is explicitly revoked.

| Date | Revision details | Approval |
|---|---|---|
| December 2013 | Edition 1.0<br>Completed detailed training syllabus for all Level 2 Technician model courses<br>13-21/Part | |
| June 2016 | Edition 2.0<br>Minor modifications to ensure compatibility with Recommendation E-141<br>Pages 3, 10, 12 and 19 | |
| June 2026 | Edition 3.0<br>Entire Document<br>Minor textual and Time in hours changes | Council 04 |
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# FOREWORD

The International Organization for Marine Aids to Navigation (IALA) recognizes that training in all aspects of Marine Aids to Navigation (AtoN) service delivery, from inception through installation and maintenance to replacement or removal at the end of a planned life-cycle, is critical to the consistent provision of that AtoN service.

Under the SOLAS Convention, Chapter 5, Regulation 13, contracting governments should undertake to take into account existing international recommendations and guidelines when establishing aids to navigation. A footnote is included referencing inter alias recommendations and guidelines of IALA.

IALA has adopted the normative Recommendation R0141 on Training and Certification of AtoN Personnel. In order to help Members of the Organization, AtoN authorities, and other stakeholders worldwide to confirm with the provisions of the Recommendation, a series of model courses covering elements of training for AtoN personnel have been developed by the Committees and the World-Wide Academy of the Organization (WWA).

It is intended that such courses shall be conducted by a training institute or an organization accredited by a competent authority in a Member State of the Organization or Non-member State. This model course is intended to provide Members, AtoN authorities, and other appropriate stakeholders with specific guidance on the training of AtoN technicians in shore marks.

# PART 1 – COURSE OVERVIEW

## 1 INTRODUCTION

### 1.1 PURPOSE OF 'LEVEL 2' TECHNICIAN MODEL COURSES

The purpose of the model courses for Level 2 AtoN technicians is to assist training institutes and their teaching staff in organizing and introducing new training courses, or in enhancing, updating, or supplementing existing training material where the quality and effectiveness of the training courses may thereby be improved.

Each subject module is sub-divided into elements and sub-elements.
Individual model courses covering specific elements and/or sub-elements will be issued periodically by the WWA.

It is not the intention of these model courses to present instructors with a rigid teaching package that they are expected to follow blindly. For teaching purposes, the subjects may be grouped and re-arranged where that is considered an advantage. The knowledge, skills, and dedication of the instructor are key components in the transfer of knowledge and skills to those being trained through this model course.

### 1.2 PURPOSE OF THE MODEL COURSE

Successful completion of some or all of the Level 2 model courses for AtoN technicians preferably should be considered as the minimum competency level for personnel tasked with conducting the installation, servicing, maintenance or replacement of AtoN. Subsequent career development training is encouraged so that it forms part of the process towards the management of AtoNfor candidates with the necessary potential and drive.

The required standard of competence is considered to be the level of proficiency that should be achieved for the proper performance of the duties carried out by the technician in his or her organization. Example levels of competence are listed in Table 1 below.

The level of competence required from an AtoN technician is shown for each element and sub-element of each Module as required. These are graded from level 1 (basic understanding) to level 3 (good understanding). Level 4 (detailed understanding) is reserved for senior technicians and AtoN Managers.

**Table 1 Levels of Competence**

| Competence Level | Learning Outcome | Instructional Objectives | Required skills |
|---|---|---|---|
| 1 | The conduct of routine tasks with some supervision | A **basic** understanding of facts and principles | First stage in acquiring competency of a complex skill. Appropriate responses are identified through trial and error |
| 2 | The conduct of routine tasks unsupervised and some more complex tasks under guidance | A **satisfactory** understanding of theoretical concepts and principles so that they can be applied in practice | Correctly acquired responses have become habitual. Actions can be performed confidently and efficiently |

| Competence Level | Learning Outcome | Instructional Objectives | Required skills |
|---|---|---|---|
| 3 | The skillful conduct of many complex and non-routine tasks | A **good** understanding of the subject matter and its interaction with others, leading to an analytical distinction between facts and inferences | Complex actions are inherently co-ordinated and performed smoothly, accurately, and skillfully |

## 1.3 USE OF THE SUITE OF MODEL COURSES

The complete suite of model courses comprises 10 modules in addition to this document. Each is covering a specific subject or area of knowledge in which AtoN technicians tasked with the application of such knowledge are required to have competence. The full syllabus is set out in part 2. Not all technicians will need to be competent in all subject areas. It will be for the competent authority or approved AtoN service provider to determine which technicians are required to take which modules. A certificate of competence will be issued to candidates on the successful completion of each module or element[2].

Each module is sub-divided into a number of subject elements. These elements are intended to cover the appropriate degree of knowledge and practical competence required for a technician to properly install, service, maintain, or replace specific components of AtoN used on both fixed and floating aids. Each specific model course begins by stating its scope and aims, and then provides a detailed teaching syllabus based on that shown in part 2. The syllabus takes account of appropriate Recommendations and Guidelines, which are listed as references in each model course.

## 1.4 PRESENTATION AND LESSON PLANS

The majority of these model courses are practical and job-centred. They are designed to provide participants with a realistic, hands-on educational experience. The modular presentation enables the instructor to adjust the course content to suit the trainee intake and provide any revisions to the learning objectives as required. Where no adjustment has been found necessary in the learning objectives, the lesson plans may simply consist of the syllabus with keywords or other reminders added to assist the instructor in making his or her presentation of the material.

The detailed teaching syllabus for each individual module or element is laid out in a learning-objective format in which the objective for each sub-element describes what each participant must achieve to demonstrate that the necessary level of knowledge has been acquired. The learning-objective format assumes that the objective for each sub-element or lesson in each specific model course is preceded by the phrase:

> "The expected learning outcome is that the participant [trainee] has acquired the recommended level of competence in ……"

Standards, recommendations, guidelines, and model courses are developed in English as the working language of the Organization. Over time, they will be translated into the other five official languages of the Organization with the help of the Members. However, it is recognized that many technicians will work in their native language. It is anticipated that accredited training organizations and institutes will adopt the most appropriate language for the instruction of participants.

### 1.5 EVALUATION OR ASSESSMENT OF PARTICIPANT PROGRESS

The award of AtoN qualifications should be based on the principle that satisfactory results are obtained during the basic training course. Participants should be evaluated on their understanding of the material and their ability to carry out the tasks associated with each sub-element or lesson of each model course. Additional guidance is provided in Part 1, Section 5.

### 1.6 IMPLEMENTATION

Thorough preparation is the key to successful implementation of the course. For the course to run smoothly and effectively, considerable attention must be paid to the availability and use of:

- qualified instructors
- support staff
- rooms and other spaces
- training equipment
- practical training sites ashore
- buoy Tenders or other AtoN service craft
- safety equipment
- reference material.

## 2 COURSE FRAMEWORK

### 2.1 SCOPE

This suite of courses is intended to provide technicians with the practical training necessary to become efficient and competent in specific aspects of installation, servicing, maintenance or replacement of AtoN and their associated components.

### 2.2 OBJECTIVE

Upon successful completion of each of these courses, participants will have acquired sufficient knowledge and skill to install service, maintain or replace specific AtoN components on the job within their authorities, organizations or other stakeholders.

### 2.3 ENTRY STANDARD

The competent authority may prescribe minimum standards for education or work experience for prospective participants to enter these courses. In preparing each of these courses, it has been assumed that participants would have the minimum physical ability and educational background necessary to carry out successfully the function of installing, servicing, maintaining or replacing AtoN and their components.

It is anticipated that the minimum entry standard will include basic technical education and a basic Health and Safety at work pre-qualification.

### 2.4 REQUIREMENTS FOR CERTIFICATION

Every candidate for certification should:

- be not less than 18 years of age
- satisfy the competent authority that they possess the theoretical and practical knowledge necessary to carry out the responsibility of installing, servicing, maintaining or replacing AtoN and their components.

## 2.5 COURSE INTAKE LIMITATIONS

Class sizes may be limited at the discretion of competent authority in order to allow the instructor to give adequate attention to individual trainees. In general, it is recommended that a maximum of 10 participants be the upper limit that a single instructor can be expected to train satisfactorily to the level of competence required.

## 2.6 TRAINING STAFF REQUIREMENTS

All instructors, supervisors, and assessors should be appropriately qualified in the subject matter covered by this course. It is expected that some, if not all, training staff will have held an AtoN Level 1 Managers Certificate for at least 3 years. In addition to technical expertise in the subject matter, approved training programmes should ensure that all members of the teaching staff have appropriate training in instructional techniques and assessment methods. As well as instructors, supervisors, and assessors, additional staff may be required for the maintenance of equipment and the preparation of materials, supplies, and work areas.

## 2.7 TEACHING FACILITIES AND EQUIPMENT

This suite of courses involves both classroom instruction and practical visits to work areas at sea or on land. Theoretical courses conducted in classrooms should be supported with blackboards or whiteboards and overhead projectors to enable presentation of the subject matter. An alternative to classroom instruction would be to provide the lecture material to students at a distance via the internet or other electronic means (i.e. e-learning). In that case, students would need access to computers and related equipment, and should be provided with a means of interacting with instructors for discussion and to answer questions.

Practical instruction in the field will require the identification of suitable shore-based training sites, such as an operational lighthouse or beacon. Sea experience for practical instruction in buoy work will require the use of a suitable buoy tender or other AtoN service craft. Pre-booking of these facilities will be required to avoid conflict with planned operations.

## 2.8 TEACHING AIDS AND REFERENCES

Participants should have access to the types of equipment that they will be expected to work with on the job. Each model course will specify which teaching aids might be most appropriate to the course of instruction.

In addition to any specific reference required by the competent authority, each model course will list those Recommendations, Guidelines or NAVGUIDE references relevant to that course.

# 3 OUTLINE OF MODEL COURSES

The complete suite of Level 2 Model Courses comprises 10 modules, sub-divided into topic elements. These are listed in the syllabus for all courses shown in part 2. The elements of each model course are broken down into teaching modules. These should provide the course outline for a specific topic, which specifies a recommended number of minimum of theoretical or practical lessons required for developing that Level 2 course. However, the lesson content can be adapted or expanded to meet the specific requirements of each competent authority.

Each model course will propose the recommended duration for lessons and site visits, an assessment of competency and the total time to complete the whole course. An example format for each model course is shown in Table 2 below. The actual content will be decided by each competent authority.

***Table 2 Example Course Outline***

| Module | Element | Subject | Duration (hours) | Description and Remarks |
|---|---|---|---|---|
| 1 | | Introduction to AtoN | | |
| | C2001-1 | Introduction to AtoN (IALA, NAVGUIDE and MBS) | 2.5 | Function of AtoN |
| | | | | Categories and types |
| | C2001-2 | Introduction to Aids to Navigation - Buoyage | 3 | Types of marine lantern |
| | | | | Types of other AtoN |
| | C2001-3 | Buoy handling and safe working practices | 4 | Includes First Aid; Methods of recovery |
| | | | | |
| | C2001-4 | Buoy moorings | 5 | Mooring design/servicing |
| | C2001-5 | Buoy cleaning | 6 | Includes practical task |
| | C2001-6 | Introduction to buoy positions | 2 | Positions at sea |
| | C2001-7 | Maintenance of plastic buoys | 5 | Repair and maintenance |
| | C2001-8 | Maintenance of steel buoys | 5 | Coatings; maintenance |
| | C2001-9 | Power sources on buoys | 3 | Power components |
| | | | | |
| | C2001-10 | Introduction to shore marks | 3.5 | Types of shore AtoN |
| | | Visit to buoy maintenance facility | 4 | View components |
| | | Sea experience in buoy tender | 8.5 | Practical tasks |
| | | Assessments | 9,5 | Short written exams |
| | **Total Instruction Hours (**Days**)** | | **61** | 10 days course |

# 4 GUIDELINES FOR INSTRUCTORS

## 4.1 INTRODUCTION

The common aim of the suite of Level 2 Model Courses for AtoN technicians is to enable participants to return to their jobs competent to install, service, maintain, or replace AtoN and their components. This should be conducted in a safe and efficient manner that protects the individual whilst enhancing navigational safety and preserving the marine environment. Instructors should be thoroughly acquainted with both national and international regulations concerning these issues and emphasize these aspects during instruction whenever they arise. Particular emphasis should therefore be placed on proper safety procedures throughout the training process, reinforced in particular by the instructor's personal example.

Technological advances and threats to safe navigation, , are generating changes and strategies to existing equipment and practices. It is essential that both instructors and assessors keep abreast of new technologies and regulations and amend or update lesson plans as necessary to reflect changes and to add new sub-elements to the detailed teaching syllabus when appropriate.

## 4.2 CURRICULUM

The levels of competence shown in Table 1 explain what a successful participant should be capable of doing in the workplace on the completion of each of the model courses. The objective of each lesson or lecture is to ensure that each participant acquires the required level of understanding in each sub-element so that the required learning outcome can be achieved.

Although the learning objectives are set out in the suite of Level 2 model courses in a certain order, instructors are not obliged to teach them in this order. Instead, instructors should treat them in the order which they consider to be the most effective for their participants and circumstances.

Sub-elements have been grouped into lessons or lectures. The recommended duration in hours for each lecture is intended to be used as an approximate guideline for planning purposes. The hours should be adjusted as necessary to suit local circumstances or based on experience with similar courses. Each Training Organization will determine the optimum lecture length, the sub-elements, topics or sub-topics it covers and over what period lectures will be delivered. This will depend on whether participants and instructors are available full time or whether work duties and other conflicting activities require lectures to be delivered in groups over an extended period.

It is also quite usual for different trainees to require different lengths of time to cover the same work. Flexibility should be built into each course to allow for adjustments during its running. It is recommended that no more than five one-hour lectures are held in any one working day to allow for this flexibility and private study.

The instructor should also make an allowance for external site visits and, if appropriate, sea-time. Using the time estimates, modified as appropriate, a timetable should be drawn up to suit the normal working day and terms of the training institute. At the conclusion of the course, a discussion should be held to determine whether changes should be made to improve future courses.

## 4.3 PRACTICAL TRAINING

As noted throughout this course overview, the intent is for students to have a realistic, hands-on educational experience. Many of the sub-elements, topics and sub-topics in this course lend themselves to practical training exercises in which participants would be expected to work directly with specific equipment and its associated components. Classroom instruction should be backed up, where appropriate, by practical training in the field, either ashore or afloat.

# 5 EVALUATION OR ASSESSMENT

To evaluate trainee progress, regular assessments must be undertaken. The nature of these assessments and the evaluation criteria used will depend on the needs of the competent authority, the style of training used, and the requirements of the training institute.

The assessment of competency should generally be evaluated by short but formally conducted short written tests. Questions can either be multiple choice or require short few-word answers. The difficulty of each question should be based on the level of competence required from the participant in that subject.

The competent authority will determine the pass mark for each test paper. The guiding principle should be that a participant being considered for the award of an AtoN Level 2 certificate will be involved actively in AtoN maintenance and servicing and will consolidate his or her basic knowledge through additional on-the-job and career development training. A participant who just fails to meet the pass mark despite active participation in the course may well develop into a satisfactory technician and should be given the opportunity to demonstrate his or her potential at a formal aural viva examination.

The following guidelines are proposed for consideration by competent authorities:

- the standard pass mark in each test is 50% equivalent to a satisfactory (Level 2) degree of understanding;
- participants who fail a competency test by less than 10% will be subject to an aural viva examination. Participants who fail the competency test by more than 10% or who do not demonstrate satisfactory competence at a viva interview will not be awarded a Level 2 Certificate. Further training may be required and failed participants will be required to re-sit another written competency test at a time to be decided by the competent authority

# PART 2 – LEVEL 2 TECHNICICAN TEACHING SYLLABII

## 1 MODEL COURSE TEACHING SYLLABUS FOR AtoN LEVEL 2 TECHNICIANS

*Table 3 Teaching Syllabus Module 1 – Introduction to Marine Aids to Navigation*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 1 | | Introduction to Aids to Navigation | | | | |
| | 1.1 | Introduction to AtoN (IALA, NAVGUIDE, MBS) | 2 | C2001-1 | 3 | 0.5 |
| | 1.2 | Introduction to AtoN - Buoyage | 1 | C2001-2 | 6 | 1 |
| | 1.3 | Buoy handling and safe working practices | 3 | C2001-3 | 9 | 1.5 |
| | 1.4 | Buoy moorings | 2 | C2001-4 | 6 | 1 |
| | 1.5 | Buoy cleaning | 3 | C2001-5 | 6 | 1 |
| | 1.6 | Introduction to buoy positions | 1 | C2001-6 | 3 | 0.5 |
| | 1.7 | Maintenance of plastic buoys | 2 | C2001-7 | 7 | 1 |
| | 1.8 | Maintenance of steel buoys | 2 | C2001-8 | 8 | 1 |
| | 1.9 | Introduction to power sources on buoys | 1 | C2001-9 | 6 | 1 |
| | 1.10 | Introduction to shore marks | 1 | C2001-10 | 6 | 1 |
| | | | | | | |
| | | | | | | |

# 6 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS

*Table 4 Teaching Syllabus Module 2 – Power Supplies*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days)[5] |
|---|---|---|---|---|---|---|
| 2 | | Power Supplies | | | | |
| | 2.1 | DC power systems | 2 | C2002-1 | 15 | 2.5 |
| | 2.2 | Primary and secondary battery maintenance | 2 | C2002-2 | 8 | 1.5 |
| | 2.3 | Photovoltaic (Solar panel) systems and maintenance | 2 | C2002-3 | 7.5 | 1.5 |
| | 2.4 | Wind generators | 2 | C2002-4 | 7 | 1 |
| | 2.5 | Mains AC power systems | 1 | C2002-5 | 10 | 2 |
| | 2.6 | Petrol and diesel generators | 2 | | | |
| | 2.7 | Lightning protection | 2 | C2002-6 | 14 | 3 |

5 Includes time for site visits if appropriate and tests

# 7 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS

*Table 5 Teaching Syllabus Module 3 – Lights and Marine Lanterns*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 3 | | Lights and Marine Lanterns | | | | |
| | 3.1 | Introduction to light and range | 1 | C2003-1 | 11 or 15 | 2 or 3 |
| | 3.2 | Light sources | 2 | | | |
| | 3.3 | Colour used in marine lanterns | 1 | | | |
| | 3.4 | Light flashers and characteristics | 2 | C2003-2 | 12 | 2 |
| | 3.5 | Lamp changers | | | | |
| | 3.6 | Self-contained (integrated power system) marine lanterns | | | | |
| | 3.7 | Rotating beacons | 2 | C2003-3 | 18 | 3 |
| | 3.8 | Classical lenses | | | | |
| | 3.9 | Maintenance of mercury rotating optics | 1 | C2003-4 | 18 | 3 |
| | 3.10 | Range, sector and Precision Direction lights | 1 | C2003-5 | 18 | 3 |

## 8 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 4 – SOUND SIGNALS

*Table 6 Teaching Syllabus Module 4 – Sound Signals*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 4 | | Sound Signals | | | | |
| | 4.1 | Sound signals (general) | 1 | C2004-1 | 6 | 1 |
| | 4.2 | Electrical sound signals and fog detectors | 2 | | | |

## 9 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 5 – PAINTING AND COATINGS

*Table 7 Teaching Syllabus Module 5 – Paintings and Coatings*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 5 | | Painting and Coatings | | | | |
| | 5.1 | Introduction to coatings and specifications | 2 | C2005-1 | 11 | 2 |
| | 5.2 | Surface preparation | 3 | | | |

## 10 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 6 – ATON SERVICE CRAFT AND TENDERS

*Table 8 Teaching Syllabus Module 6 – AtoN service Craft and Buoy Tenders*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 6 | | AtoN Service Craft and Buoy Tenders | | | | |
| | 6.1 | Introduction to service craft | 1 | C2006-1 | 2 | 2 |
| | 6.2 | Sea experience | 2 | | 8 | |

## 11 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 7 – RADAR BEACONS

*Table 9 Teaching Syllabus Module 7 – Radar Beacon*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 7 | | Radar Beacons (Racons) Maintenance | | | | |
| | 7.1 | Introduction to Racons and their configuration | 2 | C2007-1 | 9.5 | 2 |
| | 7.2 | Testing and quality control | | | | |

# 12 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 8 – AUTOMATIC IDENTIFICATION SYSTEM

*Table 10 Teaching Syllabus Module 8 – Automatic Identification System*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 8 | | Automatic Identification System (AIS) | | | | |
| | 8.1 | AIS AtoN Operations | 1 | C2008-1 | 18 | 3 |

# 13 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 9 – RADIONAVIGATION/DGNSS

*Table 11* *Teaching Syllabus Module 9 – Radionavigation and Differential Global Navigation Satellite Systems*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 9 | | Radionavigation and Differential Global Navigation Satellite Systems | | | | |
| | 9.1 | Introduction to Radionavigation Systems | 1 | C2009-1 | 8 | 1 or 2 |
| | 9.2 | Position, Navigation and Timing (PNT) | 1 | | | |
| | 9.3 | Accuracy, integrity, continuity, availability and vulnerability | 1 | | | |
| | 9.4 | Applications of GNSS on AtoN | 1 | | | |
| | 9.5 | Introduction to DGNSS and principles of operation | 1 | | | |
| | 9.6 | DGNSS receivers; integrity and reference modules | 2 | | 13 | 2 |
| | 9.7 | DGNSS transmission stations | 2 | | | |
| | 9.8 | DGNSS operation and maintenance | 2 | | | |
| | 9.9 | Monitoring of accuracy and signal strength | 2 | | | |

# 14 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 10 – REMOTE MONITORING AND CONTROL

*Table 12 Teaching Syllabus Module 10 – Remote Monitoring and Control*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 10 | | Remote Monitoring and Control | | | | |
| | 10.1 | Principles of remote monitoring | 2 | C2010-1 | 8 | 2 |
| | 10.2 | Parameters for remote monitoring and alarms | 2 | | | |

# 15 MODEL COURSE TEACHING SYLLABUS FOR ATON LEVEL 2 TECHNICIANS – MODULE 11 – STRUCTURES, MATERIALS AND MAINTENANCE

*Table 13 Teaching Syllabus Module 11 – Structures, Materials and AtoN Maintenance*

| Module | Element | Subject | Level of Competence | Model Course | Total Duration (hours) | Total Duration (Days) |
|---|---|---|---|---|---|---|
| 11 | | AtoN structures: Materials, Corrosion and Protection | | | | |
| | 11.1 | Introduction to materials | 2 | C2011-1 | 5.5 | 1 |
| | 11.2 | Marine Aids to Navigation structures | 1 | | | |
| | 11.3 | Corrosion of structures | 2 | | | |
| | 11.4 | Cathodic Protection | 3 | | | |
| | 11.5 | Weathering of stone and concrete | 1 | | | |
| | 11.6 | Preservation of structures | 2 | C2011-2 | 16 | 2 or 3 |
| | 11.7 | Maintenance planning and records | 3 | C2011-3 | 6 | 1 |