Unit summary

Unit Title: Marine Control Systems and Automation 1
Unit Code: JNE 101
Semester: 1  Block 27/4-26/6  Year 2009
Pre-Requisites: Year 11, 12, Trade Certificate in Fitting, Diesel Mechanics or equivalent
Prior knowledge &/or skills: Maths and Fundamentals of Electronics
Courses: Diploma of Marine Engineering (Watchkeeper) – Part B
Credit Points¹: N/A
National Centre: Ports and Shipping
Campus: Launceston

Teaching staff

<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
<th>Office</th>
<th>Email</th>
<th>Phone</th>
<th>Consultation Days &amp; Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-ordinator</td>
<td>Hung Nguyen</td>
<td>G86</td>
<td><a href="mailto:nguyenhd@amc.edu.au">nguyenhd@amc.edu.au</a></td>
<td>6335-4350</td>
<td>Appointment required</td>
</tr>
<tr>
<td>Lecturer 1</td>
<td>Hung Nguyen</td>
<td>As above</td>
<td></td>
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<tr>
<td>Lecturer 2</td>
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<tr>
<td>Lecturer 3</td>
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¹ Effective Full Time Student Load, e.g. if a program has 8 units in a year and all units are of equal size then each one is 1/8 = 0.125 EFTSL
Unit description

This unit is intended to provide the student with a sufficient basic introduction into the off-the-job skills associated with the application of automation and process control principles on board a ship, commensurate with his/her onboard duties as a Watchkeeping Marine Engineer Officer.

Learning outcomes

On successful completion of the unit, students will be able to:

2.2.1. Apply standard drawing symbols (as defined in AS 1101.6) together with appropriate instrumentation and process control terms when describing both the actions and the functions undertaken by automation equipment in a marine context.

2.2.2. Identify and describe the principles of operation and application of sensing elements which are commonly used in the marine industry.

2.2.3. Describe the principles of operation of pneumatic and electronic transmitters which convert sensor outputs (mechanical or electrical) into pneumatic (20 to 100 kPa) or electrical (4 to 20 mA) signals.

2.2.4. Describe the function of the controller element and its associated Manual/Automatic changeover station in an analog control loop.

2.2.5. Describe the principles of operation of solid state diodes, transistors and other electronic components and their application to modern shipboard control, monitoring and alarm equipment.

2.2.6. Describe the implications of the ‘Fail Safe” philosophy upon the design and operation of the main types of actuators available for the operation of final correcting elements.

2.2.7. Specify the requirements for a pneumatic control system air supply and describe a typical system capable of meeting these requirements including any significant features of individual components of the system.

2.2.8. Describe typical mechanisms for the control of physical parameters in a ship’s machinery space and indicate which other machinery parameters are also usually monitored and alarmed.

2.2.9. Describe schematically a typical modern ship system providing total bridge control stating why such systems are current industry practice.

Relationship to Competency Standards

- International Convention on the Standards of Training, Certification and Watchkeeping for Seafarers (Resolution 2, Annex 1, Part A, Chapter III, standards for officers in charge of the engineering watch, Section AIHJ1) revised April 1995 (electrical, electronic and control engineering at the operational level),

- Australian Maritime Safety Authority,
• and provides off the job training in theoretical knowledge required to support achievement of relevant competencies in Competency Units 54, 65, 66, 67, 73, 74, 80, 87, 90, and 91 of the National Maritime Competency Standards for the Maritime Industry.

Contents

1. Process control principles
   Terms and definitions to AS 1101.6
   Open and closed loop control
   Standard drawing symbols used in control loops.
   Control media

2. Mechanical and electrical sensors
   Sensors for temperature, flow, pressure, level and strain

3. Pneumatic and electrical instrumentation transmitters
   Flapper/nozzle mechanism - principles and input/output characteristic
   Flapper/nozzle mechanism with feedback
   Pneumatic transmitters
   Operational amplifier principles
   Operational amplifier used as gain block, adder, level shifter, V/I converter
   Electrical transmitters

4. Controllers
   On/off (relay) control
   Proportional control
   Proportional plus integral (reset) control
   Pneumatic controllers
   Electronic controllers

5. “Fail’ Safe” philosophy
   What it means in terms of ship’s machinery
   Fail open, Fail closed and Fail set options
   How options are implemented

6. Control and monitoring of ship’s machinery
   Parameters typically monitored and controlled
   Typical control loop schematic diagrams
   Parameters typically monitored
   Classification societies rules and requirements
   Basic alarm systems

7. Total bridge control
   Why it is used in modern ships
   How it works - using manufacturer’s schematic diagrams
Learning resources required

Requisite texts

Nil.

Recommended readings


E-(electronic) resources

MyLO (Web-CT): Under construction

Lectures, assessed individual tutorials and self-directed learning. Online lecture notes and material. To access online material, go to the following URL: http://www.utas.edu.au/coursesonline/ and lecturer’s website: http://academic.amc.edu.au/~hnguyen/automation01/automation01.html

Equipment & materials

Materials to be provided by the student

Non-Programmable Scientific Calculator.

Experimental work: lab coats or overalls, safety shoes.
**Materials to be provided by AMC:**

A hard copy of the lecture notes (JNE101 Marine Control Systems and Automation 1) prepared by lecturer is provided.

An electronic copy of course notes can be downloaded from the lecturer’s website: http://academic.amc.edu.au/~hnguyen

**Extra costs:**

None.

**Computer hardware & software**

TBA

**Occupational health and safety (OH&S)**

The University is committed to providing a safe and secure teaching and learning environment. In addition to specific requirements of AMC and this unit you should refer to the University’s policy at: http://www.admin.utas.edu.au/hr/ohs/pol_proc/ohs.pdf

All laboratory work requires students to follow OH&S requirements stipulated for the areas utilised. Students must wear lab coats or overalls and safety shoes for all laboratory sessions.

**Other requirements**

TBA

**Details of teaching arrangements**

**Learning strategies**

Lectures, Tutorials, Group laboratories, Assignments

**Class times**

<table>
<thead>
<tr>
<th>Class</th>
<th>Day</th>
<th>Time</th>
<th>Location</th>
<th>Group</th>
</tr>
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<tbody>
<tr>
<td>Lecture</td>
<td>Wed</td>
<td>2:10-5:00 pm</td>
<td>G71/72</td>
<td>All</td>
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<tr>
<td>Lecture</td>
<td>Thursday</td>
<td>1:10-4:00 pm</td>
<td>G47</td>
<td>All</td>
</tr>
<tr>
<td>Tutorial</td>
<td>Thursday</td>
<td>4:10-5:00 pm</td>
<td>G47</td>
<td>All</td>
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<tr>
<td>Laboratory¹</td>
<td>TBA</td>
<td>TBA</td>
<td>Control Lab G51</td>
<td>TBA</td>
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(¹) Check tutorial groups and lab timetable/groups to identify your designated time and day.
**Syllabus and Learning Schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Readings / Problems</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29/4 (Wed)</td>
<td>Unit information</td>
<td>Chapter 1</td>
<td></td>
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<tr>
<td></td>
<td>30/4 (Thu)</td>
<td>Introduction to MCSs</td>
<td>Tutorial 1</td>
<td></td>
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<td>2</td>
<td>6/5 (Wed)</td>
<td>Mechanical and electrical sensors</td>
<td>Chapter 2 Temp &amp; pressure</td>
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<td>7/5 (Thu)</td>
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<tr>
<td>3</td>
<td>13/5 (Wed)</td>
<td>Mechanical and electrical sensors</td>
<td>Chapter 2 Flow, level and strain</td>
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<tr>
<td></td>
<td>14/5 (Thu)</td>
<td>Practical 1 (G51)</td>
<td></td>
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<tr>
<td>4</td>
<td>20/5 (Wed)</td>
<td>Revision 1 Transmitters/controllers</td>
<td>Tutorial 2</td>
<td>Written test 1</td>
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<tr>
<td></td>
<td>21/5 (Thu)</td>
<td></td>
<td>Chapter 3</td>
<td></td>
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<tr>
<td>5</td>
<td>27/5 (Wed)</td>
<td>Basic control theory Control actions</td>
<td>Handout Tutorial 3 Chapter 4</td>
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<td>28/5 (Thu)</td>
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<tr>
<td>6</td>
<td>3/6 (Wed)</td>
<td>Valves and actuators</td>
<td>Tutorial 4</td>
<td>Practical report 1</td>
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<td></td>
<td>4/6 (Thu)</td>
<td>Practical 2 (G51)</td>
<td>Chapter 5</td>
<td></td>
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<td>7</td>
<td>10/6 (Wed)</td>
<td>Control air supplies</td>
<td>Tutorial 5</td>
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<td>11/6 (Thu)</td>
<td>Marine control systems</td>
<td>Tutorial 6</td>
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<td>8</td>
<td>17/6 (Wed)</td>
<td>Marine control systems</td>
<td>Chapter 7</td>
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<td>18/6 (Thu)</td>
<td>Bridge control</td>
<td>Chapter 7</td>
<td>Practical report 2</td>
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<td>24/6 (Wed)</td>
<td>Bridge control Revision 2</td>
<td>Tutorial 7</td>
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<td></td>
<td>25/6 (Thu)</td>
<td></td>
<td>Chapter 8 Handout</td>
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**Specific attendance/performance requirements**

Attendance at all assigned class times is expected. You are responsible for all information (both academic and administrative) presented during class times. Should you miss a class for whatever reason it is your responsibility to obtain information and content that was missed. Attendance at all laboratory and practical sessions is compulsory.

**Assessment**

**Assessment schedule**

There are 4 assessment events tabled as follows:

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Due Date / Details</th>
<th>%</th>
<th>Must Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical 1</td>
<td>3/6 (LO 2, LO 3)</td>
<td>15</td>
<td>Yes</td>
</tr>
<tr>
<td>Practical 2</td>
<td>18/6 (LO 6)</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>Written Test 1</td>
<td>21/5 (LO 5)</td>
<td>30</td>
<td>Yes</td>
</tr>
<tr>
<td>Written Test 2</td>
<td>25/6 (End of unit)</td>
<td>30</td>
<td>Yes</td>
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**Assessment details**

*Types and Weighting of Assessment:*
A student must achieve a mark of at least 50% in each of the written tests to achieve a pass grade in that test.

A student must demonstrate competence in a practical skill in each of the practical tests to achieve a pass grade in the test.

**How your final result is determined**

The grade that you receive for this unit will be determined by a committee of examiners. The raw marks that you receive from each piece of assessable material will be combined in order to determine a letter grade for the unit. The raw marks may undergo a scaling process to ensure meeting UTAS/AMC policies on the distribution of grades.

Results are reported as:

- **Pass** Pass grade (50% - 59%)
- **Credit** Pass with credit (60%-69%)
- **Distinction** Pass with distinction (70%-79%)
- **High Distinction** Pass with high distinction (80%-100%)
- **Failure** Failure(less than 49%)

**Problems with your assessment**

If you have questions or problems with your assessment, you should discuss this with the following people:

1. The person who marked the assessment.
2. Unit Coordinator.
3. Head, Marine Engineering.
4. Director, National Centre for Ports and Shippings

If this does not resolve the issue, you may file formal appeal by contacting the office of Registrar.

**Academic referencing**

In your written work you will need to support your ideas by referring to scholarly literature, works of art and/or inventions. It is important that you understand how to correctly refer to the work of others and maintain academic integrity.

Failure to appropriately acknowledge the ideas of others constitutes academic dishonesty (plagiarism), a matter considered by the University of Tasmania as a serious offence.

For information on presentation of assignments, including referencing styles:


Please read the following statement on plagiarism. Should you require clarification please see your unit coordinator or lecturer.
Plagiarism

Plagiarism is a form of cheating. It is taking and using someone else's thoughts, writings or inventions and representing them as your own; for example, using an author's words without putting them in quotation marks and citing the source, using an author's ideas without proper acknowledgment and citation, copying another student's work.

If you have any doubts about how to refer to the work of others in your assignments, please consult your lecturer or tutor for relevant referencing guidelines, and the academic integrity resources on the web at: http://www.utas.edu.au/tl/supporting/academicintegrity/index.html.

The intentional copying of someone else’s work as one’s own is a serious offence punishable by penalties that may range from a fine or deduction/cancellation of marks and, in the most serious of cases, to exclusion from a unit, a course or the University. Details of penalties that can be imposed are available in the Ordinance of Student Discipline – Part 3 Academic Misconduct, see: http://www.utas.edu.au/universitycouncil/legislation/

The University and any persons authorised by the University may submit your assessable works to a plagiarism checking service, to obtain a report on possible instances of plagiarism. Assessable works may also be included in a reference database. It is a condition of this arrangement that the original author’s permission is required before a work within the database can be viewed.

For further information on this statement and general referencing guidelines, see: http://www.utas.edu.au/plagiarism/ or follow the link under ‘Policy, Procedures and Feedback’ on the Current Students homepage.

Further information and assistance

If you are experiencing difficulties with your studies or assignments, have personal or life planning issues, disability or illness which may affect your course of study, you are advised to raise these with your lecturer in the first instance.

There is a range of University-wide support services available to you including Teaching & Learning, Student Services, and International Services. Please refer to the Current Students homepage at: http://www.utas.edu.au/students/. You can also access to the AMC Student Support Service homepage at: http://www.amc.edu.au/students/student.support.

Should you require assistance in accessing the Library visit their website for more information at: http://www.utas.edu.au/library/