Engineering Principles
Electrical Theory & Electronics Explained

PAIR OF WORKSHOPS
Wednesday 10th & 17th November 2010
4.00pm to 6.30pm
The Pavillion, CURTIN UNIVERSITY, BENTLEY
Visitor parking Car Park 3, off Townsing Dr

CN 8031
Open to AISWA, CEO and DET teachers, Cost $100
Register by 5th November 2010
For more information please contact:
Paul Moro: (pmoro@ais.wa.edu.au) 9441 1673

Presenter: Dr Cesar Ortega-Sanchez (Senior Lecturer of Computer Engineering, Curtin University)
Cesar Ortega-Sanchez is a Senior Lecturer of Computer Engineering. He obtained his PhD in Electronics from University of York, UK (2000); his MSc in Digital Systems from Brunel University, London, UK (1993) and his BEng in Electronics from Autonomous Metropolitan University, Mexico (1990). He is a Senior Lecturer in Computer Systems Engineering at Curtin. He teaches units on digital design, embedded systems and reconfigurable logic.

This pair of workshops will cover:
10th November - Theory and application of Electrical Circuits
17th November - Theory and application of Electronic components
(See page 2 for further details)

Please Note: Registrations for all AISWA PL events are submitted on-line via the AISWA website www.ais.wa.edu.au

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Select the month of PL event
Locate the event by scrolling through the list and click the Register tab
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Click PL Calendar on right-hand side menu then choose month of your PL and scroll through list.
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PLEASE SIGN THE ATTENDANCE SHEET
We rely on your signature to be able to credit you with PL hours, and failure to sign in may result in you being billed for non-attendance.
Please retain your email confirmation as both your schools invoice and your personal WACOT PD record. Certificates not given
Should you need to CANCEL please do so by 5th November. Email thogan@ais.wa.edu.au to cancel.
Failure to do so will incur a charge for you or your school.
### Workshop format: 45 min lecture, 90 min practical in electrons lab

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<thead>
<tr>
<th>Day 1, 10\textsuperscript{th} November – Electrical Theory</th>
<th>Day 2, 17\textsuperscript{th} November - Electronics</th>
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<td>On completion of this module participants should be able to demonstrate achievement of the following learning outcomes: Explain the concepts of voltage, current, resistance, electrical power and energy in the context of electrical DC circuit analysis. Apply the following laws and principles to the analysis of simple electrical circuits: Ohm’s law, Kirchoff’s Law, transformer theory.</td>
<td>On completion of this module participants should be able to demonstrate achievement of the following learning outcomes: Explain semiconductor theory. Describe the behaviour of the following devices: diode, BJT transistor, MOSFET. Describe the function of circuits with diodes. Design simple amplifiers using Bipolar Junction Transistors (BJT). Explain how transistors can be used as switches. Describe the function of the following logic gates: AND, OR, NOT, XOR. Analyse simple CMOS logic circuits. Design NAND gate only logic circuits.</td>
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#### Content

**Day 1:**
- Voltage, current and resistance.
- Resistors connected in series and parallel.
- Ohm’s Law.
- Voltage divider.
- Kirchoff’s Law.
- Power and energy.
- Transformer theory.

**Day 2:**
- Conductor, insulator and semiconductor materials.
- Rectifier diode.
- Circuits with diodes.
- Amplifying circuits using BJT transistors.
- Switching circuits using BJT transistors.
- Switching circuits using Field-Effect Transistors (FET).
- Basic logic functions: AND, OR, NOT, XOR.
- Logic gates using Complementary Metal-Oxide Semiconductor (CMOS) circuits.
- Logic circuits using only NAND gates.

#### Laboratory work

**Day 1:**
- Measure voltage, current and resistance using a multimeter.
- Given a set of resistors, obtain a desired resistance value by making series-parallel arrays.
- Verify results using a multimeter.
- Verify the behaviour of a voltage divider using resistors and a DC power supply.
- Verify Kirchoff’s Law using resistors and a DC power supply.
- Estimate power and energy consumption for a given resistive circuit.

**Day 2:**
- Use an oscilloscope to analyse the behaviour of circuits with diodes.
- Design a small amplifier using BJTs.
- Implement logic functions using the 74 family integrated circuits.