UNIT 502  ELECTRICAL AND ELECTRONIC ENGINEERING PRINCIPLES

Lessons 1 to 3:  Complex DC networks

Suggested Teaching Time:  3.5 hours per session

Learning Outcome: Understanding complex DC networks

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<tr>
<th>Topic</th>
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</table>
| • Introduction | Introduction to the unit: contents, aims and objectives and assessment structure. Adopt a practical approach wherever possible, to support and develop the learners understanding through linking theory to a substantial practice bias towards the recognition and analysis of circuit parameters. Computer simulation and analysis of circuits is a fundamental requirement of modern electronic design and should be encouraged. 1.1 Model an equivalent circuits, comprising of resistor-semi-conductors. Recap on learning outcomes at the end of the session. | Books:  
| • Complex DC networks | Start the session with a recap on previous session outcomes. 1.2 Evaluate the performance limits of *series*, *parallel*, and combined *series-parallel* networks for *current*, *power transfer* under design conditions, supported by simulated design package. Recap on learning outcomes at the end of the session. | Bird, J., *Electrical and Electronic Principles and Technology*, 4th Ed 2010, Newnes. ISBN 978-0-08-089056-2 |
| | Start the session with a recap on previous session outcomes. 1.3 Evaluate circuit performance, for the quality of its circuit components, power supply, signal input, circuit tolerance under variable conditions such as *temperature*, *voltage*, *power supply*, *current*, *ripple*, *step change*, through a series of practical observations. Recap on learning outcomes at the end of the session. | Simulation software: Multisim, Proteus |
| | | Test equipment and components |
**SCHEME OF WORK FOR LEVEL 5 DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING (9209)**

**UNIT 502  ELECTRICAL AND ELECTRONIC ENGINEERING PRINCIPLES**

**Lessons 4 to 7:** RLC circuits and alternating wave forms  
**Suggested Teaching Time:** 3.5 hours/per session

**Learning Outcome:** Understanding the response of RLC circuits to alternating wave forms

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>The response of RLC circuits to alternating wave forms</td>
<td>Start the session with a recap on previous session outcomes.</td>
<td>Book:</td>
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<td>2.1 The RLC circuit forms the basis of filter design, allowing or rejecting a particular range of frequency. Therefore, it is essential for any engineer to be able to model dynamic <strong>RLC circuits</strong> for <strong>series, parallel, series-parallel</strong> combinations.</td>
<td>Bird, J., <em>Electrical Circuit Theory and Technology</em>, 4th Edn 2010, Newnes. ISBN 978-1-85617-770-2</td>
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<td>Recap on learning outcomes at the end of the session.</td>
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<tr>
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<td>Start the session with a recap on previous session outcomes.</td>
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<td>2.2 Analyse frequency responses of <strong>tuned RLC circuits</strong>, <strong>harmonics</strong>, <strong>sub-harmonics</strong>, <strong>second harmonic</strong>, <strong>third harmonics</strong> within <strong>series, parallel, series-parallel</strong> combinations.</td>
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<td>Recap on learning outcomes at the end of the session.</td>
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**UNIT 502  ELECTRICAL AND ELECTRONIC ENGINEERING PRINCIPLES**

**Lesson 8: RLC circuits and alternating wave forms**

**Suggested Teaching Time:** 3.5 hours/per session

**Learning Outcome:** Understanding the response of RLC circuits to alternating wave forms

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| The response of RLC circuits to alternating wave forms     | Start the session with a recap on previous session outcomes and introduce the impact of power factor correction on AC electrical power systems; defined as the ratio of the real power flowing to the load, to the apparent power of a given circuit.  
2.3 Analyse power factor correction requirements of given industrial applications.  
Recap on learning outcomes at the end of the session. | **Book:**  
**Internet:**  
### UNIT 502  ELECTRICAL AND ELECTRONIC ENGINEERING PRINCIPLES

**Lessons 9 to 11:** Multi-port networks  
**Suggested Teaching Time:** 3.5 hours/per session  
**Learning Outcome:** Understand performance of multi-port networks

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| **Lessons: 9 and 10**  
The response of RLC circuits to alternating wave forms |  
**Lessons: 9 and 10**  
Start the session with a recap on previous session outcomes, and provide an overview of the impact of transients.  
2.4 Evaluate the **transient** effect on **RLC circuits** through calculations and circuit simulation.  
Recap on learning outcomes at the end of the session. | **Book:**  
**Simulation software:**  
Multisim, Proteus  
Test equipment and components  
**Internet:**  
[www.nptel.ac.in/courses/.../pdf/L-11(GDR)(ET)%20((EE)NPTEL).pdf](http://www.nptel.ac.in/courses/.../pdf/L-11(GDR)(ET)%20((EE)NPTEL).pdf) |

| **Lesson 11** |  
Start the session with a recap on previous sessions involving transients, outlining the practical investigations to be covered within this lesson.  
2.5 Evaluate the practical use of **transient effect** through practical investigations.  
Recap on learning outcomes at the end of the session. |  |
## SCHEME OF WORK FOR LEVEL 5 DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING (9209)

### UNIT 502 ELECTRICAL AND ELECTRONIC ENGINEERING PRINCIPLES

**Lesson 12 to 19:** Multi-port networks  
**Suggested Teaching Time:** 3.5 hours/per session

**Learning Outcome:** Understand performance of multi-port networks

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</table>
| **Lessons 12 and 13**  
Performance of multi-port networks | **Start the session with a recap on previous session outcomes on transients, outlining the outcomes of coming lessons on three port networks.**  
3.1 **Derive input and output equations for three port networks**  
Recap on learning outcomes at the end of the session. | Books:  
Simulation software:  
Multisim, Proteus |
| **Lessons 14 and 15**  
| **Start the session with a recap on previous session outcomes**  
3.2 **Analyse the output conditions of three-port networks in relation to the inputs for waveforms, voltage, current, frequency and phase shift**  
Recap on learning outcomes at the end of the session. |
| **Lessons 16 and 17**  
| **Start the session with a recap on previous session outcomes.**  
3.3 **Convert circuit values of three port networks using different parameters comprising Z (impedance model), Y (admittance model), h (hybrid model) and g (inverse hybrid model)**  
Recap on learning outcomes at the end of the session. |
| **Lessons 18 and 19** | **Start the session with a recap on previous session outcomes.**  
3.4 **Solve problems involving attenuation of three-port networks.**  
Recap on learning outcomes at the end of the session. |
UNIT 502  ELECTRICAL AND ELECTRONIC ENGINEERING PRINCIPLES

Lessons 20 to 23: Electrical systems modelled as two-port networks  
Suggested Teaching Time: 3.5 hours/per session

Learning Outcome: Understand how to analyse electrical systems when modelled as two-port networks

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| Analysing electrical      | Lessons 20 and 21  
Lessons 20 and 21  
Start the session with a recap on previous session outcomes.  
4.1 Explain the parameters used in two-port models using Z (impedance model); Y (admittance model) and h (hybrid model); using elementary matrix algebra.  
Recap on learning outcomes at the end of the session.  
Lessons 22 and 23  
Lessons 22 and 23  
Start the session with a recap on previous session outcomes.  
4.2 Explain the deriving of input and output equations for parameter models such as Z (impedance model); Y (admittance model) and h (hybrid model); elementary matrix algebra.  
Recap on learning outcomes at the end of the session. |

Books:  
**UNIT 502 ELECTRICAL AND ELECTRONIC ENGINEERING PRINCIPLES**

**Lessons 24 and 25:** Electrical systems modelled as two-port networks

**Learning Outcome:** To be able to analyse electrical systems when modelled as two-port networks

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| Analysing electrical systems when modelled as two-port networks | **Lessons 24**  
Start the session with a recap on previous session outcomes.  
5.1 Convert circuit values using parameters such as Z (impedance model); Y (admittance model) and h (hybrid model); elementary matrix algebra from different models.  
Recap on learning outcomes at the end of the session. | **Books:**  
**Simulation software:**  
Multisim, Proteus  
Test equipment and components |
| **Lessons 25**  
Start the session with a recap on previous session outcomes.  
5.2 Solve problems involving gain at low frequency; mid-band; high frequency of two-port model networks.  
Recap on learning outcomes at the end of the session. |