Department of Electronics Module Specifications

Module title
Analogue Electronics for BSc Music Technology (ELE00017I)

Credit value
20

Module credit level
Level 5

Stream
Electronics & Electromagnetics

Module coordinator and department(s) involved in delivery of the module
Dr John Dawson
Other Electronics teaching staff: Dr John Szymanski, Dr Steven Johnson, Dr Eugene Avrutin, Dr Atsufumi Hirohata, Mr Jonathan Dell, Dr Dave Pearce + Lab Staff

Indicative JACS subject code for the module
H600 (Electronic Engineering)

Teaching cycle
Spring & Summer Terms. Taught annually

Pre-requisite modules/co-requisite modules/prohibited combinations
- Introduction to Electronic Hardware (BSc Stage 1: Autumn Term)
- Music Technology: Creation and Perception (BSc Stage 1: Spring & Summer Terms)
- Maths and Programming (Stage 2: Autumn Term)

Shared teaching
BEng/MEng Analogue Electronics (Stage 1)

Breakdown of the module workload

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total hours</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>50</td>
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<tr>
<td>Practicals</td>
<td>30</td>
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<tr>
<td>Workshops</td>
<td>15</td>
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<tr>
<td>Assessment</td>
<td>46</td>
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<td>Private Study</td>
<td>59</td>
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Module aims
- To introduce:
- Further circuit analysis skills
- The operational amplifier
- To provide reinforcement of learning using laboratory investigations
- To introduce and develop fluency in mathematical tools suitable for describing single and multiple loop analogue circuits
- To place the above material in a music technology context
Module learning outcomes

- Improve their professional laboratory working practices (logbooks, experimental record keeping and measurement techniques).
- Be able to:
  - Analyse simple circuits in the time and frequency domains
  - Explain the operation and limitations of basic operational amplifier circuits
  - Use a range of mathematical techniques for the analysis of dynamic systems, networks and multiple input and output systems
  - Understand and comment on the role of analogue electronics in state-of-the-art music technology devices.

Further information about the module content

Operational Amplifiers:

Review of operational amplifier circuits: filters; bandwidth, Bode plots; bias currents; offset voltages; performance specification; input impedance; output impedance; positive feedback.
Circuits: (JFD: Spring Term only: 18 lectures; 2hr/wk and 4 workshops (Groups A & B separate))
Mesh and Nodal Analysis. Frequency Domain Analysis: complex representation of sinusoidal signals; phasors, reactance, susceptance and impedance; magnitude and phase response; decibels, Bode plots, poles and zeros.
The Maximum Power Transfer Theorem. Power in ac circuits: real, reactive, and apparent power; power factor and power factor correction. Conjugate matching. Tuned Circuits: Resonance in simple LCR circuits; determination of resonant frequency, Q-factor, bandwidth and dynamic impedance. Time domain response of circuits.

Mathematics

Supporting Mathematics for dynamic systems, networks and multiple-input, multiple-output systems:

Further integration - integration by parts, integration by partial fractions partial fractions.
Differential equations: first order, second order; free and driven systems - transient and steady state components. Matrices: Circuit network applications; Multiple input/output systems - sets of equations; definition and properties of matrices and determinants; matrix inverse - solution of sets of equations; Contradictory or insufficient equations; Ill- conditioning; The Gaussian elimination algorithm; definition and geometrical properties of vectors; the vector equation of a line. Vector equation of a plane; Time-varying vectors.

Laboratories: LC circuits, Power supplies, Operational Amplifiers. Amplifier module.

Assessment

Continuous Assessment
Examination
Reassessment
Feedback to students

Weekly workshops - Immediate feedback provided to problems raised by individual students. Assignments will be marked and returned within 4 weeks with appropriate comments. Self assessment - complete worked examples and incomplete examples for students to complete.
Reading List

** Key to recommended books **

** Strongly recommended for purchase
*Recommended Purchase
++Essential Library Reading
+Supportive Library Reading


Extensive on-line material supporting maths, circuit theory and operational amplifiers.

| Date on which the module template was last updated | 4th September 2012 |
| Date approved by BoS | 3rd March 2010 |