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Title: Digital and Analogue Electronics  
Status: Definitive  
Code: **4504USST** (126455)  
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering  
Teaching School/Faculty: University of Shanghai For Science and Technology

Team	Leader
Wei Zhang	Y

**Academic Level:** FHEQ4      **Credit Value:** 20      **Total Delivered Hours:** 68  
**Total Learning Hours:** 200      **Private Study:** 132

### Delivery Options

Course typically offered: Semester 2

Component	Contact Hours
Lecture	44
Practical	22

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Exam	70	2
Portfolio	Portfolio	Portfolio	30	

### Aims

*To provide an introduction to transistors and the small-signal equivalent circuits, the use of operational amplifiers and the operation of combinational and sequential digital logic circuits.*

## Learning Outcomes

After completing the module the student should be able to:

- 1 Analyse electronics by using diode and transistor characteristics for simple amplifier design.
- 2 Apply appropriate circuit design techniques for analogue signal processing.
- 3 Analyse and design basic combinational digital circuits.
- 4 Identify and appraise sequential digital circuits and applications.

## Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Exam	1	2	3	4
Portfolio	1	2	3	4

## Outline Syllabus

### 1. Analogue Fundamentals

*Review of fundamental notations and relations, SI units, Ohms Law, measurement of voltage, current and resistance, series and parallel circuit equivalences. Quantitative discussion of capacitors, transients in R-C circuits, and time constants.*

### 2. Transistors and op-amps

*Transistor operation and simple models.*

*Operational amplifiers and feedback; basic inverting and non-inverting amplifier; stability in feedback amplifiers; frequency response and gain-bandwidth product; input and output impedance.*

*Operational amplifier applications such as small signal amplifier.*

### 3. Digital logic and combinational circuits

*Logic Gates and Functions, DeMorgan's Theorems and gate equivalence.*

*Combinational Logic and Boolean Algebra' Boolean expression from logic diagrams and truth tables, truth tables from logic diagrams and Boolean expressions, commutative, associative and distributive properties, loading Karnaugh map from a truth table, multiple and overlapping groups. Applications of Karnaugh map: multiple output networks, decoders, code conversion network.*

### 4. Sequential circuits

*Latches and Flip-Flops: SR latch, Latches as contact-bounce eliminators, Edge triggered SR, D-type, J-K Flip-Flops.*

*Digital Counters: asynchronous and synchronous counters concept, Counter design using S-R/JK/D-type flip-flops. Shift Registers: serial shift registers, serial in-parallel out shift registers, bidirectional shift registers.*

*Use of lab equipments and CAD tools to carry out circuit design, test and simulation.*

## Learning Activities

A combination of lectures and practical work.

### **Notes**

This Level 4 module is devised for students to gain fundamental knowledge and practical skills in digital and analogue electronics circuit analysis and design.