

Liverpool John Moores University

Title: Digital Control
Status: Definitive
Code: **7307ELE** (121449)
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering
Teaching School/Faculty: Engineering

Team	Leader
Barry Gomm	Y

Academic Level: FHEQ7 **Credit Value:** 20 **Total Delivered Hours:** 35
Total Learning Hours: 200 **Private Study:** 165

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	24
Tutorial	9

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Exam	70	2
Technology	Tech	PC Based Assignment	30	

Aims

To extend concepts of digital control theory into system identification, controller design and self-tuning control techniques for single-input, single-output systems.

Learning Outcomes

After completing the module the student should be able to:

- 1 Outline the theory of sampled-data control systems
- 2 Apply system identification techniques and understand their operation
- 3 Design and implement digital and self-tuning controllers
- 4 Use computer software for discrete-time identification and controller design

Learning Outcomes of Assessments

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

Examination	1	2	3
PC based assignment	4		

Outline Syllabus

Discrete-time systems: sampling and reconstruction, open loop and closed loop discrete time analysis, system time response characteristics, poles and zeros, stability analysis techniques.

System identification: ARX/ARMAX models, least squares, model validation, recursive parameter estimation algorithms (e.g. RLS, ELS), implementation

Digital control: control system specifications, design techniques (e.g. discretisation, direct design), ringing poles, self-tuning control algorithms (e.g. pole assignment, minimum variance, optimal) and operation.

Computer packages will be used to gain experience in applying and simulating techniques.

Learning Activities

Lectures supported by handouts & tutorials where appropriate.

Computer sessions will use software packages (MATLAB, SIMULINK and toolboxes).

Individual student reports are required for the coursework.

Notes

This level 7 module expands a student's experience of discrete single-input, single-output control systems. The emphasis is on the understanding of design and identification techniques and to be able to apply the techniques both theoretically and practically.