



## Synchronisation for Digital Receivers

### **Date and Venue**

6-7 April 2009  
Glasgow

### **Cost**

£915 + VAT per person

*(Discounts available please enquire)*

### **Contact**

If you have any course queries, please contact Suzanne O'Hare on 01506 469303 or by emailing [suzanne.ohare@sli-institute.ac.uk](mailto:suzanne.ohare@sli-institute.ac.uk).

### **Overview**

Synchronisation lies at the heart of all digital communication receivers, however knowledge of how to apply the techniques that are described in literature on this subject can be difficult to come by. Furthermore, the algorithms employed in commercial equipment and devices are proprietary to chip set manufacturers and are not specified in any communication standard or specification. This course will equip participants with the knowledge required to design their own synchronisers. We present the fundamental principles upon which all synchronisation techniques are based and show how these are applied through case studies.

### **Course Aim**

To educate participants in the theory, algorithms, implementation and application of synchronisation techniques for digital communication receivers, and to equip participants with the knowledge required to design their own synchronisers.

### **Audience**

This course is aimed at engineering, technical marketing and technical management staff who already have some understanding DSP and physical layer digital communications and would like to learn how digital receivers work. Previous attendees to Steepest Ascent courses have come from a wide range of industries and backgrounds such as professional audio and acoustics, digital communications, ASIC and analog electronics, and even mechanical engineering.

**The course will include:**

- Single carrier digital modulation review
- Pulse shaping and matched filtering
- Intersymbol interference (ISI)
- Single carrier synchronisation
- Open and closed loop synchronisers
- Coherent and non-coherent synchronisers
- Synchronisation in time and frequency
- Signal resampling techniques
- OFDM synchronisation
- Propagation channels
- Channel equalisation.

**Achievable Skills**

On successful completion of the course, attendees will be able to:

- Know of the most widely used synchronisation techniques
- Understand intuitively of how these techniques work
- Know how synchronisers are applied in practical situations
- Understand the importance of correlation in synchronisation
- Understand both open and closed loop synchronisation techniques
- Know about coherent and non-coherent techniques and how their performance differs
- Understand how advanced multi-rate signal processing can be applied to implement digital timing recovery
- Understand the effect of multi-path fading channels on radio signals and synchronisation
- Be aware of the techniques for dealing with multi-path fading channels
- Have sufficient knowledge and understanding to develop their own synchronisers.

**Pre-requisites**

This course has been carefully designed to present the complex mathematical theory often associated with DSP based synchronisation in an intuitive and straightforward style to a wide audience of scientists, engineers, project

managers and even marketing staff. Although the course includes a review of digital modulation schemes, previous experience or understanding of digital communications and DSP would be beneficial.

**Course Presentation**

Synchronisation is often seen as an esoteric and very mathematical subject. In this course, the necessary mathematical theory is presented on a "need to know basis" and in an intuitive style using both simulations and demonstrations. This presentation style and ethos has been presented with considerable success to many companies, both small and large, in both Europe and the USA.

The course format is 50% Lectures, 40% DSP software hands-on simulation and 10% Tutorial Discussion.

**Laboratory Sessions**

Professional design software will be used for the laboratory sessions. This advanced software provides comprehensive state of the art communications and DSP simulation functionality.

**Course Materials**

All attendees will receive electronic and printed versions of the teaching materials. A DVD containing all the simulation models used during the course will also be distributed.

The notes provided form a superset of the materials presented on the course and will allow further in depth study after the course.

**Course Syllabus**

The full syllabus is available from [www.steepestascent.com](http://www.steepestascent.com).

**Fees**

The course fee includes handouts, lunches and morning/afternoon refreshments for each delegate.

**Accommodation**

Information on local hotels is available from Amanda Connelly [amanda.connelly@sli-institute.ac.uk](mailto:amanda.connelly@sli-institute.ac.uk).

**How to Book**

Complete the [iSLI and Steepest Ascent Training Course Booking Form](#).