

DSP

Digital Signal Processing

DSP is one of the most powerful technologies that will shape science and engineering in the twenty-first century. The world of science and engineering is filled with signals: images from remote space probes, voltages generated by the heart and brain, radar and sonar echoes, seismic vibrations, and countless other applications.

Digital Signal Processing is the science of using computers to understand these types of data. However, advanced DSP applications such as QAM/QPSK, digital communications, time-frequency signal analysis, adaptive data equalisation, acoustic echo cancellers, speech coders, psychoacoustic compression strategies are the tools of DSP developers. This 4-day short course lectures all about theory, algorithms and architecture.



developed and
presented by

steepest ascent

<http://www.steepestascent.com>

22. – 25. April 2008

Munich, Germany

18. – 21. November 2008

Munich, Germany

DSP – Digital Signal Processing

Course objective

DSP 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 DSP demonstrations. This presentation style and ethos has been used with considerable success to many companies, both small and large, in both the UK and USA.

Audience

This course has been carefully designed to present the complex mathematical theory often associated with DSP in an intuitive and straightforward style to a wide audience of scientists, engineers, project managers and even marketing staff. The following prior experience is useful but not essential: Programming principles; Electrical engineering principles; Bachelor level mathematics.

Course Presentation

- 45 % lectures and presentations
- 10 % Tutorial discussion
- 40 % Workshop with DSP Software hand-on simulation
- 5 % DSP Hardware demonstration
- Multimedia CD: hypertext of all notes, multimedia presentations, over 100 DSP audio demos, over 300 DSP demos, DSP simulation software support
- Course documentation: comprehensive 7 volume set of materials (more than 1200 pages)



Instructor

This course will be led by the team of Professor Bob Stewart and integrate presentations and design sessions from other experienced design engineers from Steepest Ascent.

Prof Bob Stewart has extensive experience presenting industry DSP courses in the USA and Europe. He is currently a faculty member of the Department of Electronic and Electrical Engineering at the University of Strathclyde. Prior to joining the University of Strathclyde, Prof Stewart was a visiting professor in Dept of Electrical Engineering at the University of Minnesota in 1990, and a visiting scholar at the University of Southern California in 1986/7. Since 1997 he has been a part-time visiting professor at UCLA.

Services

Following services are included in the fee for this 3-day technical course: participation at the course/workshop, catering during coffee breaks, soft drinks, lunch, and course documentation. The course will be held from 9.00 a.m. to 6.00 p.m. The hotels have allocated a number of rooms. Please make your booking directly with the hotel referring to "hueggenberg gbr" or in the UK "Steepest Ascent".

Syllabus

Signal Processing Review: Signals, Systems and Applications, Amplification, distortion, and noise, the 90s DSP Revolution to Software Radio in 2000

The Generic DSP System: ADCs and DACs / Signal Conditioning, anti-alias and Reconstructions Filters, distortion, Quantisation Error and Noise, the Nyquist Sampling Rate, z-domain representation and transforms

Frequency Domain Analysis: Periodic, aperiodic and random signals, the DFT, FFT and Power Spectra Spectral Leakage and Data Windowing, modern spectral analysis, Time/Frequency, Representation

Digital Filtering: FIR and IIR Digital Filters, digital Filter Design Parameters and methods, all-pass, CIC, MA, ARMA, comb filters etc., poles and zeroes, bit true simulations

DSP Software/Hardware: The Generic DSP Processor Architecture, application Specific Integrated Circuits, FPGAs for DSP, DSP Design and Analysis Software, Design for Texas Instruments Processors

DSP Audio/Baseband Processing: Over-/under-sampling; Sigma delta ADC/ DACs, Sample rate; decimation & interpolation, quantisation noise shaping

Signal (Audio) Source Coding: Waveform speech coding (ADPCM etc), speech model coding, linear prediction techniques (LPC, CELP etc), transform coding, perceptual/Psychoacoustic Coding

Adaptive DSP Algorithms: Least squares (LS) minimization, least mean squares (LMS), channel equalisation / Inverse system identification, echo Control for feedback suppression, acoustic echo control /noise control, RLS and QR algorithms

Computationally Efficient DSP Linear Systems: Uniform and Octave Subband filter banks, quadrature mirror filters, polyphase implementation

Digital Communications: Information theory, AM/FM/PM modulation; ASK/PSK/FSK Signalling, pulse shaping / Matched Filtering, data equalisation, QPSK, QAM digital communications
Error control and coding

DSP for Mobile and Wireless: Time/Frequency/Code Division Multiple Access, spread Spectrum DSP Modulation Techniques, Scrambling and Channelisation, Channel Modeling / Rake Receivers
OFDM Techniques, Ultra Wideband (UWB) Techniques

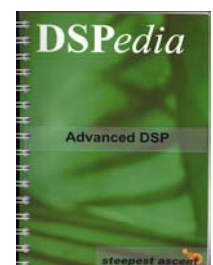
DSP (Software) Enabled Radio Architectures: Undersampling Strategies, direct Digital Downconversion (DDC) fs/4 based systems, bandpass sigma delta

DSP on FPGAs: The DSP engineers new arithmetic paradigm, Multiplies, Divides and Square Roots, Efficient mapping of digital filters, retiming techniques for DSP algorithms FPGA Technologies, doing 20 billion things a second....

Achievable Skills

On completion of this course, attendees will be able to:

- Analyse discrete time systems using time, frequency and z-domain mathematics
- Understand the fundamental theory relating, to sampling rate, quantisation noise and the architecture of a generic DSP system
- Design and implement FIR, IIR, and adaptive digital filters for real world applications in digital audio and acoustics, and telecommunications
- Understand the theory and real world application of adaptive signal processing systems
- Understand the key DSP theory of signal source coding and compression
- Understand the theory and advantages of over and under-sampling, multirate, and noise shaping;
- Undertake DSP system design using advanced analysis and design software
- Acquire the know-how to implement real time fixed and adaptive digital filters using DSP simulation software and real time DSP processor hardware
- Use DSP theory and algorithms in the application domains of modern computing, multimedia systems, and communication systems



Registration

This written registration is effective. The number of participants is limited. The invoice will be mailed with the confirmation of course registration. Please register minimum two weeks before the course starts

- via mail to hueggenberg gbr, Maximilianstraße 8, DE-82319 Starnberg – or –
- via fax to: +49-8151-55 50 09-10 – or –
- via e-mail to info@hueggenberg.com.

Terms and Conditions: Invoices have to be settled for participation. For a written cancellation within six weeks before course starts a fee of 200 € plus VAT per person is due. A deregistration within two weeks before the course will cost 50 % of registration fee plus VAT per person. For non-attendance or late notice the whole fee plus VAT per person will be charged. A substitute of the registered participant will be accepted. hueggenberg gbr reserves the right to cancel or modify the course and place at short notice and will not accept liability for costs incurred by participants or their organisations for cancelled travel arrangements and/or accommodation reservations.

Herewith I bindingly register for the technical course Digital Signal Processing at the following date. I accept the terms and conditions.

- 22. – 25. April 2008 in Munich, Germany
- 18. – 21. November 2008 in Munich, Germany

- € 2.160,00 regular fee
- € 1.950,00 early registration until 49 days before course
- € 1.840,00 per participant of two from the same company
- € 1.730,00 per participant of three or more from the same company
- € 1.190,00 University Rate (Please enclose evidence.)

All fees exclude state value added tax.

Name _____

Company _____

Title / Position / Department _____

Street / Mail box _____

Country-Zip Code-Town _____

Telephone _____ Fax _____

Email _____

Date Signature _____

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