

Electrical Drive Systems

Principles and Economic Evaluation



The University of Wollongong

A professional development course in power engineering presented by the Electricity Supply Association of Australia (ESAA) Limited in association with the University of Wollongong

Course objectives

The course is designed to provide an understanding of the technologies involved with modern electric drive systems and the opportunities that are available for enhancing efficiencies in the use of energy through appropriate design. The course will cover motors, converters, control, load characteristics, mechanical systems, complete drive systems, harmonics, power factor and economic evaluation. Hands on practice at using software for analysis of common drive problems such as performance, harmonic analysis and economic comparison, will be a feature of the course. Participants will be provided with software to use in their workplace.

Delegates will gain the knowledge and skills required to: identify applications where variable speed drives may give efficiency savings; assess the features of an application which are critical for drive selection; identify the most suitable drive for an application; estimate if proposed installations will give harmonic power factor problems; understand and perform cost benefit analyses of drive alternatives using Net Present Value, Discounted Cash Flow and other accounting techniques. As part of the ESAA Short Course Program, the course can be used to contribute towards a Graduate Diploma in Electric Power Engineering. The course can also be used by engineers to satisfy the IE Aust requirement for continuing education.

The Venue

The course will be held in the School of Electrical, Computer and Telecommunications Engineering, Building 35, at the University of Wollongong, Northfields Avenue Wollongong.

Who should attend?

The course is intended for managers, engineers and specialist technical staff involved with the specification, operation and management of installations that employ electric drives, including those working with power station auxiliaries. The principles of motor drive applications covered by the course will enable participants to achieve economic and energy efficient performance from their plants. The course will also be valuable for electricity supply industry personnel who advise customers on drive installations and energy efficiency.

About the speakers

Expert speakers are drawn from the University of Wollongong and Industry and include:

Assoc. Prof. Vic Gosbell is an Associate Professor in the Department of Electrical, Computer and Telecommunications Engineering, has extensive experience with power electronics and drives continuing education at the University of Sydney, ESAA Power Systems residential schools and other institutions both in Australia and overseas. He has consulted in this area for Westinghouse Electric, Pacific Power, Industrial Systems and others. His research includes dc drives, high performance ac drives, analysis and reduction of harmonics and computer-aided simulation for drives research and education.

Dr Arnold McLean is a Senior Lecturer, Department of Mechanical Engineering whose area of specialisation is machine and mechanical system dynamics and evaluation of power and drive requirements for Bulk Solid Handling and Equipment. Dr McLean maintains an extensive consultation practice to industry on various aspects of Bulk Solids Handling and Processing and has published widely in this field.

Dr Don Platt has extensive industrial experience and is currently a senior lecturer with the Department of Electrical, Computer and Telecommunications Engineering. He is an active worker in the areas of electric machines, power electronics and variable speed drives. In particular he has developed a number of new ideas in electric machines leading to higher efficiency, faster dynamics and more robust machines.

James Scott is general manager for Australian Baldor. He has more than a decade of engineering experience in the drives industry and regularly gives in-house training courses.

John Howitt has 25 years experience in drives including application and system engineering, sales and marketing. He has worked with Reliance, ABB and Allen Bradley and is currently manager for the Variable Speed Drives group at Siemens Ltd.

Training Investment

The course investment provides for an inclusive industry related training package with comprehensive course notes, lunches and morning and afternoon tea. ESAA members: \$1250, Associate Members: \$1350, Non Members: \$1500.

Course Outline

The course is conducted over three days commencing with registration at 8:00am on Wednesday 17 June, 1998 and comprises lectures, computer studies and a discussion workshop. Each lecture will be backed up with a computer study enabling students to obtain a feel for the input/output characteristics of different equipment. The software will be sufficiently general that it can be used to solve problems which might arise in the workplace.

Day 1

- Registration at 8 am for 8.30 am start
- *Course overview.*
- *Motors.* Torque production, DC motors, AC motors, principles of speed control.
- *Converters and complete drive systems:* Converters, power semiconductor devices, rectifier, chopper, current and voltage-source inverters, pulse width modulation, waveform distortion, DC and AC motor drives

Day 2

- *Control:* Speed controller design, current loop bandwidth, current limiting, drive response.
- *Load:* Start-up, contact loads, break-away torque, Inertial loads, shut down, backlash, vibration.
- *Mechanical drive types:* Rigid coupling, gears, chain, timing belt, vee belt, hydraulic coupling.
- *Vector Drives:* Vector drive technology goal to achieve DC drive performance from an AC drive and squirrel cage induction motor.

Day 3

- *Design implications:* Safety factor, shock load, maintenance.
- *Economics:* Loss & efficiency calculations, spreadsheet approach to economic evaluation.
- *Harmonics and Powerfactor:* Fourier analysis, harmonic sources, effects, standards, analysis, harmonic reduction.
- *Discussion workshop.*

Accommodation

Arrangements for accommodation are the responsibility of participants and costs are not included in the course fee. A list of hotels and motels in the Wollongong area will be sent to participants upon registration.

Enquiries

Registration enquiries: Please call Eudoxia Parharidis at the ESAA Melbourne Office Ph: + 61-3-9670-0188

Course enquiries: Please call Frank Zammit ESAA Short Course Manager, on +61 2 9233 7222 or 0412 013 738 or fax: +61 2 9233 7244, or email: zammit@esaa.com.au

Please call Dr Vic Smith at the Integral Energy Power Quality Centre, Uni. of Wollongong
Ph: 02 4221 4737 Fax: 02 4221 3236

ESAA actively supports the continuing education requirements of the electricity business through the Short Course Program. Whilst the program strives to reflect the business needs there is no guarantee that economic participation levels can be achieved. This programme may be changed at any time due to unforeseen circumstances. If the course can not proceed for any reason, neither ESAA nor UOW will accept liability of whatsoever kind for expenses incurred by any person or corporation with the sole exception of the course investment, which will be refunded in full.