EPECentre
ELECTRIC POWER ENGINEERING CENTRE

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Capabilities & Experience

EPECentre is a world-class clean technology research incubator that fosters collaboration and innovation.

We are a leading independent electric power and clean technologies research group, delivering specialist world-class research and innovation. Through our collaborations over the past two decades, we have a strong understanding of the NZ Electricity landscape and NZ industry in general, including the manufacturing and primary sectors.

Electric Power Engineering Centre (EPECentre)
University of Canterbury · Private Bag 4800 · Christchurch 8410 · New Zealand
Phone: +64 3 369 3114 · Email: info@epecentre.ac.nz · www.epecentre.ac.nz

Capabilities

The following is an inexhaustive summary of the capabilities of the EPECentre researchers.

Power System Engineering
Steady state, harmonic, dynamic and transient AC and DC power system modelling, design and analysis
High voltage and high current design
High voltage and high power testing
EMC, EMI, RFI testing and solution design
Protection design, co-ordination, implementation
Insulation co-ordination
System integration studies

Modelling & Analysis
Software tools - MATLAB, SINCAL, COMSOL, Ansys, Open DSS, PSCAD/EMTDC, Python, R, SPICE, Altium, C, C++
Algorithm development
Statistical analysis
Thermal modelling
Fluid dynamics modelling
Mixed integer linear programming
Energy modelling and system optimisation
Finite Element and Finite Volume Modelling
Near-field optical analysis and electromagnetic simulations
Optimisation - linear, quadratic etc.
Electronics, electro-magnetic, power electronic and power system modelling and analysis
Hierarchical control design and implementation
System/process modelling

Electro-magnetics
Motor, drive and actuator - design, construction and testing
High frequency power transformer, current transformer and inductor design, construction and testing (ferrite, amorphous metal and powder-iron cored)

Electronics & Power Electronics
Signal processing, including precision analogue and digital circuit design
Electron beam lithography
Developing nano-tech fabrication processes and process integration
PCB design
Switching circuit topology design, analysis, synthesis and implementation

Others
Scoping and requirement capture
Technical supervision
Techno-commercial analysis; financial, operational performance (losses, RAM)
Component and system testing
Chemical analysis and testing
Project planning and management
Risk identification, mitigation and management
Communication and art design

Experience

Find below an extensive experience list for EPECentre researchers.

Project	Client(s), Funder(s) and/or Supplier(s)	Related Programme
Power System Engineering		
Repurposing EV batteries for stationary energy applications in NZ - Techno-commercial evaluation	DARC Technology	
High power testing (as a test engineer)	DNV-GL (formerly KEMA), STIMBR	Smart Electrode
High voltage testing	STIMBR	Smart Electrode
HVDC and FACTS system design, power system integration studies, protection and control design	Utilities world wide, GE	
Renewable Energy Design & Integration		
Optimisation of a multiple tilt angle Solar system	DARC Technology	
Solar calculator	EECA	GREEN Grid
DGHost	Electricity Utilities and MBIE	GREEN Grid
Distributed generation (PV) connection guidelines	EEA and MBIE	GREEN Grid
Modelling NZ PV uptake	MBIE	GREEN Grid
Optimising power system reserve for contingencies while considering response times	MBIE	GREEN Grid
Fault location in distribution networks	Tait Electronics	
Modelling controlled hot water systems	EECA	
High resolution spatial and temporal solar, wind and wave power data series for New Zealand	MBIE	GREEN Grid
Design and execution of the solution to integrate off-shore windpark into an onshore grid	Tennet, GE	

Project	Client(s), Funder(s) and/or Supplier(s)	Related Programme
Design and control of half-bridge DC connected dynamic braking system	Solution development, GE	
Instrumentation & Sensors		
Design and implementation of electric and magnetic field measurement array to measure spatial current distribution in and potential distribution across isotropic or anisotropic media with electrical excitation	STIMBR	Smart Electrode
Design of wide range of signal conditioners and converters for thermo-couples and other sensors	Industrial Interface (UK)	
Novel cascaded CT-based current sensors, with bilateral depletion FET switches for measuring current distribution in and voltage distribution across novel (patented) segmented electrodes	STIMBR	Smart Electrode
Industrial Systems		
Model-based predictive control of heating of anisotropic materials such as wood	STIMBR	Smart Electrode
Development of one dimensional model to predict the heating of anisotropic materials such as wood	STIMBR	Smart Electrode
Three dimensional modelling of Joule heating in heterogeneous, anisotropic media, such as wood	STIMBR	Smart Electrode
Process heat and energy modelling	IPL NZ, Boise-Cascade (USA)	
Process flow design, optimisation and instrumentation	Petrofac LLC	
Design of pneumatic scheme for log heating rig	STIMBR	Smart Electrode
Optimisation of CAPEX and OPEX (including RAM) as a part of solution design	GE Tenders and contracts	
Electromagnetic Solutions		
Ultra high temperature brushless motors for geothermal industry, deployed internationally	MB Century Ltd	

Project	Client(s), Funder(s) and/or Supplier(s)	Related Programme
Novel single phase permanent magnet motor custom-designed for volume production	Wellington Drive Technologies Ltd, Grundfos Management A/S	
Motor design consultancy	UBCO Ltd, AuCom Ltd	
Actuator design consultancy	PulseData/Humanware Ltd	
Three-dimensional modelling of electromagnetic field distribution in heterogeneous, anisotropic media, such as wood	STIMBR	Smart Electrode
Patented magnetic components with optimally interleaved windings	Weir Electronics	
Electronics & Power Electronics Systems		
Near-field optical lithography using evanescent waves	IBM	
Photonic crystal devices including a slow light device	IBM	
World's smallest SRAM cell (circa 2004)	IBM	
Battery Go-Cart synchronous MOSFET chopper with regenerative braking driving PM 24V motor	University of Canterbury	
Novel fluorescent tube replacement system with 3 LED strings (White, Cyan-Blue, Red-Orange) driven by single modified dual-mode buck/flyback-converter	Solar Bright - LED lighting	
Development of trapezoidal current driver for large electromagnet - resulting in the invention of a novel BH-bridge	SfTI National Science Challenge	Inverting Electromagnetics
Design and fabrication of a new generation of off-line switch-mode power supplies	Weir Electronics	Inverting Electromagnetics
Design and implementation of SCADA system implemented using Zigbee, MODBUS Ethernet and LabVIEW	STIMBR	Smart Electrode
Refrigerator fan motor drive COB update	Wellington Drives	

Project	Client(s), Funder(s) and/or Supplier(s)	Related Programme
Performance evaluation of household technologies such as LED bulbs, heat-pumps and PV inverters	MBIE	Power Quality
HVDC valve performance, rating and control	Utilities world wide, GE	
Design guideline package for LCC and VSC HVDC solutions	GE	