

DTC Programme Taught Modules

Core and transferable skills “sheep dip” modules		
Loughborough: Induction (2 days) • Safe working practices • Risk assessment • Research methodologies and management (teambuilding). Translational project brief (1 Day) • Presentation/ dissemination skills • IP and commercial exploitation Engineering top up (2 days) • Basic bio-processing • Bio-materials	Nottingham: Therapeutic top up (5 days) • Tissue engineering principles • Scaffold material chemistry • Cell culture • General principles of embryonic cell culture • Mathematical modelling in tissue engineering • Overview of the use of animal models in regenerative medicine	Keele: Clinical top up (5 days) • Anatomy and physiology • Linking structure to function • Immunology • Human disease and genomics • Imaging and diagnostics • Case studies: problem based learning • Surgical theatre visit
Translation skills modules		
Stem cell therapy biology and enabling technologies (Keele and Nottingham) • Introduction to stem cells • Ethics and regulation • Embryonic stem cells • Cord blood derived stem cells • Bone marrow derived adult stem cells • Control of differentiation • Stem cell targeting • Tissue Specific Stem Cells • Engineered scaffolds for stem cells	Cell and tissue bioprocessing (Lboro) • Physical, chemical and biological heterogeneity • Strategies for scale-up/ out • Suspension/attachment cell culture • Cell culture automation • Culture process optimisation and experimental design • Adult stem cell culture • Embryonic cell culture • 3D culture systems	Healthcare Technology Assessment (Keele) • Clinical Governance, Clinical Audit • Economic Evaluation • Assessing Clinical Measurement Technologies • Randomised Controlled Trials of Therapeutic Technologies • Epidemiological Methods • Meta-analysis of Published Trials
Clinical needs and applications (Nottingham and Keele) • Gene therapy • Drug screening • Bone engineering • Tendon/ligament and cartilage • Corneal • Liver • Neural • Skin • Vascular	Industry structure, regulation and Quality Systems (Loughborough and Nottingham) • Industry structure • Ethics • Regulation and quality systems • Regulation of pharmaceuticals • Regulation of medical devices • GLP/ GMP/ GCCP and Validation • Influence of regulation on business and innovation strategy	Therapeutic product realisation (Loughborough and Keele) • New product introduction process • Stakeholder requirements capture • Biomechanical design • Reverse engineering of implants • Manufacturing processes for implants • Regulated production systems • Delivery devices and systems • Packaging, storage and transport • Bio-mimetic approaches
Specialist skills modules		
Cell mechanics, surfaces and signalling (Keele and Loughborough) • Viscoelasticity of cells • Mechanics of cell deformation • Mechanotransduction • Cell-flow interaction • Mechanics of cell adhesion • Cell-substrate interaction • Surface characterisation • Surface manipulation techniques • Micro and nano-feature formation • Electro-stimulation	Analytical and imaging technologies (Loughborough, Keele and Nottingham) • Imaging and analytical challenges • Analytical cytology • Direct optical measurement (LASER scanning cytometry, confocal microscopy, OWLS). • Non-invasive techniques (MRI, RAMAN). • Off-gas analysis (MS, GC-MS, SIFT-MS). • Integrated sensing devices. • On-line measurement, monitoring and control.	Cell therapy (Nottingham and Nottingham University hospital) • Overview of current cell therapy trials • Limbal stem cells in corneal regeneration • Mesenchymal stem cells in gut repair and Crohn's disease • Stem cell repair of Musculoskeletal tissue • Nerve repair and liver re-generation • The potential of cell therapies for Alzheimer's and Parkinson's disease • GMP cell culture within the NHS
Developmental biology, embryology and embryonic stem cells (Nottingham) • Introduction to developmental biology • Regulation of embryonic stem cells • Derivation of embryonic stem cells • Culture of embryonic stem cells • Maintenance of pluri-potency • Mouse embryonic stem cells • Human preimplantation embryo derived stem cells	Transport phenomena in biological systems (Loughborough) • Rheology and physical properties of biological systems • Heat, mass, momentum transfer • Modelling of multiphase and multi-physics material systems • Microfluidics and its modelling • Computational techniques for transfer processes • Dynamics of cell growth in scaffolds • Extracellular matrix secretion • Metabolic pathway modelling	Orthopaedics and rehabilitation (Keele) • Introduction to skeleton and joints • Posture and locomotion • Spinal instrumentation and biomechanics • Spasticity management and alteration in gait • Mobility and limb prosthesis • Anatomy and biomechanics of joints • Robotics and computer aided surgery • Fixation and the healing process • External fracture fixation systems • Joint replacement and implants