

Training services in the domain of Micro & Nano Systems

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Overview

- Setting the scene
- Trends and demands on Nanoeducation
- Lancaster University offering
- EU Networks offering

Nano-Activity

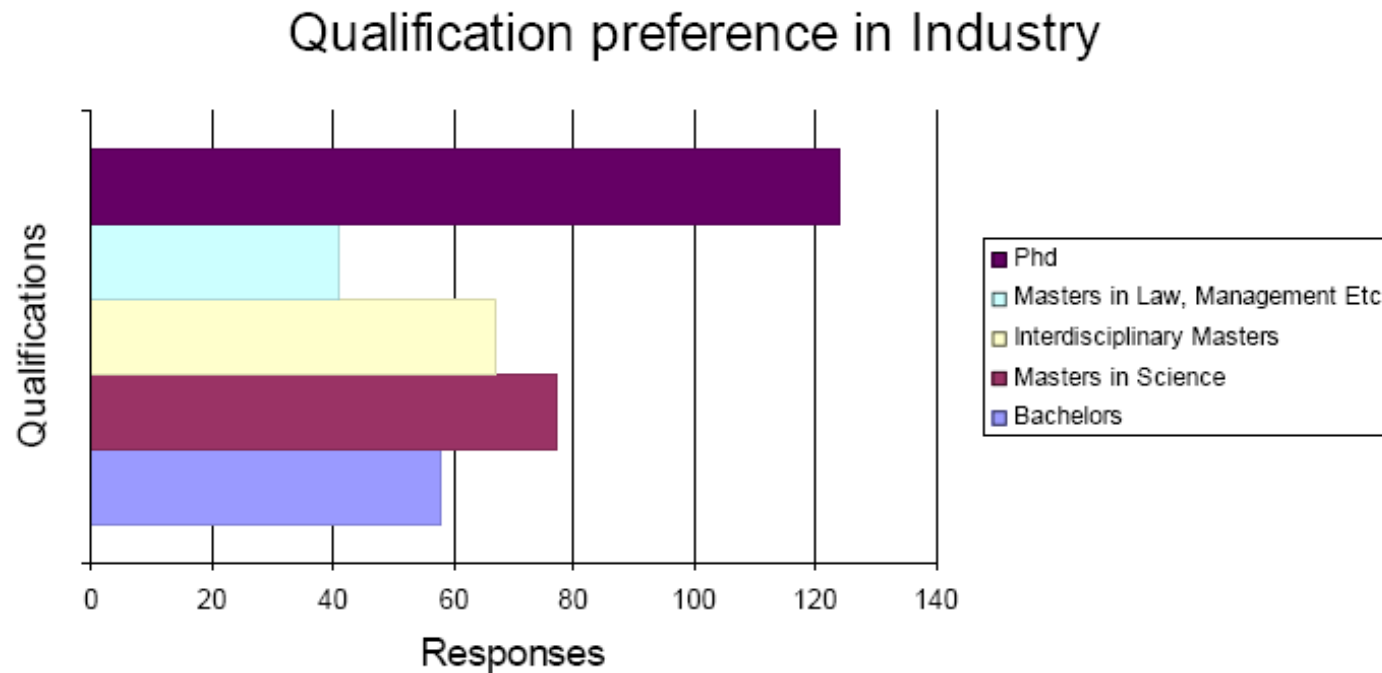
- U.S. government alone invests about \$1.4 billion yearly, an increase of more than 10-fold since 1997.
- Analysts at Yole (www.yole.fr) estimate the global market for MEMS devices at \$5.26 billion in 2006, growing to \$9.86 billion by 2010
- The European Nanotechnology Trade Alliance (ENTA) counts more than 529 nanotechnology companies in Europe.
- The National Science Foundation in America estimates the global market for products containing nanotechnology to be \$1 trillion yearly by 2015
- With this rate of growth, how do we find enough qualified personnel?

Micro and Nano

- Particular features of MNT sector
 - Knowledge intensive
 - Interdisciplinary
 - Rapidly growing and changing
- Thus we require highly qualified personnel with a broad knowledge and in great numbers!

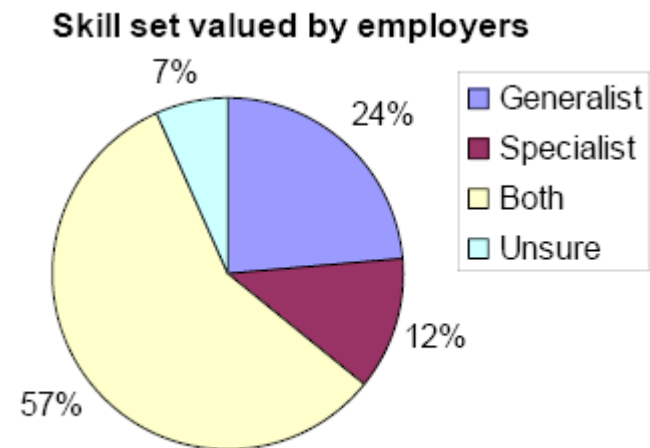
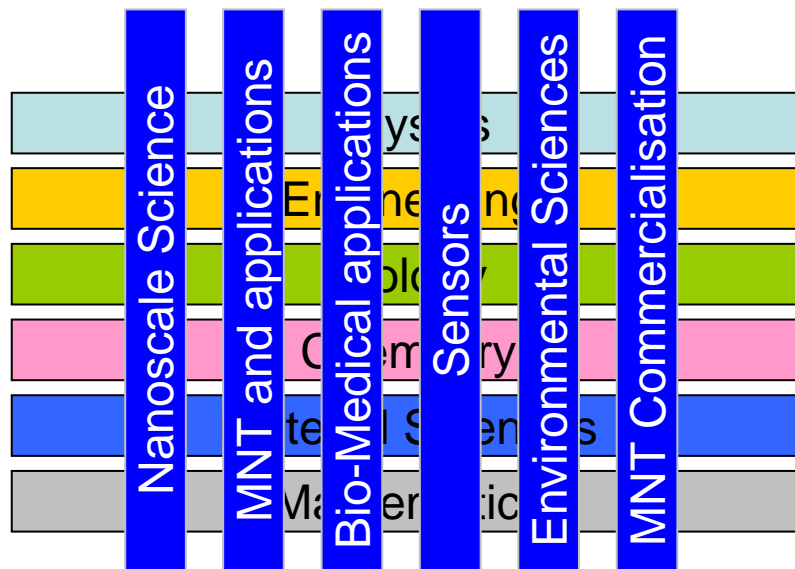
Survey

- IoN and Nanoforum conducted a survey to establish what training is needed by the MNT sector



Interdisciplinary

- Traditional teaching
- Interdisciplinary teaching

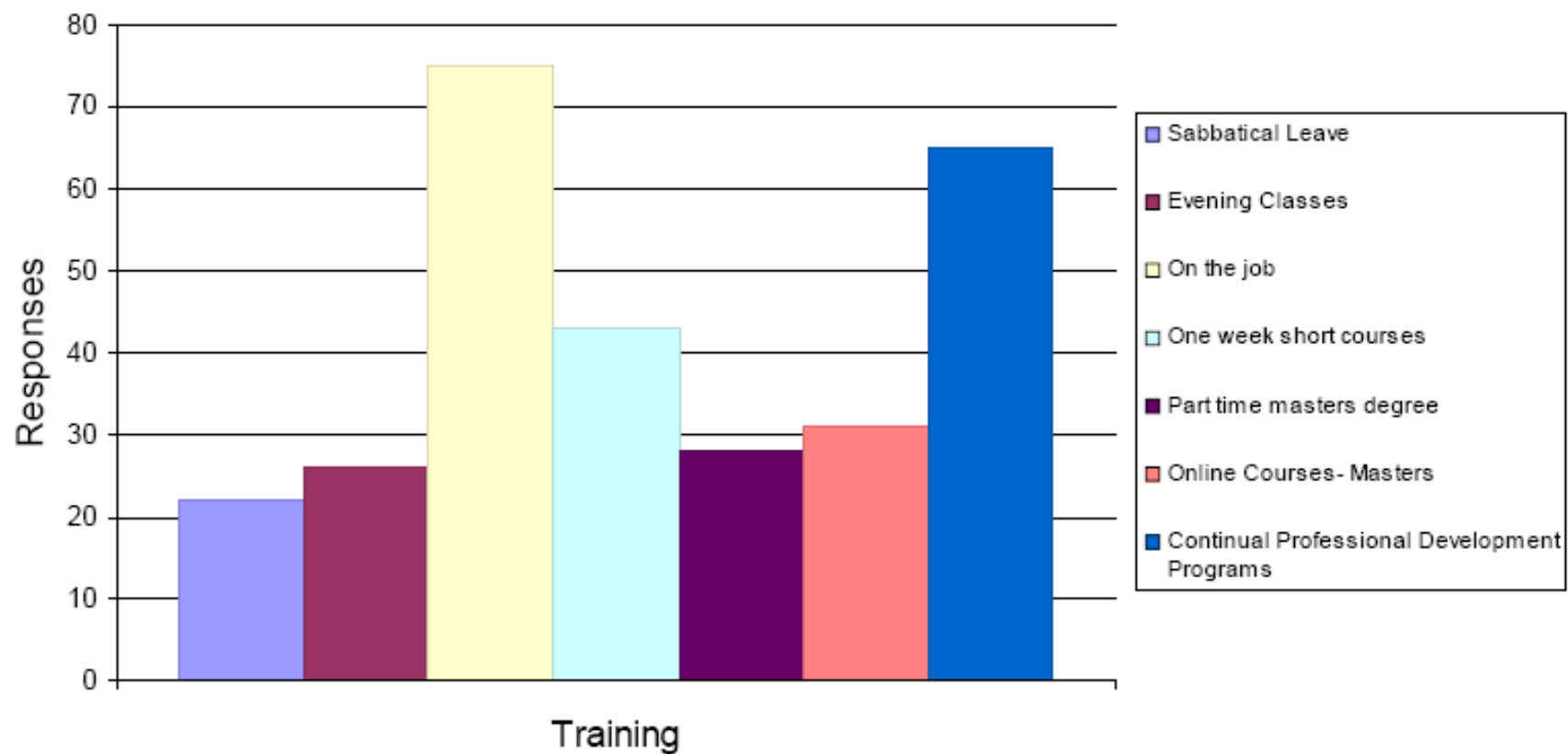


Course Types

- NVQ, apprenticeships and foundation degrees (technician training)
- Undergraduate courses in MNT
- Masters programmes
- PhD Degrees (research based)
- CPD courses and on-the-job training

Survey

Preferred Training Method



Lancaster University

- Undergraduate Course modules
- MSc in Micro and Nanotechnology – Engineering, Management and Society:
 - Modules:
 - Micro and Nanotechnology
 - Nanoscience and Nanomaterials
 - Design for manufacture and reliability testing
 - High-Tech Entrepreneurial Venture
 - Management Issues of the Technology-based Enterprise
 - The Ethical and Societal Dynamics of Nanotechnology
 - Features:
 - Each module is 1-2 weeks long
 - Course available as part-time or CPD
- MSc in Microelectronics and System-On-Chip
 - Modules:
 - Microsystem and System-on-Chip Technology
 - Advanced Computer-Aided Design and Test
 - Real Time Systems
 - Programming and Embedded Systems
 - Interfacing and Integration
- Short and custom-made Courses:
 - Micro and Nanotechnology for business



MSc in LANCASTER UNIVERSITY

Micro and Nanotechnology – Engineering, Management & Society

Part-time modular industry-based course Full-time course or

Why this course?

Micro and Nanotechnology (MNT) could well be the next industrial revolution with radical changes in the way we setup, run and market our businesses. Novel and knowledge-based manufacturing has the potential to complement, if not replace, conventional manufacturing industries with their highly materials-intensive processes. Development of a knowledge-based industry requires a highly educated workforce with key competences in the technical, management and societal dimensions of Micro and Nanotechnologies.

Although the spending on MNT will double in the next 2-3 years, there is still a profound skill shortage in the area. This means that not only will you have a top class degree, you will be highly sought after by employers in the UK and abroad.

Who is it for?

Our Micro and Nanotechnology Masters course is a unique and timely opportunity for an engineering or sciences graduate to enter an interdisciplinary research or commercial R&D career in MNT. A good balance between technical, management and social science content makes this course directly applicable to entrepreneurs in existing, as well as new businesses in the MNT area. Existing technical personnel would find novel MNT technology topics essential for their professional development, especially since this course is organised in a modular structure that allows part time intensive learning.

Course Outline

The course consists of 6 taught modules and a long project which will involve working in an academic or industrial environment in the area of MNT.

www.engineering.lancaster.ac.uk/postgraduate/mntano

Modules Offered:

Micro and Nanotechnology
Introduction to micro and nanotechnology, microsystem electronics, MEMS, microfluidics and more.

Nanoscience and Nanomaterials
Basics of solid state physics, nuclear science, manufacturing (top down and bottom up) and nanoscience.

Design for Manufacture and Reliability Testing
Introduction to design for manufacture, device testing and reliability assessment, issues with packaging, integration and manufacture.

The High Technology Entrepreneurial Venture
Provides a broad view of the issues involved in starting up and running a business with a technological focus.

Management of the Technology Based Enterprise
Provides the framework for a strategic based management of knowledge, people and resources.

The Ethical and Societal Dynamics of Nanotechnology
Introduces a range of conceptual tools for thinking through the societal and ethical dynamics of MNT.

Contact Information

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Lancaster MNT Offering

- Lancaster is collaborating with SMEs to build a coherent teaching portfolio
- Lancaster is leading training and dissemination work package in INTEGRAM*plus* network
- Lancaster is running an outreach activity to MNT community through
 - Joint research projects
 - Student placements
 - Consulting
 - Events like this one
- Lancaster is involved in training work package in NoE PATENT DfMM

STIMESI

Stimulation Action on MEMS and SiP



QinetiQ



- Activities:
 - Delivery of training courses (Main activity)
 - Course material development
 - Post-training homework support
 - Design kit update
 - Dissemination



STIMESI

Stimulation Action on MEMS and SiP

INTEGRAM*plus* MEMS Design and Prototyping Course

Course Structure

- Day 1: Introduction to MEMS
- Day 2: Introduction to Design and INTEGRAM*plus* Services
INTEGRAM*plus* Silicon MEMS Fabrication Services and Design Kits
INTEGRAM*plus* Microfluidic Service
Multi-domain and Multi-technology Integration
- Days 3-4: CAD tools for MEMS
Introduction to Layout using L-Edit
Practical layout and design rule exercises
CoventorWare Training and Tutorials
Accelerometer-based tutorial
Freeform design session with trainer support

INTEGRAM*plus*

- WP3 – responsible for training and dissemination
- Activity:
 - Converting the state of the art technology expertise of 10 partners into tutorials and courses
 - Organising courses
 - Custom made tutorials on INTEGRAM*plus* technology



NoE PATENT DfMM

- Short Courses:
 - Micro and Nanotechnology for business
 - Modelling & Analysis of MEMS Packages
 - Thermal Issues in MEMS
 - Modelling Technology to support MEMS manufacture
- MSc Courses:
 - European Masters qualification in Design for Manufacturable Microsystems

Scheduled Courses

- INTEGRAMplus MEMS Design and Prototyping Course (STIMESI 5-8 Nov 2007, Paris)
- Silicon / Polymer Microsystems for Life Sciences, CAS satellite event (INTEGRAMplus, 17 Oct 2007, Sinaia, Romania)
- Micro and Nanotechnology MSc course (Oct 2008, Lancaster University)
- Micro and Nanotechnology-Engineering, Business and Society (PATENT)



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Thank you

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<http://www.engineering.lancs.ac.uk/microsystems/>