INDUSTRY **smartware**
INNOVATED AT
INDIAN INSTITUTE OF TECHNOLOGY INDORE

Hey! I think I might breakdown tomorrow.

Don't worry, I can handle your jobs, if you want.

Thanks! I will be back in a day. ✌

INTERNSHIPS in
SMART MANUFACTURING

IIT Indore provides opportunity to highly motivated candidates to work in a research project jointly mentored by faculties of IIT Indore and Institute for Manufacturing, University of Cambridge
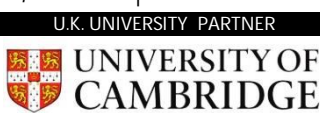
Category	UNDER-GRADUATE	POST-GRADUATE	RESEARCH FELLOW
Qualification	Pursuing B.Tech/B.E or equivalent	Pursuing M.Tech/M.E/MS or equivalent	M.Tech/M.E /MS or equivalent
	Note: Students of any branch of engineering may apply provided they meet the required skills for the specific project (please see page 3 for the details)		
Duration	02 Months - 06 Months	02 Months – 06 Months	12 Months
Stipend	**Upto INR 8,000 /- per Month**	**Upto INR 15,000/- per Month**	**Upto INR 30,000 /- per Month**

Selection — Interested candidates should see the details of each project mentioned at following pages and send their resume to the email addresses mentioned against each project. Internships open from 01st April 2016. Shortlisted candidates may have to undergo a personal interview (on-line/ in-person/telephonic) before final selection.

INDIAN INSTITUTE OF TECHNOLOGY INDORE
KHANDWA ROAD, SIMROL, 452020 | www.iiti.ac.in

MAKE IN INDIA

FUNDING PARTNER — ROYAL ACADEMY OF ENGINEERING

U.K. UNIVERSITY PARTNER — UNIVERSITY OF CAMBRIDGE

INDUSTRY PARTNERS — AVTEC · Micromatic Grinding TECHNOLOGIES LTD. · WABCO · AIA

INTRODUCTION

The Federation of Indian Chamber of Commerce and Industry (FICCI) has partnered with the UK's Royal Academy of Engineering under the Newton-Bhabha Fund which builds science, innovation and R&D ties between India and the UK, sponsored by both governments. As part of the Fund, the Academy and FICCI will be implementing the 'Higher Education Partnership' (HEP) programme to build linkages between industry and academia through sponsoring high level exchanges between both sectors. FICCI has developed a framework- National Knowledge Functional Hub (NKFH) to create a mechanism for employability and entrepreneurship amongst graduates.

IIT Indore has been selected to implement the programme with specific focus on **"Building Capacity in Collaborative Research for Advanced Manufacturing"**. The collaboration mechanism adopted by IIT Indore is shown below. The research work is broadly divided into two projects and will provide internship opportunities at various level (U.G./P.G./Research Fellow). The students will be mentored jointly by IIT Indore and Institute for Manufacturing, University of Cambridge faculty members.
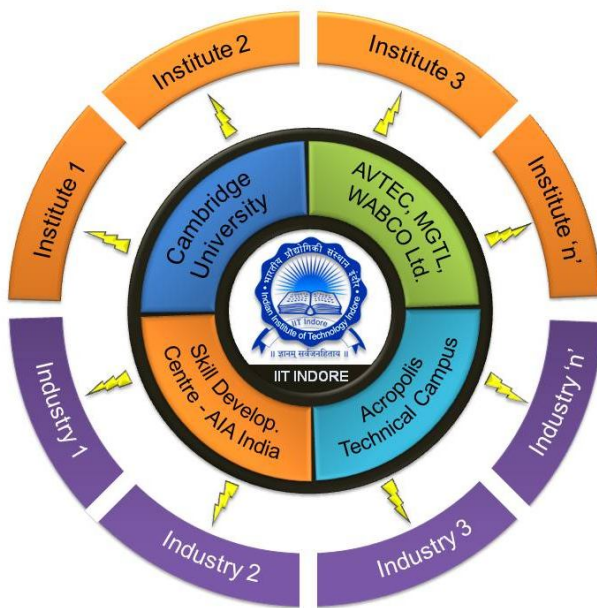
Globally, the manufacturing industry is gearing up for the next level of industrial revolution and it is called Smart Manufacturing or Industry 4.0. The aim of the project is to develop research capabilities in the areas of smart manufacturing and disseminate the knowledge to wider industrial and academic community. Smart manufacturing is where manufacturing machines and systems are self-aware, can communicate with each other, and are able to make decisions that will improve system performance. Smart manufacturing requires machines to have the ability to gather (and share) data about its condition and operation, ability to perform data analytics to understand how its condition and operation affects system performance, and decision-making ability to take actions that will improve/optimize system performance based on the gathered data.

PROJECTS

Project I: Development of a system that enables embedded intelligence in manufacturing equipment through effective data gathering, communication, analytics and decision making capabilities.

Project II: Development of self-aware and self-adaptive machine tool structures using shape memory alloys.

PROJECTS DETAILS

The Indian Government has recently taken several steps under the "Make in India" scheme to transform India into a manufacturing powerhouse. Globally, manufacturing is moving towards the next industrial revolution called 'Smart Manufacturing'. A recent summit of the Confederation of Indian Industry (CII) has also launched its Smart Manufacturing roadmap-2025 for India. Present project aims to enable the recognition and adoption of the smart manufacturing paradigm within the manufacturing sector in India.

PROJECT I

Development of a System that enables Embedded Intelligence in Manufacturing Equipment through Effective Data Gathering, Communication, Analytics and Decision Making Capabilities

The challenge is that most industries in India and even globally do not have all of their manufacturing equipment equipped with embedded sensors or external sensors for data acquisition. They rely mostly on manual data collection. Thus, one of the challenges for widespread adoption of smart manufacturing is to enable such legacy equipment with intelligence capabilities. A 'cyber twin' (a concept recently developed at IIT Indore) is a software representation of an actual machine tool that is able to replicate the machine behavior and can make decisions on behalf of the machine through embedded data analytics and optimization algorithms. The cyber twin will capture all relevant events of the machine either through manual (but standardized) data interface or through externally mounted sensors or embedded sensors. The proposed project will identify appropriate event information required from the machines for cyber twin development for different scenarios such as production scheduling, health monitoring and maintenance optimization. The use of machine tool communication standards like MTConnect, etc. will make such cyber twin concepts easily acceptable in the market. An effective communication algorithm forms the basis for operations planning within a complex network of production machines in any industry. In this project, we will develop algorithms for deciding on "what to communicate", "when to communicate" and "which cyber twins to communicate with". This is akin to the formation of 'social networks' for machines. Also, decision making algorithms will be developed based on the communication within the network. It is proposed to focus on maintenance (scheduled and predictive maintenance), production scheduling and inventory decisions in this project.

Required Skills

Demonstrated programming skills in Java, XML, MySQL, Networking, GUI development, communication standards (Mtconnect, etc), Knowledge of statistics, probability, simulation, optimization, Industrial Engineering Concepts

Interested students should send their Resume to bklad@iiti.ac.in

PROJECT II

Development of Self-Aware and Self-Adaptive Machine Tool Structures using Shape Memory Alloys

The second project targets the data collection and self-acting element of smart manufacturing through the development of self-aware and self-adaptive machine tool structures. Among the wide variety of key materials, shape memory alloy, plays a potential role owing to their capability of sensing the temperature and gets actuated to provide appropriate displacement. This functionality would be highly helpful in developing adaptive controlled clamping device for machine tools. The manufacturing of these structures is a challenging task. Compared to other techniques (Powder metallurgy, Electric Discharge Machining etc.) laser based additive manufacturing is the most suitable approach through which these structures can be developed with the required composition and has the flexibility to deposit on the cylindrical structures. The first step to achieve this objective is to design the shape memory alloy structures and optimize the composition based on the different parameters of the spindle. The parameters including the dimensions and the temperature generated by the spindle during machining can be collected from the machine tool manufacturers. Based on the inputs, the structures will be designed and the composition would be optimized. A theoretical modeling and analysis would be performed to investigate the deflection with respect to the change in actuation behavior and the thermo-mechanical loading. The influence of different process parameters towards manufacturing of shape memory alloy structures will be investigated and the mechanical properties of the samples will be characterized in detail. The post processing and surface treatment including the laser shock peening would be performed, the influence of this shock peening towards improvement in the property will be investigated. The shape memory characteristic of the as-developed structures will be characterized and the influence of various process parameters towards shape memory effect will be investigated in detail. The adaptability of the component in the machines and their behavior including the life will be investigated in detail.

Required Skills

Skill Requirement: Sound Knowledge on Mechanical, Metallographic characterization and laser based material interaction. Knowledge on thermo-mechanical modelling and simulation

Interested students should send their Resume to palaniia@iiti.ac.in

FACULTY PROFILES
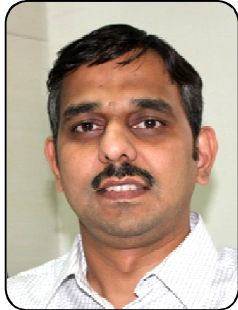
Dr. Bhupesh Kumar Lad
Webpage: www.bklad.webs.com

Dr. Bhupesh Kumar Lad is currently an Assistant Professor with the Discipline of Mechanical Engineering at the Indian Institute of Technology Indore (IIT Indore). He did his PhD in Mechanical Engineering from IIT Delhi. Before joining IIT Indore he was working with GE global research center, Bangalore as a Research Engineer. He has published several research articles in national and international journals and conferences of repute. He has recently authored a book on "Machine Tool Reliability". He has also filed two patents. His research group has active collaboration with various industries and foreign universities.

Dr. Ajith Kumar Parlikad
Webpage: http://www.ifm.eng.cam.ac.uk/people/aknp2/

UNIVERSITY OF CAMBRIDGE

Dr. Ajith Kumar Parlikad is a University Senior Lecturer at Cambridge University Engineering Department. He is based at the Institute for Manufacturing, where he is the Deputy Director of the Distributed Information and Automation Laboratory and leads the Asset Management research group. His particular focus is examining how asset information can be used to improve asset performance through effective decision-making. He actively engages with industry through research and consulting projects. He is a member of The Institution of Engineering and Technology (IET) Technical Professional Network Committee on Asset Management and sits on the judging panel for the IET/IAM Awards in Asset Management. He is also a member of the steering committee of the IFAC Working Group on "Advanced Maintenance Engineering, Services and Technology".

Dr. I. A. Palani
Webpage: http://drpalaniia.webs.com/

Dr.I.A.Palani, is currently an Assistant Professor in the Mechatronics and Instrumentation lab, Discipline of Mechanical Engineering, Indian Institute of Technology Indore. Before Joining IIT Indore, he was working as a Post doctoral research scientist in Graduate school of Information science and Electrical Engineering, Kyushu University, Fukuoka Japan. His area of research includes Opto-Mechatronics system design; Laser assisted micro-manufacturing, smart materials and structures. He is into the development of Shape memory alloy for micro-device development; he has more than 70 research publications in International journal and conference. He has also contributed, few book chapters.

Prof. Bill O'Neill
Webpage: http://www.ifm.eng.cam.ac.uk/people/wo207/

UNIVERSITY OF CAMBRIDGE

Prof. Bill O'Neill is a Professor of Laser Engineering within the Cambridge University Engineering Department and Director of the Centre of Industrial Photonics. He has written over 170 research publications and scientific papers on the subject of laser-matter interactions, optical engineering, laser based manufacturing technologies, and micro/nano fabrication techniques. He is a member of the international advisory panel of the National Laser Centre of South Africa, a Director of the Laser Institute of America, and advises industry on a number of laser based manufacturing technologies.