Indian Institute of Technology Mandi
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भारतीय प्रौद्योगिकी संस्थान मण्डी
मण्डी–175001, हिमाचल प्रदेश, भारत

RECRUITMENT FOR JRF from DST-SERB PROJECT

Applications are invited from the citizens of India for filling up the following temporary position for the sponsored project from the DST - Science and Engineering research board (SERB) undertaken in the School of Engineering of this Institute. The position is temporary and offer will be initially for a period of ONE Year and the offer can be extended through the project duration, based on performance. If candidate also fulfils the institute criteria, admission in Ph.D. can be considered. The requisite qualification & experience etc. are given below.

Project Title	Design and Failure Analysis of Cemented Acetabular Prosthesis
Funding Agency	DST – SERB, Government of India.
Position	Junior Research Fellow (1 Post)
Salary	Consolidated salary Rs.**25000**/- per month
Qualification	B.E./B.Tech. in Mechanical or Civil or equivalent, ME/M.Tech in Applied Mechanics/ Design/ Biomechanics. Candidates who have qualified GATE and/or have at least one year of working experience are preferable.
Job Profile	In this project, primary focus is to determine the mechanical causes of failure and design of new orthopaedic acetabular implant. It's completely application of solid mechanics to bone structure. So, candidate having good knowledge in Solid Mechanics, finite element (FE) method and design related subjects.

Interested candidates can send their short CV (no more than 2 pages; Please Include most relevant information suitable to project) via email to rajesh@iitmandi.ac.in (PI: Dr. Rajesh Ghosh), before **28th October, 2016**. Please write **"Application for JRF"** in the subject line of the email. The shortlisted candidates would be intimated by email for their mode of interview and date. Tentative date of interview 12th November, 2016.

Project Summary:

Total Hip Arthroplasty (THA) and Hip Resurfacing Arthroplasty (HRA) is necessary for patients suffering from arthritis or traumatic injuries. In this process, femur is replaced by artificial femoral component and socket of the pelvic bone is replaced by acetabular prosthesis. The primary goal of the project proposal is to develop and design a new cemented acetabular prosthesis that can minimize failure. According to clinicians, cemented acetabular

prosthesis performs better than cementless acetabular prosthesis, for elderly patients. However, long-term performance of cemented acetabular components has been the major causes of concern during past few decades. Cemented acetabular prosthesis may lose due to wear induced osteolysis, implant-induced adaptive bone remodelling, and failure of the cement mantle. Owing to variations in forces (hip joint force and muscle forces) during daily life activities, stresses in the cement mantle might vary from the maximum value to the minimum one, which causes might fatigue in the cement mantle. The material properties of the supported bone, implant material and implant geometry might also affects the value of stresses in the cement mantle and stresses in other components. So, bone remodelling, implant material, implant geometry and cement thickness might have effect on failure of the cement mantle and eventual loosening of the acetabular prosthesis.

Finite element method has been successfully used over the past four decades for pre-clinical analysis of orthopaedic implants. This method has less investment and computational cost over the clinical analyses for understanding the causes of failure and performance of implants. This method has been used for clear understanding the load transfer, changes in bone morphology due to changes in loading conditions, fracture behaviour, and optimized structure of acetabular prosthesis according to its specific requirements. Owing to faster computing facilities, efficient measuring instruments and better manufacturing facilities, more realistic prediction of failures and more durable implant can be easily fabricated. It is anticipated that bone remodelling around the acetabulum, implant properties and cement thickness might change the stresses in the cement mantle as well as the fatigue and fracture behavior and cement - bone interface debonding. Elevated tensile stress in the cement mantle can initiate a crack, which can further propagate due to loading. Immediate post-operative condition might not accurately predict the loosening of the implant. Changes in stress in the cement due to bone remodelling needs to be monitor to evaluate risk of loosening. The objective of this proposal is, to design a suitable cemented acetabular prosthesis that can minimize the failure.