

## **Nano-Machines Lab**

### **Session 1: One Hour**

Talk: Concepts like ideality, most useful function(s), harmful effects, convolution, need for invention, s-shaped curve in innovative design. Trimming, miniaturization, etc. while retaining functional performance of technical systems (products and processes). Examples are shown from all areas of engineering. How to build in Nano Lab, conceptual and embodiment design, use of tools, safety precautions, use of creative innovation, TRIZ and Axiomatic Design as tools in resolving technical contradiction.

### **Session 2: Two Hours**

Design & prototyping of Nano-LED lighted preset torque generating screwdriver for night repair. 3D Printed part, nanoLED, coin batteries, etc. are supplied in kit to assemble the product. Participants are able to tighten or loosen bolt at the end successfully. They take home the finished product in working condition.

### **Session 3: Three Hours**

Design & build portable, low cost, folding 2D microscope with buckling-based-focusing. Origami (folded paper) parts, acrylic mirror, balsa wood (with directions along and perpendicular to grain marked), nanoLED, coin batteries, switches, borosilicate glass ball, solution to prepare glass slide, slide, add-on lens as eye-piece supplied, etc. are supplied in kit to assemble the product. Participants are able to watch onion cells or even go in for greater magnification at the end successfully. They take home the finished product in working condition.

*Origami microscope was originally invented in Stanford University. Dr Tunde Alawode of MIT has furthered it by adding on Most Useful Functions (Sigma MUF) and simultaneously reducing its Mass, Dimensions, Energy consumed (Sigma MDE). He has therefore brought its cost remarkably down. I have added the focusing function using anisotropy of balsa wood and elasticity of acrylic sheet. Dr Tunde will be glad to support the workshop by online talk and/or answering questions at end of lesson. This project was run as lesson successfully by him during Impact Labs 2017 Summer Workshop.*

### **Session 4: One Hour**

Q and A

Total 7 hours

**Number of Team Members: 3**