

An Indian-Australian research partnership

Project Title: **Applications of Reliability Theory to Nanotechnology**
Project Number **IMURA0913** (will be inserted by The Academy)

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Research Clusters:
Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? (Please nominate JUST <u>one</u> . For more information, see www.iitbmonash.org)		Highlight which of the Academy's Theme(s) this project will address? (Feel free to nominate more than one. For more information, see www.iitbmonash.org)	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

The research problem

Reliability theory is one of the important areas of applied probability. Reliability models involving binary and multi-state coherent systems have been studied in great detail in literature. Their applications in various engineering fields such as Electronics, mechanical engineering etc have been studied quite extensively. However, reliability/statistical models' applications in nanotechnology have received very scant attention. The research problem that is intended to be pursued in this project will involve studying and developing theoretical reliability/statistical models to ensure reliable operation of biomedical devices.

Project aims

- (i) To develop reliability/statistical models that are relevant in the field of nanotechnology and nano-science.
- (ii) To explore applications of newly developed reliability/statistical models in defence and medical fields.

Expected outcomes

The expected outcomes will include

- (i) new reliability/statistical models for analysing data sets that arise in biomedical device applications

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The models developed as part of this project will ensure safe operation of devices operating defence and medical fields.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

- (i) M.Sc or M.Stat. in Statistics from a reputed institute/university.
- (ii) Good knowledge of R/Matlab programming.
- (iii) Keen interest in applications of statistics and reliability theory to various engineering disciplines.
- (iv) Good communication/writing skills in English.

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

- (i) Data Science, optimization, algorithms**
- (ii) Maths**
- (iii) Nanotechnology, nano-science**
- (iv) Modelling and Simulation.**