PMRF-ISSS Teaching Programme

Prime Minister Research Fellowship students' teaching requirement facilitated by the Institute of Smart Structures and Systems

PMRF-ISSS137/II/2024

Reliability Bottlenecks GaN HEMTs and Design Solutions

Name of the PMRF student

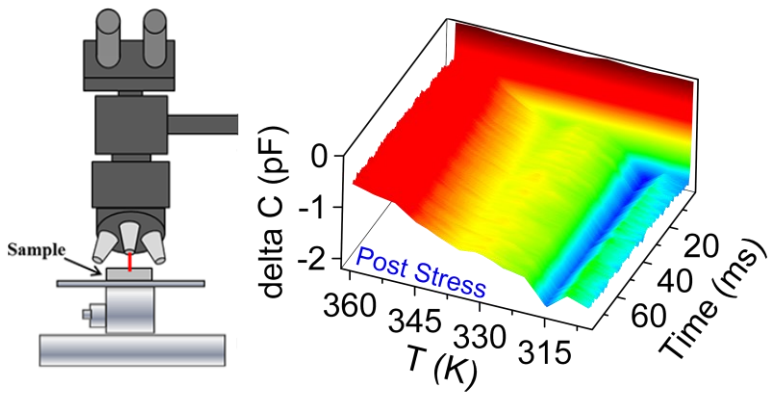
Rasik Rashid Malik

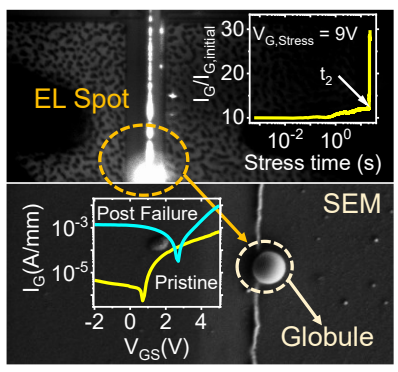
Required background of the students taught

Post Gradurate course: EE, ECE, Materials science Engg., Physics and other related departments (s)
Prerequisite: Knowledge of Semiconductor devices

Online session coordinator

Will be chosen from the list of registrants





Details of the content of the module

This course is designed to provide in-depth knowledge of Reliability Bottlenecks through comprehensive literature reviews and practical case studies.

Introduction to GaN HEMTs: Overview of HEMT technology, Comparison with competitive technologies, D-mode vs E-mode Devices and operation, Applications of GaN HEMTs in power electronics, Figures of Merit – **4hours**

Dynamic R_{ON} : Expected Sources of Dynamic R_{ON}, Experimental approaches to study Vth instability, High Field and hot electron stress, Surface Vs Buffer Trapping, Electron injection and Hole Emission, Self Heating, Design approaches to mitigate dynamic R_{ON}. **6 hours**

Breakdown mechanisms: Channel electric field distribution, Avalanche action, Surface and Buffer traps interplay in breakdown, Dynamic breakdown – **6 hours**

Gate Leakage: Gate leakage mechanisms,, Modeling approaches , Mitigation strategies – **4hours**

Threshold Voltage Instability . Experimental approaches to study Vth instability, Factors defining V_{TH}, Short-term and long-term Vth shifts, Role of charge trapping and de-trapping– **6hours**

Vertical GaN Devices - Competitive Advantages, Challenges and proposed solutions: Layer Transfer Technology, GaN-on-Si Substrate Approach, Edge termination; Vertical GaN technologies with a breakdown voltage > 1 kV - **4hours**

Schedule of the module

Start Date: 20th Aug 2024

Tentative End Date: 15th Oct 2024

(may get extended by a week or 2)

Day: The lectures will either be recorded and uploaded or presented live every Saturday and Sunday

Time: 6PM – 8PM IST

Meeting link : will be shared later

Contact email ID: isss.forum@gmail.com

Registration link: https://forms.gle/5tmY9w8gbL5fBg886