

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING



VLSI-MEMS RESEARCH CENTER



VLSI-MEMS RESEARCH CENTER

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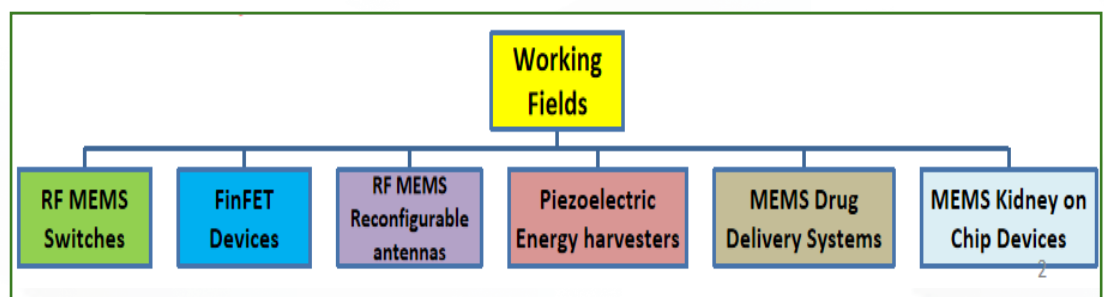
ABOUT CENTER

Establishment of VLSI-MEMS Research Lab:

Established the state-of-the-art research laboratory to promote the research activities of semiconductor devices and the modelling of Nanoscale transistors for digital, RF, Analog, Sensor applications and Micro electro mechanical Systems (MEMS) for RF (L-Band to K-band) and Bio-Sensor Applications since 2017.

Research Areas: Designing, Modeling and Fabrication of Various Nanoscale Devices/Micro-Electro-Mechanical Systems (MEMS) devices by TCAD/ COMSOL / Intellisuite Software Tools and hands-on Experience in Clean Room.

- FinFETs, Dual Gate, Multi Gate FinFET's, SRAM Cell, Memory Cell Design etc.
- Micro-Sensors Devices i.e Accelerometers,
- Bio-Sensors, Drug Delivery Systems, MEMS Pressure Sensors
- RF MEMS Devices, RF MEMS Filters, Reconfigurable Antenna's etc
- Micro-Actuators, i.e Gyroscopes, Composite Transducers, Micro mirrors etc.





VISION

To be a global leader in VLSI and MEMS technologies, pioneering miniaturized electronics and sensor solutions through interdisciplinary innovation. We aim to drive advancements in RF MEMS, Bio-MEMS, and smart sensors for industrial and healthcare applications.

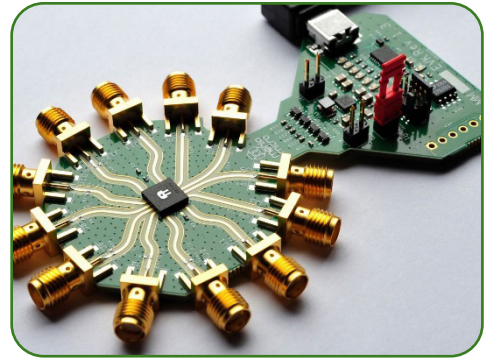
MISSION

- To conduct groundbreaking research in VLSI and MEMS technologies, focusing on the miniaturization of devices and the integration of electronic and mechanical systems.
- To develop novel MEMS sensor technologies, including RF MEMS, Bio-MEMS, and smart sensors, through the use of state-of-the-art CAD tools.
- To collaborate with private foundries for the fabrication, packaging and commercialization of advanced VLSI-MEMS solutions.
- To nurture a research ecosystem that promotes innovation, education, and interdisciplinary collaboration in the field of MEMS and VLSI.
- To contribute to the advancement of industries such as telecommunications, healthcare and consumer electronics through the development of efficient and intelligent sensor technologies.

RESEARCH WORKS:

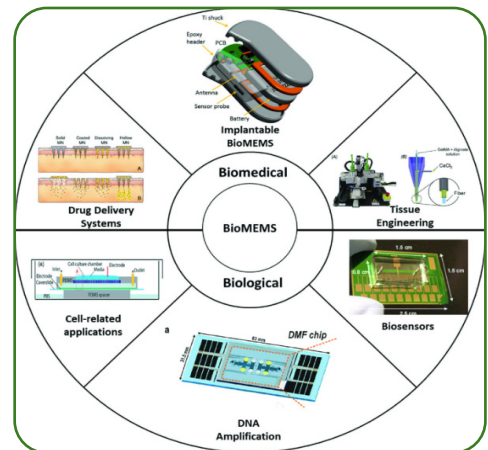
RF MEMS:

- ❖ MEMS ACTUATORS
- ❖ MEMS INERTIAL SENSORS
- ❖ RF MEMS SWITCHES
- ❖ RECONFIGURABLE ANTENNAS
- ❖ MEMS FILTERS



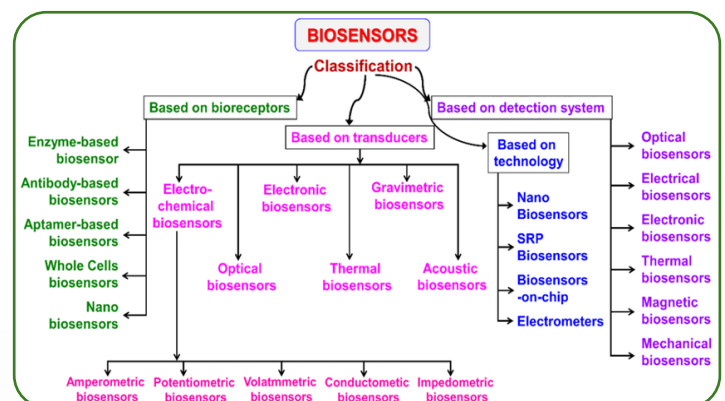
BIO - MEMS:

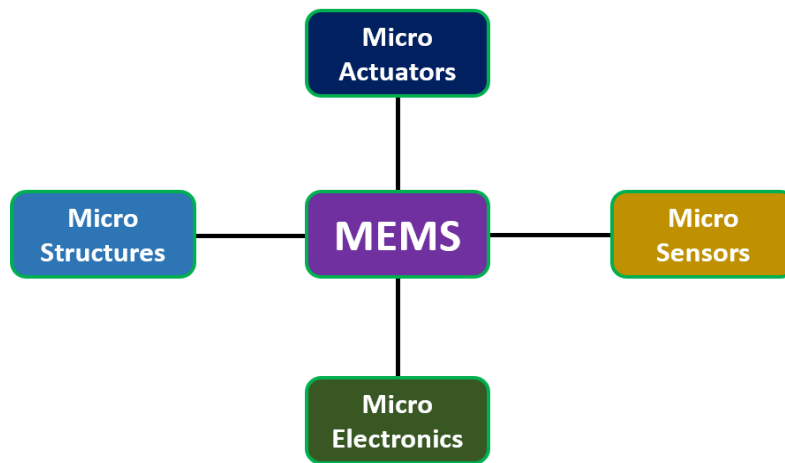
- ❖ AIR BAG SENSORS
- ❖ MICRO NEEDLE
- ❖ MICRO CHANNEL
- ❖ ENERGY HARVESTERS



TFET BIO SENSORS:

- ❖ DM-TFET
- ❖ DMDG-TFET
- ❖ DMDG-VTFET
- ❖ Heterojunction DMDG-VTFET
- ❖ Junction less TFET



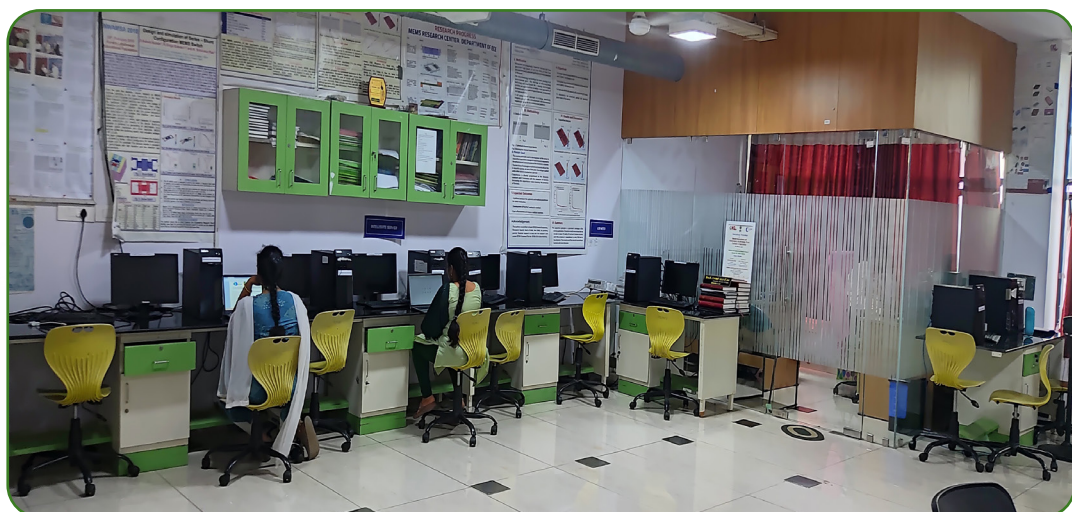
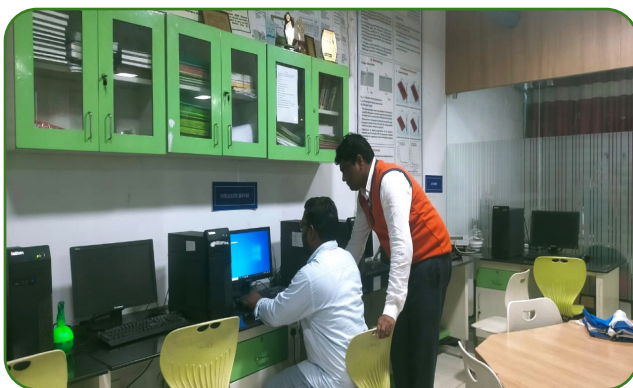


Motto: To promote MEMS field and interdisciplinary research nature in academic & Industry community.



Research is always successful with interdisciplinary

VLSI-MEMS RESEARCH CENTER (VMRC)

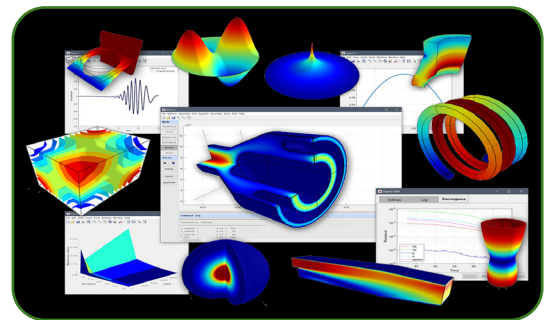


FACILITIES AVAILABLE IN THE CENTER

1) COSMOL Multiphysics:

COSMOL Multiphysics is a computational tool used for simulating and analysing complex physical systems. It integrates multiple physics phenomena such as fluid dynamics, heat transfer, and electromagnetics into a unified platform. COSMOL enables engineers and scientists to model real-world problems and optimize designs efficiently.

Manufacturer	: COSMOL Multiphysics
Version	: 5.2
Number of Licenses	: 5



2) Intellisuite:

Intellisuite is a suite of software tools used for MEMS (Micro-Electro-Mechanical Systems) and semiconductor device simulation. It includes tools for layout design, process simulation, and device characterization, making it essential for MEMS and semiconductor industries.

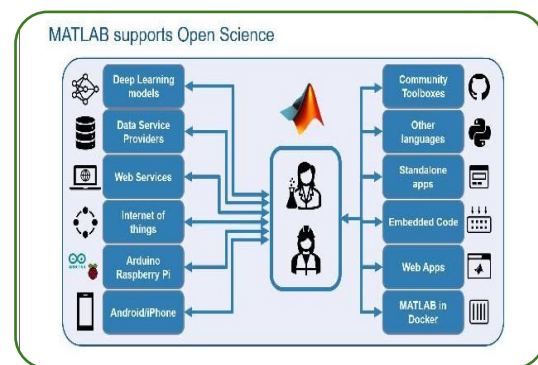
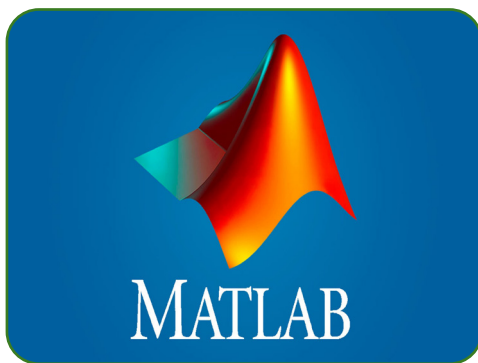
Manufacturer	: Intellisuite IT Solutions
Version	: 8.1
Number of Licenses	: 5



3) MATLAB:

MATLAB is a high-level programming language and computing environment widely used in engineering and scientific research. It offers tools for data analysis, algorithm development, and modelling, making it versatile for various disciplines including signal processing, image processing, and control systems.

Manufacturer	: MathWorks
Version	: R2024a
Number of Licenses	: 5



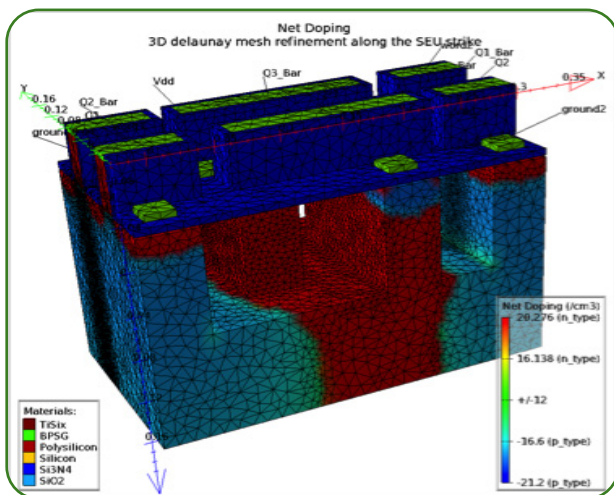
4) TCAD (Silvaco):

TCAD stands for Technology Computer-Aided Design and is provided by Silvaco. It's used for semiconductor process and device simulation, enabling engineers to simulate the fabrication process and electrical behaviour of semiconductor devices at a detailed level. This aids in optimizing device performance and reliability.

1) LCR Meter:

An LCR meter is a device used to measure inductance (L), capacitance (C), and resistance (R) of electronic components. It typically operates by applying an AC voltage to the component under test and measuring the resulting current. LCR meters are essential tools in electronics for component testing and quality control due to their accuracy and versatility.

Quantity	: 1
Specification	: 1mHz-5.5MHz ZM2376
Manufacturer	: NF
Cost	: 1065000



SILVACO



FACULTY ASSOCIATED IN THE CENTER



Dr.K.SRINIVASA RAO
PROFESSOR AND HEAD



Dr.K.GIRIJA SRAVANI
ASSOCIATE PROFESSOR



Dr.K.HARI KISHORE
PROFESSOR



Dr.FAZAL NOOR BASHA
PROFESSOR



Dr.P.SRINIVASU BABU
PROFESSOR



Dr.GRK PRASAD
ASSOCIATE PROFESSOR



Dr.GV GANESH
ASSISTANT PROFESSOR



Dr.N.SIDHAIAH
ASSISTANT PROFESSOR



Dr.B.BALAJI
ASSISTANT PROFESSOR

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NIT, SILCHAR



DR.SANGEETA SINGH
NIT PATNA



DR.BALWINDAR RAJ
NIT JALANDHAR



DR.BRAJESH K.KOUSHIK
IIT ROORKEE



PROF.SANKET GOEL
BITS PILANI HYDERABAD



PROF.NP MAITY
MIZORAM UNIVERSITY



PROF.K.J.VINOY
IISC, BANGLORE



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NIT SILCHAR



PROF.PREM PAL
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INHA UNIVERSITY SOUTH KOREA



PROF.POENAR DANIEL PUIU
SCHOOL OF ELECTRICAL & ELECTRONIC
ENGINEERING, NTU SINGAPORE

LIST OF SCHOLARS AWARDED



DR.P.ASHOK KUMAR
RF MEMS ELEMENTS FOR
RECONFIGURABLE DEVICES



DR.G.DIVYA VANI
ROBOTS BY NOVEL VLSI
ARCHITECTURES



DR.P.GOPI CHAND
RF MEMS FILTERS



DR.GV GANESH
RF MEMS



DR.D.MANASWI
TFET BIOSENSORS



DR.G.SAI LAKSHMI
BIO-MEMS



DR.G.SHANTHI
RF MEMS BAND PASS FILTERS

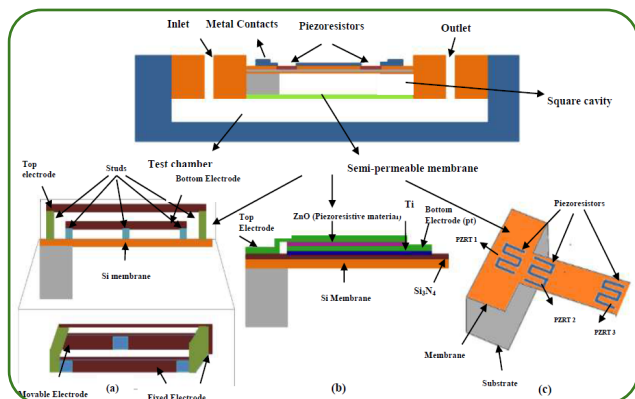


DR.SK.SHOUKAT VALI
RF MEMS FILTERS

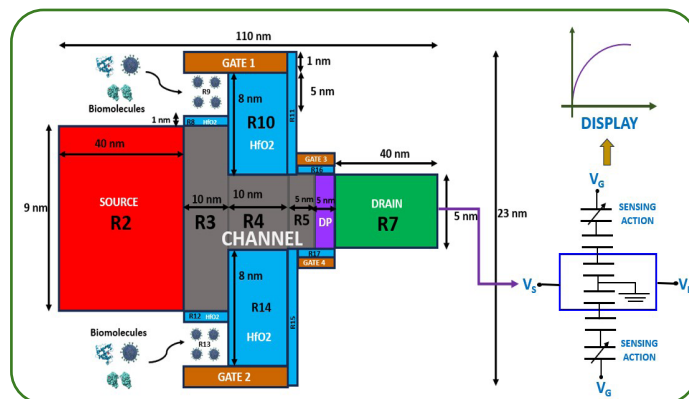


DR.T.SIVASANKARA PHANI
RF MEMS BAND PASS FILTERS

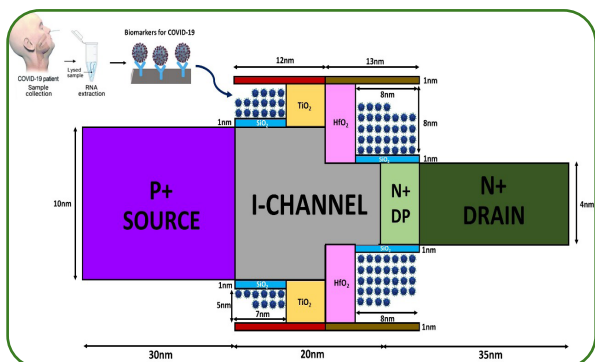
HIGHLIGHTS OF RESEARCH CENTER WORKS



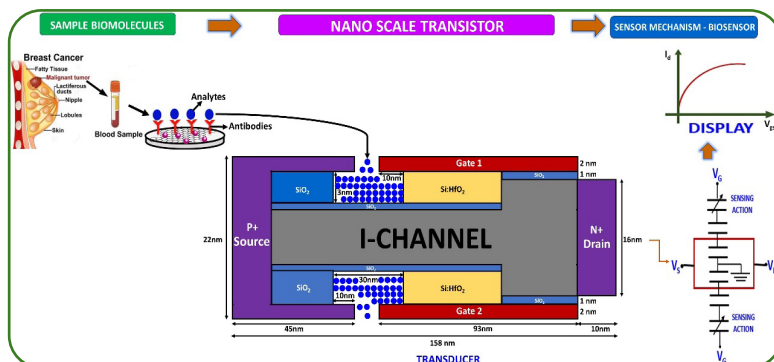
MEMS PRESSURE SENSOR FOR CONTINUOUS GLUCOSE MONITORING



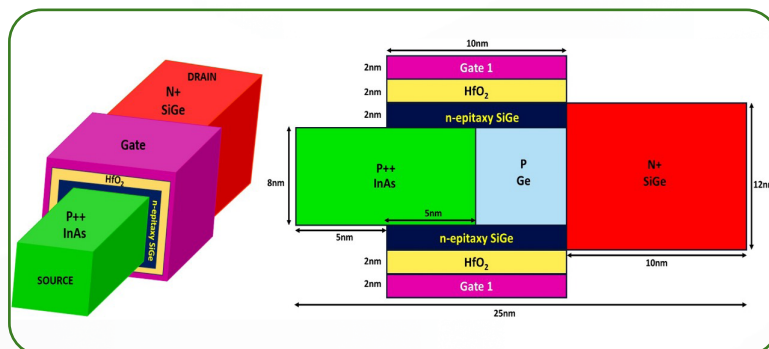
SPLIT-GATE T-SHAPE CHANNEL DM DG-TFET BIOSENSOR



N+ POCKET-DOPED TRIPLE METAL VERTICAL DM-DGDPFET BIOSENSOR (SARS COV2 (COVID CELLS, K=4), CARBOHYDRATES (K=5), RNA (K=8), AMINO ACIDS (K=12)).



A NOVEL T-SHAPE CHANNEL WITH AN INVERTED-T NANO-CAVITY LABEL-FREE DETECTION USING SI:HFO₂ FERROELECTRIC DGDM-JLTFET AS A BIOSENSOR (LIPID (K=3), CARBOHYDRATES (K=5), PLANT PROTEIN ZEIN (K=7), AMINO ACIDS (K=12) AND MDA-MB-231 (BREAST CANCER CELL, K=22)).



MACHINE LEARNING APPROACH BASED ON DEVICE SIMULATION FOR LINE TFET CHARACTERISTICS

PUBLICATION ANALYTICS

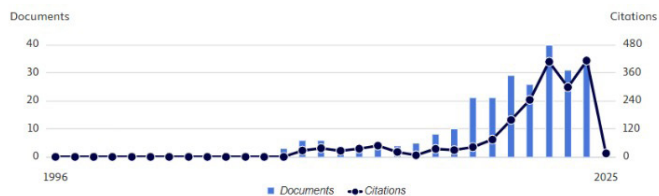
Srinivasa Rao, Karumuri

[K L Deemed to be University, Vaddeswaram, India](#) [57202260857](#) <https://orcid.org/0000-0003-1239-5196> [View more](#)

1,915 Citations by 925 documents | 253 Documents | 23 h-index View h-graph | [View more metrics >](#)

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Document & citation trends



[Analyze author output](#) [Citation overview](#)

Sustainable Development Goals

Goal 3: Good health and well-being	21 documents	Goal 11: Sustainable cities and communities	2 documents
Goal 6: Clean water and sanitation	2 documents	Goal 12: Responsible consumption and production	1 document
Goal 7: Affordable and clean energy	8 documents	Goal 15: Life on land	1 document
Goal 9: Industry, innovation and infrastructure	10 documents	Goal 17: Partnership for the goals	1 document

Most contributed Topics 2019–2023

Electric Switches; Capacitive; Microelectromechanical System
67 documents

Field Effect Transistor; Nanowires; Metal-Oxide-Semiconductor Field-Effect Transistor
9 documents

Field Effect Transistor; Heterojunctions; Metal-Oxide-Semiconductor Field-Effect Transistor
7 documents

[View all Topics](#)

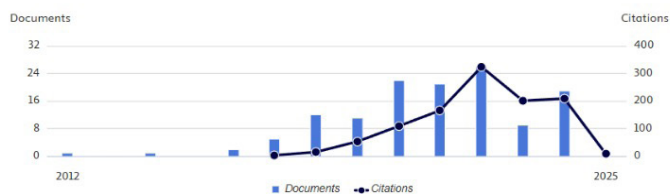
Girija Sravani, Kondavitee

[K L Deemed to be University, Vaddeswaram, India](#) [55305727600](#) <https://orcid.org/0000-0003-1239-5196> [View more](#)

1,089 Citations by 588 documents | 129 Documents | 18 h-index View h-graph | [View more metrics >](#)

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Document & citation trends



[Analyze author output](#) [Citation overview](#)

Sustainable Development Goals

Goal 3: Good health and well-being	15 documents	Goal 9: Industry, innovation and infrastructure	6 documents
Goal 7: Affordable and clean energy	3 documents		

Most contributed Topics 2019–2023

Electric Switches; Capacitive; Microelectromechanical System
58 documents

Micropump; Piezoelectric; Microelectromechanical System
5 documents

Biosensor; Glucose Sensor; Microelectromechanical System
4 documents

[View all Topics](#)

FUNDED PROJECTS

Project Title: Design, Simulation, Fabrication and Characterization of MEMS Bio-Sensor for the detection of Cholera and Diarrhea SERB-ECRA Scheme

Principal Investigator: Dr. Srinivasa Rao Karumuri

Scheme: SERB/ECRA Scheme

Sanction Amount: Rs.31, 55,000.00

Duration: 3 years (Nov 2016- October 2019)

Sponsor: Department of Science & Technology, New Delhi

Project Title: Development of wearable MEMS based Sensor for Parkin's Diseases
Project mentor: Dr. Srinivasa Rao Karumuri DST-WOS-A Scheme

Principal Investigator: Ms. M. Preeti

Scheme: DST-WOS-A

Sanction Amount: Rs.28, 00,000.00

Duration: 3 years (2017-2020)

Sponsor: Department of Science & Technology, New Delhi

RESEARCH GRANTS RECEIVED FROM FUNDING AGENCIES

As a Convener:

SERB Sponsored National Workshop on "Recent Trends in RF MEMS Devices for IOT Applications" will be held on 15th-16th, September 2019, Organized by Microelectronics research Group, Department of ECE at KL University, Green Fields, A.P, India

File No: SSY/2019/000569

Sponsored Amount: Rs.1,00,000

AICTE-ATAL Sponsored 5 Days Faculty Development program on " Challenges and opportunities in VLSI" held on 21st-25th, June 2021, Organized by Organized by Microelectronics research Group, Department of ECE at KL University, Green Fields, A.P, India

Sponsored Amount: Rs. 93,0000

LIST OF PATENTS

Title : DESIGN OF DIFFERENT PRINCIPLES BASED MICRO CANTILEVER FOR MEMS PRESSURE SENSOR

Investigators : 1) G Sai Lakshmi, 2) K. Srinivasa Rao , 3) K. Girija Sravani

Country of Filing : India

Document No : 202341062473

Filing Date : 16-09-2023

Published Date : 07-11-2023

Title : DESIGN OF A LABEL-FREE BIOSENSOR EMPLOYING AN H-SHAPED CHANNEL DM DPDG-TFET CONFIGURATION

Investigators : 1) Rapolu Anil Kumar, 2) K. Srinivasa Rao , 3) K. Girija Sravani

Country of Filing : India

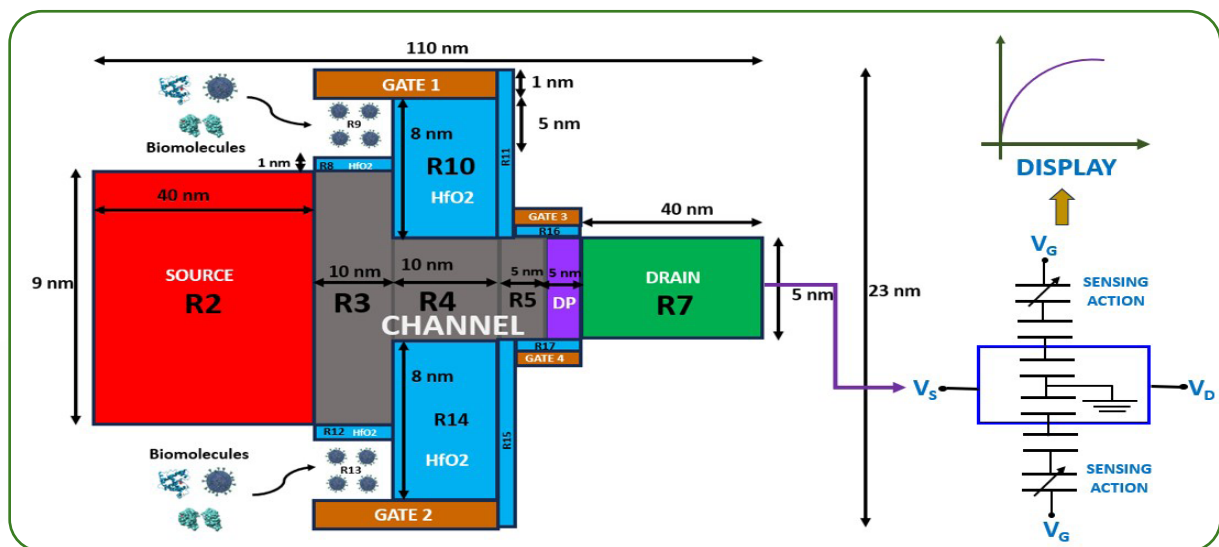
Document No : 202341079752

Filing Date : 23-11-2023

Published Date : 22-12-2023

CONSULTANCY

DESIGNING, SIMULATING, MODELING AND FABRICATION OF TFET BIOSENSORS



SPLIT-GATE T-SHAPE CHANNEL DM DG-TFET BIOSENSOR

LIST OF PUBLICATION

1. A Novel T-Shape Channel With an Inverted-T Nano-Cavity Label-Free Detection Using Si:HfO₂ Ferroelectric DGDM-JLTFET as a Biosensor - A Simulation Study

Cite this Research Publication: Kumar R.A.; Kondavitee G.S.; Wadhwa G.; Karumuri S.R.

Journal: IEEE Sensors Journal
doi: 10.1109/JSEN.2024.3459100
Quartile: Q1

Impact Factor: 4.3
vol:24 issue: 22
pp: 37923-37931

2. Design and Performance Analysis of N⁺ Pocket-Doped Vertical DMDGDP TFET with T-Shape channel for Sensitivity Improvement---As a Biosensor

Cite this Research Publication: G. S. Kondaveeti, R. A. Kumar and S. R. Karumuri.

Journal: IEEE Sensors Journal
doi: 10.1109/JSEN.2024.3476693.

Impact Factor: 4.3
Quartile: Q1
pp: 37923-37931

3. Design and Analysis of MEMS Pressure Sensor based on various principles of Microcantilever beam

Cite this Research Publication: Sai Lakshmi G , Srinivasa Rao K , Girija Sravani K -Design and Analysis of MEMS Pressure Sensor based on various principles of Microcantilever beam.

Publisher: IEEE Transactions on Nano bioscience
doi: 10.1109/TNB.2023.3334749
ISSN: 1536-1241

Impact factor: 3.7
pp:(99)

4.Design and Performance Analysis of a Microbridge and Microcantilever-Based MEMS Pressure Sensor for Glucose Monitoring

Cite this Research Publication: Lakshmi G.S., Karumuri S.R., Kondavitee G.S., Lay-Ekuakille A.

Publisher: IEEE Sensors Journal
doi: 10.1109/JSEN.2023.3234594
ISSN: 1530437X

Impact factor: 4.32
Vol:23 Issue: 5
pp: 4589-4596

LIST OF PUBLICATION

5. Design and Modeling of Bioreactor Utilizing Electrophoresis and Di-Electrophoresis Techniques for Regenerating Reabsorption Function of Human Kidney PCT in Microfluidics Environment

Cite this Research Publication: Sateesh J., Guha K., Dutta A., Sengupta P., Rao K.S.

Publisher: IEEE Transactions on Nano bioscience
doi: 10.1109/TNB.2021.3131351
ISSN: 15361241

Impact factor: 3.9
Vol:21 Issue: 4
pp: 529- 541

6. Design and performance analysis of self-similar reconfigurable antenna by cantilever type RF MEMS switch

Cite this Research Publication: Rao K.S., Naveena P., Swamy T.V.A., Kumar P.A., Guha K., Sravani K.G.

Publisher: Microsystem Technologies
doi: 10.1007/s00542-019-04370-x
ISSN: 9467076

Impact factor: 1.6
Vol:28 Issue: 3
pp: 733-744

7.Design and Analysis of MEMS Electro spray Thruster Device

Cite this Research Publication: Srinivasa Rao K., Vali S.S., Ashok Kumar P., Girija Sravani K.

Publisher: Transactions on Electrical and Electronic Materials
doi: 10.1007/s42341-020-00226-8
Impact factor: 2.37
Vol: 22 issue: 2
pp: 204-210

8. Analysis of PDMS based MEMS device for drug delivery systems

Cite this Research Publication: Srinivasa Rao K., Ganesh G.V., Sai Lakshmi G., Gopichand C., Sravani K.G.

Publisher: Microsystem Technologies
doi: 10.1007/s00542-020-05032-z

Impact factor: 1.6
Vol: 27 issue: 2
pp: 659-664

9. Improve the Performance of a Novel Capacitive Shunt RF MEMS Switch by Beam and Dielectric Materials

Cite this Research Publication: Gandhi S.G., Govardhani I., Kotamraju S.K., Kavya K.C.S., Prathyusha D., Rao K.S., Sravani K.G.

Publisher: Transactions on Electrical and Electronic Materials
doi: 10.1007/s42341-019-00155-1
ISSN: 12297607

Impact factor: 1.6
Vol:21 Issue: 1
pp: 83-90

LIST OF PUBLICATION

10. Analysis of a novel RF MEMS switch using different meander techniques

Cite this Research Publication: Sravani K.G., Guha K., Rao K.S

Publisher: Microsystem Technologies
doi: 10.1007/s00542-019-04703-w
ISSN: 9467076

Impact factor: 1.6
Vol:26 Issue: 5
pp: 1625-1635

11. Design and Optimization of Piezoresistive Materials Based Microbridge for Electro-osmosis Pressure Sensor

Cite this Research Publication: Girija Sravani K., Sai Lakshmi G., Srinivasa Rao K.

Publisher: Transactions on Electrical and Electronic Materials
doi: 10.1007/s42341-019-00098-7
ISSN: 12297607

Impact factor: 1.6
Vol:20 Issue: 3
pp: 315-327

12. Design, Modeling and Analysis of Perforated RF MEMS Capacitive Shunt Switch

Cite this Research Publication: Rao K.S., Chand C.G., Sravani K.G., Prathyusha D., Naveena P., Lakshmi G.S., Kumar P.A., Narayana T.L.

Publisher: IEEE Access
doi: 10.1109/ACCESS.2019.2914260
ISSN: 21693536

Impact factor: 3.4
Vol:7
pp: 74869-74878

13. Design and Flow Analysis of MEMS based Piezo-electric Micro Pump

Cite this Research Publication: Sateesh J., Girija Sravani K., Akshay Kumar R., Guha K., Srinivasa Rao K.

Publisher: Microsystem Technologies
doi: 10.1007/s00542-017-3563-x
ISSN: 9467076

Impact factor: 1.6
Vol:24
pp: 1609-1614



(DEEMED TO BE UNIVERSITY)



**CATEGORY 1
UNIVERSITY**
BY MHRD, Govt. of India

**KL ACCREDITED BY
NAAC WITH A++
GRADE**

nirf
2024
NATIONAL
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FRAMEWORK

**RANKED 22
AMONG ALL
UNIVERSITIES**

**45 YEARS OF
EDUCATIONAL
LEADERSHIP**