Prof. (Dr.) Kulwant Singh, M. Tech, Ph.D.

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Areas of Expertise: Semiconductor Device Technology, MEMS Sensors, Biosensors, Energy Storage Devices

- More than 8 years of R&D experience in a semiconductor clean room environment from CSIR-CEERI, Pilani Govt. of India and NIT Calicut, for leading-edge semiconductor/MEMS device technology work (wafer cleaning, Thermal oxidation, thin film deposition using PVD/CVD techniques, ion implantation, diffusion process, lithography, dry & wet etching, bulk-micromachining optimization, wafer-level testing, and device packaging).
- More than 12years of teaching experience from different technical Institutions/Universities.
- Strong understanding of VLSI/MEMS device design, fabrication process, and various thin film analysis techniques – AFM, XRD, SEM, EDS, thin-film thickness measurements.
- Proven ability to collaborate with local and overseas teams on projects and good project management skills.
- Ability to travel for extended periods to the R&D site for collaborative R&D work.
- Ability to be self-motivated, responsible, and able to work on a tight schedule when needed.

➢ Ph.D. Supervision: Completed

S. No.	Name	Title
1.	Dr. Meetu Nag	Design and Optimization of Graphene Piezoresistive MEMS Pressure Sensor
2.	Dr. Mahesh Kumar	A microfluidic device for efficient dielectrophoretic separation and sensing of biological cells
3.	Dr. Mona Sharma	Analysis of Solar Photovoltaic Arrays Configuration for Power Enhancement under Partial Shading Conditions
4.	Dr. Himanshu Priyadarshi	State Estimation Technology for Energy Storage Device Management
5.	Dr. Ankur Saxena	Integration of Pressure Sensor Mechanism for Fluid Flow Control in MEMS Microfluidic Device Application
6.	Dr. Monica Lamba	Analytical Study of application specific Piezoresistive MEMS Force Sensor
7.	Dr. Samridhi	Analytical study and performance analysis polysilicon piezoresistive MEMS pressure sensor
8.	Dr. Jayprakash Vijay	Structural and optical gain analysis of nanoscale heterostructures using compound semiconductors
9.	Jai Prakash Mishra	Sea Wave Turbulence Monitoring System using Multiple MEMS Sensors and IoT Technology.

- **Ph.D. Supervision: Ongoing:** Total 6 (Including supervision/co-supervision)

- **Research Projects (PI/Co-PI): -**

1. Project entitled "Microfluidic channel development and integration on flexible substrate material for health care application" Ref:EF/2021-22/QE04-02 **(Rs. 2,87,000)**
2. Project entitled "Synthesis of Graphene Composite for High-Speed Energy Storage Devices for Electrical Vehicle Application" Ref:EF/2021-22/QE04-06 **(Rs. 2,97,400)**
3. Project entitled "Optimization of Self Moisturizing Contact Lens Employing Microfluidic Capillary Mechanism" Ref: DOR/MRB/2023/SG/02 **(Rs, 5,50,000)**
4. Project entitled "Fabrication and characterization of polymer hybrid nanocomposite P(VDF-TrFE) / NdMnO3 / rGO for energy harvesting device" Ref: Pid: P550265665, under INUP program, IIT Bombay funded by MeitY, Govt. of India.
5. Project entitled "Microcantilever integrated microchannel fabrication for microfluidic device application" Ref: Pid: P78376062_5, under INUP program, IIT Bombay funded by MeitY, Govt. of India.

- **List of Patents**

Patent	Title	Filling/ Issue Date	Description/Job details
Indian Patent Application Number: - 202211009425	A Microfluidic Cancer Cell Sorter Device	Filling Date: - 22/02/2022 Publication Date: - 04/03/2022	The present invention relates to a microfluidic cancer cell sorter device for separating cancer cells from blood cells using the dielectrophoresis technique.
Indian Patent Application Number: - 202211077036	System and method for battery state estimation incorporating varied geographical dataset	Filling Date: - 30/12/2022 Publication Date: - 06/01/2023	This patent is on estimation of states corresponding to an energy storage management device using Data-based algorithm.
Indian Patent Application No.202211063668 A	A Method for Synthesis of Gamma Iron Oxide Nanoparticles Using Nano Sedimentation	Filling Date: 08/11/2022 Publication Date: 18/11/2022	A method for the synthesis of gamma iron oxide nanoparticles for producing maghemite electrode using a novel doping-enriched nano-sedimentation technique for energy storage device technology
Indian Patent Application No.202311056369 A	A Novel prediction Approach for Nanoindentation Load-Deformation in a Thin Film Deposited on a Thick Substrate	Filling Date: 23/08/2023 Publication Date: 22/09/2023	This invention correlates the change in materials behavior in presence of misfit strain between the film and the substrate. For the quantification purpose, the inventors have conducted nanoindentation numerical experiment on a Gallium Nitride (GaN) thin film deposited on a thick Sapphire/Silicon substrate to evaluate the load vs deformation in the film. This is important for the electronic industries and devices like MEMS, NEMS, LEDs, etc. as small change in deformation can affect the performance of these devices.
Indian Patent Application No.202311061807 A	A Novel Vision based Method for Detection and Measurement of Surface Anomaly for Life Critical Industrial Applications	Filling Date: 14/09/2023 Publication Date: 20/10/2023	The present invention relates to a novel vision-based method for detection and measurement of surface anomaly for Life Critical Industrial Applications. The monitoring of critical structures/mechanical parts provides the detection of any surface anomaly at its initial stage.
Indian Patent Application No. 202311064100 A	A novel large-scale solar photovoltaic array configuration with enhanced power	Filing Date: 25/09/2023 Publication Date: 13/10/2023	The present invention relates to a novel large-scale solar photovoltaic array configuration with enhanced power generation under partial shading conditions. Present invention proposes a Modified Sudoku configuration to enhance

	generation under partial shading conditions		maximum power of solar photovoltaic arrays. Further invention implements the new prediction method for finding suitable configuration for customizable PV panel installation in solar industries.
Indian Patent Application No. 202311056388 A	Synthesis of poly [(3,4-ethylenedioxy) thiophene]: polystyrene sulfonate (pedot: pss) for energy storage device application	Filing Date: 23/08/2023 Publication Date: 06/10/2023	The present invention specifically relates to a synthesis method of poly [(3,4-ethylenedioxy) thiophene]: polystyrene sulfonate (PEDOT: PSS) for energy storage device application. To increase electrical conductivity, PEDOT/PSS particles were made using a chemical oxidative polymerization process.
Indian Patent Application No. 202311056427 A	A novel process to estimate wave height utilizing microelectromechanical systems (mems), the internet of things (iots), and machine learning (ml)	Filing Date: 23/08/2023 Publication Date: 22/09/2023	The present invention relates to estimate wave height utilizing micro-electromechanical systems MEMS), the internet of things (IoTs), and machine learning (ML). A floating buoy is built with the help of a MEMS inertial measurement unit and an IoT microcontroller. The constructed buoy is put through an experiment where varying wave heights are experienced in real time.
Indian Patent Application No. 202411043143 A	A method for preparation of tire char nanoparticles towards sustainable electrode fabrication technology	Filing Date: 04/06/2024 Publication Date: 14/06/2024	The present invention relates to a novel method to prepare nanoparticles from tire waste. The method comprises a storage tank, a grinding chamber, ultrasonic chamber, a liquid container with stirrer, another ultrasonic chamber for purify the nanoparticles, centrifuge machine, a filter, a vacuum chamber and a mortar employed to obtain the nanoparticles.
Indian Patent Application No. 202411066148	Fabrication of high-performance symmetrical coen cell supercapacitors by using polyla ethylenedioxythiophene): polystyrene sulfonate/magnesium oxide (pedot:pss/moo) composite electrodes	Filing Date: 02/09/2024 Publication Date: 20/09/2024	The present invention relates to a high-performance symmetrical coin cell supercapacitor using PEDOT:PSS/MgO composite electrodes. Nano-MgO was mixed with PEDOT:PSS, dried, ground, and combined with carbon black and PVDF binder to form a slurry. The slurry was applied to copper and aluminum sheets, heated, and assembled into a CR2012 cell. The device achieved 1.3 Wh/kg energy density, 5514 W/kg power density, and powered an Arduino temperature sensor.

➢ Scholarly Publications| Journals

1) Sharma, Arpana Pal, Uvais Valiyaneerilakkal, **Kulwant Singh**, and Dhaneshwar Mishra. "Synergistic interaction of Neodymium Manganite (NdMnO3) nanoparticles and Reduced Graphene Oxide (rGO) to enhance the polar β phase crystallization in P (VDF-TrFE) for piezoelectric applications." *Journal of Alloys and Compounds* 1007 (2024): 176349.
2) Priya darshi, Himanshu, Ashish Shrivastava, Dhaneshwar Mishra, and **Kulwant Singh**. "Iron-ion nanoparticles for smart and cost-effective energy storage cell electrode integration using novel nano-sedimentation method." *IEEE Transactions on Nanotechnology* (2024)
3) Agrawal, Amit, Amit Rai, **Kulwant Singh**, Ankita Bhatt, Ashish Shrivastava, Shubham Tiwari, and Bidyut Mahato. "Implementation of novel full-wave rectifier using second generation current conveyor (CCII)." *Analog Integrated Circuits and Signal Processing* 120, no. 1 (2024): 21-30.
4) Gupta, Shubham, Dhaneshwar Mishra, Suddhendu DasMahapatra, and **Kulwant Singh**. "Integration of silicon nanostructures for health and energy applications using MACE: a cost-effective process." *Nanotechnology* (2024).
5) Goyal, Megha, **Kulwant Singh**, and Nitu Bhatnagar. "Applications of Nanomaterials for Enhanced Performance, and Sustainability in Energy Storage Devices: A Review." *ChemistrySelect* 9, no. 22 (2024): e202400543.

6) Ananthi, S., Himanshu Chaudhary, and **Kulwant Singh**. "Sensitivity enhanced flexible capacitive pressure sensor microstructure optimization for biomedical applications." *Engineering Research Express* 6, no. 2 (2024): 025550.
7) Saxena, Ankur, Mahesh Kumar, and **Kulwant Singh**. "Comparative examine of fluid pressure within microchannel through integrated cantilevers for microfluidic applications." *Materials Today: Proceedings* (2024).
8) Vajire, Sujal Laxmikant, Arya Ranjan, Dhaneshwar Mishra, **Kulwant Singh,** Vimal Kumar Pathak, Ramanpreet Singh, Ashish Kumar Srivastava, Kuldeep K. Saxena, Chander Prakash, and Dharam Buddhi. "Effect of porosity on the stress–strain response of aluminium nanocomposites: a multiscale approach." *International Journal on Interactive Design and Manufacturing (IJIDeM)* 18, no. 3 (2024): 1255-1266.
9) Saxena, Ankur, Mahesh Kumar, Dhaneshwar Mishra, and **Kulwant Singh**. "Optimization of Newtonian fluid pressure in microcantilever integrated flexible microfluidic channel for healthcare application." *Biomedical Physics & Engineering Express* 10, no. 3 (2024): 035015.
10) Sharma, Mona, Smita Pareek, and **Kulwant Singh**. "An efficient power extraction using artificial intelligence based machine learning model for SPV array reconfiguration in solar industries." *Engineering Applications of Artificial Intelligence* 129 (2024): 107516.
11) Goyal, Megha, **Kulwant Singh,** and Nitu Bhatnagar. "Conductive polymers: A multipurpose material for protecting coating." *Progress in Organic Coatings* 187 (2024): 108083.
12) Priyadarshi, Himanshu, Gulzar Ahmed, Dhaneshwar Mishra, Ashish Kumar Srivastava, Randolph McGee, Ashish Shrivastava, and **Kulwant Singh**. "Sustainable graphene-based energy storage device technology: Materials, methods, Monitoring and digital twin." *Critical Reviews in Solid State and Materials Sciences* (2024): 1-34.
13) Yadav, Supriya, **Kulwant Singh**, Anmol Gupta, Mahesh Kumar, Niti Nipun Sharma, and Jamil Akhtar. "Structural analysis of paper substrate for flexible microfluidics device application." *Microelectronics International* 41, no. 1 (2024): 48-55.
14) Goyal, M., **Singh, K**. and Bhatnagar, N., 2023. Circular economy conceptualization for lithium-ion batteries-Material procurement and disposal process. *Chemical Engineering Science*, p.119080.
15) Saxena, A., Kumar, M., Mishra, D. and **Singh, K**., 2023. An efficient microfluidic pressure sensing structure optimization using microcantilever integration. *Physica Scripta*, 98(5), p.055006.
16) Yadav, S., **Singh, K.,** Gupta, A., Sharma, N.N. and Akhtar, J., 2023. Influence of inter and intra cellulose fibres in paper substrate for flexible microfluidic channel integration. Surface Review and Letters.
17) Mishra, J.P., **Singh, K.** and Chaudhary, H., 2023. Analyzing the effectiveness of MEMS sensor and IoT in predicting wave height using machine learning models. Measurement Science and Technology, 34(7), p.075904.
18) Sharma, M., Pareek, S. and **Singh, K.,** 2023. Robust reconfiguration strategies for maximum output power from large-scale photovoltaic arrays under partial shading conditions. *Physica Scripta*.
19) Goyal, M., Agarwal, S.N., **Singh, K**. and Bhatnagar, N., 2023. Synthesis and characterization of poly [(3, 4-ethylenedioxy) thiophene]: polystyrene sulfonate (PEDOT: PSS) for energy storage device application. Journal of Applied Polymer Science, p.e53830.
20) Mishra, J.P., **Singh, K.** and Chaudhary, H., 2023. Research advancements in ocean environmental monitoring systems using wireless sensor networks: a review. TELKOMNIKA (Telecommunication Computing Electronics and Control), 21(3), pp.513-527.
21) Kumar, M., Vasage, A., Kulkarni, G., Padhye, O., Kerkar, S., Gupta, M. and Singh, K., 2023. Calibration and optimization of FSR based smart walking assistance device. Engineering Research Express, 5(2), p.025016.
22) Agarwal, S.N., Shrivastava, A. and **Singh, K**., 2023. Synthesis Technique of Graphene Composite for Energy Storage Devices. Journal of Mines, Metals & Fuels, 71(4).
23) Goyal, M., **Singh, K.,** Bhatnagar, N., Shrivastava, A. and Agarwal, S.N., 2023. Electrolyte in Sodium-ion Battery-Modelling and Simulation. Journal of Mines, Metals & Fuels, 71(4).
24) Ananthi, S., Chaudhary, H. and **Singh, K**., 2023. Sensitivity Analysis of Micro-Structured Dielectric Layer of Capacitive Pressure Sensors for Flexible Electronics Applications. Journal of Mines, Metals & Fuels, 71(4).
25) Saxena, A., Kumar, M. and Singh, K., 2023. Analytical Study of 2D Integrated Microcantilever Pressure Sensing of Fluid for Healthcare Application. Journal of Mines, Metals & Fuels, 71(4).

26) Vajire, S.L., Singh, A.P., Saini, D.K., Mukhopadhyay, A.K., **Singh, K**. and Mishra, D., 2022. Novel Machine Learning-based Prediction Approach for Nanoindentation Load-Deformation in a Thin Film: Applications to Electronic Industries. Computers & Industrial Engineering, p.108824.
27) Peethan, A., Pais, M., Rao, P., **Singh, K**. and George, S.D., 2022. Wettability tailored superhydrophobic and oil-infused slippery aluminium surface for improved anti-corrosion performance. Materials Chemistry and Physics, 290, p.126517.
28) Kumar, A., Devi, M., Kumar, M., Shrivastava, A., Sharma, R., Dixit, T., Singh, V., Shehzad, K., Xu, Y., **Singh, K**. and Hu, H., 2022. Silicon Nanostructures and Nanocomposites for Antibacterial and Theranostic Applications. *Sensors and Actuators A: Physical*, p.113912.
29) Lamba, M., Chaudhary, H., **Singh, K.,** Keshyep, P., & Kumar, V. (2022). Graphene piezoresistive flexible MEMS force sensor for bi-axial micromanipulation applications. Microsystem Technologies, 1-13.
30) Priyadarshi, H., **Singh, K**., & Shrivastava, A. (2022). Experimental study of maghemite nanomaterials towards sustainable energy storage device application. Materials Science in Semiconductor Processing, 147, 106698.
31) Valiyaneerilakkal, U., Cherumannil Karumuthil, S., **Singh, K**., Bhanuprakash, L., Komaragiri, R., & Varghese, S. (2021). High-performance P (VDF-TrFE)/BaTiO3 nanocomposite based ferroelectric field effect transistor (FeFET) for memory and switching applications. Nano Select, 2(12), 2400-2406.
32) Agrawal, A., Shrivastava, A., Singh, K., Mahato, B., Tiwari, S. and Rai, A., 2022. SEPIC converter in discontinuous conduction mode: Small signal modeling and analysis. International Journal of Circuit Theory and Applications, 50(2), pp.633-652.
33) Kumar, M., Kumar, A., George, S.D. and **Singh, K**., 2021. A novel microfluidic device with tapered sidewall electrodes for efficient ternary blood cells (WBCs, RBCs and PLTs) separation. Measurement Science and Technology, 32(11), p.115106.
34) Tiwari, P., Sharan, S. N., **Singh, K**., & Kamya, S. (2021). Content based image retrieval using multi-level 3D color texture and low level color features with neural network based classification system. International Journal of Circuits, Systems and Signal Processing, 15, 265-270.
35) Gupta, S. and **Singh, K**., 2021. Analysis of a Markov chain system model of a power generating system composed of generating units and transformer units. Life Cycle Reliability and Safety Engineering, 10, pp.273-283.
36) Kumar, M., Palekar, N., Kumar, A. and **Singh, K**., 2020. Optimized hydrodynamic focusing with multiple inlets in MEMS based microfluidic cell sorter for effective bio-cell separation. Physica Scripta, 95(11), p.115005.
37) M Lamba, H Chaudhary, **K Singh**, Optimized Analysis of Sensitivity and Non-Linearity for PDMS–Graphene MEMS Force Sensor, IETE Journal of Research, 1-15 (2020)
38) Samridhi, M Kumar, **K Singh**, S Kumar, PA Alvi, Understanding vibrant behaviour of Si-circular diaphragm for low-pressure measurement, International Journal of Modern Physics B 34 (19), 2050174 (2020)
39) Samridhi,**Singh, K.** and Alvi, P.A., 2020. Influence of the pressure range on temperature coefficient of resistivity (TCR) for polysilicon piezoresistive MEMS pressure sensor. Physica Scripta, 95(7), p.075005.
40) Nag, M., Singh, J., Kumar, A. and **Singh, K**., 2020. A high sensitive graphene piezoresistive MEMS pressure sensor by integration of rod beams in silicon diaphragm for low pressure measurement application. Microsystem Technologies, 26, pp.2971-2976.
41) Sharma, M., **Singh, K**., Kumar, S. and Alvi, P.A., 2020. Analytical study of graphene as a novel piezoresistive material for MEMS pressure sensor application., Journal Of Nano- And Electronic Physics 12 (No 2), 02001 (2020)
42) M Lamba, N Mittal, **K Singh,** H Chaudhary, Design analysis of polysilicon piezoresistors PDMS (Polydimethylsiloxane) microcantilever based MEMS Force sensor, International Journal of Modern Physics B 34 (09), 2050072 (2020)
43) SC Karumuthil, **K Singh**, U Valiyaneerilakkal, J Akhtar, S Varghese, Fabrication of poly (vinylidene fluoride-trifluoroethylene)–Zinc oxide based piezoelectric pressure sensor, Sensors and Actuators A: Physical 303, 111677 (2020)
44) M Nag, J Singh, A Kumar, PA Alvi, **K Singh,** Sensitivity enhancement and temperature compatibility of graphene piezoresistive MEMS pressure sensor, Microsystem Technologies 25 (10), 3977-3982 (2019)
45) Mahesh Kumar, Supriya Yadav, Ashish Kumar, Niti Nipun Sharma, Jamil Akhtar, **Kulwant Singh**, MEMS impedance flow cytometry designs for effective manipulation of micro entities in health care applications, Biosensors and Bioelectronics 142, 111526 (2019)

46) Samridhi, M Kumar, S Dhariwal, **K Singh**, PA Alvi, Stress and frequency analysis of silicon diaphragm of MEMS based piezoresistive pressure sensor, International Journal of Modern Physics B 33 (07), 1950040, (2019)
47) U Valiyaneerilakkal, A Singh, CK Subash, **K Singh**, SM Abbas, Soney Varghese, Preparation and characterization of poly (vinylidene fluoride-trifluoroethylene)/barium titanate polymer nanocomposite for ferroelectric applications, Polymer Composites 38 (8), 1655-1661 (2017)
48) S C K, V Uvais, **K Singh**, S Varghese, Device level optimization of poly (vinylidene fluoride-trifluoroethylene)–zinc oxide polymer nanocomposite thin films for ferroelectric applications, Journal of Applied Physics 118 (20), 204102 (2015)
49) S C K, V Uvais, **K Singh**, S Varghese, Device level optimization of poly (vinylidene fluoride-trifluoroethylene)–zinc oxide polymer nanocomposite thin films for ferroelectric applications, Journal of Applied Physics 118 (20), 204102 (2015)
50) **K Singh**, S Kumar, R Joyce, R Saha, S Varghese, J Akhtar, Influence of grains and surface roughness in boron and phosphorus implanted LPCVD polycrystalline silicon thin film, Microsystem Technologies 21 (9), 1987-1994 (2015)
51) R Joyce, **K Singh**, S Varghese, J Akhtar, Effective cleaning process and its influence on surface roughness in anodic bonding for semiconductor device packaging, Materials Science in Semiconductor Processing 31, 84-93 (2015)
52) **K Singh**, S Varghese, J Akhtar, Ultra uniform arrays of micro patterns on large area substrate by employing wet chemical etching, Materials Science in Semiconductor Processing 31, 351-357 (2015)
53) **K Singh**, R Joyce, S Varghese, J Akhtar, Fabrication of electron beam physical vapor deposited polysilicon piezoresistive MEMS pressure sensor, Sensors and Actuators A: Physical 223, 151-158 (2015)
54) R Joyce, **K Singh**, S Varghese, J Akhtar, Stress reduction in silicon/oxidized silicon–Pyrex glass anodic bonding for MEMS device packaging: RF switches and pressure sensors, Journal of Materials Science: Materials in Electronics 26 (1), 411-423 (2015)
55) **K Singh**, J Akhtar, S Varghese, Multiwalled carbon nanotube-polyimide nanocomposite for MEMS piezoresistive pressure sensor applications, Microsystem technologies 20 (12), 2255-2259 (2014)
56) U Valiyaneerilakkal, A Singh, **K Singh**, CK Subash, SM Abbas, Rama Komaragiri, and Soney Varghese, Ferroelectric characteristics of MFIS structure with P(VDFTrFE)/BaTiO3 nanocomposite as ferroelectric layer, Applied Physics A 117 (3), 1535-1540 (2014)
57) **K Singh**, R Joyce, S Varghese, J Akhtar, A new method for fast anodic bonding in microsystem technology, Microsystem technologies 20 (7), 1345-1349 (2014)
58) Joyce, R., **Singh, K.,** Sharma, H., Varghese, S. and Akhtar, J., 2014. Low cost anodic bonding for MEMS packaging applications. Microsystem technologies, 20, pp.1153-1158.
59) Kumar, V., Akhtar, J., **Singh, K.,**& Maan, A. S. (2012). Simulation Based Analysis of Temperature Effect on Breakdown Voltage of Ion Implanted Co/n-Si Schottky Diode. Journal of Nano-& Electronic Physics, 4(4).
60) N Yadav, **K Singh**, A Gupta, Development of Analog SPICE Behavioral Model of PCI Buffer Based on IBIS Model. IUP Journal of Science & Technology 7 (1), (2011)
61) **K Singh**, SK Gupta, A Azam, J Akhtar, A wet-etch method with improved yield for realizing polysilicon resistors in batch fabrication of MEMS pressure sensor, Sensor Review (2009)

➢ Scholarly Publications| Book chapters (Selected)

1. Yadav, Supriya, **Kulwant Singh**, Suddhendu DasMahapatra, and Dhaneshwar Mishra. "Nanofluidics and emerging concepts in microfluidic devices." *Utilizing Microfluidics in the Food Industry* (2025): 113-122.
2. Mishra, Dhaneshwar, Harsha Pandey, and **Kulwant Singh**. "Nanoindentation Modeling of Materials Using Finite Element Method." In *Deformation and Fracture in Materials*, pp. 206-217. CRC Press, 2025
3. Mishra, Dhaneshwar, Harsha Pandey, and **Kulwant Singh.** "10 Nanoindentation of Materials Using Modeling Finite." *Deformation and Fracture in Materials: Advances in Experimental and Numerical Studies* (2024): 206.

➢ Scholarly Publications | Conferences (Selected)

1. Saxena, Ankur, Vimal Kumar Agrawal, Mahesh Kumar, and **Kulwant Singh**. "Comparative analysis of microcantilever MEMS switch designs utilizing electrostatic actuation method." In *AIP Conference Proceedings*, vol. 3156, no. 1. AIP Publishing, 2024.

2. Kumar, Mahesh, Jiya Sharma, Ankur Saxena, Prabh Deep Singh, and **Kulwant Singh**. "Automated multi axis depth controlled drilling machine." In *AIP Conference Proceedings*, vol. 3156, no. 1. AIP Publishing, 2024.
3. Sharma, Mansi, Prabh Deep Singh, **Kulwant Singh**, and Mahesh Kumar. "A hybrid analytical machine learning method for identification and counting of biological cells." In *AIP Conference Proceedings*, vol. 3156, no. 1. AIP Publishing, 2024.
4. Kumar, Mahesh, Anmol Gupta, Ashish Kumar, and Kulwant Singh. "Coplanar semi-circular electrodes based multi-microchannel microfluidic network device for binary bio-cell separation." *Materials Today: Proceedings* 79 (2023): 254-259.
5. Mishra, Jai Prakash, Kulwant Singh, and Himanshu Chaudhary. "Recent advancement of AI technology for underwater acoustic communication." In *AIP Conference Proceedings*, vol. 2752, no. 1. AIP Publishing, 2023.
6. Kumar, Mahesh, Anmol Gupta, Abhikrishn Mishra, Ankur Saxena, Ashish Kumar, and Kulwant Singh. "Electrode optimization for improved dielectrophoretic separation of microparticles." In *AIP Conference Proceedings*, vol. 2752, no. 1. AIP Publishing, 2023.
7. Sharma, Arpana Pal, Ankur Saxena, Uvais Valiyaneerilakkal, and Kulwant Singh. "Simulation study of triboelectric material with different combination of polymers for energy harvesting application." In *AIP Conference Proceedings*, vol. 2752, no. 1. AIP Publishing, 2023.
8. Alam, Md Shahbaz, Suddhendu Das Mahapatra, Kulwant Singh, Amit Agrawal, and Ashish Srivastava. "Modelling of digital differential over-current relay for power transformer." In *American Institute of Physics Conference Series*, vol. 2752, no. 1, p. 080005. 2023.
9. Ananthi, S., Himanshu Chaudhary, and Kulwant Singh. "Parameter optimization of MEMS capacitive pressure sensor for higher sensitivity." In *AIP Conference Proceedings*, vol. 2752, no. 1. AIP Publishing, 2023.
10. Yadav, Supriya, Anmol Gupta, Kulwant Singh, Jamil Akhtar, and Niti Nipun Sharma. "Analysis of fluid transport on porous material for flexible microfluidic device applications." In *AIP Conference Proceedings*, vol. 2752, no. 1. AIP Publishing, 2023.
11. Tatraiya, Pratham, Himanshu Priyadarshi, Kulwant Singh, Dhaneshwar Mishra, and Ashish Shrivastava. "Applicative Analysis Of Activation Functions For Pneumonia Detection Using Convolutional Neural Networks." In *2023 IEEE IAS Global Conference on Emerging Technologies (GlobConET)*, pp. 1-8. IEEE, 2023.
12. Kumar, Mahesh, Nikhil Palekar, Ashish Kumar, Ashish Shrivastava, and Kulwant Singh. "Influence of interdigitated electrode-gap width ratio on efficient separation trajectories of blood cells in a microfluidic device." In *2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)*, pp. 1045-1048. IEEE, 2021.
13. Saxena, Ankur, Mahesh Kumar, Anmol Gupta, Ashish Shrivastava, and Kulwant Singh. "Optimization of Microfluidic Pressure Sensing Mechanism Integrated Microcantilever in Microchannel." In *2021 International Conference on Recent Trends on Electronics, Information, Communication & Technology (RTEICT)*, pp. 361-365. IEEE, 2021.
14. Priyadarshi, Himanshu, Kulwant Singh, and Ashish Shrivastava. "Insolation prediction for reliable energy storage using deep learning algorithms." In *2021 International Conference on Recent Trends on Electronics, Information, Communication & Technology (RTEICT)*, pp. 416-419. IEEE, 2021.
15. Priyadarshi, Himanshu, Gulzar Ahmed, Kulwant Singh, and Ashish Shrivastava. "Two-dimensional Modeling and Analysis of Lithium-ion Cell for Electric Vehicle Application." In *2021 4th International Conference on Recent Developments in Control, Automation & Power Engineering (RDCAPE)*, pp. 548-552. IEEE, 2021.
16. Goyal, M., S. N. Agarwal, K. Singh, A. Shrivastava, and N. Bhatnagar. "A review: conductive polymer-based aluminium current collector for Li-ion batteries." 5.
17. Singh, Kulwant, and P. A. Alvi. "Influence of Pressure on TCR of Polysilicon Piezoresistive Sensor." In *2020 International Conference on Emerging Trends in Communication, Control and Computing (ICONC3)*, pp. 1-3. IEEE, 2020.
18. Nag, Meetu, Ajay Kumar, Kulwant Singh, and Bhanu Pratap. "Graphene based flexible piezoresistive pressure sensor for electric vehicles applications." In *AIP Conference Proceedings*, vol. 2294, no. 1. AIP Publishing, 2020.

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➢ Details of Devices/instruments already developed in the past

1) Prototype development of multifunctional MEMS pressure sensor with cost-effective technology
2) Anodic bonding instrument for MEMS device packaging (Commercialized by Solidblocks Semiconductor Solutions Pvt. Ltd)