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Department of Mechanical Engineering

R.V.R. & J.C. College of Engineering, Guntur-522019

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Contents

- ✓ Research Projects in Progress from Govt. Bodies
- ✓ Industrial Research Projects in Progress
- ✓ Research Paper Publications
- ✓ Guest Lecture Delivered
- ✓ Paper Presentations in Conferences
- ✓ Book Chapter published
- ✓ NPTEL Certification Courses Completed
- ✓ Workshops/FDP's Attended
- ✓ Ph.D Awarded Under Faculty Guidance
- ✓ Industrial Tour

Digital Twins, IoT & Smart Mechanical Systems — When Machines Become Intelligent

The mechanical world is entering a new digital era where machines are no longer just moving parts — they can now sense, learn, and respond. This transformation is driven by two key innovations: the Digital Twin and the Internet of Things (IoT), together forming the backbone of smart mechanical systems.

What it is:

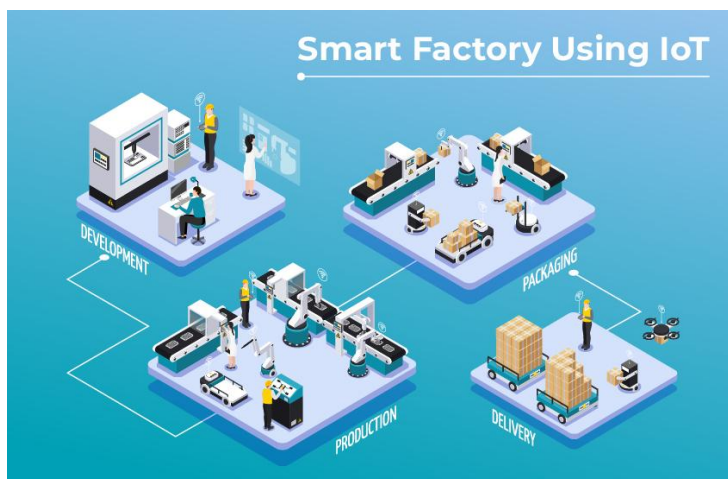
A **Digital Twin** is a **virtual replica** of a real mechanical component, such as an engine, turbine, or robotic arm.

Through **IoT sensors**, the real system constantly sends live data (temperature, vibration, stress, etc.) to its digital counterpart.

Engineers then use this twin to **simulate, monitor, and predict** how the machine will perform — without interrupting real operations.

Why it matters:

- ✚ In manufacturing, smart systems reduce downtime, optimize processes, and improve efficiency.
- ✚ For mechanical engineers, this means blending traditional ME skills (structures, thermodynamics, design) with sensors/data analytics.
- ✚ This is aligned with your interest in drones/object detection: smart systems, sensor-integration, real-time data.



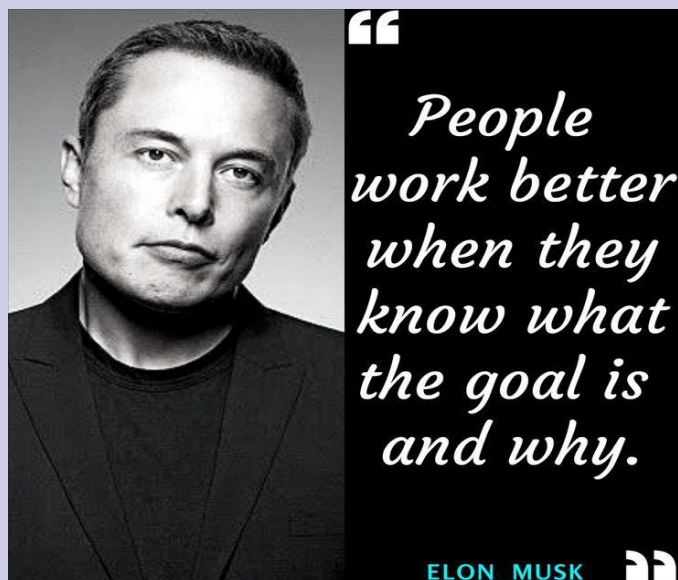
Closing Thought:

As technology evolves, mechanical systems are becoming partners in innovation rather than mere tools.

By combining engineering with intelligence, the next generation of mechanical engineers will build machines that truly think, adapt, and communicate.

Research Projects in Progress from Govt. Bodies

- AICTE project of Prof. V. Chittaranjan Das, and Dr. K. Praveen Kumar on 'Synthesis and Characterization of MWCNT/UHMWPE Nanocomposites for Orthopedic Applications' is in progress.
- A DST-AMT project of Dr. K. Sobha and Dr. S. Radhika on 'Wound Dressing Material Containing Copper Coated Cotton Fabrics and Piezoelectric Electrospun Biopolymer Nano-Fibrous Composites' is in progress.



Industrial Research Projects in Progress

- Research project on 'Mechanical and Electrical Behaviour of Boron & Vanadium Doped Fe-6.5 (Wt. %) Si Soft Magnetic Alloy Ribbons Fabricated by Direct Powder Rolling' of K.Ravindra, V.Chittaranjan Das, K.Praveen Kumar is in completed.
- Research project on 'Improvement of COP of air-conditioning systems by using different types of insulations and nano-compressor oil' of N.V.V.S.Sudheer, B.Ramgopal Reddy, V.Tarachand, and Md.Hasheer is completed.
- Research project on 'Investigation on performance improvement methods of the transformer using nanofluids in the perspective of cooling of G.Srinivasarao, C.Srinivas, K.Balaprasad, N.Govind, and Sneha.H.Dhoria is completed.
- Research project on 'Evaluation and optimization of process parameters for agitation in concrete mixing' of C.Tarasasanka, S. Radhika, and J.P.Karthik is in progress.
- Research project on 'Development and characterization of boron & vanadium doped Fe-6.5(Wt. %) soft magnetic alloy ribbons with TiO₂ coatings' by K.Srinivas, D.V.V.Krishnaprasad, G.Chaitanya, V. Ramakoteswararao, J.Rangaraya Chowdary is completed.

- Research project on 'Influence of heat treatment on the characterization of alumina reinforced AZ91 Mg alloy metal matrix composites' of Ch.Devaraj, M.Vijaya, A.Muddu, G. Kishore Chowdari, and K.Hari Prasad is completed.
- Research project on 'Optimization of selective laser melting (SLM) process parameters using Taguchi and super ranking concepts to produce Ti-6Al-4V alloy samples' of R.Sreenivasulu, D.Swapna, K.L.Chaitanya, D.Kondalarao, Y.N.V.Sairam, T.N.S.Ramakrishna is completed.

Research Paper Publications

- Md. Hasheer, K. Srinivas, Y.N.V. Sairam, 'Exploring low-GWP refrigerants for enhanced domestic refrigerator performance: A comprehensive investigation, Journal of Thermal Engineering, 11(1), pp. 40–48, Jan, 2025 <https://doi.10.14744/thermal.0000902>
- Yamini Tamminana, Vijay Muditana, Jarubula Ranga Raya Chowdary, Palavalasa Rohini Kumar, Tara Sasanka C, Sneha. H. Dhoria, "Enhancing the Mechanical Performance of Al6061/Graphite Composites Reinforced with Sic and Aluminium Oxide Processed by Stir Casting", Journal of Polymer and Composites. Jan. 2025; 13(02):66-74. (Web of Science).
- G.Srinivasarao, V. Tarachand, T. K. Nagaraja, Harish Hanumanthappa, D. Kondalarao, M. Usha. 'Experimental investigation of herbal based Al₂O₃ nano cutting fluids with minimum quantity lubrication in optimization of turning, International Journal on Interactive Design and Manufacturing, 1-13, Jan.2025 (WOS).
- D.Deepthi, Kamineni B.T.Sundari, B.Satish Babu, K.Thiriochana, A.Mahalakshmi, Sneha.H.Dhoria, "Leveraging Count Vectorizer for Job Title Prediction: A Comparative Study of Machine Learning Algorithms", Journal of Theoretical and Applied Information Technology, 103(5), March, 2025. (Scopus)
- Srinivas Chandanam, Ramgopal Reddy Bijjam, N. V. V. S. Sudheer, Rognatha Rao Dasi, 'Optimizing the Mechanical Properties of AS21 Magnesium Alloy/SiC-TiO₂ Hybrid Composites by Taguchi Method', Revue des Composites et des Matériaux Avancés-Journal of Composite and Advanced Materials, 35(1), 105 - 116, 2025 (ESCI/SCOPUS).
- Mallapuram Bala Chennaiah, G. Dilli Babu, K. Dilip Kumar, Reddy Sreenivasulu, Tarunika Sharma, A. Somaiah, R.Meenakshi Reddy, Nishant Kumar, "Effect of wear and frictional force on Al6063-T6 with magnesium and zinc

oxide nanoparticles", Innovation and Emerging Technologies, 12, pp. 2440016-1 to 2440016-7, June 2025. <https://doi.org/10.1142/S2737599424400164> (WOS, SCOPUS).

✚ J.Ravindra Babu, V.Venkataiah, T. Lakshmi Narayana, Ch.Ranga rao, Ch. Deva raj, R.C.H.S.N.P.Sairam, B.Anusha,"Analyzing the Effectiveness of ML and DL in Combatting Personal Condition Misinformation on Social Media", IAENG International Journal of Computer Science, 52(1), 258-267, Jan.2025. (Scopus).

✚ Ch.Srinivasa Rao, G. Vijay Kumar, V.Ananda Babu, G. Chaitanya, "Advances in Hybrid Nanocomposites for Solar Applications and Photo Catalysis: A Comprehensive Review", SSRG International Journal of Electrical and Electronics Engineering, 12(4), 143-154, April 2025. <https://doi.org/10.14445/23488379/IJEEE-V12I4P110>.

✚ Satish Kumar Patnala, K Suresh Kumar, Killi Bhushan Rao, K Praveen Kumar, Venkata Anusha Kolluru, Parimila Garnepudi, Shaik Mahaboob Basha, Ravi Kumar Munaganuri, Mamatha Maddu, & Narasimha Rao Yamarthi, "Recognition of Objects Using Fast RCCN Hybrid Particle Swarm Firefly Algorithm", Journal of Image and Graphics, 13(3), 293-303, June 2025. <https://doi.org/10.18178/joig.13.3.293-303>.

✚ K.Sivakrishna, Gowrisankar Kalakoti, N.Krishnaveni, Neeraj Shrivastava, Nagendar Yamsani, K.Praveen Kumar, "Optimization of Electric Vehicle Charging or Discharging Scheduling and Energy Storage in Multi-Objective Market Transactions based on Quantum Genetic Algorithm", 10(23s), 593-604,2025. <https://doi.org/10.52783/jisem.v10i23s.3758>.

✚ Yellapragada Naga Venkata Sairam, Mohammad Hasheer Shaik, Rohini Kumar Palavalasa, Medikonduru Maithili Saisree, "Preparation and Experimental Investigation of Lanthanum Hexa-Aluminate Calcinated Powders", Annales de Chimie. Science des Materiaux, International Information and Engineering Technology Association, 49(1), 2025. <https://doi.org/10.18280/acsm.490109> (WOS, SCOPUS).

✚ J.P.Karthik, C. Tara Sasanka, A. Muddu, C. M. Raguraman, D. Sameer Kumar. "Rheological and stability behavior of coal-water slurry: the impact of pH with dual-impeller configurations", International Journal of Coal Preparation and Utilization, May, 2025. <https://doi.org/10.1080/19392699.2025.2505453>.

✚ Sneha H Dhoria, D. Madhavi, K. Nagalakshmi, Shaik Jani Basha, A.Muddu," advancements in Al6061 metal matrix composites: The Role of SiC, Al₂O₃, and Graphite

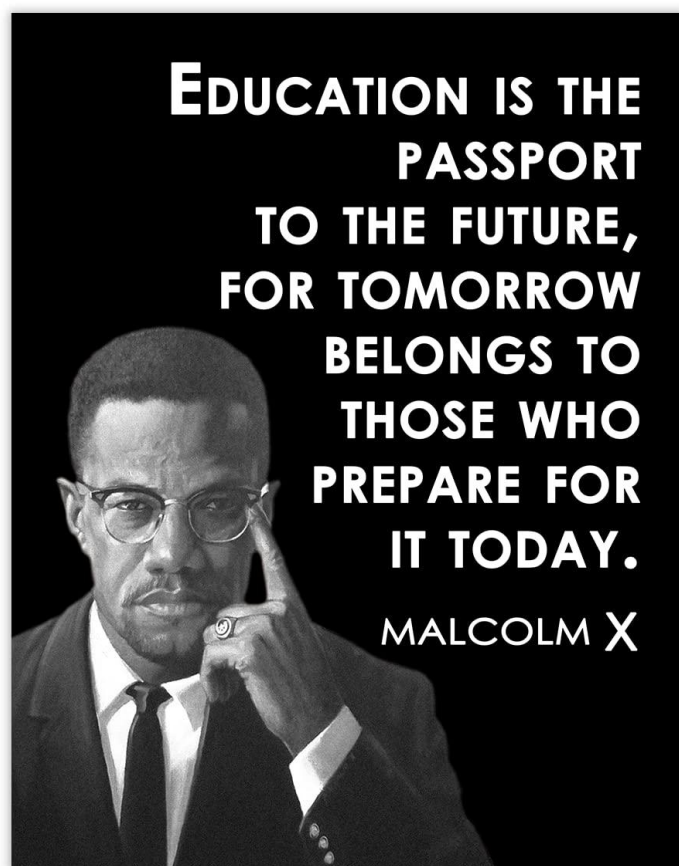
reinforcements in enhancing properties and Applications", Journal of Polymer and Composites, 13(03),90-98, April,2025.(WOS)

✚ Sneha.H.Dhoria, K.Venkata Subbaiah, V.Durga Prasada Rao," Experimental investigation of wire EDM on squeeze cast Al6351/Gr/SiC hybrid metal matrix composites: A Taguchi–GRA-based optimization framework", AIP Advances 15,045317, April, 2025. [https://doi.org/10.1063/5.0267581\(SCIE\)](https://doi.org/10.1063/5.0267581(SCIE)).

✚ A.Manoj Kumar, G.Rakesh, D.Shiva Kumar choudary, J.Ranga Raya Chowdary, "Optimization of Dry Sliding Wear Parameters of Aluminium Reinforced Hybrid Composite Materials with Silicon Carbide and Graphene Using Taguchi and Regression Analysis", International Journal of Scientific Research in Engineering and Management, Vol: 9(6), June 2025.

✚ G.Srinivasa Rao, M.Arun Kumar, P.Sharmila, D.Umesh, "evaluation of wear properties of al 7075 alloy reinforced with herbal extracted sic", IJARIE,2025.

✚ R.Siva Adithya, S.Ravi Teja, Y.Dhanunjaya, Sk.Mohammed Hasheer," Thermodynamic Evaluation of R513A as replacement for R134a in Vapor Compression Refrigeration system", International journal of Research Publication and Reviews, Vol.6(6), 2896-2899, June 2025.



Guest Lecture Delivered

- ✚ G. Chaitanya, 'Intellectual Property Rights and their Commercialization, and A. Muddu, 'Recaping of innovation Basics for Entrepreneur Development', Innovation, Design, Entrepreneurship Boot camp at R.V.R&J.C College of Engineering, AICTE and ministry of Educations Innovation cell, 19, Feb.2025.
- ✚ J.P.Karthik, "3D printing technology", Smart Manufacturing: AI Enabled Drones and 3D Printing", Narayana Engineering College, 10, July, 2025.

Paper Presentations in Conferences

- ✚ M. Durga Naidu, Reddy Sreenivasulu, Shaik Abdul Rehaman and V. Vital Paul, 'Combination of CNC End Milling Parameters to Optimize Chip Thickness Using Taguchi Approach' at the International Conference on Advances in Civil and Mechanical Engineering (ICACME-2025), Sant Gajanan Maharaj College of Engineering, Mahagaon, during 02–04 April 2025.
- ✚ Sneha H. Dhoria, 'A Comparative study of machine learning models for predicting single bead geometry of Inconel 625 deposits using WAAM process' at the 3rd International Conference on Recent Advancements in Mechanical and Industrial Engineering–2025, Department of Mechanical Engineering, PVPSIT, during 08–09 May 2025.
- ✚ Sneha. H. Dhoria, 'Multi-objective optimization of WAAM process parameters using integrated GRA-PCA for mild steel using GMAW' at the 3rd International Conference on Recent Advancements in Mechanical and Industrial Engineering–2025, Department of Mechanical Engineering, PVPSIT, during 08–09 May 2025.
- ✚ Sneha. H. Dhoria, 'Leveraging Term Frequency Inverse Document Frequency for Job Title Prediction: A Comparative Study of Machine Learning Algorithms' at the First International Conference on Machine Intelligence and Data Science, Department of Computer Science and Engineering, School of Engineering & Technology, Centurion University of Technology and Management, Odisha, during 21–22 March 2025.
- ✚ Sneha H. Dhoria, 'Multi-Criteria Optimization of Process Parameters of WEDM of Al6351/Sic/Gr MMC using AHP-TOPSIS approach' at the 2nd International Conference on Materials and Energy Sciences, Department of Mechanical Engineering, Adithya University, during 21–22 March 2025.

- ✚ Y.Krishna, Y.N.V.Sairam, K.Rishi, S.Sai babu, "Experimental Characterisation of stir cats AA6061-LHA composites selected via TOPSIS technique", International conference on Advancements and Future Trends in collaborative Technologies: Engineering, Social Sciences, Humanities and Management, Sambhram Institute of Technology, 24 may,2025.
- ✚ J.V.Kushal, K.Jeevan Ratnam, T.Sai, N.V.V.S.Sudheer, "Experimental study on effect of condenser air temperature on COP of R32 Refrigerant in a 1.5 ton Split AC", International conference on Advancements and Future Trends in collaborative Technologies: Engineering, Social Sciences, Humanities and Management, Sambhram Institute of Technology, 24 May,2025.
- ✚ P.Krishna Prakash, M.Narendra reddy, S.L.N.Rohith Kumar, C.Srinivas, "Investigating the effect of NaOH on mechanical properties of Coir and jute fiber reinforced polymer composites", International research journal of Modernization in Engineering Technology and Science, June 2025.
- ✚ Y.Naveen Kumar, K.Thanoj Kumar, Sk.Ajmitulla, S.Radhika,"Friction surfacing of AA5083 on AA7085: Influence of process parameters on Mechanical properties", IJARIE, Vol: 1(3), 3779-3784, June, 2025.
- ✚ R.Manideep, Sk.Kranthi, P.Dinesh, N.Govind, "Design and fabrication of a belt grinder", International journal of Modernization in Engineering Technology and science, Vol:7(4), April,2025.
- ✚ Reddy Sreenivasulu, M.Durga Naidu, Sk.Abdul Rehaman, V.Vital Paul, " Combination of CNC end milling parameters to optimize chip thickness using Taguchi Approach", ICACME, Sant Gajanan Maharaj College of Engineering,02-04, April,2025.
- ✚ P.Suresh Kumar, Y.Hemanth Kumar, P.Abdul Khadar. M.Sai Ajay Kumar," Autonomous Enabled smart Agricultural robot", International journal of Advance scientific research and Engineering trends, 9(6), June,2025.
- ✚ K. Kondala rao, P.Balaji, M.Sree Krishna, Sk. Sameer, "Development of the fire Fighting robot", International journal of Applied Science Engineering and Management,19(2),april,2025.



Book Chapters Published

- ✚ Sneha.H.Dhoria, Y.Madhavi, K.Sobha, "Industry 4.0 Based Approaches for Fabrication, Processing and Testing of Metal Matrix Composites", Fundamentals and Advances in Metal Matrix Composites, CRC Press, eBook ISBN: 9781003499718, 181-195, 2025.
- ✚ Kota Sobha, K. Lakshmi Chaitanya, Ratnakumari Anantha, and Sneha H. Dhoria. "3D Printing of Bio-organs: Materials, Methods and Future Prospects." In Challenges and Innovations in 3D Printed Bio-Organs and Their Materials, pp. 67-109. Springer, Cham, 2025, https://doi.org/10.1007/978-3-031-90807-1_3
- ✚ Richa Khare, P.Suresh Kumar, A. Chinnasamy, R.Hemalatha, G.Shashibhushan, B.Sampath, 'Energy case cade conversion system and Energy efficient infrastructure: Experimentation, Results, and Discussion and Case studies', CH006 - IGI GLOBAL- publisher, <https://doi.org/10.4018/979-8-3693-0492-1>
- ✚ Jarubula Ranga Raya Chowdary, Abdul Sattar Kajavali and Veeravalli Ramakoteswara Rao, "Processing, Properties and Applications of Metal Matrix Composites", Fundamentals and Advances in Metal Matrix Composites, CRC press, ISBN: 9781003499718.

NPTEL Certification Courses Completed

- ✚ Y.N.V Sairam, NPTEL Online certification (12 week), 'Data Analytics with Python' IIT Roorkee, Jan-Apr 2025.

Workshops/FDP's Attended

- ✚ K.Praveen Kumar, V.Ramakoteswara Rao, C. Tarasasanka, ATAL FDP, 'Importance of Artificial Intelligence in

Robotics', Indian Institute of Information Technology Design and Manufacturing Kurnool 20-25, Jan. 2025.

- ✚ J.Rangaraya Chowdary, Sneha.H.Dhoria, A.Muddu, online FDP, AICTE, 'Introduction to Generative AI Models and Applications', Dept. of CSE, RVRJCCE, 20 - 25 Jan, 2025.
- ✚ G.Srinivasarao, online FDP, "Machine Learning and its prospects in Manufacturing & Industry 4.0", Seshadri Rao Gudlavaluru Engineering College, 10-15, Feb.2025.
- ✚ Reddy Sreenivasaulu, 6-Day FDP, "Drive Train: Building Expertise for the Next Gen Automotive Classroom", GITAM Deemed to be University, 27 Jan. - 01 Feb 2025.
- ✚ C.Tarasasanka, J.Ranga Raya Chowdary, Sneha.H.Dhoria, Innovation, Design and entrepreneurship (IDE) Boot camp as Faculty mentor at R.V.R & J.C college of engineering, Guntur, AICTE & ministry of education's innovation cell, 17-21 Feb. 2025.
- ✚ G.Chaitanya, Two week National Level FDP, Engineering Education Excellence, Centre for Engineering Education Excellence (CEEE) initiative by the Indian National Academy of Engineering (INAE), in association with AICTE, funded by the Infosys Foundation, IIT Madras, 15-27, June 2025.

Ph.D Awarded Under Faculty Guidance

- ✚ Under the guidance of Dr.C.Tarasasanka, Associate Professor, RVRJCCE, Ph.D degree was awarded for J.Purushottam Karthik in the month of Feb, 2025 from Annamalai University, Chidambaram with title of the thesis as 'Optimization and Evaluation of Overall Heat Transfer Coefficient and pH value of Coal Water Slurry with Different Impellers using Agitation Vessel Equipment.
- ✚ Under the guidance of Dr.K.Praveen Kumar, Associate Professor, RVRJCCE, Ph.D degree was awarded for B.SrinuNaik in the month of May, 2025 from ANU, with title of the thesis as 'Tribological and Corrosion studies AZ91D Magnesium matrix composite reinforced with SiC/Graphite.

Industrial Tour

- ✚ The II/IV B.Tech (A & B Sections) students visited Balaram Spinning Mills pvt.Ltd. Jindal Urban Waste Management, on 31, Jan.2025.
- ✚ The III/IV B.Tech (A & B Sections) students visited Jocil Limited, Chaitanya Packagings Pvt. Ltd. on 12, 13, March, 2025.