



## Curriculum Vitae

### Dr. Ramesh Gupta Burela

842, FH, Shiv Nadar University  
Greater Noida, Delhi NCR,  
INDIA. 201314

+91 9891648578, 9560032246  
[rameshgupta.iisc@gmail.com](mailto:rameshgupta.iisc@gmail.com)  
[rameshguptaphd@gmail.com](mailto:rameshguptaphd@gmail.com)

### CURRENT STATUS

Mechanical Engineering Department, **Shiv Nadar University\*** [6y 10m]  
Associate Professor [Jul 2019 to till date]  
Assistant Professor [Jul 2013 to Jun 2019]  
\*Govt. of India chooses SNU as Institute of Eminence status  
<https://mech.snu.edu.in/people/faculty/ramesh-gupta>

### EDUCATION:

#### Indian Institute of Science (IISc)

**Ph.D.** Department of Aerospace Engineering, [2012]  
Thesis: Asymptotically correct dimensional reduction of nonlinear material models  
(Isotropic; Dielectric; & Orthotropic hyperelastic material models for plate/shell structure)  
▪ Ecole Normale Supérieure (ENS) de Cachan, France  
*Internship on collaborative research work* [Mar. – Sept. 2008]

#### Malnad College of Engineering, Visveswaraiiah Technological University

**M Tech.** CADES (Computer Aided Design of Structures) [Sept. 2000 – Mar. 2002]  
Marks Scored ... 83 % First Class with Distinction.  
Thesis: Finite Element Analysis of Flexible Structures with Piezoelectric Patch Actuators

#### acharya Nagarjuna University,

[1995-1998]  
75 % First Class with Distinction.

ibowli, Hyderabad.

*se in Computer Application*) [1999]

### CE:

rd Mechanics Department, IIT-D for M.Tech students: 2017,

2018, 2019

- **Reviewer:** International Journal of Engineering Sciences (IJES), Journal of Reinforced Plastics and Composites, AIAA Journal, Mechanics Based Design of Structures and Machines, International Journal of Advances in Engineering Sciences and Applied Mathematics, Journal of Aircraft, Journal of Applied Mechanics and Materials, AIAA conference (Gossamer spacecraft forum), Biennial international conference on Power and Energy Systems: Towards Sustainable Energy (PESTSE) [2018]
- **National Advisory Committee Member:** International conference on advances in mechanical engineering and nanotechnology (ICAMEN), Manipal University, Jaipur, Mar. 8-9, 2019
- **Honorable Advisor:** International Conference on Thermal Engineering and Management Advances (ICTEMA 2020) to be held at JGEC, West Bengal, June 27-28, 2020.
- **IISc representative:** Organizer of KVPY test at Noida center [2018]
- **Guest of Honor and Judge:** National Level Project Competition - Technoblast2016
- **Moderation committee member:** School of Engineering and Technology, IGNOU, New Delhi. and Teerthanker Mahaveer University, Moradabad, UP.
- **Global Team of Educator:** Member of Peer Learning Experience Program (PLEXP) through Dassault Systèmes

SHIV NADAR UNIVERSITY



- **Technical panel member:** Campus interview selection committee for Infotech Ent. Ltd. [2012-13]
- **FDP:** Conducted a session on “Introduction to Finite Element Analysis” at Dronacharya Group of Institutions, Greater Noida, May 15, 2015.

**INVITED TALKS**

- Ramesh Gupta Burela, *Energizing the world with innovative multifunctional composite structures*, Third International Conference on Advanced Materials (ICAM 2019), Mahatma Gandhi University, Kottayam, Kerala, Aug. 9-11, 2019.
- Ramesh Gupta Burela, *Floating and Flying Aerospace Vehicles for Multi Role Capabilities*, Celestia Explora (Astronomy Club of SNU), Shiv Nadar University, Sept. 30, 2019.
- Ramesh Gupta Burela, *3D Printing of Composites*, Five days online FDP, Kalasalingam Academy of Research and Education, May 21, 2020.

**CHAIR AND ORGANIZER OF SYMPOSIUM:**

**Title:** Analysis and Design of Multi-Functional Composite Structures  
**Conference:** 12<sup>th</sup> International Conference of Numerical Analysis and Applied Mathematics (ICNAAM 2014)  
**Place and Date:** Rhodes, Greece, 22—28 Sept. 2014.

**PUBLICATION COMMITTEE CHAIRMAN & ORGNIZING COMMITTEE MEMBER**

**Conference:** 39<sup>th</sup> National Systems Conference (NSC2015)  
**Place and Date:** Shiv Nadar University, 14 – 16 Dec. 2015

**TEACHING EXPERIENCE:**

Mechanical Engineering, SNU.

Dynamics of machines (UG)	Strength of materials (UG)
Kinematics of machines (UG)	Finite element method (UG & PG)
CAD (UG)	Manufacturing process (UG)
Mechanics of composite structures (UG & PG)	Numerical methods (UG & PG)
Kinematics & Dynamics of Machines (UG)	Energy & Variational Methods in Structural Mechanics (PG)
Advanced mechanics of solids (PG)	Nonlinear finite element analysis (PG)
Engineering mechanics (UG)	Introduction to flight (UG)

Teaching Assistant, Department of Aerospace Engineering, IISc.

° Nonlinear composite theory (PG)	° Flight vehicle structures (PG)
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Visiting Faculty, Department of Civil Engineering, MRIT, Hyderabad.

° Theory of plates (PG)	° Structural dynamics (PG)
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**RESEARCH INTERESTS:**

<b>VAM</b> (Variational Asymptotic Method)	Nonlinear material models ( <b>hyperelastic models</b> )
<b>Multifunctional smart structures</b>	Auxetic structures
Nonlinear Finite Element Analysis	Reduced order models
Multi-body dynamics	Machine learning
Additive manufacturing (3D printing)	High Altitude Airships, eVTOL
Allied structural <b>analytical</b> and <b>computational mechanics</b> fields	

**RESEARCH GUIDENCE:**

**Ph.D, Mechanical Engg, SNU**

- Jagath K (Defended on 22-05-2020)  
 Title: Geometric nonlinear analysis of laminated composite stiffened panels using Variational Asymptotic Method (VAM)
- Ranjan Mishra, (synopsis presented on 28-11-19, Thesis submission by 10-06-2020)

Title: Fracture and Fatigue analysis of piezoelectric structures with multiple discontinuities using Extended Finite Element Method (XFEM)

- Balaji (2017-ongoing, comprehensive exam cleared on 11-7-2019)  
Title: Design, development and automated manufacturing system for auxetic structures

### INDUSTRIAL EXPERIENCE:

- **Asst. Manager (Technical) : Cyient Ltd.** [Apr. 2012 to Jul. 2013]
  - Analysis and Design of control surfaces for Dassault SMS jet
  - Peer review of Stress Dossier and Concessions for Airbus -A400M Spar
  - KDC comments review and Checkstress updates for FEM books (A400M Spar and Ted)
  - Creation and Empowering the Knowledge Sharing Sessions to Associates
- **Tech Lead: MSC Software (Symphony Services Pvt. Ltd)** [Mar. 2011 to Apr. 2012]
  - **MSC-MARC & NASTRAN** (nonlinear finite element software)
    - Validation of various test cases, verification of modules development, various types of testing and acceptance. Preparation of reports.
  - **MSC-Adams** (multi-body dynamics software)
    - Flexible body creation using 3-D and 2-D elements.
    - Development of user interface (UI) for AView using C, C++ and CMD.
    - Integration and preparation of SDD (Software Design Document).
- **Senior consultant engineer: ADA** [May 2002 to July 2003]  
ADA (Aeronautical Development Agency), Ministry of Defense, Govt. of India, Bengaluru.  
Development of structures module for Fluid-Structure interaction analysis

### ACADEMIC RESPONSIBILITIES:

- **Established:** MultiFunctional Composites Lab (MFC Lab), SNU. [2017].
- **Developed:** CAD lab and Dynamics lab, SNU.
- **Coordinator:** Purchase requisitions and industrial relations, MED, SNU
- **Member:** Board of Studies, Time table committee, SNU
- **UG adviser:** Mechanical Engineering Department, SNU.
- **Department representative:** Career Development Center (Campus placements), SNU.
- **Faculty in-charge:** Software and hardware, SNU.
- **Organizer:** Various workshops and seminars, SoE, SNU
- **Member and/or Coordinator:** Various departmental activities of UG and PG, SNU

### AWARDS:

- International travel grant, DST (SERB), India, [2014]
- International fellowship, ENS de Cachan, France, [March - Sept 2008]
- IISc scholarship, Government of India, [2003-2009]
- Graduate assistantship, UGC, India, [2000-2002]

### AFFILIATIONS:

- Life member, The Indian Society of Theoretical and Applied Mechanics (**ISTAM**)
- Life member, Indian Society for Applied Mechanics (**ISAM**)
- Life member, Institute of Smart Structures and Systems (**ISSS**)
- Associate member, The Aeronautical Society of India (**AeSI**)
- Member, American Institute of Aeronautics and Astronautics (**AIAA**)

### INDUSTRY INTERACTION

GE Power, UnoMinda, UFI filter, Panasonic, Escorts.

### PROPOSED RESEARCH COLLABORATION

- Prof. Vijay Kumar Thakur, Univ. of Edinburgh, UK
  - Experimental and numerical characterization of multifunctional composite structures

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- University of Oregon, USA
  - Green composites (biocomposites) for automotive and sports applications

#### STUDENT GROUP ACHIEVEMENT

Saarang, Haarica, and Sandhya, has qualified for the semifinals at India Innovation Challenge Design Contest (IICDC) 2017 (TI-DST initiate)

#### CO-FUNDER OF START-UPS:

- **SYmbosim** (The Future of Composites Design)
  - Winner: ELEVATE100 (100 most innovative start-ups), Karnataka Government, Aug. 2017.
  - Selected for the second season of Airbus BizLab accelerator program.
- **MultiFun** (multifunctional composites & structures)
  - Winner, Best Startup Company, ITMA Future Materials Awards, Milano, Italy + 4 finalist
  - nominations by World Textile information Network (WTiN), UK:
  - Best Innovation: Mobile Textiles[Automotive, Aerospace & Other Transport];
  - Best Innovation – Sustainable Textiles; and Launch of the Year
  - Submitted application for incubation at Atal Incubation Center, SNU

#### SEED GRANT:

Funding Agency: Shiv Nadar University  
Amount: 7.5 Lakh (INR)  
Year 2017-18

#### SPONSORED PROJECTS:

- **Title:** Startup Grant for SYmbosim  
**Funding Agency:** KBITS, Gov. of Karnataka  
**Amount:** 25 Lakh (INR)  
**Year** 2017-18
- **Title:** Multi-functional film-fabric laminate modeling for HAA  
**Funding Agency:** ARDB (under review)  
**Amount:** 24.42 Lakh (INR)
- **Title:** 3D Printing of structural battery composites  
**Funding Agency:** SERB, Core Research Grant (under review)  
**Amount:** 20.90 Lakh (INR)

#### PATENTS:

- **Title:** A multifunctional system and a method for integrated energy recycling and storing  
**Patent No:** 287775.  
**Date of Award:** 21/09/2016  
**Country:** India  
**Patentee:** MultiFun Technologies Pvt. Ltd. (MTPL)  
**Status:** **Awarded**
- **Title:** Cloud-based simulation platform for rapid modeling, design and optimization of structures  
**Patent No:** 7210 (confirmation number).  
**Date of Sub.:** 09/01/2018  
**Country:** USA  
**Patentee:** Symbolic Simulations Pvt. Ltd. (SSPL)  
**Status:** Applied
- **Title:** Low-Cost Syringe Based Printer for Printing of a Patterned Thin Film of Solution Processable Organic and/or Inorganic Materials and Application in Organic Electronics  
**Country:** India

Patentee: Aman Khatkar, Vamsi Krishna G, Yogesh Yadav, Lubna Khanam, Ramesh Gupta,  
Samarendra P. Singh  
Status: Patentability search  
Patent No: XXX.  
Date of Sub.: XXX

## **PUBLICATIONS:**

### **International Journal Articles**

1. **Ramesh Gupta Burela** and Dineshkumar Harursampath, "VAM applied to dimensional reduction of non-linear hyperelastic plates", *International Journal of Engineering Sciences (IJES)*, Vol. 59, pp. 90-102, 2012. (IF: 9.052) <http://www.sciencedirect.com/science/article/pii/S0020722512000626>
2. Tigmanshu Goyal and **Ramesh Gupta**, Multi-objective weight-cost-strength optimization of symmetric laminated composites using modified genetic algorithm by various failure theories, *Journal of Sustainable Manufacturing and Renewable Energy (JSM&RE)*, Vol. 2, No. 1-2, pp. 65-84, 2013. [https://www.novapublishers.com/catalog/product\\_info.php?products\\_id=46214](https://www.novapublishers.com/catalog/product_info.php?products_id=46214)
3. **Ramesh Gupta Burela** and Dineshkumar Harursampath, Dielectric elastomers: Asymptotically-correct three-dimensional displacement field, *International Journal of Engineering Sciences (IJES)*, Vol. 87, pp. 1-12, 2015. (IF: 9.052). doi: 10.1016/j.ijengsci.2014.10.006 <https://www.sciencedirect.com/science/article/abs/pii/S0020722514002146>
4. Ranjan Mishra, **Ramesh Gupta Burela** and Himanshu Pathak, Crack interaction study in piezoelectric materials under Thermo-Electro-Mechanical loading environment, *International Journal of Mechanics and Materials in Design*, Vol. 15, No. 2, pp. 379 – 412, 2019 (IF: 3.143) <https://doi.org/10.1007/s10999-018-9410-0>
5. **Ramesh Gupta Burela**, Aravind C, Rogan S, Effective Properties Evaluation for Multifunctional Composite Materials, *International Journal of Advanced Composites*, Accepted and available online <http://www.sci-en-tech.com/IJNI/index.php/IJAC>.
6. K. Jagath Narayana, and **Ramesh Gupta Burela**, A review of recent research on multifunctional composite materials and structures with applications, *Materials Today: Proceedings*, Vol. 5, pp. 5580-5590, 2018. (IF: 0.694) <https://doi.org/10.1016/j.matpr.2017.12.149>
7. T. S. Shakthivel and **R. G. Burela**, Vibration Based Piezoelectric Energy Harvesting, *Applied Mechanics and Materials*, Vol. 852, pp. 846-851, 2016. <https://doi.org/10.4028/www.scientific.net/AMM.852.846>
8. Himanshu Pathak, **Ramesh Gupta**, Akhilendra Singh, I.V. Singh, Thermo-elastic failure simulation of 3-D orthotropic composites by XFEM, *AIP Scitation (AIP Publishing)*, Vol. 1648, pp. 360006-1–360006-5, 2015. (IF: 0.4) <https://aip.scitation.org/doi/10.1063/1.4912589>
9. Alap Kshirsagar, Dineshkumar Harursampath, and **Ramesh Gupta Burela**, VAM applied to dimensional reduction of non-linear multifunctional film fabric laminates, *AIP Scitation (AIP Publishing)*, Vol. 1648, pp. 360004-1–5, 2015. (IF: 0.4) <https://aip.scitation.org/doi/abs/10.1063/1.4912587>
10. K. Jagath Narayana and **Ramesh Gupta Burela**, Constraint method for laminated composite flat stiffened panels using Variational Asymptotic Method (VAM), *Thin-walled Structures*, Vol. 145, pp. 106374, 2019. (IF: 3.488). <https://doi.org/10.1016/j.tws.2019.106374>
11. Ranjan Mishra and **Ramesh Gupta Burela**, Thermo-electro-mechanical fatigue crack growth simulation in piezoelectric solids using XFEM approach, *Theoretical and Applied Fracture Mechanics*, Vol. 104, pp. 102388, 2019. (IF: 2.848). <https://doi.org/10.1016/j.tafmec.2019.102388>

12. K. Jagath Narayana, **Ramesh Gupta Burela**, and Dineshkumar Harursampath, Geometric nonlinear analysis of laminated composite flat stiffened panels using Variational Asymptotic Method (VAM), **under review** *AIAA Journal*.
13. Srinivasan G Ram, Paul George, Jaideep Sharma, Ramesh Gupta and Dineshkumar Harursampath, A feasibility study on dielectric elastomer actuators for aerial applications, **under review** at *CEAS Aeronautical Journal*, Springer (IF: 1.58).
14. Balaji B, Ramesh Gupta Burela, Ganeshthangaraj Ponniah, An attempt at tuning of impact and compressive strengths of arrow head auxetic structure, **submitted to** *International Journal of Materials and Product Technology*, InderScience (IF: 0.67).
15. Ranjan Mishra, **Ramesh Gupta Burela** and Himanshu Pathak, Thermo-electro-mechanical interfacial crack interaction study in piezoelectric solids, **under preparation** to be submitted to *Mechanics of Advanced Materials and Structures*, Taylor & Francis (IF: 2.873).

### Book Chapters

1. **Burela R. G.**, and Harursampath D. (2019) "Asymptotically-Accurate Nonlinear Hyperelastic Shell Constitutive Model Using Variational Asymptotic Method". In: Altenbach H., Chróscielewski J., Eremeyev V., Wiśniewski K. (eds) *Recent Developments in the Theory of Shells. Advanced Structured Materials*, Vol 110. Springer, Cham. [https://doi.org/10.1007/978-3-030-17747-8\\_9](https://doi.org/10.1007/978-3-030-17747-8_9)
2. **Ramesh Gupta Burela** Jagath Narayana Kamineni, and Dineshkumar Harursampath. (2020) "Multifunctional Polymer Composites for 3D and 4D Printing", in the book *3D and 4D Printing of Polymer Nanocomposite Materials: Process, Applications and Challenges*, Edited by Kishor Kumar Sadasivuni, Kalim Deshmukh, and Mariam Ali S A Al-Maadeed, pp. 231 – 257, Elsevier. <https://doi.org/10.1016/B978-0-12-816805-9.00008-9>

### Book

3. **Ramesh Gupta Burela** and Dineshkumar Harursampath, *Dielectric Hyperelastic Shells: Reliable Modeling*, AR Tech House, Boston, U.S.A. **under preparation**.

### Conference Publications (international: I, national: II, B. Tech: \*)

1. **B. Ramesh Gupta** and D. Harursampath, Asymptotically Accurate Non-linear Analysis of Inflatable Structures, Proceedings, *9<sup>th</sup> AIAA Gossamer Spacecraft Forum*, Hawaii, USA, Apr 23-26, 2007, **AIAA Paper # 2007-1823**, I
2. **B. Ramesh Gupta** and D. Harursampath, Asymptotically Accurate Nonlinear Analysis of Electro-Elastomer Membrane Structures, *Proceedings, Electro active Polymer Actuators and Devices (EAPAD) XII, SPIE Smart Structures and Materials + Nondestructive Evaluation and Health Monitoring*, San Diego, United States, March 7-11, 2010. Paper Number: 7642-33, I
3. **B. Ramesh Gupta** and D. Harursampath, VAM applied to dimensional reduction problems of nonlinear materials, *International Conference in Honor of V. Berdichevsky's 65<sup>th</sup> Birthday on Advances in Continuum Mechanics and Thermodynamics*, Ruhr University Bochum, Germany, June 30-July 2, 2010. Invited paper, proceedings being published in special volume of "Continuum Mechanics and Thermodynamics," **Springer**, I
4. Alap Kshirsagar, Dineshkumar Harursampath and **Ramesh Gupta Burela**, VAM applied to dimensional reduction of non-linear multifunctional film fabric laminates, *12<sup>th</sup> International Conference of Numerical Analysis and Applied Mathematics (ICNAAM 2014)*, Rhodes, Greece, 22–28 Sept. 2014, I



5. Himanshu Pathak, **Ramesh Gupta Burela**, Akhilendra Singh and Indra Vir Singh, Thermo-Elastic Failure Simulation of 3-D Orthotropic Composites by XFEM, *12<sup>th</sup> International Conference of Numerical Analysis and Applied Mathematics (ICNAAM 2014)*, Rhodes, Greece, 22–28 Sept. 2014.
  6. Jebin Thomas, **Ramesh Gupta** and Dineshkumar Harursampath, Optimal sizing and placement of inflatable stiffeners in high altitude airships using finite element and asymptotic modeling, 1<sup>st</sup> Pan-American Congress on Computational Mechanics (**PANACM 2015**), Buenos Aires, Argentina, 27–29 Apr. 2015.
  7. Shakthivel T S and **Ramesh Gupta**, Vibration based piezoelectric energy harvesting, International Conference on Mechanical Engineering Design (ICMED 2016), SSN College of Engineering, Chennai, India, 25-26 Apr. 2016.\*
  8. Aravind C, Rogan S and **Ramesh Gupta**, Effective properties evaluation for multifunctional composite materials, 7<sup>th</sup> International Conference on Computational Methods (ICCM2016), Berkeley, CA, USA, 1–4 Aug. 2016.\*
  9. Nadimpalli L Vishnuvardhan Raju, Bhavya S, **Ramesh Gupta**, and Dineshkumar H, Hyper Velocity Impact Resistance of Multi-layer Composite Materials, 21<sup>st</sup> AIAA International Space Planes and Hypersonic Systems and Technologies Conference, China, 6–9 March 2017. **AIAA Paper # 2017-2394**; <https://doi.org/10.2514/6.2017-2394>\*
  10. Jagath Narayana K, **Ramesh Gupta**, A review of recent research on multifunctional composite materials and structures with applications, 7<sup>th</sup> International Conference on Materials Processing and Characterization (ICMPC 2017), Hyderabad, 17–19 Mar. 2017.
  11. Chetan Gupta, Dineshkumar Harursampath, and **Ramesh Gupta**, Design of a ducted-fan micro-rotorcraft with structural battery, 6<sup>th</sup> annual Asian-Australian Rotorcraft Forum (**ARF**) and Heli Japan 2017, Kanazawa city, Japan, Nov. 7–9, 2017. **SKU # : sm\_arf\_2017\_UAV\_003**\*  
<https://www.vtol.org/store/product/design-of-a-ductedfan-microrotorcraft-with-structural-battery-12437.cfm>
  12. Srinivasan G Ram, Paul George, Jaideep Sharma, **Ramesh Gupta**, Flapping wing actuation using smart materials, Annual International Conference on Engineering, Smart Materials and Technologies, ESMT-2018, Osaka, Japan, Apr. 25-26 2018. **Paper ID: ESTM-APRIL18-105**.\*
  13. Dharanee Dharan, **Ramesh Gupta Burela**, Venkatramani J, Acoustic energy harvesting using piezoelectric device from random ambient noise, 14<sup>th</sup> International Conference on Vibration Engineering and Technology of Machinery (**VETOMMAC XIV**), Lisbon, Portugal, Sept. 10–13, 2018.\*
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14. **B. Ramesh Gupta** and D. Harursampath, Asymptotically Accurate Nonlinear Elastic Constitutive Model with NURBS Based Finite Element Analysis of Membrane Structures, *Proceedings, IISc Centenary International Conference and Exhibition on Aerospace Engineering, ICEAE2009*, Indian Institute of Science (**IISc**), Bengaluru, India, May 18-22, 2009. Paper Number: GN-138.
  15. **B. Ramesh Gupta** and D. Harursampath, Asymptotically Accurate Nonlinear Analysis of Orthotropic Hyperelastic Inflatable Structures, Poster, *4<sup>th</sup> European Workshop on Inflatable Space Structures - 4EWISS*, Noordwijk, The Netherlands, June 16-18, 2008.
  16. **B. Ramesh Gupta** and D. Harursampath, Asymptotically Accurate Nonlinear Analysis of Orthotropic Hyperelastic Shells, *EuroMech Colloquium 527 - Shell-like Structures, Non-classical Theories and Applications*, Leucorea, Martin-Luther-Universität, Lutherstadt Wittenberg, Germany, Aug 22–26, 2011.
  17. M. Manisha Banker, D. Harursampath, G. Narayana Naik and **B. Ramesh Gupta**, Computationally Efficient Yet Accurate Analysis of Composite Plates, *ISAMPE National Conference on Composites- INCCOM 10*, R&DE (DRDO), Pune, India, Nov. 18–19, 2011. Paper Number: CP4.

18. T. Goyal and **Ramesh Gupta**, Assessment of Various Failure Theories for Weight and Cost Optimized Laminated Composites Using Genetic Algorithm, *Indo-Danish International Conference WEMEP*, BITS–Pilani, Hyderabad Campus, India, Nov. 22–23, 2012.
19. **Ramesh Gupta Burela** and Umamaheshwar, Finite Element Analysis of Chiral Honeycomb with Elliptically Structured Central Node, *2<sup>nd</sup> World Conference on Applied Sciences, Engineering & Technology (WCSET 2013)*, GITAM University, Hyderabad Campus, 8–9, March, 2013. Paper Id: WC13AE006
20. **Ramesh Gupta Burela**, Effect of global rotation constraints on nonlinear analysis of compressible hyperelastic plates, *2<sup>nd</sup> World Conference on Applied Sciences, Engineering & Technology (WCSET 2013)*, GITAM University, Hyderabad Campus, 8–9, March, 2013. Paper Id: WC13AE005
21. Kavya Vaddadi, **Ramesh Gupta B**, Sanjay Kumar Ash, Nikhil Bharadwaj V.V.S and Venkata Sai Anoop. B, Mercury Ion Engine of Ancient Aeronautics: Advanced technology in Vimanas, *2<sup>nd</sup> International Space Conference (ISC 2015)*, Amity University Campus, Noida, India, 8 – 9 Jan. 2015. Paper Id: ISC-S011502
22. Sai Sandeep, Abhishek Udataneni, Naveen Varma and **Ramesh Gupta**, Film-fabric laminated shell structure analytical modeling using VAM, *2<sup>nd</sup> Indian National Conference on Applied Mechanics (INCAM 2015)*, IIT-Delhi, 13–15 Jul. 2015.\*
23. Ranjan K Mishra, **Ramesh Gupta**, and Himanshu Pathak, A state of the art review on fracture analysis of piezoelectric materials, *Proceedings of 61<sup>st</sup> congress of ISTAM*, VITU-Vellore, 11–14 Dec. 2016
24. **Ramesh Gupta**, Kartkaye Uniyal, and Anunay Kausteya, Designing a biomimetic flapping wing air vehicle capable of sustained and controlled flight, *1<sup>st</sup> International Conference on Future Learning Aspects of Mechanical Engineering (FLAME - 2018)*, Amity University, Noida, Oct. 3 – 5, 2018.\*
25. Jagath Narayan, **Ramesh Gupta Burela**, Multiscale modeling and simulation of natural fiber reinforced polymer composites (Bio-composites), *2<sup>nd</sup> International Conference on New Frontiers in Engineering, Science & Technology (NFEST-2019)*, NIT Kurukshetra, Feb. 18-22, 2019. Paper # 221  
K. Jagath Narayan, **Ramesh Gupta Burela**, Multiscale modeling and simulation of natural fiber reinforced polymer composites (Bio-composites), *Journal of Physics: Conference Series*, Vol. 1240, pp. 012103, 2019. <https://iopscience.iop.org/article/10.1088/1742-6596/1240/1/012103>
26. Durga V, Hariharan M, Saarang G, **Ramesh Gupta Burela**, Analysis and Retardation of Helium Permeation for High Altitude Airship Envelope Material, *International Conference on Advances in Mechanical Engineering and Nanotechnology (ICAMEN 2019)*, Manipal University, Jaipur, Mar. 8-9, 2019. Paper # DE3309.\*  
Durga V, Hariharan M, Saarang G, **Ramesh Gupta Burela**, Analysis and retardation of helium permeation for high altitude airship envelope material, *AIP Conference Proceedings*, Vol. 2148, No. 1, pp. 030027, 2019. <https://aip.scitation.org/doi/abs/10.1063/1.5123949>

#### Technical Reports

1. Dr. K. Jawahar Reddy, **B. Ramesh Gupta**., “Theoretical document for dynamic analysis module”, ADA/TD/CFD/TR/102, Sep 2002.
2. Dr. K. Jawahar Reddy and **B. Ramesh Gupta**., “Dynamic analysis module of FINESSE – validation and acceptance”, ADA/TD/CFD/TR/101, Aug 2002.

#### PROJECT PARTICIPATION DETAILS:

##### Doctoral thesis from Indian Institute of Science (IISc)

**Title:** *Asymptotically correct dimensional reduction of nonlinear material models.*

- Analytical expressions for constitutive law, 3-D warping functions and recovery relations



- An efficient and high fidelity unified nonlinear finite element analysis software named **VAMNLM** (Variational Asymptotic Method for NonLinear Material models) was developed
- **Hyperelastic material models** (isotropic, orthotropic and dielectric)
- Geometrically and materially nonlinear analysis of plates and shells

### Abstract

This work aims at dimensional reduction of nonlinear material models in an asymptotically accurate manner. The three-dimensional (3-D) nonlinear material models considered, include isotropic, orthotropic and dielectric hyperelastic material models. Hyperelastic materials have potential applications in space based inflatable structures, pneumatic membranes, replacements for soft biological tissues, prosthetic devices, compliant robots, high altitude airships and artificial blood pumps, to name a few. They have special engineering properties like high strength-to-mass ratio, low deflated volume and low density. Most of these applications imply a thin shell form factor, rendering to problem geometrically nonlinear as well. Despite their superior engineering properties and potential uses, there are no proper analysis tools available to analyze these structures accurately yet efficiently. The development of a unified analytical model for both material and geometric nonlinearities encounters mathematical difficulties in the theory but its results have considerable scope. Therefore, a novel tool is needed to dimensionally reduce these nonlinear material models. In this thesis, Prof. Berdichevsky's **Variational Asymptotic Method (VAM)** has been applied rigorously to alleviate the difficulties faced in modeling thin shell structures (made of such nonlinear materials for the first time in the history of VAM) which inherently exhibit geometric small parameters (such as the ratio of thickness to shortest wavelength of the deformation along the shell reference surface) and physical small parameters (such as moderate strains in certain applications). Saint Venant-Kirchhoff and neo-Hookean 3-D strain energy functions are considered for isotropic hyperelastic material modeling. Further, these two material models are augmented with electromechanical coupling term through Maxwell stress tensor for dielectric hyperelastic material modeling. A polyconvex 3-D strain energy function is used for the orthotropic hyperelastic model. Upon the application of VAM, in each of the above cases, the original **3-D nonlinear electro'elastic' problem splits into a nonlinear one-dimensional (1-D), through-the-thickness analysis and a nonlinear, two-dimensional (2-D) shell analysis**. This greatly reduces the computational cost compared to 3-D analysis. Through-the-thickness analysis provides a 2-D nonlinear constitutive law for the shell equations and a set of recovery relations that expresses the 3-D field variables (displacements, strains and stresses) through the thickness in terms of 2-D shell variables calculated in the shell analysis (2-D). **Analytical expressions (asymptotically accurate) are derived for stiffness, strains, stresses and 3-D warping field for all three material types**. Consistent with the three types of 2-D nonlinear constitutive laws, 2-D shell theories and corresponding **finite element programs have been developed**. Validation of present theory is carried out with a few standard test cases for isotropic hyperelastic material model. For another two test cases, 3-D finite element analysis results for isotropic hyperelastic material model are provided. Application of the dimensionally reduced dielectric hyperelastic material model is demonstrated through the actuation of a clamped membrane subjected to an electric field. Finally, the through-the-thickness and shell analysis procedures are outlined for the orthotropic nonlinear material model.

### Projects at Aeronautical Development Agency:

#### Project #1

Title: *Development of Computational Structural Dynamics (CSD) module for fluid structure interaction package INSTAR*

Software: C-Language

1. **INtegrated STructure and AeRodynamic Interaction Package (INSTAR)** integrating CFD and CSD programs through an interface
  - Design and development of algorithm and software for CSD module in time domain;
  - Finite element modeling of various test cases;
  - Validation of results with ANSYS, NASTRAN, and solutions available in literature;
  - Frame work for mutual interaction of three modules (CSD, CFD and interface FASTNER);
  - Validation of CSD module in coupled mode and documentation.
2. Dynamic analysis module of FINESSE validation and acceptance.  
FINESSES (Finite Element Structural Synthesis) is an in-house Finite element package of Aeronautical Development Agency.
  - Finite element modeling various test cases (frames, beams and plates);
  - Preparation of input cards/deck for dynamic analysis; Analysis includes modal, harmonic and transient response;
  - Validation of results with ANSYS, NASTRAN, SAP and closed form solutions available in literature;

- Preparation of technical reports.

**Project #2**

Title: *Finite Element Analysis of Flexible Structures with Piezoelectric Patch Actuators and sensors.*

Software: **ANSYS 5.4**

Project was carried out at **A.D.A, Bengaluru** as part of Masters Degree

- Analysis of structures with piezoelectric actuators and sensors by using ANSYS FE package.
- The base structures studied includes beams, plates, and box beams composed of isotropic and composite materials.
- Analysis includes static, modal, harmonic response and transient response.
- Analysis is carried out for a given mechanical/voltage input and the results are compared with experimental and/closed form solutions available in literature.

**PROJECT GUIDENCE:**

**M.Sc Engineering, Aerospace Department, IISc [2011]**

- M.V. Peereshwar Rao, IISc, India.  
Thesis: Inter-laminar stresses in composite sandwich panels using Variational Asymptotic Method

**Boeing Externship Program [2013]**

1. Tigmanshu Goyal, IIT-Kanpur, India  
Title: Weight-cost optimization of laminated composites using genetic algorithm for various failure criteria
2. Avinash Verma, IIT-Kanpur, India  
Title: Evaluation of first ply failure load of composite laminate plates

**B. Tech, Mechanical Engg, SNU [2014-15]**

1. Siddharth Sharma  
Title: An asymptotically-correct model for initially twisted non-linear hyperelastic strip
2. Ranjit Raj  
Title: An asymptotically-correct dimensional reduction of film-fabric laminate for High Altitude Airship (HAA)
3. Vignesh Kumar G, Sabari J  
Title: Finite element analysis of electro-thermo-elastic multi-functional structures
4. Abhishek M  
Title: Finite element analysis of membrane wrinkling
5. Ranjith P V and Senthil M  
Title: Finite element analysis of magnetic hyperthermia
6. Sai Sandeep, Naveen and Abhishek U  
Title: Film-fabric laminated shell structures modelling using VAM

**B. Tech, Mechanical Engg, SNU [2015-16]**

7. Siddharth M and Vishnu M.  
Title: Buckling analysis of multifunctional composite plates
8. Shakthivel T S  
Title: Vibration based piezoelectric energy harvesting
9. Vaibhav H and Vishal S  
Title: Analysis of thermoelectric composite generators
10. Aravind C and Rogan S  
Title: Analysis of multifunctional piezoelectric structural fiber composites
11. Bhaskar S Manjunath K and Kiran I  
Title: Optimization of Solar Energy for Geostationary Airship
12. Mokshit Reddy  
Title: Analysis of micro fiber green composites
13. Christopher R  
Title: Logical modeling and simulation of an aircraft landing gear
14. Upasana M  
Title: Design & development of replacement tool for process module shower head

**B. Tech, Mechanical Engg, SNU [2016-17]**

15. Vishnuvardhan Raju N L  
Title: High velocity impact on multilayer materials
16. Mrinal K L and Chitwan K  
Title: Tear propagation of in laminated woven fabrics
17. Srideep Gupta  
Title: Multi objective optimization of composite materials using genetic algorithm
18. Chetan Gupta  
Title: Micro aerial vehicle with multifunctional structure
19. Bhavya S  
Title: Elimination of wheel juddering on application of brake in tractors
20. Ankit Agrawal and Gaurav Garg  
Title: Design of multifunctional composite materials for structural batteries

**B. Tech, Mechanical Engg, SNU [2017-18]**

21. Srinivasan G Ram, Kashyap Jothish and Vijeth K  
Title: Flapping wing actuation using dielectric elastomers
22. Meka Naga Kumar  
Title: Development of pipelines using nano-composites for oil and gas industry
23. Vaibhav Sharma and Manan Goyal  
Title: Design and development of Turbocharger using composite materials
24. Kartikaye Uniyal and Anunay Kaustya  
Title: Dynamics of a robotic bird

**B. Tech, Mechanical Engg, SNU [2018-19]**

25. Guru Naidu, Kevin Tom Sonny and Arvind Raj  
Title: A self-power generating helium balloon envelope material using flexible solar panels and its optimization
26. Saarang Gaggar, Durga Vasudevan, and Hariharan Mohan  
Title: Analysis & Retardation of Helium Permeation for an High Altitude Airship Envelope Material
27. Abhishek Palchoudary, Kalpriksh Bist and Sai Tarun Teja  
Title: Tear strength analysis using numerical and analytical modelling of Aerostat envelope material
28. Antas Animesh, Aman Khatkar and Vamsi G  
Title: 3D printing of organic solar cells
29. Saikrishna Pola  
Title: 3D printed flapping wing ornithopter modeling
30. Saikrishna Pola  
Title: Design and fabrication of a water surface cleaning vehicle 3D printed flapping wing ornithopter modeling
31. Abhishek Palchoudary, Kalpriksh Bist and Sai Tarun Teja  
Title: Thermo-mechanical, crash analysis and design of monocoque chassis
32. Ketan Singh  
Title: To develop a model based design for development of evaporative emission control system used in gasoline engines
33. Arvind Raj Shakthivel  
Title: Non-linear optimisation of acoustic energy harvesting using piezoelectric element

**B. Tech, Mechanical Engg, SNU [2019-ongoing]**

34. Bommisetty Gowtham  
Title: Multi scale modelling and stochastic analysis of natural fibre-reinforced composites
35. Abhishek Mukherjee  
Title: Graphene based multifunctional composite for advanced applications
36. Trilok Chittala  
Title: Predicting Properties of Composites using Machine Learning Techniques

**Opportunities for Undergraduate Research (OUR) Projects, SNU**

1. Ranjit Raj [2014-15]  
Title: An asymptotically correct dimensional reduction of film-fabric laminate for high altitude airship
2. Bhavya S [2015-16]  
Title: Damage modeling of multi functional composite materials
3. Chetan Gupta [2016-17]  
Title: Hybrid morphing smart wing using piezoelectric actuation
4. Ashwin Kumar [2017-18]  
Title: Strain energy density of non-linear hyperelastic strip
5. Shubhakar Gupta [2018-19]  
Title: Energy harvesting mechanism for rotary motion applications using piezoelectric materials
6. Pratyush Kumar Singh [2018-19]  
Title: Finite element modeling of plates subjected to generalized forces; error estimation using effective adaptive techniques
7. Manan Gupta [2019-20]  
Title: Multifunctional composite analysis using Digital Image Correlation (DIC)
8. Akshat Jain [2019-20]  
Title: Conceptual design of eVTOL (Electric Vertical Take-off Landing) air taxi for on-demand aviation

**MAJOR SUBJECTS STUDIED**

◦ Linear & Nonlinear finite element analysis	◦ Analysis and design of composites
◦ Structural mechanics	◦ Theory of plates and shells
◦ Structural dynamics	◦ Numerical analysis
◦ Multibody dynamics	◦ Optimum design of structures

**COMPUTER SKILLS:**

Programming Languages: C, C++, Fortran  
 Operating Systems: UNIX, Windows  
 Scientific Applications: Mathematica, Matlab, Maple  
 FE Packages: Ansys, Nastran, Patran, Marc, Mentat, Adams, Abaqus  
 Technical softwares: VAPAS, DYMORE, VABS  
 CAD software: Solid works, CATIA.  
 Documentation: Latex, Microsoft word, PowerPoint

**FDP: GIAN Courses attended:**

- Name: 3D Printing & Additive manufacturing  
 Course Code, Dates & Place: 151036L03, 20<sup>th</sup> – 24<sup>th</sup> June, 2016. NIT-Warangal  
 Foreign Faculty: Prof. Ian Gibson, Deakin University, Australia.
- Name: Dynamic response of advanced composites  
 Course Code, Dates & Place: 171034L01, 10<sup>th</sup> – 14<sup>th</sup> Dec, 2018. NITK-Surathkal  
 Foreign Faculty: Prof. Nikhil Gupta, New York University, USA.
- Name: Medical prototyping using 3D printing  
 Course Code, Dates & Place: 171036L08, 15<sup>th</sup> – 19<sup>th</sup> July, 2019. NIT-Warangal  
 Foreign Faculty: Prof. Ian Gibson, Deakin University, Australia.

**FDP: ISSS Foundation course attended**

- Name: IoT (Internet of Things)  
 Dates & Place: 22<sup>nd</sup> July – 02<sup>nd</sup> Aug., 2019. RBCCPS, IISc  
 Faculty: Dr. Ashish Joglekar, Dr. Abhay Sharma and team.

**FDP: SPARC course & workshop attended**

- Name: Pragmatic Optimization for Practical Problem Solving &

Dates & Place: Workshop on Computational Intelligence and Its Applications  
12<sup>th</sup> – 15<sup>th</sup> Nov., 2019. IIT-Roorkee Campus – Gr. Noida  
Faculty: Prof. Kalyanmoy Deb, Prof. Anantha Suresh, Dr. Dhish

### **COURSERA COURSES COMPLETED**

- *Materials Science: 10 Things Every Engineer Should Know!*  
James Shackelford, Distinguished Professor Emeritus, University of California, Davis  
<https://www.coursera.org/learn/materials-science>
- *Introduction to battery-management systems*  
Gregory Plett, Professor, University of Colorado  
<https://www.coursera.org/learn/battery-management-systems>
- *The 3D Printing Revolution!*  
Aric Rindfleisch, John M. Jones Professor, University of Illinois at Urbana-Champaign  
<https://www.coursera.org/learn/3d-printing-revolution>
- *Machine learning (on going)*  
Andrew Ng, Professor, Stanford University  
<https://www.coursera.org/learn/machine-learning>

### **PROFESSIONAL PROGRESS PROFILE**

I would like to distribute my efforts such that analytical, computational and experimental activities go hand on hand. I am also co-founder of two start-ups (**SYmbosim** – The Future of Composites Design and **Multifun Technologies Ltd**) and I want to see that they should make significant contribution to the society through our products (software and hardware).

I would like to continue with design of multifunctional composite structures using mathematical methodology called Variational Asymptotic Method (**VAM**) to derive **analytical expressions**. NFEA and XFEM also be extended to various problems for numerical solution. I would like to guide research scholars (PhD/MTech/BTech students) for solution of various problems by using VAM and NFEA/XFEM.

I have initiated the manufacture of transistors and organic solar cells using 3D printing (additive manufacturing).

Further, I would like to explore other technologies along with core technologies. Design, Analysis and Optimization are primary technologies that are required for any product development. Having in-depth knowledge in these domains is very essential, at the same time if we can find interface with other technologies like Artificial Intelligence, Machine Learning, IoT and Augmented Reality that will lead to smart and functional products/structures which are more efficient and cost effective than conventional manufacturing. It is my goal to establish Computer Aided Engineering (CAE) research center to combine my range of experience to develop these type of smart functional products/structures.

Being a founding faculty of our university, various administrative roles are also handled.

### **PERSONAL PROFILE:**

Nationality : Indian.  
Place and year of birth : Hyderabad, 1975.  
Marital Status : Married.  
Languages known : Telugu, English, Hindi, Kannada (basic)  
Permanent Address : H. No. 1-7-18, Kamala Nagar, ECIL Post, Hyderabad. Telangana. IND.

Ramesh Gupta