DR. RAMAKALYAN AYYAGARI

Date of Birth & Age   16th January, 1969, 55 yrs
Present Designations   Professor, Dept of Instrumentation & Control Engg. (ICE)
National Institute of Technology Tiruchirappalli (NIT-T)
TIRUCHIRAPPALLI 620 015, INDIA
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➕ Educational Qualifications:

S.No.	Degree	University/Institution	Year	Main Subjects
1.	Ph.D.	IIT Delhi	2000	Control Systems
2.	M.E.	Andhra Univ., Visakhapatnam,	1993	Control Systems
3.	B.E.	Andhra Univ., Visakhapatnam,	1990	Electronics & Communications

➕ Doctoral Thesis:

Robust Output Feedback Controllers for Nonlinear Systems, EE Dept., IIT Delhi

➕ Recent Diplomas:

a. **NPTEL** – Demystifying the Brain, IIT Madras, 2018
b. **UiPATH** – Robotic Process Automation (RPA), 2023 & 2024

➕ Research Areas:

Core	Applications and such
1. Mathematical Control Theory	7. Algorithms, Complexity Theory and Randomization
2. Linear Algebra, Graph Theory, Analysis	
3. Neural Networks and Learning Algorithms	8. Mixed Precision Arithmetic and Exa-scale computing in Control.
4. Network Control Problems	
5. Cyber-Physical Systems [incl. ITS]	9. Robotic Process Automation & Extreme Automation in FinTech
6. Modeling & Intelligent Control of Big data Systems [Estimation & Filtering]	10. Problems in Observability at large

➕ Employment Record:

S. No.	Period of service	Designation
1.	12th March 2018 till date	Professor, NIT Tiruchirappalli
2.	1st July 2009 to 11th March 2018	Associate Professor, NIT Tiruchirappalli
3.	1st July 2006 to 30th June 2009	Assistant Professor, NIT Tiruchirappalli
4.	21st Dec 2000 to 30th June 2006	Senior Lecturer, REC/NIT Tiruchirappalli
5.	13th May 1996 to 20th Dec 2000	Lecturer, REC Tiruchirappalli

29 years of research, teaching, and consultancy

➕

Visits Abroad:

1. "Advances in Control Education," 12th IFAC Symposium on Advances in Control Education (IFAC-ACE 2019), Philadelphia, USA, July 7 – 9, 2019. Delivered invited talk "A Fresh Approach to Teaching State-Space Methods in an Undergraduate Course."

2. Electrical & Computer Engg. (ECE) Dept., Texas A & M Univ., College Station, TX 77843 USA: from April 13 to May 9, 2008. This TEQIP I sponsored visit is upon invitation from Dr. Shankar P Bhattarcharyya, Robert M Kennedy Professor, ECED, TAMU. During this period I have delivered the following lectures and initiated joint research in the area of Algorithmic aspects of PID Controller Design."
    i. "Mathematics of Robust Control," Lecture to the Graduate Students
    ii. "Robust Stability: Hermite-Biehler Theorem & Proof," Lecture to the Grad Students
    iii. "A New Algorithm for Fixed Order Multivariable Controller Synthesis," Lecture to the Research Students & Faculty
    iv. "Stability Analysis and Control Design Using Time-Series Data," Lecture to the Research Students & Faculty

3. University of Leicester, UK: from June 30 to July 25, 2008, and again from Sept 5 to 18, 2011. These visits are part of my collaborative research "Towards Reliable Smart and Adaptable Air-Vehicles" funded by British Council under the UKIERI Scheme.

Research and Academic Contributions:
https://scholar.google.com/citations?user=bqmKMIwAAAAJ&hl=en&oi=ao

(a) Research papers published in Refereed Journals (only recent ones, most cited)

1. **[SCIE/SCOPUS, IF 2.5]** Subbareddy Chitta, **Ramakalyan Ayyagari**, "On the Nonlinear Control of a Class of Cruise Missiles," *Int. J Control, Automation & Systems*, vol. 23 (3), pp. 788-797, 2025

2. **[SCI, IF 1.188]** Sarika Raju, Ezhilarasi, D., **Ramakalyan Ayyagari,** "An experimental analysis of a robust event triggered super twisting sliding mode control for Quadcopter trajectory tracking," *Sādhanā,* 49, 259. https://doi.org/10.1007/s12046-024-02566-0, 2024.

3. **[SCI, IF 1.6]** Sarika Raju, Ezhilarasi, D., **Ramakalyan Ayyagari,** "Experimental evaluation of event-triggered sliding mode control for trajectory tracking of a quadcopter," Proc. Inst. of Mech. Engineers, Part I: J. Systems and Control Engg., vol. 237, No. 7, pp. 1281-1295, Feb 2023. doi: 10.1177/09596518231153324

4. **[SCI, IF 5.009]** Sharmila Devi, K, A. Malikopoulos & **Ramakalyan Ayyagari**, "Optimal Coordination of Platoons of Connected and Automated Vehicles at Signal-Free Intersections," *IEEE Tr. Intelligent Vehicles*, vol. 7, No. 2, pp. 186-197, June 2022.

5. **[SCI, IF 1.188]** Rao, P., Murthy Arikapalli, V., Bhowmick, S., & **Ramakalyan Ayyagari,** "Investigative Design of Missile Longitudinal Dynamics using LQR-LQG Controller in presence of Measurement Noise and Inaccurate Model," *Sādhanā* **47,** 38. https://doi.org/10.1007/s12046-021-01784-0, 2022.

6. **[SCIE]** Rao, P., Murthy Arikapalli, V., Bhowmick, S., & **Ramakalyan Ayyagari,** "Missile Longitudinal Dynamics Control Design Using Pole Placement and LQR Methods," *Defence Science Journal*, 71(5), pp. 699-708, Sept 2021.

7. **[Scopus CiteScore 1.7]** P. Satya Ravi Teja, S. S. Annamraju & **R. Ayyagari**, "An Alternative Design for the Traditional Lag-Lead Compensator," *IEEE Potentials*, vol. 40, no. 1, pp. 43-48, Jan.-Feb. 2021.

8. **[SCI, IF 1.188]** Sharmila Devi, K., & **Ramakalyan Ayyagari**, "A graph-theoretic approach for optimizing signalized intersections under connected vehicle environment," *Sādhanā* **46,** 152 (2021). https://doi.org/10.1007/s12046-021-01651-y, 2021.

9. **[SCI, IF 9.551]** Sharmila Devi, K., & **Ramakalyan Ayyagari**, "A Decentralized Signal Control for Non-lane-based Heterogeneous Traffic under V2I Communication," *IEEE Tr. Intelligent Transportation Systems*, vol. 21, No. 4, pp. 1741-1750, 2020.

10. **[SCI]** D. Ganesha Perumal, S. Seshadhri, B. Subathra, G. Saravanakumar, & **R. Ayyagari**, "MILP based autonomous vehicle path-planning controller for unknown environments with dynamic obstacles", *Int. J. Heavy Vehicle Systems*, Vol. 23, No. 4, pp. 350-369, 2016.

11. **[SCIE]** S. Ismail, A.A. Pashilkar, **R. Ayyagari** & N. Sundararajan, "Diagonally dominant backstepping autopilot for aircraft with unknown actuator failures and severe winds," *The Aeronautical Journal (of the Royal Aeronautical Society, UK)*, Vol. 118, No. 1207, 2014.

12. **[SCI]** S. Ismail, A.A. Pashilkar, **R. Ayyagari** & N. Sundararajan, "Improved Neural-aided Sliding Mode Controller for Autolanding under Actuator Failures and Severe Winds," *Elsevier J. Aerospace Science & Technology*, Vol. 33, No. 1, pp. 55-64, 2014**.**

13. **[SCIE, IF 6.823]** S. Seshadhri, & **R. Ayyagari**, "Advanced driver assistance system for AHS over communication links with random packet dropouts," *Elsevier J. Mech. Systems and Signal Processing*, Vol. 49, pp. 53-62, 2014.

14. **[SCIE]** P. Kavitha, and **R. Ayyagari**, "Simple and Straight Proofs of Stability Criteria for LTIL Systems," *Tr. of the Institute of Measurement & Control*, Vol. 36, No. 4, pp. 523-528, 2014.

15. **[SCOPUS]** P. Kavitha, & **R. Ayyagari**, "A computationally faster algorithm to test the stability of characteristic polynomials," *Int. J. Sys., Con. & Comm.,* Vol. 5(2), pp. 166-176, 2013.

16. **[ESCI/SCIE]** S. Ismail, A.A. Pashilkar, **R. Ayyagari** & N. Sundararajan, "Neural-Sliding Mode Augmented Robust Controller for Autolanding of Fixed Wing Aircraft," *Polish J. of AI and Soft Computing Research*, (Polish Neural Network Society) Vol. 2, No. 4, pp. 317-330, 2012.

17. **[SCOPUS]** S. Seshadhri, & **R. Ayyagari**, "Dynamic controller for Network Control Systems with random communication delay," *Int. J. Sys., Con. & Comm.* Vol. 3(2), pp. 178-192, 2011.

18. **[SCOPUS]** S. Seshadhri, & **R. Ayyagari**, "Platooning over packet-dropping links," *Int. J. Vehicle Autonomous Systems,* Vol. 9, Nos. 1-2, pp. 46 – 62, 2011.

(b) Research papers published in Refereed Conferences (only recent ones)

1. **[SCOPUS]** Sharmila Devi, K, A. Malikopoulos & **R. Ayyagari**, "Decentralized Cooperative Merging of Platoons of Connected and Automated Vehicles at Highway On-Ramps," *2021 American Control Conf. (ACC)*, pp. 2055-2060, doi: 10.23919/ ACC50511 .2021. 9483390, 2021.

2. **[SCOPUS/WoS] Ramakalyan Ayyagari,** "A Fresh Approach to Teaching State-Space Methods in an Undergraduate Course, 12th **IFAC Sym. on Adv. in Control Edn. (IFAC-ACE 2019), Philadelphia, July 7 – 9, 2019**. IFAC PapersOnLine vol. 52 (9), pp. 97 – 102, July 2019.

3. **[SCOPUS]** V. S. N. Murthy A, V. Chandrakanth, P. V. R. R. Bhogendra Rao **& R. Ayyagari**, "Improved IIR tracking by fusion of centroid estimation processing with IMM filter," *Int. Conf. on Comm. & Elec. Sys. (ICCES)*, pp. 999-1003, doi: 10.1109/ICCES45898.2019.9002274, 2019.

4. **[SCOPUS]** Lakshmi Prasanna, M., Shiladitya B., P.V.R.R. Bhogendra Rao, V.S.N.Murthy, A., and **Ramakalyan Ayyagari**, "Instrumentation Network for Assessment of Impact on Operator due to Weapon Firing – An Approach Paper," Presented at the International Conf. on Instrumentation & Control Engg. (ICECON 2019), NIT Tiruchirappalli, Dec 19 – 21, 2019.

5. **[SCOPUS]** Sharmila Devi, K., **Ramakalyan Ayyagari**, "Design of Optimal Phase Plan for Urban Signalized Intersections accommodating Safe Pedestrian Crosswalks," 21st *Int. Conf. on Int. Trans. Systems (ITSC)*, USA, Nov 2018. **DOI:** 10.1109/ITSC.2018.8569980 pp. 3905-3910, 2018.

6. **[SCOPUS]** Ambili, T.A., Sharmila Devi, K., Thilagavathy, M.S., **Ramakalyan Ayyagari**, "Design of Optimal Phase Plans for Isolated Intersections using Vertex Coloring and Binary Integer Linear Programming," 21st *Int. Conf. on Int. Transportation Systems (ITSC)*, Maui, Hawaii, USA, November 4-7, **DOI:** 10.1109/ITSC.2018.8569736 pp. 3591-3595, 2018.

7. **[SCOPUS]** P. S. Tekale, **R. Ayyagari**, S. D. Sudarsan, R. Jetley and S. Ramaswamy, "Modeling and analysis of FPGA based power management system for renewables," *22nd IEEE Int. Conf. on Emerging Technologies and Factory Automation (ETFA)*, 2017, pp. 1-5, doi: 10.1109/ETFA.2017.8247717.

8. **[SCOPUS]** Dey, Abhishek, Ramakalyan Ayyagari, "Robust PID Controller Design Using Fuzzy Pole Placement Techniques," In Proc. Fourth International Conference on Advances in Control & Optimization of Dynamical Systems, NIT Tiruchirappalli, India, 2016. This paper may be accessed on-line at http://www.ifac-papersonline.net, pp. 789 – 794.

9. **[SCOPUS]** Ambili, T.A., Ramakalyan Ayyagari, "Polynomial Modeling and Parameter Estimation of Class B Power Amplifiers," In Proc. Fourth International Conference on Advances in Control & Optimization of Dynamical Systems, NIT Tiruchirappalli, India, 2016. This paper may be accessed on-line at http://www.ifac-papersonline.net, pp. 314 – 319.

10. **[SCOPUS]** Hituraj Sahu, Ramakalyan Ayyagari, "Interval Fuzzy Type-II Controller for the Level Control of a Three Tank System," In Proc. Fourth International Conference on Advances in Control & Optimization of Dynamical Systems, NIT Tiruchirappalli, India, 2016. This paper may be accessed on-line at http://www.ifac-papersonline.net, pp. 561 – 566.

11. **[SCOPUS]** Shaik Ismail, A. Pashilkar, **R. Ayyagari**, "Phase Compensation & Anti-windup Design for Neural-aided Sliding Mode Fault-tolerant Autoland Controller," In Proc. of IEEE Int. Conf. on Cognitive Computing and Information Processing (2015 CCIP), Noida, India, March 3-5, 2015.

12. **[SCOPUS]** M. Jerome Moses and **A. Ramakalyan**, "A Computationally Faster Randomized Algorithm for NP-Hard Controller Design Problem," In Proc. of IEEE Int. Sym. on Intelligent Informatics [Published in Recent Advances in Intelligent Informatics, Vol. 235 (2014), pp. 411-417, Springer-Verlag] SJCE, Mysore (2013). This paper may be accessed on-line at http://link.springer.com/chapter/10.1007%2F978-3-319-01778-5_42

13. **[SCOPUS]** M. J. Moses, and **R. Ayyagari**, "The Benefits of Noise in Systems and Control." In Proc. of 3rd IEEE Conference on Power, Control, Signals & Computation, Thrissur, India, 2014. **DOI:** 10.1109/EPSCICON.2014.6887486

14. **[SCOPUS]** M. J. Moses, and **R. Ayyagari**, "A Brief Survey of Stochastic Resonance and Its Applications to Control." In Proc. Third International Conference on Advances in Control & Optimization of Dynamical Systems, Kanpur, India, 2014. This paper may be accessed on-line at http://www.ifac-papersonline.net/Detailed/64786.html

15. **[SCOPUS]** A. Pashilkar, S. Ismail, **R. Ayyagari**, & N. Sundarrajan, "Design of a Nonlinear Dynamic Inversion Controller for Trajectory Following and Maneuvering for Fixed Wing Aircraft," IEEE Sym. on Comp. Intelligence for Security and Defense Applications (2013 CISDA), Nanyung Technological Univ., April 16 – 19, 2013.

16. **[SCOPUS]** A. Pashilkar, S. Ismail, **R. Ayyagari**, & N. Sundarrajan, "Improved Autolanding Controller for Aircraft Encountering Unknown Actuator Failures," presented at IEEE Symposium on Computational Intelligence for Security and Defense Applications (2013 CISDA), Nanyung Technological Univ., April 16 – 19, 2013.

(c) Books, including a chapter in a book

1. Raol, Jitendra & **Ramakalyan Ayyagari**, "Control Systems: Classical, Modern, and AI Based Approaches," CRC Press, Taylor & Francis group, USA, ISBN: $978 - 0 - 8153 - 4630 - 2$, **2020**

2. **Circuit Theory / Linear Electrical Networks, 2018**
   - National Mission Project on Education through ICT: Developing suitable pedagogical methods for various classes, intellectual calibers and research in e-learning.

3. S. Seshadhri and **R. Ayyagari**, "**Formation Control in Multi-Agent Systems over Packet Dropping Links**" Eds.: Dr. J R Raol and Dr. Ajith Gopal, *Mobile Intelligent Autonomous Systems: Recent Advances*, CRC Press, USA, ISBN: 978-1-4398-6300-8, **2013**.

4. **A. Ramakalyan, "Linear Circuits: Analysis & Synthesis**," Oxford Univ. Press, **2005**. ISBN: $0 - 19 - 567001 - 0$

5. **A. Ramakalyan, "Control Engineering: A Comprehensive Foundation**," Vikas Publishing House, New Delhi, India, ISBN: $81 - 259 - 1432 - 3$, **2003**.

(d) Research Projects

1. **[2019 - 21]** "Development of Modern Control Laws for a Class of Cruise Missiles," DRDL Hyderabad.

2. **[2015 - 18]** "De-congesting India's transportation networks using mobile devices" sanctioned by Information Technology Research Academy (ITRA) under the focus area Mobile Computing, Networking & Applications, to IIT Madras, IMSc Chennai, NIT Tiruchirappalli and Univ. of Calcutta. $2015 - 18$

3. **[2015 – 18]** "Model Driven Engineering for Integration of Industrial Automation Systems with Application to Water Networks," ABB Global Industries and Services Ltd. $2015 - 18$.

4. **[2007 – 11]** UKIERI (www.ukieri.org) Major Award: "Towards Reliable Smart and Adaptable Air-Vehicles." This is a UK-India collaborative project awarded to the research group consisting of Prof. Ian Postlethwaite et. al., Control & Instrumentation Research Group at the University of Leicester, Prof. M. Seetharama Bhat, Dept. of Aerospace Engg. at IISc. Bangalore, Flight Mechanics & Control Division at the National Aerospace Laboratories (FMCD, NAL Bangalore), Prof. B. Bandyopadhyay, Interdisciplinary Programme in Systems & Control Engg., at the Indian Institute of Technology Bombay (IIT Bombay, Mumbai), and **Dr. Ramakalyan Ayyagari**, Dept. of Instrumentation & Control Engg., at the National Institute of Technology (ICE, NIT Tiruchirappalli). The total amount sanctioned to NIT Tiruchirappalli was **£** 17320, equivalent to Rs. 14,00,000/-

5. **[2005]** Summer Research Fellowship of the Indian Academy of Sciences: "Density Functional Theory and Quantum Control of Systems." Worked at the National Chemical Laboratory (NCL) Pune with Professor BD Kulkarni.

6. **[2002 – 05]** Awarded **Young Scientist** by Dept. of Science and Technology (DST) under SERC for Young Scientists 2001-02. This award was to carry out the research project "Robust and Efficient Algorithms for Modern Control Systems."

7. **[2001 – 05]** Visited the Institute of Mathematical Sciences, Chennai as an associate professor in the theoretical computer science group.

(e) Consultancy Projects

- 2012: Lab On Chip (LoC) – Xcyton Diagnostics, Bangalore
- 2006: Control Education using LabVIEW – National Instruments, Bangalore
- 2006: Middleware for protocol based supervisory control in Intelligent Vehide Highway Systems (IVHS) – SANKHYA Technologies, Chennai

(f) Research Guidance @ NIT-T

1. **Ph.Ds. ongoing (registered in 2015/16)**
   a. Subbareddy Chitta, Full-time candidate funded by the Institute
2. **Ph.Ds. guided as main guide and degree awarded**
   a. V.S. Murthy Arikapalli, **Design of Modern Optimal Control Laws for Tactical Vehicles**, Part-time (External), August 2022.
   b. K. Sharmila Devi, **Graph Theoretic Modeling and Control for Decongesting Transportation Networks**, October 2021.
   c. S. Ismail, **Fault-Tolerant Autolanding Controller using Diagonally Dominant Backstepping and Neural-Sliding Mode Augmentation**, November 2014.
   d. P. Kavitha, **A Study on the Proofs and Computational Complexity of Stability Criteria in Control Engineering**, September 2013.
   e. N. Raju, **Analysis of Welding Distortion using Strain Gauge based Instrumentation System**, December 2010.
   f. S. Seshadhri, **Estimation & Design Methodologies for Networked Control Systems with Communication Constraints**, PhD Awarded in December 2010.
3. **PhDs. guided as co- guide and degree awarded**
   a. B. Vasuki, **Analysis of Uncertainty for Instrumentation Systems using Interval Methods**, December 2009
4. **M.S./Research Projects:**
   a. T. A. Ambili, Electronic Circuit Design from a Control Systems Perspective, August 2016
   b. Jerome M Moses, Stochastic Resonance and Applications in Control Systems, July 2014
5. **Number of significant M.Tech Projects guided: 18**

➕ **International Conferences & Workshops participated on invitation recently (major ones)**

1. TEQIP III – Professional Development Training Programme for Faculty & Administrators, Indian Institute of Management Visakhapatnam, January 27 – 29, 2021.
2. TEQIP III – Professional Development Training Programme for Faculty & Administrators, Indian Institute of Management Tiruchirappalli, September 23 – 27, 2019.
3. "Advances in Control Education," 12th IFAC Symposium on Advances in Control Education (IFAC-ACE 2019), Philadelphia, USA, July 7 – 9, 2019.
4. "Human Cyber Physical System Interaction: Control for the Human Welfare," IFAC & IEEE-CSS sponsored International Workshop, Paris, Sept 22-23, 2014.
5. "Workshop on Probability and Stochastic Processes in Engineering," EE Dept, IIT Bombay, March 11-15, 2013.

➕ **Invited Lectures Delivered @**

1. 16-hour module taught for **eMasters in Finance Technology & Management (FTM) @ IITKanpur**, Oct-Dec, 2023, Apr-Jun, 2024, Oct-Dec, 2024, Apr-Jun, 2025.
2. DRDL Conference on Latest Trends in Anti-Tank Guided Missile Technologies, October 11, 2021, on Modern Control Strategies for ATGMs
3. AICTE Margdarshan National Workshop on Outcome Based Education, NIT Trichy, June 2021, on "Landscape of Higher Engineering Education."
4. AICTE Margdarshan FDP on Perspectives and Challenges in Outcome Based Research, NIT Trichy, July 2020, on "Computing & Research."

5. 12th **IFAC Symposium on Advances in Control Education (IFAC-ACE 2019), Philadelphia, USA, July 7 – 9, 2019**, on "A Fresh Approach to Teaching State-Space Methods in an Undergraduate Course,"
6. AICTE Margdarshan FDP on Process Optimization & Control, NIT Trichy, June 2019.
7. Invited talk on Systems & Control for Society Through Institute – Industry Collaboration, ABB Academia Co-Creation Workshop, **ABB, Bangalore**, March 22-23, 2018.
8. Workshop on Advances and Success Stories of Robust & Adaptive Control, Dept of Aerospace Engineering, **Indian Institute of Science, Bangalore**, September 8-9, 2017.
9. Invited talk on Control in Finance at **IDRBT, Hyderabad**, May 27, 2017.
10. Invited talk on Industry 4.0 at **ABB, Bangalore**, March 16, 2017.
11. TEQIP funded Faculty Development Programme, Dept. of EEE, **NIT Calicut**, Jun-July, 2016.
12. Workshop on Nature Inspired Computing in Engg Appls, **IISc., Bangalore**, April 6-8, 2015.
13. Certificate Course on *Advanced Control Engineering for the Scientists* of **DRDL Hyderabad** (8 lectures), Jan - Mar, 2013.
14. UKIERI workshops – **NAL Bangalore**, Dec 2011, **Univ. of Leicester, UK**, Sept 2011, **IIT Bombay**, Dec 2010, **NIT-T**, Dec 2009, **IISc Bangalore**, Aug 2008, **Univ. of Leicester, UK**, July 2008.
15. Invited Lecture, Aerospace Engineering Dept, **IISc Bangalore**, Oct 2008.
16. **Texas A&M University, USA**, April 2008 (4 lectures).

⬩ Conferences Organized
1. Co-General Chair, ICECON 2019, Int. Conf. on Instr. & Control Engg.," 19 – 21, Dec 2019.
2. Member, International Program Committee, & Associate Editor, 12th IFAC Symposium on Advances in Control Education (IFAC-ACE 2019), July 7 – 9, 2019, Philadelphia, USA.
3. General Chair, 4th IFAC Conference on Advances in Control & Optimization of Dynamical Systems (ACODS), Feb 1-5, 2016, NIT Trichy.
4. Convener, ICECON 2009, Organizing Secretary, ICECON 2007
5. Founder Organizing Secretary, "National Conference on Instrumentation & Control Engineering (ICECON)," 4th to 6th Dec 2003

⬩ Courses/Workshops organized as a coordinator
1. AICTE Margdarshan FDP on Process Optimization & Control, June 3 – 7, 2019
2. Workshop on Innovative & Sustainable Chemical Process Analysis, Design and Synthesis, NIT Trichy, Aug 28 to Sep 1, 2017.
3. ACDOS Workshop "Emerging Avenues in Advanced Control," NIT Trichy, Oct 17, 2015
4. TEQIP – II sponsored workshop "Flight Mechanics, Guidance, & Control," Nov 5-6, 2015.
5. TEQIP – II sponsored workshop "Data Based Analysis & Synthesis of Linear Systems," Prof. Shankar P Bhattacharyya Festschrift, Dec 31, 2013.
6. TEQIP - II sponsored workshop "Perspectives on Curriculum," May 9-10, 2013.
7. Certificate Course on Advanced Control Engineering for the Scientists of DRDL Hyderabad (8 lectures), Jan - Mar, 2013
8. ACDOS Workshop "Fascinating and Challenging Applications of Estimation," NIT Trichy, Nov 10-11, 2011
9. AICTE FDP on Trends in Biomedical Engineering, 28th June to 3rd July, 2010
10. UKIERI funded Programmes organized at NIT Trichy, Univ. of Leicester, IISc Bangalore, IIT Bombay, and NAL Bangalore during 2008 – 2011.

+ **Membership in Professional bodies**
  1. The Institution of Electrical & Electronics Engineers (**IEEE**), USA – **Senior Member**
  2. The Society for Industrial & Applied Mathematics (**SIAM**).
  3. The Automatic Control & Dynamic Optimization Society (**ACDOS**, an affiliated National Member Organization of the International Federation of Automatic Control (**IFAC**)); Founder secretary 2011 – 14, Vice-President 2014-16, and President 2016 – 18.

+ **Other information:**
  - **Administrative Positions and Professional Development related activities**
    1. Served as Dean of Academic Programs of the institute January 2021 – January 2024.
    - Hugely successful in handling academic affairs during COVID-19/online classwork.
    - Brought in several significant reforms in line with the National Educational Policy 2020. [Incl. flexible inter/multi-disciplinary projects, foreign languages]
    2. Served as the Head of Computer Support Group, the IT hub of NIT Trichy, for 5 years from April 2015 – June 2020.
    - Handled projects worth Rs. 32 crores, well versed with GIFR.
    - Proposed in 2016 for a supercomputer under National Supercomputing Mission (NSM) of GoI, which has been approved in 2020. A 650TF supercomputer costing about INR 19.5 crores.
    3. Held the position of Head of the Department from Dec 1, 2009 to Nov 30, 2012.
      - Instrumental in streamlining administrative activities and simplifying procedures
      - Procured equipment worth approx. Rs. 1 Crore in addition to the DST-FIST funding.
      - Architect of Industry-taught courses (core and elective)
      - Motivated ministerial staff in organization, productivity, and delivery
    4. Held the position of Associate Dean R&C from Sept 1, 2008 to Nov 30, 2009
    5. Conceived and nurtured Carnatic Music Club called AMRUTHAVARSHINI and organized Thyagaraja Aradhana for 5 consecutive years from 2006 to 2010.
    6. Has been staff advisor for IEEE Student chapter since 1999, for Linux Users Group since 2004, and for Robotics & Machine Intelligence club since 2008.
    7. Was a staff advisor for ACM Student chapter and E-cell during 2005 – 2007

  - **Other interests:**
    o Mathematics & Science Education, Classical Music, Reading

Reference: The Director,
    National Institute of Technology Tiruchirappalli
    TIRUCHIRAPPALLI, 620 015, INDIA
    Email: director@nitt.edu
    Tel: +91 – 431 – 2503 – 001

All the data furnished in this curriculum vitae pp. 1 – 8 are true to the best of my knowledge.

NIT Trichy,
April 11, 2025

Statement on Research and Teaching

My doctoral work at IIT Delhi was in the broad area of Robust Control. After a short stint with simulation studies using Neural Networks and Fuzzy Logic, I preferred to switch over to a more rigorous approach of applying game theory to control problems in nonlinear systems. I succeeded in my attempt to integrate the measures of robustness (the H_∞-norm), and intelligence (the reinforcement learning), in the game theoretic setting. I am proud to say that this work was conceived and conceptualized more than a decade ahead of the current software packages and sundry applications in deep neural networks and reinforcement learning.

Dynamic Programming was an integral part of my thesis and working extensively on this goaded me to look at the "computational" issues. Soon after my thesis, I started looking at the controller design problems from a computational complexity point of view and discovered certain interesting issues; for instance, the pole placement problem (full state feedback control) in linear systems with constraints is *NP hard* (it may take ages to arrive at a satisfactory design), and the complexity of simple and the most popular output feedback control problem is unknown. This problem is still in the list of open problems in Systems & Control. Complexity theory provides a rigorous mathematical framework to study such problems and prompts us to invent computationally tractable algorithms. This line of research is very pragmatic since computation is now regarded as an equal and indispensable partner along with theory and experiment in engineering practice. In the year 2001 I was invited to visit the Institute of Mathematical Sciences Chennai, as an associate professor. This institute has provided facilities for my carrying out this research for three years. Towards late 2002, the Department of Science & Technology (DST, GoI) has approved my proposal for further research in this direction on a larger scale and funded me under its Young Scientists scheme. Since then I have been working towards developing computationally efficient control algorithms. This bringing together control systems and complexity theory of computer science is has been scintillating, and all of my learning and current research has been pivoted on this.

In May 1996 I joined the National Institute of Technology at Tiruchirappalli as a lecturer in the fledgling department of Instrumentation and Control Engineering. Owing to the wider spectrum of courses offered here, I was assigned to devise the "Control Stream" with core courses - MATHEMATICS, NETWORK THEORY, SIGNALS AND SYSTEMS, MICROELECTRONICS, OPERATIONAL AMPLIFIERS, CONTROL SYSTEMS, DATA STRUCTURES AND ALGORITHMS, and MODERN CONTROL THEORY (in that order, semester-wise), and related electives like ROBOTICS, NONLINEAR CONTROL, AUTOMOTIVE CONTROL SYSTEMS, INTELLIGENT CONTROL, COMPUTATIONAL TECHNIQUES IN CONTROL ENGG., PROBABILITY & COMPUTING, and COOPERATIVE CONTROL. Most of these courses are regularly offered by me. I also had an opportunity to be the founder-convener for the department's library and the computer center.

Over the years this stream has evolved quiet well with a rich blend of mathematical rigor and physical intuition. I have also developed four core laboratories, primarily for the undergraduate students, where low cost electrical network elements and hands-on experimentation are preferred to expensive demonstration modules. One of the interesting experiments is the non-inverting Deboo Integrator during V and VI semesters. This practice has been well received since it enables the student to apply the theory verbatim and conduct an *experiment* rather than simply *demonstrate*. There are several masters' and doctoral students who work in these laboratories for enriching their fundamentals. Using the resources of these laboratories I have guided students in

designing and developing low-cost self-navigating mobile robots. For the Robotics & Machine Intelligence (RMI) club under the IEEE student chapter, I have guided several projects, including an all-terrain vehicle, self-balancing bicycle, and a virtual xylophone. These activities have been much sought after in the campus, motivating several students into pursuing research in the USA, the UK, and Australia. In turn this motivates me to nurture the student community here. I have summarized my experiences, partly in teaching and partly in research, and authored two textbooks titled CONTROL ENGINEERING: A COMPREHENSIVE FOUNDATION and LINEAR CIRCUITS: ANALYSIS AND SYNTHESIS.

Post 2005, NIT Tiruchirappalli added research to its otherwise teaching agenda. Continuing with my research in computational complexity for practical control systems, I have collaborated with the Dept. of Aerospace Engg., Indian Institute of Science (IISc) Bangalore in 2007. Our joint proposal "Towards Reliable Smart and Adaptable Air-Vehicles" was granted major award by the British Council under its maiden UKIERI scheme 2007-11. In addition to IISc Bangalore, I worked closely with the research groups at the University of Leicester (UK), IIT Bombay, and National Aerospace Laboratories (NAL) Bangalore. In particular, I contributed to the design and analysis of path planning algorithms for UAVs and certain on-board electronics for mini and micro air-vehicles. As a part of this project I guided a PhD in the broad area of Networked Control Systems. In addition to the project there was another strong collaboration with the Flight Mechanics & Controls Division of the NAL which resulted in a PhD on Autolanding Controllers for fixed-wing aircrafts. Furthermore, a year ago one of my students got her Ph.D. for her work on Graph Theoretic Modeling and Control of Decongesting Traffic Networks wherein we tapped on V2V and V2I communications and developed a robust framework for the design of very large intersections.

During January-March 2013, I conducted a Certificate Course in Advanced Control Engineering for the scientists at the defense research laboratories (DRDL Hyderabad) of the government of India, with important topics such as State-space methods, Optimal Control & Dynamic Programming, and Kalman Filters, tailored to their research activities. Subsequently, one of the senior scientists of the organization worked on these ideas extensively and obtained his PhD for his thesis on Modern Control Laws for a class of Missile Systems.

In summary, all through I have been quite proactive in the academic activities, pertinent to my parent institution. I strengthened myself in peer-networking over years. I have healthy professional relationship with several universities around the world, as well as with the industry. It is always a source of deep inspiration and immense satisfaction receiving mails of appreciation periodically from my passed-out students who stand witness to my mentoring.

During 2019, I was invited to deliver a talk "A Fresh Approach to Teaching State-Space Methods in an Undergraduate Course" at the prestigious 12th IFAC Symposium on Advances in Control Education (IFAC-ACE 2019), July 7 – 9, 2019, Philadelphia, USA. Recently I have co-authored a huge reference book *Control Systems: Classical, Modern, and AI based Approaches*, covering the gamut of control and this is published later in 2019 by the Taylor & Francis group, CRC Press, USA; my co-author and collaborator was from NAL Bangalore.

I look forward to taking up more exciting projects both in theory and in practice that would enrich my learning, and consequently allow me to work for the welfare and growth of the society around me.