



Associate Professor-Senior Scale & Group Leader: Control Systems.
Young Scientist Scheme Grant Awardee (2013-2017), DST. G.O.I. Co-PI, ISRO Research Project, G.O.I(2019-2021)
Dept. of Instrumentation and Control Engineering
Manipal Institute of Technology, MAHE (Institution of Eminence),
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Dr.I.Thirunavukkarasu, Ph.D. IEEE Senior Member

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CV Last update : 9th November 2021

SCOPUS ID : 25928064400 ; H-Index : 5

<https://manipal.pure.elsevier.com/en/persons/thirunavukkarasu-indiran>

Désignation : Associate Professor- Senior Scale

Associate Professor

Assistant Professor-Sr. Scale

Lecturer, ICE, MIT, Manipal

Lecturer, EIE, Hindustan College of Engg.

Lecturer, EEE, Thirumalai Engg. College

- 12th July 2017 to **Till date.**

- 2nd April 2012 to 11th July 2017

- 2009 to 1st April 2012

- 15th July 2006 – 2009

- August 2005 to 13th July 2006

- Feb. 2005 to August 2005

Post Doctoral Research (Oct 2020- March 2021) to work on Parameter Estimation and Non-linear controller design under **Prof.Dr.Radhakant Padhi**, Dept. of Aerospace, **IISc, Bangalore.**

Visiting Professor (2018), Dept. of Chemical Engineering, Ryerson University, Canada

Teaching Expérience : 15Yrs +.

Area of Research : NMPC, NMBC, T-MPSP, State Estimation and Non-linear Kalman filters.

Alma Mater :

Post Doctoral Research & Publication

- M.I.T, MAHE, India. 2013-2015.

Ph.D (Control Systems)

– M.I.T, MAHE, India - 2012.

M.E (Process Control & Instrumentation)

– 1st Class, Annamalai University, India - 2005.

B.E (Instrumentation & Control Engg.)

– 1st Class, Madras University, India - 2002.

Diploma (ECE)

– 1st Class with Honors.

State Board of Technical Education, 1999

Skill Sets: MATLAB, MAPLE, PID Algorithms, Implementation of Control algorithms on Pilot Plants,

Area of Specialization: Advanced Process Control, Control Systems, Robust & Optimal Control.

Post-Doctoral : Design and Implementation of a Sliding Mode Controller for the Nonlinear process

Doctoral Thesis: Optimal Robust H-Infinity Controller for an Integrating Process with Dead Time,

Doctoral Thesis Advisor: Prof.(Dr.) V.I.George,

Thesis Examiner: Prof.(Dr.) J.Prakash, IE, MIT, Anna University.

Master's Thesis: Fault Identification and Accommodation in a Three Tank System.

Thesis Advisor: Prof.(Dr.) S.Abraham Lincon

Thesis Examiner: Prof.(Dr.) S.Sundara Moorthy, Chemical Engg. PEC,
Puducherry.

Under Graduate Thesis: Design and Development of the PLC program for the CSRDM
carried out in IGCAR, Kalpakkam. Dept. of Atomic Energy, Govt. of India.

Thesis Advisor: Sri.P.Udhaya Kumar, Scientist, MAPS, Kalpakkam. /

Sri.S.Chandrasekhar, Scientist, IGCAR, Kalpakkam

Examiner: Prof. Umashankar, Ex-Professor & Head-EEE, MIT, Manipal

Professional Memberships

IEEE Senior Member	- 94463159
Life Member in Systems Society of India	- LM27072
Life Member in Indian Society of Technical Education	- LM55395
Associate Member in Institution of Engineers-India	-AM09652907
Life Member in ISSE, India.	-LM 00275
American Chemical Society Member	- 31981804
ACDOS Member (Indian National Member Organization of IFAC) - Professional member till 31/12/2023	

Subjects Taught.

For UG

Virtual Instrumentation, Optimal Robust Control, Sensor Signal Processing, Process Instrumentation & Control, Digital Signal Processing, Analog System Design, Electronic Instrumentation, Neural Networks and Fuzzy Logic, Industrial Instrumentation – I, Industrial Instrumentation – II, Instrumentation & Transducer, Network Analysis and Synthesis, Dynamics of Systems, Control Systems, Modern Control Theory, Instrumentation and Control in Petrochemical Industry, Chemical Process Systems, Linear Control Theory.

For PG (10+ Year's Experience)

Process Dynamics and Control, Advanced H-Infinity Control, Optimal Control, Nonlinear Control Systems, System Modeling and Identification, Advance Virtual Instrumentation, Soft Computing, Robotics and Automation, Space Science Instrumentation, Space Mission Analysis and Design Technique.

Ph.D Thesis Evaluated as Indian Examiner. [Interaction with outside world]

- 1.“A Novel Maximum Power Point Tracking of Photovoltaic Array and Online Dynamically Coupled Control of Micro-Grid Connected Inverter” - Anna University, Chennai, 2014.
- 2.“Fuzzy Logic Based Super-Twisting Sliding Mode Controllers for Dynamic Uncertain Systems “, St. Peter's University, Chennai, 2014.
- 3.“Certain Investigations on Control Strategies for Linear and Non-Linear Systems", Annamalai University, Chidambaram, 2015.
- 4.“Comprehensive Analysis of Intelligent Controllers for LFC Applications”, Annamalai University, Chidambaram, 2016.
- 5.“Certain Investigation on Tuning Of PID Controller In Automatic Voltage Regulator System By Bio-Inspired Optimization Techniques”, Anna University, Chennai, 2016.
- 6.“Development of Optimal Controller for Parallel Operation and Interconnected Operation of Heavy Duty Gas Turbine Plants”, Anna University, Chennai, 2016.
- 7.“Certain Investigation on tuning of PID controller in Automatic Voltage Regulator System by Bio-Inspired Optimization Techniques”, Anna University, Chennai, 2016.
- 8.“Application of Computational Intelligent Technique for Load-Frequency Control of Interconnected Power System”, Annamalai University, Chidambaram, 2016.
- 9.“Performance Enhancement of a Boiler using Flame Image Processing”, Annamalai University, Chidambaram, 2016.
10. “Development of Optimal Controller for Parallel Operation and Interconnected Operation of Heavy Duty Gas Turbine Plants”, Anna University, Chennai -2016.
11. “Design of Economic Dispatch and Economic Emission Dispatch Models for GENCOS with Thermal and Wind Powered Generators”, Anna University, Chennai -2016.
12. “Automatic Blood Gases Control in Perfusion System for ECMO Support and CPB surgery Conditions”, Annamalai University, Chidambaram-2016.
13. “Investigation in Location based Multipath Secured Energy Efficient Routing Approach for MANET”, Karpagam University, Coimbatore-2016.

14. “Design and Analysis of Two Degree of Freedom Hybrid Controller for Integral Process with Longer Time Delay”, Anna University, Chennai - 2017.
15. “Certain Investigations on Soft Computing Techniques based Controllers for Bidirectional DC-DC Converters”, Karunya University, Coimbatore-2017.
16. “Certain Investigations on The Performance and Comparative Analysis of Three Phase Induction Motor with ANN Controller”, Anna University, 2018.
17. “Implementation of Maximum Power Point Tracking Controller for PMSG Based Variable Speed Wind Energy Conversion System”, Anna University, 2018.
18. “Certain Investigation on Segmentation of Image and Video for Multiple Object Detection”, Annamalai University, 2020.
19. “Design of Soft Computing Controller for Direct Torque Control Induction Motor Drive”, Anna University, 2020.
20. “A Novel DLIONABC Segmentation and Feature Selection Approach for Lung Cancer Recognition on CT Images Based On ICNN Classification”, SRM University, 2020.
21. “A certain investigation on effluent waste water treatment process”, Karunya University, 2020.
22. “Wireless Sensor Network (WSN) Based Analysis of Healthcare and Movement Parameters For Horizontal Distance Event – Javelin”, Tamil Nadu Physical Education and Sports University”, 2021.
23. “Investigation of Multilevel Inverters for Photovoltaic System”, Sri Chandrashekara Saraswathi Swamigal Viswa Maha Vidyalaya, Enathur, Kanchipuram, 2021.

Universities Visited on Abroad

- 1.Universiti Teknologi of MARA, Pulu Pinang, Malaysia- Dec 2008.
- 2.Nanyang Technological University, Singapore- Feb 2010.
- 3.Sultan Qaboos University, Muscat-Oman – Dec 2010.
- 4.Ryerson University, Toronto, Canada – Aug 2013.
- 5.University of Westminster, London-UK – June 2014.
- 6.Manipal University Dubai, Dubai – Oct. 2014.
- 7.Saarbruken University, Germany – June 2015.
- 8.University of Palermo, Italy – Nov. 2015.
- 9.Chulalongkorn University, Thailand – June 2016.
10. Massachusetts Institute of Technology, Boston – Sep. 2016.
11. King Mongkut's Institute of Technology Ladkrabang, Thailand. – Oct. 2017.
12. University of Malaya, Kuala Lumpur, Malaysia – Nov. 2017
13. University of Bahrain, Bahrain – April 2019.
14. Amity University, London – April 2019.

Lab Established: Advanced Process Control Lab for PG Control Systems in ICE Dept.

Awards

1. Research Incentive cash award from Manipal University for the research publication in 2008.
2. Received the best paper award in CISCON'08.
3. Received Conference grants from Manipal University to present the research paper in Malaysia, Oman Conferences
4. Received the best paper award in ICM2ST-2011 International Conference, Jaipur, Nov. 2011.
5. Received the best paper award in DRDO-CSIR Sponsored 9th CISCON-2012.
6. Under the "Excellence in Teaching and Research publication" of Manipal University scheme availed the round trip facility to Ryerson University, Toronto, Canada for the ICMEM'13 conference.
7. Awarded Rs.5,000/- as 1st Price in Paper presentation(Best paper award) in Manipal Research Colloquium- Apr. 2014.
8. Best Paper award in ICDAMS, Saveetha University, Chennai. 7th-8th April 2016.
9. Best Paper award in ICPEME-2016, Bangkok, Thailand, 18th-19th June 2016.
10. Best Paper award in FAME-2016, Sathyabama University, 18th-9th July 2016.
11. Best Paper award in ICICE-2016, Chicago, USA, 19th Sep. 2016.
12. Best Paper award in ICRIET-2016, Orissa, 5th-6th Nov. 2016.
13. Best Paper award in IEEE- ICPCT, Kollam, Kerala – 20th-21st April 2017.
14. Best Paper award in ICEEC-2017, Pune on 20th March 2017.
15. Best Paper award in Cambridge Summit-2018, London- Jan 2018.
16. Best Paper award in ETMN-2021, MUJ, Jaipur, 8-9 Oct 2021.

Grants/Funding Received

S. No	Funding Agency	Event	Amount
1	DRDO, Govt. of India	International Conference ICSDC2010	Rs.35,000/-
2	ISRO, Govt. of India	International Conference ICSDC2010	Rs.50,000/-
3	National Instruments, Bangalore	International Conference ICSDC2010	Rs.50,000/-
4	MRPL (Subsidy of ONGC, Govt. of India), Mangalore.	International Conference ICSDC2010	Rs.10,000/-
5	Edu. Tech (I) Ltd, Chennai.	International Conference ICSDC2010	Rs.25,000/-

6	DRDO, Govt. of India	CISCON2011 – An International Conference	Rs.35,000/-
7	MIT, MAHE, Manipal	Post-Doctoral Research Grant	Rs.1,20,000/- (Completed)
8	DST-Fast Track Young Scientist Scheme Ref. No: SERC/ET-0308/2012	Project worth of Rs.13.53 Lakhs	Rs.13.53 Lakhs Sanctioned for 3 years. Completed with Excellent Grade in meeting held in IIT-Madras, Apr' 17.
9	BRNS, DAE, Govt. of India. Ref. No: 2012/17/34/101/140-BRNS/2420	FDP on Process Control 17 th -21 st Dec '13.	<u>Rs.50,000/-</u>
10	Design of SMC for Quadrotor UAV. ISRO, Govt. of India.	Rs.12.28 Lakh	<u>On-Going</u>
11	Research Seed Money Grant, MAHE Manipal towards “Kinetic modeling of Batch Reactor and implementation of nonlinear control algorithm”	Rs.50,000	<u>On-Going</u>
12	ISRO, Govt. of India (Nonlinear Controller implementation on MAV)	Rs.19.5 Lakh	<u>Under Review.</u>
13	DRDO, Govt. of India	Rs.66 Lakh	<u>Under Review.</u>

University Assignments:

1. Question paper setter for (a) Anna University, Chennai. (b) Goa University, Goa (c) Kannur University, Kannur (d) Kongu Engg. College (Autonomous), Perundurai, Erode. (e) CVR College of Engg., Hyderabad
2. Served as an observer for the SMU distance education exam in Hyderabad center.
3. Indian Examiner for Ph.D Thesis Evaluation – Anna Univ., Annamalai University, Etc.
4. External Member for B.O.S-Sri Ramakrishna College of Engg., Coimbatore-2016.
5. DCC Member, EIE Dept., Sri Ramakrishna College of Engg., Coimbatore-2019.
6. Question paper setter & Moderator for EIE, Ramaiah Institute of Technology, Bangalore, 2021

Guest Editor:

1. International Journal of Intelligent Systems Technologies and Applications, Vol. 19, No.4, 2020, Inderscience Publication. ISSN: 1740-8873(Online) & 1740 8865 (Print)
2. International Journal of Vehicle Information and Communication Systems, Vol.6, No.1, 2021 , Inderscience Publication. ISSN: 1741-8208(Online) & 1741 0242 (Print)

Editor, Reviewer (Peer Reviewed SCI Journals) & MoU :

1. Proceedings of International Conference on System Dynamics and Control (ICSDC 2010). *I.K International publishing house Pvt. Ltd. ISBN 978-93-80578-58-3* (<http://eprints.manipal.edu/id/eprint/142464>)
2. ISA Transactions (Q1) – Reviewer.
3. Industrial and Engineering Chemistry Research (Q1) – Reviewer.
4. ACS Omega (Q2) – Reviewer.
5. Inderscience Publications- Reviewer.
6. Doctoral Committee Member (Area: Advanced Process Control), Karunya Institute of Technology and Science, Coimbatore.
7. MoU with Prof. Srinivas Palanki, Chemical Engineering, West Virginia University – Students /Faculty Exchange – Initiated and Under Progress with MAHE.
8. Research – Funding (Pvt. & Govt.) Collaboration with MUJ, Jaipur in the area of Advanced Process Control.
9. Research Collaboration with Faculty of Engineering, Naresuan University, Thailand.

B.Tech Honors Students Mentorship.

1. Vignesh Renganathan, “Design and Implementation of MPSP on a Binary Distillation Column Pilot Plant”, 2021-2023. (One and half years’ project)
2. Gautham Raj, “Validation of UKF-NMPC on a laboratory scale Binary Distillation Column”, 2021-2023. (One and half years’ project)

Journal Publications:

2021

1. Salikandi, M., Ranjbar, B., Shirkhan, E., S.Shanmuga Priya, **Thirunavukkarasu, I.**, Sudhakar, K, “Recent trends in liquid desiccant materials and cooling systems: Application, performance and regeneration characteristics”, Journal of Building Engineering (Q1), **Impact Factor: 3.379** , 2021, 33, 101579
2. Tinu Valsa Paul, V.I.George, **Thirunavukkarasu Indiran**, “Nonlinear Dynamic Modeling of a Quadrotor and its Control using SMC” – **Journal of Aerospace Engineering (Q2) Impact Factor: 1.78 –Accepted-ASENG-3722R2 (Final revisions submitted)**
3. Eadala Sarath Yadav, Prajwal.J, Susmitha Poojary, Shreesha.C, **Thirunavukkarasu Indiran**, “Data Driven Modeling of Pilot Plant Batch Reactor and Validation of Nonlinear Model Predictive Controller for a

- Dynamic Temperature Profile Tracking”, **Manuscript ID: ao-2021-000878**, **ACS Omega (Q2)**, **Impact Factor 2.87**. **D.O.I:** 10.1021/acsomega.1c00087, **June 2021**
4. Suraj Suresh Kumar, V.I.George, **Thirunavukkarasu Indiran**, “Simulation of Advanced Nonlinear Controllers for a Nonlinear Quadrotor UAV Model”, - **Under Review – TADR-2021-0333**
 5. Mary Ann George, Dattaguru V. Kamath, **Thirunavukkarasu Indiran**, “OTA-C realization of an optimized $PI^{\lambda}D^{\mu}$ controller for BLDC motor speed control”, **IETE Journal of Research (Q3)** ,P.No.1-19, July 2021, **Impact Factor: 1.03**, **D.O.I:** <https://doi.org/10.1080/03772063.2021.1951380>
 6. Prajwal Shettigar J, *et al.* “Validation of Advanced Nonlinear Predictive Control Algorithms on a Lab-Scale Acrylamide Polymerization Batch Reactor”, **ACS Omega (Q2)**, **Impact Factor: 3.512**, Manuscript ID: **ao-2021-03386t**, (<https://doi.org/10.1021/acsomega.1c03386>), **August 2021**.
 7. Janani.R, Eadala Sarath Yadav **Thirunavukkarasu Indiran**, “Experimental Modeling and Validation of Control Algorithms on a Lab Scale Non-Square Batch Distillation Column” – **Yet to communicate**.
 8. S.Meenatchi Sundaram, Navya Sree Shetty, Hariharan, **Thirunavukkarasu Indiran**, “Batch Reactor Temperature Control using Optimized DMC based PID” – Yet to communicate
 9. Abhirami.M, **Thirunavukkarasu Indiran** “Maximum Sensitivity based PID Controller for active load disturbance rejection in Lab Scale Batch Reactor-An Experimental Work”- CISCON-2021- **Accepted for Oral Presentation – Springer Lecture Series**.
 10. Sandipan Kumar Mishra, Sarath Yadav.E. **Thirunavukkarasu Indiran**, “Validation of Split Range Control Algorithm on a Laboratory Scale Batch Reactor Heating System” – **Best Paper Awarded**, MUJ, Jaipur. 9th Oct 2021. **AIP Proceedings**
 11. Shreasha.C, Prajwal Shettigar J, Ankita Pai, Yuvanshu Joshi, **Thirunavukkarasu Indiran et al**, “Hammerstein Modeling of a lab scale batch reactor and Validation of Nonlinear PID controller for a polymerization process” – **Journal of Indian Institute of Chemical Engineers (Q3) - Final draft ready to submit**.
 12. Prajwal Shettigar J, Eadala Sarath Yadav, Jatin K, **Thirunavukkarasu Indiran et al** “Artificial Neural Network based Weiner modeling and Validation of GPC for an Acrylamide Polymerization Batch Reactor” – **ACS Omega, Q2** – Yet to communicate.
 13. Prajwal Shettigar J, Cyril Joseph, Bredon D’Souza, Akshay K, **Thirunavukkarasu Indiran et al** “Estimation of Heat Release in Batch Reactor using Neural Networks and Validation of GMC for a Polymerization Process” – **Final draft ready to submit – Brazilian Journal of Chemical Engineering**.
 14. Prajwal Shettigar J, Harishankar, **Thirunavukkarasu Indiran**, “Support Vector Machine based Modeling and Validation of Nonlinear GPC control for a Batch Reactor Pilot Plant”- **I&ECR (Q1)**
 15. Krupa Narwekar, Prajwal Shettigar.J, **Thirunavukkarasu Indiran**, “Design and Validation of class of Sliding Mode Controllers for a Polymerization Reactor in the presence of Parameter Uncertainty” – Writing in Progress.
 16. Pavanraj.H.R, Prajwal Shettigar.J, **Thirunavukkarasu Indiran**, “Implementation of Receding-Horizon Nonlinear Kalman Filter based NMPC for an Acrylamide Polymerization Batch Reactor” – In Progress.
 17. Prajwal Shettigar.J, **Thirunavukkarasu Indiran**, Radhakant Padhi, “Implementation of UKF based Model Predictive Static Programming for a Polymerization Batch Reactor” – In Progress.
 18. Prajwal Shettigar.J, **Thirunavukkarasu Indiran**, Radhakant Padhi, “Neuro Adaptive Controller based on RBF for a Lab Scale Batch Reactor” – In Progress.

2020

1. Yadav, Eadala Sarath, **Indiran, Thirunavukkarasu**, Priya, S Shanmuga, “System Identification and Conditional Control for an Optimal Operation of a Pilot Plant Binary Distillation Column” International Journal of Computing and Digital Systems, Issue:1, Vol.9,2020.
2. Eadala Sarath Yadav, **Thirunavukkarasu Indiran**, S. Shanmuga Priya, “Optimal Energy Consumption of Distillation Process and its Purity Analysis Using UV Spectroscopy” ACS Omega, Vol.6, Issue 2, P.No: 1697-1708. **Published on 31/12/2020** [<https://pubs.acs.org/doi/pdf/10.1021/acsomega.0c0573>] [**ScopusQ2/WOS-Impact Factor : 2.87**]
3. Janani.R, Vinayambika.S.Bhat, **Indiran Thirunavukkarasu**, V.I.George, “Identifying the Stabilizing region of PI Controller based on Frequency Specifications for a Lab Scale Distillation Column”, International Journal of Digital Signals and Smart Systems, Vol.4, No.1/2/3, 2020, **Inderscience Publishers**.
4. Eadala Sarath Yadav, **Thirunavukkarasu Indiran**, Dayananda Nayak, “Simulation Study of Distillation Process using ASPEN Plus” – **Materials Science Today Proceedings**, Available online from 4 September 2020.
5. Suraj.S, V.I.George, **Thirunavukkarasu Indiran**, “Sliding Mode based Control Design for a Quadrotor UAV”, **CISCON-2020, Springer Lecture Series. –Presented**.
6. Janani.R, **Thirunavukkarasu Indiran**, “Decentralized PI Controller Tuning Based on Routh Hurwitz Tuning for an Interacting Distillation Process”. Presented in an International Conference. Dept. of Mechanical Engg, Serbia. Nov, 2020.
7. Janani.R, **Thirunavukkarasu Indiran**, Sarath Yadav.E, S. Shanmuga Priya, “Modeling and Control of Tray Temperature along with Column Pressure in a Pilot Plant Distillation Column”, Extended paper of ICACTM2019 in the Special Issue on Computational Statistics, **Springer Nature Journal**, Oct. 2020.

2019

1. Eadala Sarath Yadav, **Thirunavukkarasu Indiran**, S.Shanmuga Priya and Giuseppe Fedele., “Parameter Estimation and Extended Predictive Based Tuning Method for a Lab Scale Distillation Column”, **ACS Omega, ACS Publications, Dec. 2019 [ScopusQ1/WOS-IF: 2.58]**
2. Eadala Sarath Yadav and **Thirunavukkarasu Indiran** et al., "PRBS based model identification and GPC PID control design for MIMO Process", **Materials Today: Proceedings, Elsevier Publications**, Volume 17, Part 1, 2019, Pages 16-25 [Scopus Indexed].
3. Yadav, Eadala Sarath; **Indiran, Thirunavukkarasu**; Priya, S Shanmuga, “Experimental Validation of Amigo Based PID for a Binary Distillation Column” International Journal of Engineering and Advanced Technology, Volume-9, Issue-1S3, December 2019

2018

1. Vinayambika S Bhat, **I. Thirunavukkarasu**, S. Shanmuga Priya, “Design of Centralized Robust PI Controller for a Multivariable Process”, **Journal of Engineering, Science and Technology**, vol. 13, no. 5, pp. 1253-1273, 2018. ISSN: 1823-4690 (SCOPUS Indexed). 2018.

2. EdalaSarathYadhav, **Dr.I.Thirunavukkarasu**, S. Shanmuga Priya, Relay Based Identification and Control of SISO process –An Experimental Approach via Conical Tank, International Journal of Pure and Applied Mathematics, 118 (20). ISSN 1314-3395
3. Vinayambika S. Bhat, **I. Thirunavukkarasu**, S. Shanmuga Priya, Janani.R “Identifying the Stabilizing Region of PID Controller Using Polytopic Polynomial Approach for Pilot Plant Binary Distillation Column” vol. 118, no. 18, pp. 2229-2240, 2018. ISSN 1311-8080.
4. Janani.R, **I. Thirunavukkarasu**, Vinayambika S Bhat, “Experimental implementation of CDM based two mode controller for an interacting 2*2 distillation process” vol. 118, no. 18, pp. 2241-2251, 2018. ISSN 1311-8080.
5. Santhosh Kumar. P. L,S. Selva Kumar, **I. Thirunavukkarasu**, Vinayambika S. Bhat, “Decentralized PI controller with decoupler for the distillation column”, International Journal of Pure and Applied Mathematics, vol. 118, no. 20, pp. 9-14, 2018. ISSN 1311-8080.
6. Santhosh Kumar. P. L,S. Selva Kumar, **I. Thirunavukkarasu**, Vinayambika S. Bhat, “Experimental validation of PI controller based on pole placement for a batch distillation column”, IJPAM, Vol. 118, no. 9, pp. 413-419, 2018. ISSN 1311-8080
7. Santhosh Kumar. P. L,S. Selva Kumar, **I. Thirunavukkarasu**, Vinayambika S. Bhat, “Smith Predictor Based PI Controller Design for a Batch Distillation Column” , IJPAM, vol. 118, no. 22, pp. 1109-1115, 2018. ISSN 1311-808
8. Eadala Sarath Yadav, **Thirunavukkarasu Indiran**, Ganesh UG, Shreesha C, Akhil V Jose, “Online Relay Based System Identification and Controller design with Anti-Reset Windup for the Binary Distillation Column”, International Journal of Engineering & Technology 7(4):516-520, DOI: [10.14419/ijet.v7i4.30.25772](https://doi.org/10.14419/ijet.v7i4.30.25772)
9. T.Bhuvanendhiran, Abraham Lincon, I.Thirunavukkarasu & Edala Sarath Yadav, “Nonlinear Control Design For A Nonlinear Process- An Experimental Approach”, Journal of Advanced Research in Dynamical and Control Systems, 2018.
10. S.Shanmuga Priya,Lisa Maria Ubbenjans, **I.Thirunavukkarasu**, “ANN and ANFIS modeling of Global Solar Radiation data for different locations for design of solar energy conversion system”, Vol.7, Issue.2., International Journal of Engineering and Technology(UAE), Page. No: 88-93, 2018.

2017

1. Bharath K Udupa, **I.Thirunavukkarasu**, Dayananda Nayak, Vinayambika S Bhat “Extended Predictive Controller for a First Order Process with Dead Time Model”, International Journal of Pure and Applied Mathematics, Volume 114 No. 10 2017, 477-486.
2. Sree Latha Chopparapu, V. I. George, **I. Thirunavukkarasu**, Vinayambika S Bhat4, “Design and Simulation of Kalman Filter for the Estimation of Tray Temperatures in a Binary Distillation Column”, International Journal of Pure and Applied Mathematics, Volume 114 No. 9 2017,
3. Vinayambika S Bhat, S. Shanmuga Priya, **I. Thirunavukkarasu**, R. Russell Rhinehart, “Local Transient Model of a Pilot Plant Distillation Response”, International Journal of Pure and Applied Mathematics, Volume 114 No. 10 2017.
4. Raja. H Krishna Chaitanya, Subramanyam Ravva, Eadala Sarath Yadav, **I.Thirunavukkarasu**, “Online Mechanical Characterization of a Shell and Tube Heat Exchanger”, International Journal of Pure and Applied Mathamatics, Volume 114 No. 10, 2017.

2016

1. Edala Sarath Yadhav, **Dr.I.Thirunavukkarasu**, “Servo Mechanism Technique based Anti-Reset Windup PI Controller for Pressure Process Station”, Indian Journal of Science and Technology, Vol.9. Issue.8, Feb 2016. P.No:1-4. (SCOPUS Indexed)
2. E. Sarath Yadhav and **Thirunavukkarasu Indiran**, “Optimal Actuation of Controller Using Predictive PI for Nonlinear Level Process”, Indian Journal of Science and Technology, Vol 9(34), DOI: 10.17485/ijst/2016/v9i34/100987, September 2016. (SCOPUS Indexed).
3. Praveen Kumar and **Thirunavukkarasu Indiran**, “Advance Control Strategies for a Conical Process”, Proceedings of 2nd International Conference on Intelligent Computing and Applications, Volume 467 of the **Springer Publication** series Advances in Intelligent Systems and Computing pp 475-481
4. E. Sarath Yadhav and **Thirunavukkarasu Indiran**, “Comparative approach towards Modified Smith Predictor and Back Calculation design for conical tank level process control, **Lecture Notes in Mechanical Engineering, Springer publication**, pp 569-577, Sept 2016. **10.1007/978-981-10-1771-1_60**.
5. Vinayambika S Bhat, **I.Thirunavukkarasu**, S.Shanmuga Priya, “An Experimental Study on Implementation of Centralized PI Control Techniques on Pilot Plant Binary Distillation Column”, International Journal of ChemTech Research, Vol.9, Number.11, December. 2016 (SCOPUS Indexed).
6. Vinayambika.S.Bhat, Dr.S. Shanmuga Priya, **Dr.I. Thirunavukkarasu**, “Design and Implementation of Decentralized PI Controller for Pilot Plant Binary Distillation Column”, International Journal of ChemTech Research, Vol.10, Number.1, Jan. 2017.
7. S.Shanmuga Priya, **I.Thirunavukkarasu**, “Indoor Air Quality Optimization by Thermal Displacement Air-Conditioning Methods”, Indian Journal of Science and Technology, Vol.9, Issue 36, Sep.2016. P.No:1-6.(SCOPUS Indexed).
8. S.Shanmuga Priya, **I.Thirunavukkarasu**, “Solar Pebble bed reactor for treatment of textile and petrochemical industrial wastewater” , Indian Journal of Science and Technology, Vol.9, Issue 11, Dec.2016. P.No: 261-270. (SCOPUS Indexed).

2015

1. R.Satheeshbabu, **Dr.I.Thirunavukkarasu** et al, “Comparative Realization of 2DoF PID Controllers for Flow Process with Measurement Delay”, Journal of Control and Instrumentation, ISSN: 2229-6972(online), ISSN: 2347-7237(print) Volume 6, Issue 1, April 2015.
2. Deepa Amarnani, Rishabh Rajvant, **Dr.I.Thirunavukkarasu**, “Implementation of CDM Based PID Controller for a Stable and Double Integrating Process”, Journal of Mechatronics and Automation, Vol.2, No.2, May 2015 Issue.P.No:15-22.
3. Bipin Krishna, Deepak Chandran, Dr. V. I George, **Dr.I.Thirunavukkarasu**, “Modeling and Performance Comparison of Triple PID and LQR Controllers for Parallel Rotary Double Inverted Pendulum”, International Journal of Emerging Trends in Electrical and Electronics (IJETEE – ISSN: 2320-9569) Vol. 11 Issue. 02, June. 2015.
4. Mithun.P **Dr.I.Thirunavukkarasu**, “Nonlinear Controller design for a Shell and Tube Heat Exchanger – An Experimentation Approach”, International Journal of Electrical, Electronics and Data Communication, ISSN: 2320-2084 Volume-3, Issue-8, Aug.-2015.

5. Edala Sarath Yadhav, Santosh Kumar Choudhary, **Dr.I.Thirunavukkarasu**, “Design and Simulation of Nonlinear Control system for Magnetic Levitation of steel ball”, International Research Journal of Engineering and Technology, Volume 2, Issue 8, 544-549, 2015, p-ISSCompaN: 2395-0072. **2015**.
6. Vinayambika.S.Bhat, Dr.S.Shanmuga priya and **Dr.I.Thirunavukkarasu**, “A Comparative Study On Control Techniques Of Non-Square Matrix Distillation Column”, International Journal of Control Theory and Applications, Vol.8, Issue.3, 2015. P.No: 1129-1136.
7. Dr.S.Shanmuga Priya, Stefan Bauregger and **Dr.I.Thirunavukkarasu**, “Modeling of Solar air heaters”, International Journal of Control Theory and Applications, Vol.8, Issue.3,2015 P.No: 1161-1170.

2014

1. Rakesh.M.K, Satheesh babu.R and **I.Thirunavukkarasu**, “Sliding Mode Control with Dead Time Compensation for a Conical Tank Level Process”, International Journal of Electronics and Communication Technology, Vol.5, Issue.2, April-June 2014. P. No: 244-247. ISBN: 2230-9543.
2. Rakesh.M.K, Satheesh babu.R and **I.Thirunavukkarasu**, “Design and Implementation of a Two Degree of Freedom Nonlinear PID Controller for a Nonlinear Process”, IOSR Journal of Electrical and Electronics Engineering, Vol.9, Issue.3, Ver.III, May-June 2014. P. No: 59-64. E-ISBN:2278-1676.
3. Shanuak Chakrabartty , **I.Thirunavukkarasu**, “Performance Analysis of Various Anti-Reset Windup Algorithms for a Flow Process Station”, Int. Journal of Engineering Research and Applications, Vol.4, Issue 5, May 2014, P. No: 13-18. ISBN: 2248-9622.
4. Satheesh babu.R, **Dr.I.Thirunavukkarasu** *et al.*, “Temperature control of a shell and tube heat exchanger using PID algorithms”, International Journal of Advancements in Electronics and Electrical Engineering – IJAEE, Vol.3, Issue.3, Sep.2014
5. **Dr.I.Thirunavukkarasu**, Dr.V.I.George, R.Satheeshbabu “Relay Feedback based PID Controller for Nonlinear Process”, Int'l Journal of Computing, Communications & Instrumentation Engg. (IJCCIE) Vol. 1, Issue 1 (2014) ISSN 2349-1469 EISSN 2349-1477
6. R.Satheeshbabu, **Dr.I.Thirunavukkarasu** *et al.*, “Model Predictive Control for Distillation Column”, Journal of Mechatronics and Automation, Volume 1, Issue-3, 2014.P.No:1-8.

2013

1. S.Shanmuga Priya, Manish Ratna, Rahul Shrivastava, **I.Thirunavukkarasu**, “Design and Performance Evaluation Of Solar Trickle Down Reactor For Cypermethrin Effluent Treatment”, International Journal of ChemTech Research, CODEN(USA), Vol.5, No.2, P. No. 629-633, April-June 2013

2012

1. Dr.V.I.George and **I. Thirunavukkarasu**, “Vibration Control of Flexible Spacecraft Using Adaptive Controller”, International Journal on Advanced Science Engineering Information Technology, ISSN :2088-5334, Vol 2 no.1 (2012), pp 38 -43
2. Bipin Krishna, **I. Thirunavukkarasu**, Dr. V.I.George, “Dead beat model and state observer design for Rotary Inverted Pendulum”, Asian Journal of Mechanical Engineering(AJME), part C: Applied mechanics and control system. **Accepted for publication.**
- 3.**Dr.I.Thirunavukkarasu**, Mohammed Ibrahim Fareed Abuaiah, Dr.V.I.George & Dr.S.Shanmuga Priya, “An Experimentation on Anti-Reset Windup Scheme for Level Process Station”, Journal of Sensors and Transducers, International Frequency Sensor Association (IFSA), Vol.147, Issue: 12, Dec. 2012. P. No: 87-94.

2011

1. S.Shanmugapriya, M.Premalatha, S.R.Rajkumar & **I.Thirunavukkarasu**, “Analysis of Cooling Degree Days For Tiruchirappalli – A District In India”, IJRRAS 8 (1), July 2011, P.No: 44-56.
2. **I.Thirunavukkarasu**, Dr.V.I.George & Dr.S.Shanmugapriya, “First Order Robust Controller Design for the Unstable Process with Dead Time”, Journal of Emerging Trends in Engg and Applied Sciences, March 2011, Vol.No:2. Issue.1, P. No: 117-122.

2010

1. **I.Thirunavukkasrau**, Dr.V.I.George, “Determination of the Region of Stabilizing Controller Parameters of Polytopic Polynomials”, Journal of Sensor and Transducers, Vol.119, Issue 8, August 2010.ISSN: P.No:174-181.

2009

1. **I.Thirunavukkasrau**, Dr.V.I.George “Robust Stability and Performance analysis of unstable process with dead time using Mu synthesis”, Journal of Engineering and Applied Sciences, Vol.4, No.2, April 2009, ISSN: 1819 6608.P.No:1-5.

2008

1. **I. Thirunavukkarasu**, Dr.V.I.George & G.Saravanakumar, “Admissible set of Robust PID Controller design using Hurwitz Criteria”, International Journal of Applied Engg Research”, Vol.3, No.11, November2008, ISSN: 0973-4562, P.No:1507-1522.

2. **I.Thirunavukkarasu**, Dr.V.I.George & Dr.S.Shanmugapriya, “New Rules for the Improvement of Stability and Robust Performance”, Hindustan Journal, ISSN:, P.No:45-54.

3. Saravanakumar.G.,WahidabanuR.S.D, **Thirunavukkarasu I** “Design and analysis of Modified smith predictors for self-regulating & Non-self regulating processes with dead-time” in the Indian Chemical Engineering Journal of IIT, Delhi , volume 50, No: 1, March 2008.

4. S.Shanmugapriya, Dr.M.Premalatha & **I. Thirunavukkarasu**, “Solar Photocatalytic Treatment of Phenol Wastewater”, Journal of Institution of Engineers (India), Chemical Engineering Division, Vol : 89, P. No: 31-35

2006

1. Saravanakumar.G.,Wahidabanu R.S.D, George V.I,**Thirunavukkarasu I**, “Design of Modified dead-time compensators for stable processes with Integrator & Longer dead-times using Adaptive control”, in the Indian Journal of System Science & Engineering ,November 2006,Volume 14.

National Conferences:

1. **I.Thirunavukkarasu**& S.Abraham Lincoln “Fault Detection and Identification in three tank system”, National level conference in Annai Mathammal Sheela Engg college –Namakkal. 13th -14th July 2005
2. **I.Thirunavukkarasu**& S.Abraham Lincoln “Fault Detection and Accommodation in Three tank system” in National Conference on Process Control Identification and Diagnosis conducted by M.I.T – Anna University - 16th -17th Dec 2005, Sponsored by **CSIR, Govt. of India.**

3. **I.Thirunavukkarasu** & Dr.V.I.George “Impact of modulus and complementary modulus margin in controller design” in Advance technology in Instrumentation-2007 National conference held in St.Peters Engg College – Avadi, Chennai- 9th-10th Feb 2007.
4. **I.Thirunavukkarasu** & Dr.V.I.George “Parameterized controller for time delay processes”, Electronics Control & Instrumentation 2007 in St. Joseph college of Engg – Chennai-30th Jan 2006.
5. **I.Thirunavukkarasu** & Dr.V.I.George “Performance improvement of Servo and Regulatory response with modified smith predictor for integral process with dead time” in national conference on process control and instrumentation 2007, St.Peters college of Engg, Chennai.-Jan 2007
6. **I.Thirunavukkarasu** & Dr.V.I.George “An approach of Frequency based controller design for unstable time delayed process” in a National conference AECT 2007, M.I.T, Manipal-23rd-24th Mar 2007.
7. **I.Thirunavukkarasu** & Dr.V.I.George “A survey on unstable processes with dead time –A fifty years Journey” in S.V.University conducted by **Institute of Engineers**(Tirupathi Section) on 29th-30th June 2007.
8. **I.Thirunavukkarasu** & Dr.V.I.George “H[∞] Controller design for the Distillation Column Model with Dead Time”, NSC2007-M.I.T, Manipal. 14th-15th November 2007. Sponsored by **ISRO, DRDO, MOES, Govt. of India.**
9. **I.Thirunavukkarasu** & Dr.V.I.George "Comparison of Various PID Controller Design for the Integral Process with Dead Time” 18th-19th March 08, Dept of EEE, M.I.T.
10. Cyril Joseph, **I.Thirunavukkarasu** & Dr.V.I.George “PID Controller design using H-Infinity Sensitivity Function”, NSC2008, IIT- Roorkee, 17th-18th Dec 2008, **ISRO Sponsored.**
11. **I.Thirunavukkarasu** & Dr.V.I.George “Synthesis of Robust PID Controller for the Pure Integral system with Dead Time”, 7th-8th Nov 2008, CISCON08, Dept of ICE, MIT, Manipal University.
12. **I.Thirunavukkarasu** & Dr.V.I.George “Lower Order Controller using H-Infinity Principles for the Unstable Process with Dead Time”, 2-4April 2009, AECT09, Dept of EEE, MIT, Manipal University.
13. G.Saravana Kumar, **I.Thirunavukkarasu** “Enhancement of PID Controller”, in the national conference on Soft Computing Technique in Process Control and Inst, Dept of EIE, St.Peters College of Engg, Avadi, Chennai 15th-17th Feb 2007.
14. **I.Thirunavukkarasu** & Dr.V.I.George “Lower Order Controller design using GA”, NCRCA, Jamia Hamdad University, New Delhi. 12-13 August 2009. Conference was sponsored by **CSIR and DIT, Govt of India.**
15. Vinayambika.H, Narayana Iyer.S, **Thirunavukkarasu.I**, George.V.I, “An Approach to Design of Controller for Time Delay System”, PG Fest, Dept. of EEE, NMAMIT, Nitte, 2009. **BEST PAPER AWARD**
16. Jeane.M.D’Souza & **I.Thirunavukkarasu**, “Lower Order Robust Controller Design using Polynomial Stabilization Approach”, National Conference IIIT2010, Erode Sengunthar College of Engg, Tamil Nadu. 13th March 2010.
17. Bipin Krishna & **I.Thirunavukkarasu**, “Design and synthesis of PID Controller design for the Rotary Inverted Pendulum”, National Conference CISCON09, MIT, Manipal.

18. **I.Thirunavukkarasu** & Dr.V.I.George, “Robust PID Controller Design Using Singular Frequencies”, National Conference on Recent Trends in Manufacturing and Industrial Engineering, Sathyabama University, Chennai. 9th-10th April 2010.
19. **I.Thirunavukkarasu** & Dr.V.I.George, “Design of PID Controller based on Maclaurin Series with Impulse Response as an Input”, PICON2011, Z.H.C.E, Aligarh Muslim University, Aligarh, 12th -13th Feb 2011. Conference was sponsored by **CSIR and MNRE, Govt. of India**.
20. **Dr.I.Thirunavukkarasu et al.**, “Two Degree of Freedom Smith Predictor Control Scheme for the Unstable Processes with Time Delay”, **DRDO & CSIR** sponsored 9th CISCON, Dept. of ICE, MIT. Page No: 5- 10. ISBN: 9789382338260.
21. **Dr.I.Thirunavukkarasu et al.**, “Design of Robust PI Controller for Processes with Dead Time using Gain margin and Phase margin”, **CSIR** sponsored 6th AEET, Dept. of EEE, MIT, Manipal.
22. **Dr.I.Thirunavukkarasu et al.**, “PID Controller Design for Unstable Processes with Dead Time based on Gain Margin and Phase Margin”, NCCCIT’13, Dept. of E.I.E, SRM Eswari College of Engg., Chennai, 6th May 2013.
23. **Dr.I.Thirunavukkarasu et al.**, “2DOF Controller for a Pure Integrating Process with Dead Time”, NCCCSE’13, Dept. of I.C.E, Tamil Nadu College of Engg. Coimbatore, 12th-13th Sep. 2013.
24. **Dr.I.Thirunavukkarasu et al.**, “Certain discussions on Two degree of freedom PID control and with anti-windup, bumpless transfer and conditional integration schemes for the first order process with large dead time”, CSIR Sponsored 10th National Conference on Control Instrumentation System Conference, ICE Dept., MIT, Manipal. 20th-21st Dec. 2013.
25. **Dr.I.Thirunavukkarasu et al.**, “Real Time experimental studies of PID and Robust Controller for Conical Tank System”, ETSDET-2014, S.S. College of Engineering, Udaipur. 31st Jan-1st Feb. 2014.
26. Satheeshbabu.R, **I.Thirunavukkarasu et al.**, “Design of Model Predictive Control for a Distillation Column Model”, CISCON-2014, ICE Dept., MIT, Manipal. P.No:1-10.
27. Vinayambika.S.Bhat, **I.Thirunavukkarasu**, “Design of Robust Controller for Pure Integrating Process with Time Delay based on Sensitivity Function”, AEET-2015, Dept. of EEE, MIT, Manipal.
28. Anshuman Kumar Jha, **I.Thirunavukkarasu**, “Nonlinear Modeling of a Distillation Column Process”, AEET-2015, Dept. of EEE, MIT, Manipal.
29. Anshuman Kumar Jha, Abhishek Kumar, **Dr.I.Thirunavukkarasu** & Dr.V.I.George, "Equivalent Transfer Function based De-coupler for 4 x 4 Distillation Column Model", National Conference on Power and Energy: Building Industrial and Domestic Demands organized by Dept. of ECE, Jeppiar Institute of Technology, Chennai. 26-27 March 2015.
30. Vinayambika.S.Bhat, Dr.S.Shanmuga priya and **Dr.I.Thirunavukkarasu**, “A Comparative Study On Control Techniques Of Non-Square Matrix Distillation Column”, CISCON-2015, MIT, Manipal, Nov,2015.
31. Dr.S.Shanmuga Priya, Stefan Bauregger and **Dr.I.Thirunavukkarasu**, “Modeling of Solar air heaters”, CISCON-2015, MIT, Manipal, Nov,2015.

INTERNATIONAL CONFERENCES:

1. **I.Thirunavukkarasu**, Dr.V.I.George, G.Saravana Kumar, “Comparison and Analysis of Conventional and Robust Controller design for the Pure Integrating Process with Dead Time Process”, International Conference

- on Science and Technology held on 12-13 Dec 2008 at University Technology of MARA, Pulau Pinang, Malaysia, 12th – 13th December 2008
2. SaravanakumarG., Wahidabanu R.S.D., **I.Thirunavukkarasu** “Design and analysis of Modified Dead-time compensators for self-regulating and Non-self regulating processes with long dead-time using Auto-tuning, International Conference on Intelligent Systems (ICIAS 2007) held on 25-28th November 2007 at KL Convention Centre, Kuala Lumpur, Malaysia.
 3. **I. Thirunavukkarasu**& Dr.V.I.George, “Determination of the Region of Fixed-order Stabilizing Controller for the Dynamically Varying Systems”, International Conference on Applied, Materials and Manufacturing, Department of Mechanical and Industrial Engineering, Sultan Qaboos University, Muscat, Oman. 13th-15th Dec 2010.
 4. Dr.S.Shanmugapriya, **I.Thirunavukkarasu**, M.Premalatha “Modeling the kinetics of photolysis of phenol by Artificial Neural Network”, International Conference on Chemical Engineering and Applications (CCEA2010), Singapore, 26th – 28th February 2010.
 5. Dr.S.Shanmugapriya, **I.Thirunavukkarasu**&M.Premalatha “Studies on Photocatalytic degradation of Phenol effluent”, International Conference on Science and Applications in Industry and Education (ICSTIE 2008), Pulau Pinang, Malaysia, 12th – 13th December 2008
 6. Bipin Krishna, **I.Thirunavukkarasu**& Dr.V.I.George, “Design and Simulation of Quadratic Optimal Controller for Rotary Inverted Pendulum” Proceedings of ‘International Conference on System Dynamics and Control’ (ICSDC-2010), MIT-Manipal, India. August-2010
 7. Bipin Krishna, **I.Thirunavukkarasu**& Dr.V.I.George, “Design and Simulation of Dead Beat Model and Minimum-Order State Observer for Rotary Inverted Pendulum” Proceedings of ‘International Conference on Science & Technology: Applications in Industry & Education (2010)’ (ICSTIE-2010), Universiti Teknologi MARA Pulau Pinang, Malaysia, Dec-2010
 8. **I.Thirunavukkarasu**& Dr.V.I.George, “Design of PID Controller For Non Square MIMO System”, in the International Conference on Methods and Models to Science and Technology- ICM2ST2011 organized by IEATS, Jaipur, during **Published in American Institute of Physics – Conference Proceedings. P. No: 39-42. ISBN 978-0-7354-0991-0.** 19th-20th Nov 2011.
 9. Dr.S.Shanmuga Priya, **I.Thirunavukkarasu**& Dr.M.Premalatha, “ Design of Solar Heat Sheet for Air Heaters”, in the International Conference on Methods and Models to Science and Technology- ICM2ST2011 organized by IEATS, Jaipur, during 19th-20th Nov 2011. **Published in American Institute of Physics – Conference Proceedings. P. No: 21-26. ISBN-978-0-7354-0991-0.**
 10. **I.Thirunavukkarasu**& Dr.V.I.George, “PID tuning for Various Order Process- A Brief Review”, International Conference on IECTEC organized by Maria College of Engineering at Thiruvattar, Kanniya Kumari Dist during 8th-9th March 2012.
 11. **Dr.I.Thirunavukkarasu** *et al*, “Enhancement of Servo Response of the Integrating Process with 2DOF Control Structure”, 6th International Conference on Advanced Computing and Communication Technologies, Asia Pacific Institute of Information Technology, Haryana – 3rd Nov 2012.
 12. **Dr.I.Thirunavukkarasu** *et al*, “PID Controller Design for Unstable System with Desired Phase Margin using D-curve Method”, ICMEM2013, Ryerson University, Toronto, Canada. 8th-9th August 2013.

13. **Dr.I.Thirunavukkarasu** *et al.*, “Anti-Windup Strategies for PI/PID Controllers -An Overview” at the International Conference on Computation and Communication Advancement (IC3A) 2013 to be held during 11th-12th January, 2013 at our Institution JIS College of Engineering, Kolkata. **Proceedings published by Mc-Graw Hill Publishers.**
14. **Dr.I.Thirunavukkarasu** *et al.*, “PID Controller design for a real time ball and beam system – A double integrating process with dead time”, ISTE sponsored SPC2013, ACEEE conference, Lucknow, DOI: 03.LSCS.2013.3. Proc. of Int. Conf. on Advances in Signal Processing and Communication 2013, 21st June 2013. P. No. 96-99.
15. **Dr.I.Thirunavukkarasu** *et al.*, “Tuning of 2 Degree of Freedom PID Controller for a Nonlinear Process”, Trends in Industrial Measurement and Automation-TIMA’13, Dept. of Instrumentation Engg., MIT, Anna University, Chennai. 23-25 Dec’13.
16. Satheesh babu.R, **Dr.I.Thirunavukkarasu** *et al.*, “Temperature control of a shell and tube heat exchanger using PID algorithms”, CSM-2014, London, UK. 1st-2nd June 2014. DOI:10.15224/978-1-63248-012-5-61, ISBN 978-1-63248-012-5:
17. **Dr.I.Thirunavukkarasu**, Dr.V.I.George, Satheeshbabu.R, “Relay Feedback based PID Controller for Nonlinear Process”, International conference on Computer & Information Systems, Organized by International Inst. Of Engineers, held in Dubai during 17-18 Nov,2014.
18. Satheesh babu.R, **Dr.I.Thirunavukkarasu** *et al* “Linear Transformation of Nonlinear Level system: A Process Identification Methodology”, ICGTEPC2014, NIT-Trichy, Sep’14.
19. Mithun.P, Satheeshbabu.R, **Dr.I.Thirunavukkarasu**, “Nonlinear Controller Design for a Shell and Tube Heat Exchanger – An Experimentation Approach”, ICETA-2015, Berlin, Germany, 13th June 2015.
20. **Dr.I.Thirunavukkarasu**, **Dr.V.I.George** *et al.*,” “Adaptive Control of Shell and Tube Heat Exchanger”, ACCN-2015, Bangkok, Thailand, 22-23 August 2015.
21. Majaz, Vinayambika.S.Bhat, S.Shanmuga Priya & **Dr.I.Thirunavukkarasu**, “Centralized Controller Tuning for MIMO Process with Time Delay”, ICRERA, Italy, Nov. 15.
22. Edala Sarath Yadhav, **Dr.I.Thirunavukkarasu**, “Servo Mechanism Technique based Anti-Reset Windup PI Controller for Pressure Process Station”, International Conference on “Electrical Electronics Instrumentation and Computer Communication, Coimbatore, India, 2015.
23. Praveen Kumar, **Dr.I.Thirunavukkarasu**, “Advance Control Strategies for a Conical Process”, 2nd International Conference on Intelligent Computing and Applications, KCG College of Engineering, Chennai. Feb 2016.
25. Edala Sarath Yadhav, **Dr.I.Thirunavukkarasu**, “Online Implementation of Cascade predictive PI control for Nonlinear processes”, Gandhi Institute Of Engineering And Technology, ICRIET-2016, Orissa, 5th-6th Nov. 2016.
26. Vinayambika S Bhat, **I. Thirunavukkarasu**, S. Shanmuga Priya, & Shreesha C, “Predictive Control Algorithm based on Integral Action- Design and Implementation on a Conical Tank System”, ICMME-2017, Presented at University of Malaya, Kuala Lumpur, Malaysia. (**MATEC WoS Proceedings**)
27. Edala Sarath Yadav, **Thirunavukkarasu Indiran**, Ashutha K, Shanmuga Priya. S “Experimental Validation of AMIGO Based PID for a Binary Distillation Column”, Cambridge Summit-2018, **Cambridge University, UK**, Jan 2018 - Best Paper Awarded

28. Janani.R, **I.Thirunavukkarasu**, Vinayambika S Bhat, “Design of Centralized Robust PI Controller with Loop Shaping for a Non-square Matrix Distillation Column” 4th International Conference on Computational Methods in Engineering and Health Sciences, 19th-20th Dec. 2017.
29. Janani.R, **I.Thirunavukkarasu**, Vinayambika S Bhat, V.I.George, “Admissible set of PI Controllers based on Gain and Phase Margins for a Pilot Plant Binary Distillation Column”, 30th Symposium of Malaysian Chemical Engineers, Monish University, Malaysia.6th-7th Dec. 2017.
30. Janani.R, Vinayambika. S. Bhat, **I. Thirunavukkarasu**, Shreesha C, “Multi-variable PI Controller based on Gain and Phase Margins for a Pilot Plant Binary Distillation Column” **CHEMCON-2017**, Haldia Inst. of Technology, Kolkata
31. Ashutha K, Edala Sarath Yadav,**Thirunavukkarasu Indiran**& Shreesha.C, “Implementation of Fuzzy Control for a Non-Linear System - Conical Level Process” IEEE Conference on ICICET-2017, Thailand-Accepted for oral presentation. (*IEEE Explorer publication*).
32. Vinayambika S Bhat, **I. Thirunavukkarasu**, Janani. R “Design and Implementation of MSC based Multi-loop PID Controller for Pilot Plant Binary Distillation Column”, IEEE International Conference on circuits Power and Computing Technologies – Best Paper Awarded. *IEEE Explorer* (Web of Science/ SCOPUS).
33. Ashutha,K, Sarath Yadhav, **I.Thirunavukkarasu**”, “AMIGO based PID control design for Non-linear process” in International Conference on Communication, Electrical, Electronics and Computer Engineering (ICEEC-2017) on 20th March 2017, Best Paper Awarded.
34. Janani. R , Vinayambika. S. Bhat , **I. Thirunavukkarasu**, S.Shanmuga Priya, “Design of H-infinity Loop Shaping PI Controller for a Distillation Column Model with an Experimental Validation”, Presented in IEEE conference held at Vimal Jothi College of Engg, Kottayam, Kerala, April 2018.
35. Eadala Sarath Yadav and **Thirunavukkarasu Indiran** et al., “PRBS based model identification and GPC PID control design for MIMO Process” *ICAMEES-2018*, Dec’18 UPES, Dehradun. (*Elsevier Proceedia–Scopus Indexed*)
36. Eadala Sarath Yadav and **Thirunavukkarasu Indiran** “PRBS Based Identification and Conditional Control for an Optimal Operation of a Pilot Plant Binary Distillation Column” *The 8th International Conference on Modeling, Simulation and Applied Optimization (ICMSAO’2019)*, Bahrain April 2019
- 37.Janani Rajaraman, Eadala Sarath Yadav and **Thirunavukkarasu Indiran**., “Modeling and Control of Tray Temperature along with Column Pressure in a Pilot Plant Distillation Column” *ICACTM - 2019*, AMITY University, London, UK- *IEEE Explorer (Scopus & Web of Science)*, April 2019.

ORGANIZER:

1. Resource person in five day work shop on “Process Control and Its Applications” in Department of Electronic and Instrumentation Engg, HCE, Chennai from 13-03-2006 to 17-03-2006
2. Organizing member of the Control and Instrumentation System National Conference CISCON06 – 3rd & 4th NOV 2006 - Manipal Institute of Technology – Manipal.
3. Co-Convener for the “Two day workshop on Digital Controls” - 9th & 10th FEB 2007 – M.I.T –Manipal.
4. Organizing member of the “National System Conference-2007” held in M.I.T-Manipal- 16th -18th Dec 2007.

5. Editor of the Control and Instrumentation System National Conference CISCON07 – 9th & 10th NOV 2007 - Manipal Institute of Technology – Manipal.
6. Co-Convener for the SDP on Modern Controller Design Techniques, 9th -13th June 2008.
7. Convener for the International Conference on System Dynamics and Control, 19th -22st August 2010, Manipal Institute of Technology – Manipal.
8. Convener for the **DRDO sponsored** 8th Control Instrumentation System Conference held during 3rd-6th Nov 2011, Dept. of ICE, MIT, Manipal.
9. Organizing member for the National Symposium on Space Engineering and Sciences conducted by the Dept. of ICE, MIT, Manipal-2011.
10. Convener for the **AICTE-BRNS sponsored FDP** on Advanced Process Control and Systems scheduled during 6th-10th Jan. 2014.
11. Coordinator for the **MHRD-ISTE** two-week workshop on “Control Systems” held at MIT, Manipal Remote Center(ID:1033) during 2nd-12th Dec. 2014.
12. Co-Coordinator for the three-day workshop on “Navigation, Guidance and Control”, Dept. of ICE, MIT, Manipal. April-2016.
13. Co-Coordinator for the two-day workshop on “Internet of Things”, Dept. of ICE, MIT, Manipal. Sep. 2016.
14. Co-Coordinator for the five-day FDP on “PLC, SCADA, HMI and Analog Systems”, Dept. of ICE, MIT, Manipal. Dec 2016.
15. Organized a guest lecture on “Control Systems: Transfer Function and State Variable Approach”, 25th Sep. 2017, Dept. of ICE, MIT, Manipal.
16. Coordinator “Three days SDP on PID Controllers: Theory, Practice and Research”, ICE Dept., Nov 2019.
16. Coordinator “Two Weeks AICTE FDP on Robust H-Infinity Adaptive and Optimum Control”, ICE Dept, 17-29 June 2019.
17. Coordinator “ATAL- AICTE Sponsored Five days online FDP on Control Systems for Aerospace Applications with Sensor Technology”, 19th-23rd Jan 2021.

WORKSHOPS / SDP/ SEMINARS ATTENDED:

@ QIP-STC's attended in **Institute of National Importance** (IITs & NITs)

1. Five days **QIP-STC** on “Thermodynamic Analysis of Modern Separation Process” held at **IIT Madras**, Chennai during 23rd-28th Nov. 2014. (**Instructor Prof.Kannan**)
2. Five days **QIP-STC** on “Process Control”, Dept. of Chemical Engg., **IIT Madras**, Chennai during 15th Dec 14 to 19th Dec 14. (**Instructor Prof.M.Chidambaram**)
3. Five days **QIP-STC** on “Dynamics and Control in State Space”, Dept. of Aeronautics, **IIT, Bombay** during 18th -22nd May 2015. (**Instructor Prof.Ashok Joshi**)
4. **TEQIP- STC** sponsored Five (5) days on “Fixed Point Theory and Nonlinear Analysis and its application” in Dept. of Mathematics, **SVNIT, Surat** during 30th June-4th July 2014 (**Instructor: Dr.Vishnu Mishra**)
5. Five days **QIP-STC** on “Real Time Embedded Systems” conducted by Dept of CSE, **IIT-KGP**, 13th - 17th Feb 2008. (**Instructor Prof.Rajib Mal**)

6. Five days **QIP-STC** on “Analysis and Design of Classical Control Systems” conducted by Aerospace Dept., **IIT, Bombay** during 11th -15th June 2012. (**Instructor Prof.Ashok Joshi**)
7. One day Tutorial Session on “PID Controllers” by **Dr.S.P.Bhattacharya** , Texas A&M University, organized by Dept. of ICE,**NIT-Trichy**. 27th Dec 2007.
8. The Three days “Workshop on Challenges in Control Engineering”, organized by the dept of ICE, **NIT, Trichy**. (**Instructor: Dr.A.Ramakalyan**)
9. The **UKIERI** workshop on “Control of Smart Reliable and Adaptable Air Vehicles” during 4th-6th Dec 2009, Dept of ICE, **NIT, Trichy**. (**Instructor: Dr.A.Ramakalyan**)
10. Four days **STC** on “Modern Techniques on Nonlinear Robust Control”, 7th-10th August 2017, **IIT-Roorkee**, (**Instructor: Dr.Soham Chakraborty & Dr.Manas Bera**).
11. Five days **MHRD GIAN course** on “Waste Water Treatment” organized by Dept. of Civil Engg., **NIT, Patna**. Dec. 2018 (**Instructor: Dr.Ramesh Goel, University of Uttah, USA**)
12. Seven days **AICTE QIP STC** on Robotics, Dept of Mechanical Engg., **IIT KGP**, 13th-19th Nov. 2019 ((**Instructor: Dr.Dilip..K.Prathikar**)

FDP/ STC attended in Private/State Govt. Institutions

13. **AICTE** thirteen (13) days SDP on “Digital System Design Using FPGA’s” conducted by Dept of EEE, MIT-Manipal, 23rd June to 7th July 2007 (**Instructor Prof.Vinod Thomas**)
14. **AICTE** five days FDP on “Graphical System Design using LabVIEW” organized by the Dept. of EEE, MIT, Manipal during 15th-19th July 2013.
15. Five Days SDP on “Modern Controller Design Tech” conducted by the Dept of ICE,MIT, Manipal – 9th -13th June 2008. (**Instructor: Dr.V.I.George**)
16. Twelve Days SDP on “Non Linear Control System” conducted by the Dept of CFD/EEE, **Anna University**, Chennai – 4th-16th Dec 2006. (**Instructor: Dr.G.Uma**)
17. A course of training in PLC conducted by **SISI, Govt of India**, Chennai.18th -22nd June 2002.
18. The two days “National seminar on Instrumentation Engineering-Practices, Teaching and Research”, Dept of Instrumentation, **MIT, Anna University**, 27th -28th Oct 2006. (**Instructor: Dr.J.Prakash**)
19. The one day workshop on “Real Time Embedded system” conducted by Dept of EIE, RMK Engg College, Chennai. 7th April 2007.
20. . One day hands on practice in ARM Processor, **Anna University**-Chennai
21. The **UGC sponsored** STC on “Goal Oriented System Modeling and Identification”, conducted by Dept of Instrumentation Engg, **Annamalai University**. 7th-8th Jan 2009. (**Instructor: Dr.D.Siva Kumar**)
22. The “Linear Algebra Application in Engineering and Sciences”, by Dept. of Mathematics, MIT, Manipal University during 19th-20th August 2011.
23. The two day workshop on “PID controller design and advanced process control” organized by the Dept. of EIE, Karpagam University, Coimbatore during 16th-17th Dec 2011.
24. Three day workshop on “MATLAB-2012: An Extensive Usage” organized by Dept. of Continuing Education, MIT, Manipal
25. Two day workshop on “PID Controller”, organized by Instrumentation Engg., MIT, **Anna University** during 22nd-23rd Sep 2012. (**Instructor: Dr.J.Prakash**)

26. Three days **FDP** on “Nonlinear Control Systems”- Lecture by **Prof.Ravi.N.Banavar,IIT Bombay**, Dept. of ICE, MIT, Manipal. 8th-10th Jan 2015.
27. Two days **FDP** on Recent Measurement Science, Dept. of Mechanical Engineering, NITTE, March 2016.
28. Two days Research Oriented FDP on Applied Machine Learning , Dept. of Instrumentation Engg., MIT Anna University, 9th-10th March 2020.
29. One Week Online FDP on Insights on writing research proposals and funding opportunities”, Organized by Research & Facilities Group, St. Joseph Engineering College, Mangalore during 20th-24th July 2020.
30. **ATAL-AICTE** Five Days FDP on Control Systems and Sensor Technology during 19th-23rd Jan 2021, Dept. of ICE, MIT, Maniapal.
31. **ATAL AICTE** Five Days FDP on Advanced Process Control during Feb 2021, Dept. of EEE, **NIT Calicut**.

Guest Lectures Delivered [Interaction with outside world]

1. “Introduction to conventional controllers and robust controllers – An Overview” at NMAMIT, Nitte, Karkala.
2. “Design and Implementation of advance control algorithms using MATLAB” at VNR Vignan Jothi College of Engineering and Technology, Bochupali, Hyderabad **supported by TEQIP-II**
3. “Nonlinear Controllers for Nonlinear Processes” at M.S.Ramaiah Institute of Technology, Bangalore **supported by TEQIP-II**
4. “Design and implementation of 2DOF PID controllers for a nonlinear process”, Karpagam University, Coimbatore.
5. “MAPLE for Complex Equations and Inequality Problems”,5 Days STTP on AFPTNLES-2014, SVNIT, Surat. **Supported by TEQIP-II**. 29th June -4th July 2014
6. “Nonlinear Actuators” in Anna University sponsored FDP on “Robotics & Automation”, Dept. of ICE, Tamilnadu college of Engineering, Coimbatore, TN. 22nd Dec. 2014.
7. “Design of Nonlinear PID for a Conical Tank System”, Dept. of EIE, SCVMV, Kanchipuram, 12th Feb. 2015.
8. “Nonlinear Distillation Process MIMO system modeling” in “Potential avenues for research in Instrumentation, Power System”, Two day workshop held in Karpagam College of Engineering, Coimbatore. 5th-6th Feb 2015.
9. “Design of Nonlinear Control Systems” to 6th Sem. EIE students of Sri Vidyanikethan Engineering College, Thirupathi on 30th March 2015. **(Supported by TEQIP-II, Govt. of India)**
10. “Soft computing Techniques for nonlinear processes”, FDP on Soft Computing and its engineering applications, M.S.Ramaiah Institute of Technology, Bangalore. 12th August 2015. **(Supported by TEQIP-II, Govt. of India)**

11. “Nonlinear Control of MIMO processes”, Potential avenues for research in Instrumentation, Power System”, Two day workshop held in Karpagam College of Engineering, Coimbatore. 25th-26th Feb 2016.
12. “Design of Nonlinear 2DOF PID Controller for a nonlinear process – Real time implementation”, ACIIT-2016, Dept. of EIE, Kongu Engg. College, Perundurai. 7th March 2016.
13. “Controller tuning for Non-Linear Process”, Dept. of ICE/ Dept. of Chemical Engg., AMACE, Kanchipuram, 12th July 2016. Arranged **under IEEE Madras Chapter.**
14. “Nonlinear Controller design for the MIMO process”, 12th Feb. 2017, Dept. of EIE, Karpagam College of Engineering, Coimbatore.
15. Delivered **seven webinars** in various Govt. /Private engineering colleges with advanced control algorithms applied to various pilot plant operations during COVID-19.
16. “Data Driven Modeling and NMPC design for a Batch Reactor”, ATAL FDP on Industry 4.0, Dept. of EIE Kongu Engineering College, Erode. 19th August 2021

B.E Projects Guided (Best Selected from In-house project)

1. Improved IMC Using Marquardt optimization algorithm for time delayed systems.
2. An approach of Frequency based controller design for integral time delayed processes.
3. Design of PID Controller for Unstable & Integrating Processes with dead time.
4. Robust controller design for the Integral process with dead time.
5. PID Controller for the robust performance.
6. PID Controller design based on the Equating Co-Efficient Method.
7. Identification of Unstable Process with Optimization Method.
8. Digital PID Controller design for the Time delayed system (Using IMC design Tech.)
9. LabVIEW based Robust PID controller design.
10. Certain analysis of Robust PID controllers for the Ball and Beam arrangement- An real time experimentation.
11. Analog 2DOF PID controller for processes with dead time.
12. Frequency based Robust PI controller design.
13. Anti-reset windup based on the low frequency gain and H^∞ .
14. 2DOF Modified Smith Predictor for the processes with dead time.
15. Design and Implementation of SMC for the Conical Tank System.
16. Identification and Non-Linear PID controller design for the Heat Exchanger system.

17. Design of MPC for the SISO (Conical) and MIMO (Distillation Column) systems.
18. Design of DMC based PID controller for the Shell and Tube heat exchanger.
19. Design of DMC and DMC PID Controller for the SISO and MIMO process.
20. Predictive PI Controller for the Conical Tank process.
21. Integral MPC for Distillation Column Control.
22. Temperature Trajectory Optimization and Nonlinear Control Design for a Batch Reactor.
23. Design, Simulation and Implementation of Split Range and Cascade Control for a Lab Scale Batch Reactor.
24. Weiner Model Identification and Nonlinear PI Control validation for the batch reactor pilot plant.
25. Artificial Intelligence based model identification and design of GMC for a batch reactor.
26. Implementation of NMPC & SMC controllers on a Quadrotor setup for trajectory tracking problem.

M.Tech Projects Guided (In-house project)

1. **Mrs.Vinayambika.H**, (2008) “Robust PID Controller design for the Pure Integral Process with a combination of PADE approximation for the time delay” (Under NMAMIT, Nitte, VTU, Belagavi, Guide. Prof.Dr.S.Narayana Iyer)
2. **Mr.Bipin Krishna**, (2009)“Hybrid controller design for the Rotary Inverted Pendulum”.
4. **Mrs.Jeane Maria D’Souza**, (2010) “First Order Controller design based on the H-Infinity Principles”.
5. **Mr.Rakesh**(2014), “Design of Non-Linear Controller for the Conical Tank System”
6. **Mr.Mithun.P**, (2015) “GMC and Adaptive controller for a Shell and Tube Heat Exchanger”.
7. **Mr.C.P.Praveen Kumar**,(2016) “Constrained MPC for the MIMO Process”.
8. **Ms.Sreelatha.C**, (2017)“Kalman Filter Estimation and Control of Binary Distillation Column”(Guide: **V.I.George**)
9. **Mr.Bharath K Udupa**,(2017) “Robust MPC for a Binary Distillation Column”.
10. **Mr.Ganesh.U.G**,(2017) “Relay based Identification of a MIMO system”.
11. **Ms.Susmitha Poojary**(2020), “NARX model identification, design and implementation of NMPC on a lab scale Batch Reactor”.
12. **Mr.Prajwal Shettigar**,(2021), “NMPC and NMBC controller design for the pilot plant Batch Reactor”
13. **Mr.Sangamesvaran.S**, (2021), “Mathematical Modeling and Design of Nonlinear Controller for MAV
14. **Mr.Sanjay James**, “*Nonlinear Estimator based Nonlinear Controllers for a Quadrotor Model*”.- **On Going**

15. **Mr.Vineet D'Souza**, “Integral SMC for a Quadrotor Model”- **On Going**
16. **Ms.Sonu**, “Obstacle Avoidance Algorithms with NMPC for Autonomous UAV”- **On Going**
17. **Mr.Karthick**, “Reinforcement Learning based Nonlinear Controller for an Autonomous Vehicle”- **On Going**
18. **Ms.Sreelakshmi**, “Data Driven Modeling and TS Fuzzy clustering design for an UAV”- **On Going**
- 19 **Mr.Anjay Ranjan**, “Artificial Intelligence based SMC for a Multirotor Aircraft” - **On Going**

Ph.D Guidance:

1. **Dr.Vinayambika.S.Bhat**, (Reg. No: 150900015) Professor & Head-ECE, MITE, Mangalore– “Design and Validation of Robust Controller for a Binary Distillation Column”.–(Deputed on study leave from Mangalore Institute of Technology & Engineering, Moodabidri, Mangalore).(Completed VIVA on 25th August 2018) – **Examiner Prof.Ramakalyan.A, ICE Dept., NIT Trichy.**
2. **Dr.Cyril Joseph** (Reg. No: 090900020) – “Controller Synthesis for Complementarity Hybrid Dynamical System”. (Completed VIVA on Sep. 2018) – As Co-Guide. Examiner **Prof. G. N. Pillai, EE,IIT Rourke.**
3. **Dr.R.Janani**, (Reg. No: RM15E162) “Design of Robust PID Controller for a Binary Distillation Column”, SCSVMV University, Enathur, Kanchipuram. (VIVA VOCE, 9th April 2021)- **Examiner Prof. Giuseppe Fedele, Univ. of Calabria, Italy.**
4. **Dr.Sarath Yadav**, (Reg. No: 160900032) “Design, Implementation and Validation of Control Schemes on the Batch Distillation Column” (VIVA VOCE completed on 5th August 2020). Examiner: **Prof.M.Chidambaram-Emeritus Prof-Chemical Engg., NIT Warangal, Ex-Director-NIT Trichy, Ex-Prof & Head - Chemical Engineering, IIT M.,)**
5. **Ms.Tinu Valsa Paul**, (Reg. No: 190900107) “Model Validation and Design of Robust Controller for Non-linear Dynamics of Quadrotor” (August 2019-Till date) – (**Dr.J.Prakash, MIT-Anna Univ. / Dr.Ambalal.Vinayak Patil, NAL–DAC Members**) - Third DAC Completed
6. **Mr.Suraj Suresh Kumar**, (Reg. No: 200900017) JRF, ISRO Project on SMC for Quadrotor & PhD in “Design and Simulation of Advanced Non-Linear Controllers for MAV” (Sep 2020 to Till date) (**Dr.J.Prakash, MIT Anna Univ. / Dr.VijayVinayak.Patil, NAL–DAC Members**) - Second DAC Completed on 6th Nov 2021.

IAESTE Projects Guided (International Students)

1. Admissible set of Robust PID Controller Using Hurwitz Criterion for the Pure Integrating Process with Dead Time.
2. Design of Lower Order Controller H-Infinity Controller
3. Controller tuning for the Rotary Inverted Pendulum
4. PID controller tuning based on the phase margin and gain margin.
5. Tracking and Back-Calculation based Anti-reset windup PID Controller scheme.
6. PID Controller for Magnetic Levitation System using D-Curve method.
7. Investigations on best suitable controller for Ball and Beam System –An Experimentation.
8. Analysis of stable region of PID Controller using GM and PM.
9. Sliding Mode Controller design for the chemical processes.
10. Implementation of various control algorithms for the conical tank system.
11. State Estimation and realization of MPC algorithms in a Binary Distillation Column.

Services offered to Govt. of India

1. Served as election officer in the parliament election 2009.
2. Served as an observer for the AIEEE examinations during 2009 (Ernakulum Center), 2011(Hyderabad Center), 2012(Warangal Center).