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# D. Sukumar

*suku@math.iith.ac.in*

Presently working as an Associate Professor in the Department of Mathematics, IITH

## Teaching and Research Positions

- |                       |   |
|-----------------------|---|
| Jan 2019 - till date  | • <b>Associate Professor</b> , Indian Institute of Technology Hyderabad.                    |
| Nov 2012 - Dec 2018   | • Assistant Professor, Indian Institute of Technology Hyderabad.                            |
| Feb 2008 - Nov 2012   | • Assistant Professor, National Institute of Technology Karnataka.                          |
| Oct 2007 - Jan 2008   | • Project Associate, Indian Institute of Sciences Bangalore                                 |
| July 2007 - Sep 2007  | • Visiting Scientist, Indian Statistical Institute Bangalore                                |
| Aug 2006 - May 2007   | • Guest Lecturer, Ramanujan Institute for Advanced Study in Mathematics, Madras University. |
| July 2003 - June 2006 | • Senior Research Fellow, Indian Institute of Technology Madras                             |
| July 2001- June 2003  | • Junior Research Fellow, Indian Institute of Technology Madras                             |

## Academics

- |             |  |
|-------------|--|
| Ph.D (2007) | • Indian Institute of Technology Madras, Chennai,India.<br>Thesis title : <b>Ransford spectrum in Banach algebra</b><br>Guide: <b>Prof. S. H. Kulkarni</b> |
| M.Sc (2001) | • Indian Institute of Technology Madras, Chennai, India.   |
| B.Sc (1999) | • Voorhees College, Madras University, Vellore, India.   |

## *National Level Exams and Fellowships*

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|-----------------|--|
| GATE (2001)     | • 81.45 Percentile All India Rank: 159 |
| NET (Dec 2004)  | • Joint CSIR-UGC NET for Lectureship   |
| NBHM (Oct 2007) | • Postdoctoral Fellowship              |

## Research

### *Research Interest*

- **Functional analysis, Banach algebra**
- Working on multiplicative functions and almost multiplicative functions in the context of generalized spectrum
- Properties of condition spectrum and generalization of eigenvalue and pseudospectra results.

### *Projects & Grants*

- Seed grant project of NITK in “Analytical aspects of condition spectrum” with a sanctioned amount of Rs 2,00,000.
- Project under SERC Fast Track Scheme for Young Scientist with the title “Analytical and computational perspective of condition spectrum” with a sanctioned amount of Rs 15,00,000.

### *Research and Project Guidance*

PhD (Completed)

- Dr. Veeramani S  
*Thesis: Continuity of Condition Spectrum and its Level Set in Banach Algebra*  
Assistant professor, VIT Vellore  
veeramani.s@vit.ac.in
- Dr. Geethika Sebastian  
*Thesis: A study of Banach algebras and maps on it through invertible elements*  
Instructors for the B.Tech (Mathematics and Computing) IISc and Postdoc  
geethikas@iisc.ac.in
- Dr. Sivaramakrishnan (as a co-supervisor with Dr. D. Venku Naidu)  
*Thesis: On the Images of Sobolev spaces under Schrödinger semi group*  
Assistant Professor, NIT Srinagar  
sivaramakrishnan@nitsri.net
- Dr. Ganesh Jadav (as a co-supervisor with Dr. G Ramesh)  
*Thesis: Spectral theory of absolutely minimum attaining positive operators*  
Associate Professor, Mathematics, GITAM School of Science, HYD  
jganesh@gitam.edu

PhD (On going)

M.Sc

Other

- 3 students. Arindam Ghosh, Mohana Rahul N, Sugirtha Gayathri
- 8 students (1 ongoing)
- M.Tech 4 students, MCA 3 Students, B.Tech 3 Students

### *Professional memberships and activities*

- BOS member of ICT
- Member of AMS, IMS
- Reviewer in Mathscinet, JMA, evaluated Thesis of NIT and Central University

## Publication

### Books

- Book • Functional Analysis: A first course, S. Kumaresan and D. Sukumar, Narosa Publishing House 2020

### Journals

- 1 • (with S. H. Kulkarni) *Gleason-Kahane-Żelazko theorem for spectrally bounded algebra*, **Int. J. Math. Math. Sci.** (2005), no. 15, 2447–2460. MR 2184484  
<https://doi.org/10.1155/IJMMS.2005.2447>
- 2 • (with S. H. Kulkarni) *Condition Spectrum*, **Acta Sci. Math. (Szeged)** (2008) 74, no. 3-4, 625–641. MR 2487937
- 3 • (with S. H. Kulkarni) *Almost multiplicative functions on commutative Banach algebra*, **Studia Math**(2010) 197, no. 1,93-99. MR 2600028  
<https://doi.org/10.4064/sm197-1-8>
- 4 • (with Ganesh, Jadav; Ramesh, Golla), *On the structure of absolutely minimum attaining operators*, **J. Math. Anal. Appl.** 428 (2015), no. 1, 457–470 MR3326997  
<https://doi.org/10.1016/j.jmaa.2015.03.016>
- 5 • (with Veeramani, S), *Level sets of condition spectrum*, **Annals of Functional Analysis** 8 (2017), no. 3, 314-328.  
<https://doi.org/10.1215/20088752-0000016X>
- 6 • (with Geethika, Sebastian), *On the open ball centered at an invertible element of a Banach algebra*, **Operators and Matrices** 12 (2018), no.1, 19-25.  
<http://dx.doi.org/10.7153/oam-2018-12-02>
- 7 • (with Ganesh, Jadav; Ramesh, Golla), *Perturbation of minimum attaining operators* **Advances in Operator Theory** Vol 3 (2018) 3, no 9, 473-490  
<http://dx.doi.org/10.15352/aot.1708-1215>
- 8 • (with Sebastian, Geethika), *A characterizing property of commutative Banach algebras may not be sufficient only on the invertible elements*, **C. R. Math. Acad. Sci. Paris**, 356 (2018), no.6, 594–596.  
<https://doi.org/10.1016/j.crma.2018.05.002>
- 9 • (with Ganesh, Jadav; Ramesh, Golla), *A characterization of absolutely minimum attaining operators* **J. Math. Anal. Appl.** 468 (2018), no. 1, 567–583  
<https://doi.org/10.1016/j.jmaa.2018.08.034>
- 10 • (with Sivaramakrishnan, C; Naidu, D.V.) *On the images of Sobolev spaces under the Schrödinger semigroup* **Advances in Pure and Applied Mathematics** 10 (2019), no. 1, 65–79  
<https://doi.org/10.1515/apam-2016-0116>
- 11 • (With Sivaramakrishnan, C; Venku Naidu, D), *On the Images of Dunkl-Sobolev spaces under the Schrodinger semigroup associated to Dunkl operators*, **Journal of Pseudo-Differential Operators and Applications**, 10 (2019), no. 1, 93–120.  
<https://doi.org/10.1007/s11868-017-0233-9>
- 12 • (with Veeramani, S), *Level Sets of  $(p, e - p)$  Outer Generalized Pseudo Spectrum*, **The Journal of Analysis** (2017)  
<https://doi.org/10.1007/s41478-017-0039-4>

## Publication (continued)

- 13 • (With Veeramani, S), *Continuity of a condition spectrum and its level sets*, **J. Aust. Math. Soc.**, 108 (2020), no.3, 412–430.  
<https://doi.org/10.1017/s1446788719000338>
- 14 • (With Geethika, Sebastian) *A weaker Gleason-Kahane-Żelazko theorem for modules and applications to Hardy spaces*, **Colloq. Math.** 164 (2021), no. 2, 273–282  
DOI: 10.4064/cm8015-9-2019
- 15 • *Some comparative results on eigenvalues, pseudospectra and conditionspectra* **J. Anal** 29 (2021), no.2, 607–617.  
<https://link.springer.com/article/10.1007/s41478-019-00201-4>
- 16 • (with Ghosh, Arindam), *On condition spectrum of Toeplitz operator*. **Pure Appl. Funct. Anal.** 8 (2023), no. 1, 243–259.  
Link
- 17 • (with Ghosh, Arindam) *Non Commutativity Of Condition Spectrum*, **Palestine Journal of Mathematics** accepted

### *Communicated*

- 18 • (with Sugirtha Gayathri G, Mohan Rahul N, Ghosh, Arindam) *Inclusion Results On Numerical Range of Powers of A Matrix In Terms of Its Lower Powers*  
*Preprint*
- 19 • (with Ghosh, Arindam) *Commutativity of exponential spectrum in operators on direct sum of sequence spaces*
- 20 • (with Mohana, Rahul) *A generalized GKZ theorem for reproducing kernel Hilbert space*
- 21 • (with Sugirtha Gayathri G) *A generalization of Kowalski-S lodkowski theorem for condition spectrum selection*

### *Selected Conferences Presentaions*

- *When is a linear function on a Function algebra almost multiplicative?* (06-08, June 2007) 22nd Annual Conference of Ramanujan Mathematical Society at National Institute of Technology Karnataka, Surathkal, Mangalore
- *Almost multiplicative functions on a class of Banach algebras* (28, Nov- 01, Dec 2009) International conference on Functional Analysis and Its applications. Scott Christian College, Nagercoil
- *Condition Spectrum Result that generalizes usual spectral results* (03-09, July 2011) 22 International Workshop on Operator Theory and Application (IWOTA2011) Universidad de Sevilla, Spain
- *Biggest open ball in invertible elements of a Banach algebra*, (26 - 29, March 2015) Geometry of Banach space and Operator Theory (GBOT), IIT Kanpur
- *Biggest open ball in invertible elements of a Banach algebra*(4-12, August 2015) Banach Algebras and Applications, The Fields Institute, Toronto, Canada
- *Progeny of spectrum* (15-16, March 2022) P. C. Vaidya National Conference on Mathematical Sciences, S P University, Gujarat.

## Publication (continued)

- *Condition number of a matrix and associated spectrum* (3, March 2023) National Seminar on Mathematical Techniques and Applications Mahatma Gandhi University, Nalgonda.

## Teaching

### *Awards and prizes*

- IITH
- 2016, Excellence in Teaching, In recognition of distinguished teaching in the year 2015,

### *Under Graduate Courses*

- **Best Math Foundation**  
Indian Institute of Technology Hyderabad, July- Nov, 2017
- **Introduction to number system**  
Indian Institute of Technology Hyderabad, 2023
- **Vector Calculus**  
Indian Institute of Technology Hyderabad, 2013
- **Engineering Mathematics-I**  
National Institute of Technology Karnataka, Jan 2008-2012  
Indian Institute of Technology Hyderabad, Jan- 2012-2013
- **Engineering Mathematics-II**  
National Institute of Technology Karnataka, Jan 2008-2012
- **Linear Algebra**  
National Institute of Technology Karnataka, Jan 2008-2012  
Indian Institute of Technology Hyderabad, Jan-July 2013
- **Numerical Methods**  
National Institute of Technology Karnataka, Jan 2010-May 2010
- **Basic Maths** (Tutorials)  
Indian Institute of Technology Madras, July 2005-May 2006

### *Post Graduate Courses*

- M.Sc
- MA 4010 **Analysis of functions of single variable** (Aug - Dec 2016).
  - MA 4020 **Linear algebra**, (August -December 2013, July-December, 2014)
  - MA 4030 **Ordinary Differential Equations**, (Juy- December 2015)
  - MA 4060 **Complex Analysis** (Jul-Nov 2021, Jul-Nov 2022)
  - MA 4080 **Partial Differential Equations** (Jan-May 2016)
  - MA 4080 **Measure and Integration** (Jan-May 2020)
  - MA 4090 **Multivariable Calculus** (Jan-May 2020)
  - MA 5020 **Functional Analysis** (Jul-Nov 2017)
  - MA 5040 **Topology**, (Jan -May 2014, Jan-May 2015)
  - MA 6160 **Banach Algebra** (Jan - May 2017)
  - MSI C003 **Ordinary Differential Equations**, (August -December 2006)

## Teaching (continued)

- MSI C006 **Partial Differential Equations**, (January -May 2007)  
at Ramanujan Institute for Advanced Study in Mathematics, University of Madras.
- MSI C001 **Real Analysis**, (July-December 2006)  
at Department of Statistics, University of Madras.
- M.C.A • **Automata Theory** (July-December 2006) (A part of the Discrete Mathematics course)  
Department of Computer Science, University of Madras.
- Ph.D • **MA6010 Topics in Analysis**
- **MA904 Linear Algebra and Matrix Theory**  
National Institute of Technology Karnataka, Jan 2009-May 2009
- **MA6090 Operator Theory**  
Indian Institute of Technology Hyderabad, Aug 2013-December 2013
- **MA6120 An introduction to Operator Algebra**  
Indian Institute of Technology Hyderabad, Jan - May 2014

### *Courses introduced*

- Banach algebra, An introduction to Operator Algebra (jointly with G Ramesh)

## Other Mathematical Activities

- MTTS • The Mathematics Training and Talent Search (MTTS) programme is one of the most popular and significant training programmes in India. This programme has been running since 1993 and has made an impressive impact on the mathematical scene in the country. Funded by National Board for Higher Mathematics (NBHM). I actively take part in it and many times have been invited as resource person and resident faculty of courses at Level O, I and II.
- PTMT • Pedagogical Training for Mathematics Teachers. This runs about 2 weeks. I have been invited to teach 3 times at CUTN, Khalsa College Punjab, on linear algebra, real analysis and functional analysis.
- InitMath • Initiation into Mathematics, One week Programme for rural and remote area students. Given training many times. Recently in Mangalore University.
- OFCM • Online foundation course in mathematics, 6 parallel camps to reach the students across the country. Taught courses for the last 3 years during pandemic.
- ATS • Lectures in Advanced Training School Dec 11-13, 2017 in IIT Tirupathi
- Series • Series of lectures on Banach algebra, 10-18, March 2019. in IIT Roorkee
- MTA • *Effective methodology in an online classroom and use of online resources for students' learning* Third MTA Conference (online) (September 4, 2021) Mathematics Teachers' Association (India)

## Administrative Service

- |                             |  |
|-----------------------------|--|
| Chairman-TLC<br>HOD         | <ul style="list-style-type: none"><li>• <b>Serving from 21-04-2023 to till date</b></li><li>• <b>Served (3 years)</b> as the head of the Mathematics Department, IITH from 10-10-2014 to 9-10-2017. During that period:<ul style="list-style-type: none"><li>• B.Tech Math and Computing was introduced</li><li>• Ramanujan day was celebrated</li><li>• Summer training for the nearby school students were organised and conducted by PhD and MSc students</li><li>• Training for undergraduate students of the nearby college was organised</li></ul></li></ul>   |
| FIC-Sunshine                | <ul style="list-style-type: none"><li>• <b>Served (3 Years)</b> as a Faculty-in-charge for the student counselling cell of IIT Hyderabad, from Nov 22, 2019 to Nov 21, 2022 During that period:<ul style="list-style-type: none"><li>• 2 Counsellors (1 Female and 1 Male) have joined.</li><li>• Faculty representative for each department was introduced.</li><li>• Mentor programme was introduced</li><li>• Buddy programme was introduced</li><li>• Active team of 186 member was built from 10 members in three years.</li><li>• Annual Sunshine Pulse magazine was launched.</li><li>• Mental health week, Happiness week are lauched.</li></ul></li></ul> |
| Senate member<br>Department | <ul style="list-style-type: none"><li>• from October 2014 to October 2017</li><li>• Time Table incharge for an year 2013-14</li><li>• PhD Admission-Many times from years from 2014 to till date</li><li>• Faculty Advisor-For the BTech Math and Computing batch 2019-2023</li></ul>  |
| NCC                         | <ul style="list-style-type: none"><li>• Completed a 3 month PRCN course and got Honorary <b>Lieutenant</b> Rank. Worked as an Associate NCC Officer (ANO) of 2 Eng Karnataka NCC Unit, for 3 Years.</li></ul>  |