Dr. Anil N. Raghav

Assistant Professor, Department of Physics, University of Mumbai.

PERSONAL DATA

Date of Birth **January 06, 1984**

Gender **Male**

Nationality **Indian**

Status **Married**

Address **E-06, Academic Staff Quarters, Mumbai University Campus, CST Rd, Vidyanagari, Kalina, Santacruz - East, Mumbai, Maharashtra, India 400098.**

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e-mail raghavanil1984@gmail.com and anil.raghav@physics.mu.ac.in

Current Position

Assistant Professor, Department of Physics, University of Mumbai, From December 17, 2008 to date.

Teaching Experience: ~ 11 years

- **Postgraduate Teaching**: ~ 11 years at Department of Physics, University of Mumbai.
- **Undergraduate Teaching**: ~ 6 months at K.C. College, Mumbai from June to December 2008.

Courses taught

- **PG (Core) courses:** Nuclear Physics (4 years), Electrodynamics (3 years).
- **PG (specialization) courses:** Experimental techniques in Nuclear Physics (8 years), Space Plasma Physics (2 years), Nuclear Structure (2 years), Nuclear Reaction (1 year).
- **UG courses:** Nuclear Physics (2 batches), Statistical Physics (1 batch), Atomic-Molecular physics (1 batch)

Language known

Advanced **English** *fluent*

Mothertongue **Marathi**

Advanced **Hindi** *fluent*

Current Research Interest

Introduction

Space weather is the crucial branch of Astrophysics in the forthcoming satellite era. The solar activity in the form of solar flares, Coronal Mass Ejections (CMEs), high-speed streamers, solar energetic particles (SEPs), etc., is considered as the primal driver of the heliospheric dynamics in which massive energy and mass of the Sun flow through the interplanetary medium. This effect is more profound on the inner planets and can cause large-scale changes in the space surrounding the planet. In the case of Earth, Spatio-temporal variations occurred in the magnetosphere, ionosphere, and thermosphere due to the adverse effects of space weather. In the present era, there are space vehicles, space stationed and space missions passing through both low-earth orbits and interplanetary space. In fact, some nations are attempting manned missions. The radiation from solar wind not only affect human health in space but also can cause disruption of electronics on space-based and ground-based communications systems. It is also affected navigation and telecommunication systems, pipeline transportation of petroleum products, and high potential power grids that could black out an entire city. In fact, their direct and indirect effects can engender a threat to the global economy. Thus, space weather plays a very crucial role in life on Earth and affects almost all aspects of modern society. Therefore, a clear understanding of space weather has become a necessity for modern civilization. With this view in mind, I have strongly focused my research work in this direction.

Objectives

1. The evolution of CMEs (large-scale magnetic structure) in interplanetary space.
2. Study of CME-ambient solar wind, CME-CME and CME-CIR interaction, the energy exchange processes involved therein.
3. Arrival time prediction of CMEs at Earth.
4. Study of magneto-hydrodynamic fluctuations inside ICME substructure i.e. shock-sheath and flux rope.
5. Study of CME-Earth interaction, its effect on magnetosphere, ionosphere, and thermosphere.
6. Study of a geomagnetic storm, ground-level enhancement, cosmic ray modulation (Forbush decrease).

PUBLICATIONS

Peer Reviewed Papers

2020 **Evolution of Planar Magnetic Structure within the Stream Interaction Region and its connection with recurrent Forbush decrease**, Zubair Shaikh, Anil Raghav, Geeta Vichare accepted in **MNRAS**

2020 **Comparative Statistical Study of Characteristics of Plasma in Planar and Non-planar ICME sheaths during Solar Cycles 23 and 24**, Zubair I. Shaikh*, Anil Raghav, Geeta Vichare, Ankush Bhaskar, and Wageesh Mishra accepted **MNRAS**

2020 **Study of flux rope characteristics at sub AU distances using Helios 1 & 2 spacecraft**, Anil Raghav*, Sandesh Gaikwad, Yuming Wang, Wageesh Mishra, Zubair I. Shaikh and Ake Zao, accepted in **MNRAS**

2020 **Exploring the common origins of the Forbush decrease phenomenon caused by the interplanetary counterpart of coronal mass ejections or corotating interaction regions**, Anil Raghav*, Zubair Shaikh, Disha Misal, Gopika Rajan, Wageesh Mishra, S. Kasthurirangan, Ankush Bhaskar, Nitinkumar Bijewar, Abhishek Johri, and Geeta Vichare, Physical Review D 101 (6), 062003, **Impact Factor: 4.368**

2020 **Response of γ-ray spectrum during Ockhi cyclone**, Gauri Datar, Geeta Vichare, Anil Narayan Raghav, Ankush Bhaskar, A K Sinha, K U Nair, Frontiers in Earth Science, section Atmospheric Science, 8(2020):15. https://doi.org/10.3389/feart.2020.00015 **Impact Factor: 1.205**

2020 **The pancaking of coronal mass ejection: an in-situ attestation**, Anil Raghav*, & Zubair Shaikh, Monthly Notices of the Royal Astronomical Society: Letters, Volume 493, Issue 1, March 2020, Pages L16-L21, https://doi.org/10.1093/mnrasl/slz187, **Impact Factor: 5.231**

2019 **Co-existence of planar magnetic structure (PMS) and Alfvén wave in ICME shock-sheath**, Zubair Shaikh*, Anil Raghav*, & G. Vichare, The Monthly Notices of the Royal Astronomical Society, 490 (2), 1638-1643, https://doi.org/10.1093/mnras/stz2743 **Impact Factor: 5.231**

2019 **Concurrent effect of Alfvén wave and planar magnetic structure on Geomagnetic storm**, Zubair Shaikh*, Anil Raghav, Geeta Vichare, Ankush Bhaskar, Wageesh Mishra, and Komal Choraghe, The Monthly Notices of the Royal Astronomical Society, 490 (3), 3440-3447, https://doi.org/10.1093/mnras/stz2806 **Impact Factor: 5.231**

2019 **The cause of an extended recovery of ICME induced extreme geomagnetic storm: a case study**, Anil Raghav*, Komal Chorage, & Zubair Shaikh, The Monthly Notices of the Royal Astronomical Society, Volume 488, Issue 1, September 2019, Pages 910-917, https://doi.org/10.1093/mnras/stz1608 **Impact Factor: 5.231**

2018 **The identification of planar magnetic structure within ICME shock-sheath and its influence on galactic cosmic ray flux**, Zubair I. Shaikh* Anil Raghav*, Geeta Vichare, Ankush Bhaskar, and Wageesh Mishra, The Astrophysical Journal 866 (2), 118, https://doi.org/10.3847/1538-4357/aae1b1 **Impact Factor: 5.533**

2018 **Does the Alfvén wave disrupt the large-scale magnetic cloud structure?**, Anil Raghav* & Ankita Kule, Monthly Notices of the Royal Astronomical Society: Letters, Volume 480, Issue 1, p.L6-L11, https://doi.org/10.1093/mnrasl/sly106 **Impact Factor: 5.194**

2018 **Torsional Alfvén wave embedded ICME magnetic cloud and corresponding geomagnetic storm**, Anil Raghav*, Ankita Kule, A. Bhaskar,W. Mishra, Geeta Vichare, Shobha Surve. The Astrophysical Journal 860.1 (2018), 26, https://doi.org/10.3847/1538-4357/aabba3 **Impact Factor: 5.533**

2018 **Equatorial Secondary Cosmic Ray Observatory to study space weather and terrestrial events,** Geeta Vichare, Ankush Bhaskar, Gauri Datar, Anil Raghav, K.U. Nair, Selvaraj, Ananthi, A.K. Sinha, M. Paranjape, T. Gawade, C.P. Anil, Pannerselvam, Sathishkumar, K. Jeeva, S. Gurubaran, Advances in Space Research, Volume 61, Issue 10, 15 May 2018, Pages 2555-2568, https://doi.org/10.1016/j.asr.2018.03.006 **Impact Factor: 1.40**

2018 **The First *insitu* observation of torsional Alfven waves during the interaction of large-scale magnetic clouds**, Anil Raghav* & Ankita Kule, Monthly Notices of the Royal Astronomical Society: Letters, Volume 476, Issue 1, 1 May 2018, Pages L6-L9, https://doi.org/10.1093/mnrasl/sly020 **Impact Factor: 5.194**

2017 **Forbush decrease: A new perspective with classification**, Anil Raghav*, Zubair Shaikh, Ankush Bhaskar, Gauri Datar, Geeta Vichare, Solar Physics 292, no. 8 (2017): 99, https://doi.org/10.1007/s11207-017-1121-4, **Impact factor-2.682**

2017 **Presence of Turbulent and Ordered Local Structure within ICME Shock-sheath and Its Contribution to Forbush Decrease** Zubair Shaikh, Anil Raghav*, and Ankush Bhaskar, The Astrophysical Journal, Volume 844, Number 2 , 2017 July 28, https://doi.org/10.3847/1538-4357/aa729f ,**Impact factor-5.533**

2017 **High-spin states in Cs 133 and the shell model description.** Biswas S, Palit R, Sethi J, Saha S, Raghav A, Garg U, Laskar MS, Babra FS, Naik Z, Sharma S, Deo AY. Physical Review C. 2017 Jun 22;95(6):064320 https://doi.org/10.1103/PhysRevC.95.064320.**Impact factor-3.82**

2016 **The role of solar wind speed and interplanetary magnetic field in Forbush decreases**, Ankush Bhaskar, Geeta Vichare, K.P. Arunbabu and Anil Raghav, Astrophysics and Space Science **361**, 7, 1-132 (2016) https://doi.org/10.1007/s10509-016-2827-8 **Impact factor-1.622**

2014 **Quantitative understanding of Forbush decrease drivers based on shock-only and CME-only models using global signature of February 14, 1978 event**, Anil Raghav*, Ankush Bhaskar, Ajay Lotekar, Geeta Vichare and Virendra Yadav, *Journal of Cosmology and Astroparticle Physics (JCAP)* 10 (2014) 074 https://doi.org/10.1088/1475-7516/2014/10/074 **Impact factor-5.877**

2014 **Low energy secondary cosmic ray flux (gamma rays) monitoring and its constrains**, Anil Raghav, Ankush Bhaskar, Virendra Yadav and Nitinkumar Bijewar, *Astrophys Space Sci* (2014) 355:2172, https://doi.org/10.1007/s10509-014-2172-8 **Impact factor-1.622**.

2013 **Confirmation of secondary cosmic ray flux enhancement during the total lunar eclipse of 10 December 2011**, Anil Raghav, Ankush Bhaskar, Virendra Yadav, Nitinkumar Bijewar, Chintamani Pai, Ashish Koli, Nilam Navale, Gurinderpal Singh, Nitin Dubey, Sushant Pawar, Pradnya Parab, Gandhali Narvankar, Vaibhav Rawoot, Vikas Rawat, Satish Borse, Nagnath Garad, Carl Rozario, Nitin Kaushal, Shailendrakumar Tiwari, M. R. Press *Journal of Geophysical Research: space physics* vol. 118, https://doi.org/10.1002/2013JA019007 **Impact factor-3.44**

2012 **Small quadrupole deformation for the dipole bands in ^{112}In,** A. Raghav in T. Trivedi et al. *Phys. Rev. C* 85, 014327 https://doi.org/10.1103/PhysRevC.85.014327 **Impact factor-3.341**

2011 **Structural change of the unique-parity $\pi\, h_{11/2} \otimes \nu\, h_{11/2}$ configuration in 134Cs**, A. Raghav in H. Pai et al., *Phys. Rev. (Rapid Comm.) C* 84, 041301 https://doi.org/10.1103/PhysRevC.84.041301 **Impact factor-3.341**

2011 **Complete and incomplete fusion in ^{9}Be + ^{124}Sn system**, A. Raghav in V. V. Parkar et al., *Proc. Radiochim. Acta* 1, 131-134, https://doi.org/10.1524/rcpr.2011.0024

2011 **A study of secondary cosmic ray flux variation during the annular eclipse of 15 January 2010 at Rameswaram, India**, A. Raghav in Ankush Bhasker et al., *Astroparticle Physics* 35, 223-229 https://doi.org/10.1016/j.astropartphys.2011.08.003 **Impact factor-4.023**.

2010 **Fusion cross sections for the ^{9}Be + ^{124}Sn reaction at energies near the Coulomb barrier**, A. Raghav in V. Parkar et al., *Phys. Rev. C* 82, 054601, https://doi.org/10.1103/PhysRevC.82.054601 **impact factor-3.341**

Papers under-review process or arxiv

2020 **Flattened ICME Close to the Sun: an in-situ observation by Parker Solar Probe**, Zubair Shaikh & Anil Raghav **under formal review**

2020 **What is the mysterious cause of the most intense geomagnetic superstorm of the current century**, Anil Raghav*, & Zubair Shaikh **under formal review**

2019 **The observable in-situ evidence of Alfvénic turbulence in shock-sheath**, Anil Raghav*, & Zubair Shaikh **under formal review of MNRAS**

2019 **In-situ evidence of highly twisted ICME magnetic cloud with less twisted substructure (fluxrope) at 1 AU,**, Anil Raghav* W. Mishra, Y. Wang, A. Bhaskar, Z. Shaikh. **Under formal review of solar physics**

2016 **Cosmic ray acceleration via magnetic reconnection of magnetic islands/fluxropes**, Anil Raghav, Zubair Shaikh, arXiv:1610.09628.

2014 **Lunar eclipse induces disturbance in the lunar exosphere**, A. Raghav et al., arXiv:1401.6559.

Training program/ workshop /School attended

2019 A short course on **Space Weather** conducted during 14-27 November, 2019 at Physical Research Laboratory (PRL), Ahmedabad under the auspices of Center for Space Science and Technology Education in Asia and the Pacific (**CSSTEAP**), affiliated to the **United Nations**.

2019 **Multi-wavelength Sky Observations - AstroSat and Beyond**, February 3-7, 2019, Indian Institute of Technology (IIT) Indore

2017 **2 month training under the SCOSTEP Visiting Scholar (SVS) program, at CAS Key Laboratory of Geospace Environment, University of Science and Technology of China (USTC).** In this program, I have studied velocity modified cylindrical force free flux rope model based on Lundquist solution and velocity modified non-linear (uniform twist) force free flux model with Gold and Hoyle (GH) solution under the supervision of Prof. Yuming Wang.

2015 **Ninth Heliophysics Summer School 2015,** conducted by *the University Corporation for Atmospheric Research (UCAR)*, held in Boulder, Colorado, July 28 - August 4, 2015 under NASA 'living with star' funds.

2015 **Refresher Course in Astronomy and Astrophysics** conducted by *The Inter-University Centre for Astronomy and Astrophysics (IUCAA)* , Pune from May 05, 2015 to June 05, 2015.

2014 **28 days Orientation Course** conducted by *UGC Academic Staff College, University of Mumbai*, Mumbai from September 03, 2014 to October 01, 2014.

2013 **Six days training program on Computer Interfaced Science Experiments** conducted by *Inter University Accelerator Centre*, New Delhi from October 14, 2013 to October 19, 2013.

2013 Two days National workshop on **Python in Science and Education** jointly organized by *Department of Physics, University of Mumbai and Inter University Accelerator Centre*, New Delhi on 19-20 September 2013

2013 One day workshop on **Effective implementation of credit based system for M. Sc.-II course including elective E-I and E-II** organized by *Department of Physics, K. J. somaiya College of Science and Commerce*, Mumbai on July 10, 2013.

2012 **7th Winter School on Astro-Particle Physics** held at *Cosmic ray laboratory, TIFR*, Ooty, during the period from December 20, 2012 to December 28, 2012.

2012 **7th workshop on Astro-Particle Physics** held at *Cosmic ray laboratory, TIFR*, Ooty, during the period from December 16, 2012 to December 19, 2012.

2012 **Science Academies Refresher Course in Theoretical Physics** at *Department of Physics, University of Mumbai* from July 16, 2012 to July 28, 2012.

2009 **UGC sponsored Refresher Course in Physics** at *Department of Physics*, University of Mumbai from September 23, 2009 to October 12, 2009.

2009 **School cum workshop on Nuclear Yrast and Near Yrast States** held at Department of Physics, *Indian institute of Technology, Roorkee*, during the period of October 26-30, 2009.

Conference Presentations

2010 **Structure of Dipole Bands in ^{112}In: Through Lifetime Measurement**, A. Raghav in T. Trivedi at el., *Journal of Physics: Conference Series*, presented in Rutherford Centennial Conference.

2009 **High spin structure of ^{133}Cs**, A. Raghav et al., poster presentation in *International DAE Nuclear Physics symposium held at Bhabha Atomic Research Centre*, Mumbai during 08-12 December, 2009

2009 **High spin spectroscopy of ^{134}Cs**, A. Raghav in H. Rai et al., poster presentation in *International DAE Nuclear Physics symposium held at Bhabha Atomic Research Centre*, Mumbai during 08-12 December, 2009.

2009 **Complete and incomplete fusion cross-sections in $^{9}Be + ^{124}Sn$ system and its implications in horizontal spectroscopy** A. Raghav in V. V. Parkar et al., poster presentation in *International DAE Nuclear Physics symposium held at Bhabha Atomic Research Centre*, Mumbai during 08-12 December, 2009.

2008 **Particle Identification in CsI(T1) detectors** A. Raghav in R.Palit et.al, Poster Presentation in *DAE-BRNS Symposium on Nuclear Physics*, Indian Institute of Technology Roorkee, Roorkee -247667, December 22-26, INDIA-2008.

2006 **Hybrid detector telescope for fission fragment and heavy ions**, A. Raghav in D. C. Biswas et al., presentation in *DAE-BRNS symposium on Nuclear Physics* held at The Maharaja Sayajirao University of Baroda, Vadodara during 11-15 December, 2006.

ACHIEVEMENTS

Detail of Prizes/Awards/scholarships achievements:

2017 **SCOSTEP Visiting Scholarship 2017** .

2015 **Selected for NASA "Living with star" project funds**, *to attend Heliophysics Summer school 2015*.

2007 **SET Exam Feb2007**, *Common Entrance Test for lecturer-ship at state level*.

2007 **JEST Exam 2007**, *National level Ph.D. entrance test with 94.88 percentile.*.

2005 **Meritorious Student**, *in* T. Y. B.Sc,.
I have achieved 2nd rank from Mumbai University in the subject of Physics.

2005 **Awarded by six prizes**, *by* Patkar- Varde college, Mumbai.
as I have secured 1st rank (highest Marks) at all faculty level of college.

PROJECTS

- **Co-investigator** of project entitled **Secondary cosmic ray studies**. Under this project, we have installed NaI(Tl) scintillation detector at regional center of Indian institute of geomagnetism at Tirunelveli.

EDUCATION

Qualification **Ph.D. in Science (Physics)** *August 2009- May 2015*

Institute **University Department of Physics**, Mumbai, India

University **University of Mumbai**, Mumbai, India

Subject Space Physics

Title Study of Secondary Cosmic Ray Flux Variation During Certain Natural Events

Summary We have developed a secondary cosmic ray (SCR), mainly gamma ray, flux monitoring setup (energy range of 0.2-4 MeV) using 3 inch X 3 inch NaI(Tl) scintillation detector. Using this setup, we have studied temporal variation of SCR flux during eclipses (Annular solar eclipse and total lunar eclipse). The experimental results confirmed previous observations and advance our understanding of the various possible physical mechanisms behind this SCR variations during eclipses. We have performed similar type of experiments during full-moon day, new-moon day and days close to them. During these experiments, we have observed couple of abnormal events which show presence of atmospheric radioactivity (radioactive Ar^{41}). This is the first successful foray in the field of experimental Space Physics research by the Mumbai University, Department of Physics with in-house instrumentation and data acquisition system.

We have also carried out the quantitative understanding of Forbush decrease (FD) phenomena. To the best of our knowledge, this is the first time FD shock amplitude component has been separated from total FD amplitude, and FD shock and MC component investigated independently using CME-only and shock-only model. This work confirms present accepted the physical scenario that the first step of FD is due to propagating shock barrier and the second step is due to flux rope of CME/magnetic cloud.

Contribution In this work, I have contributed to: (1) development, testing and characterization of the SCR flux monitoring setup (2) Developing formalism for data processes and analysis (3) actual data analysis and (4) finally, writing manuscript for papers. The numerical calculations involved in study, which were performed using code in Scilab and Matlab software.

Qualification **Master of Science (M.Sc.) in Physics** *2005-2007*

Institute **University Department of Physics**, Mumbai, India

University **University of Mumbai**, Mumbai, India

Subject

M.Sc. Part I	M.Sc. Part II
Mathematical Physics	Statistical Physics
Classical Mechanics	Electrodynamics
Quantum Mechanics-I	Atomic and Molecular Physics
Nuclear Physics	Laser and Plasma Physics
Quantum Mechanics-II	Advanced Nuclear Physics
Solid State Physics	Nuclear Reaction, Nuclear Structure
Electronics	Particle Physics
Solid State Devices	Exp. Techniques In Nuclear Physics
percentage 71.0 %	Percentage 65.6 %

Overall Percentage in M.Sc. Course – 68.3 %

** Project Fellow at Tata Institute of Fundamental Research (TIFR), Mumbai from October 30, 2007 to 30 April 2008.

During this work, I have Participated in testing of HPGe clover Detector, Cs-I charge particle detector and its respective signal processing instrumentation. I have also participated in heavy ion-beam experiments using pelletron facility at intermediate beam energy range available at (TIFR) and Inter University accelerator centre (IUAC). We have used Gamma Detector Array (GDA) facility at TIFR, and Indian National Gamma Array (INGA) facility at IUAC. These experiments lead us to investigate high spin nuclear structure properties for intermediate mass region A $\sim$ 110 and A $\sim$ 130 nuclei. In this work, I have learned nuclear radiation detection techniques and instrumentation, data acquisition and analysis of the data generated using these experiments. During this data processing and analysis I have worked with different sophisticated softwares (PACE, CASCADE, RADWARE, LAMPS, CANDLE, DAMM and xmgrace) based on LINUX operating system.

Note Participation in Nuclear structure group start from June 2008 and even after ending the project fellowship, I have participated in group till 2010.

Project

1. Project trainee at Nuclear Physics Division, Bhabha Atomic Research Centre (BARC), Mumbai from May 1, 2006 to July 15, 2006.

   During this work ,I have participated in the development of a hybrid telescope for the detection of heavy ions and fission fragments produced in heavy ions reaction.

2. I have done project titled 'Design and working of multi-wire proportional chamber (MWPC)' in the detector laboratory at Inter University Accelarator Center (IUAC), Delhi under the guidance of Mr. Akhil Jhingan.

3. I have done a project on 'Compton Scattering Effect' at University Department of Physics, University of Mumbai, Mumbai in year of 2006-2007.

4. I have done project titled 'Mean Lifetime Measurement of Muon' at Indian Institute of Technology (IIT), Mumbai in year of 2005-2006.

Qualification **B. Sc. (Bachelor of Science) in Physics** *2002-2005*

Institute **Patkar–Varde College**, Goregoan-west, Mumbai, India

University **University of Mumbai**, Mumbai, India

Subject Third Year B. Sc.

Major Subject

Solid State Physics and Electronics

Classical and Statistical Mechanics

Atomic and Nuclear Physics

Electrodynamics and Relativity

Minor Subject

Electronic Instrumentation-I

Electronic Instrumentation-II

Percentage 85.75 %

Qualification **H.S.C.(Higher Secondary Certificate)** *2000-2002*

Institute **Vartak Junior College** Vasai road, Thane, India

Board **Mumbai Divisional Board**, Mumbai, India

Percentage 71.00 %

Qualification **S.S.C.(Secondary School Certificate)** *2000*

Institute **Abhinav Vidya Mandir**, Bhayander, Thane, India

Board **Mumbai Divisional Board**, Mumbai, India

Percentage 75.76 %

COMPUTER SKILLS

Operating System

Linux (Ubuntu and Fedora) and Windows (user)

Softwares

Microsoft Office (Word, Excel, Powerpoint), Matlab, Scilab, Origin, Latex, Basic Programing Languages known (c, Fortran, Python)

Data processing and analysis techniques used in various publications.

Regression, Correlation, minimum or maximum variance analysis (MVA) for spacecraft data, Power Spectral Density (PSD), 3D hodogram, stack plots, contour 2-dimensional plots, Walen test, Alfvén wave characteristics, curve fitting by least square method, lundquist model, Gold Hoyle model, and Grad-Shafranov reconstruction model for uderstanding global evolution of CMEs, normalization of worldwide neutron monitors data, etc.

Teaching and Administration Experience

Theory Courses

- **Electrodynamics (core course)** for **3 semesters** (2015-16, 2016-17, 2018-19).
- **Space Plasma Physics** for **2 semester** (2017-18, 2018-19).
- **Nuclear Physics (core course)** for **4 semesters** (2011-12, 2012-13, 2013-14, 2014-15).
- **Experimental Techniques in Nuclear Physics** (Elective course/ specialization) for **8 semesters** (2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2014-15, 2015-16, 2017-18).
- Nuclear Physics (Structure and Reaction) (Elective course/ specialization) for **2 semesters** (2009-10, 2010-11).
- visiting lecturer for M.Sc. Part I Physics course in Gogate Joglekar College of Arts, Commerce and Science, Ratnagiri, and S.H. Kelkar College of Arts, Commerce and Science, Devgad, Maharashtra.

Innovative processes developed in teaching and learning

- Prepared tutorial sheets to supplement classroom learning
- Regular assessments (at least 1-2 per semester) to assess learning efficacy
- Routinely use of presentations tools on projector to emphasize topics
- Allow students to give presentation on certain topics (usually complete study material is provided to the student)

Laboratory Courses

- In-charge of **Nuclear Physics** laboratory for 8 years from 2009 to April 2017.
- In-charge of **Astronomy and Space physics** laboratory for 5 years from 2014.
- I have worked in **General Physics** laboratory of M.Sc. semester I for **8 years** (year 2009- 10, 2010-11 and year 2014-15 to till date).

Exam work

- Paper setter, examiner and moderator for University of Mumbai for **10 years**.

Participation in curricular development

- Member, Syllabus Revision Committee for **Nuclear Physics (core)**.
- Member, Syllabus Revision Committee for **Electrodynamics (core)**.
- Member, Syllabus Revision Committee for **Nuclear Structure (Elective)**.
- Member, Syllabus Revision Committee for **Nuclear Reaction (Elective)**.
- Member, Syllabus Revision Committee for **Space Physics 1 (Elective)**.
- Member, Syllabus Revision Committee for **Space Physics 2 (Elective)**.
- Member, Syllabus Revision Committee for **Galactic and Extra-galactic Astronomy (Elective)**.

Participation in co-curricular and extra-curricular activities

- Member, **Advisory Committee**, Department of Physics (Autonomous).
- Member, **Academic Board**, Department of Physics (Autonomous).

- Member, **Time table committee**, Preparing lecture schedule and Exam Timetable for all semester for last 5 years.
- **Preparing Academic calendar** for the Autonomous Department of Physics for last 5 years.
- **Preparing workload document** of the department for last 4 years.
- Member, **Results and Grade Cards Unit (earlier results cell)** Participate in results generation and verification process.
- Member, **Elective Allotment Committee.**
- Member, **Project allotment committee.**
- Assisting Committees of the University e.g IQAC, NIRF etc.

References

1. **Dr. M. R. Press,**
   Ph.D. Supervisor, Associate Professor, Department of Physics (Autonomous), University of Mumbai, Santacruz (east), Mumbai, India- 400098
   Email: mrpress@physics.mu.ac.in & mrpress01@gmail.com
2. **Dr. Anuradha Misra,**
   Professor & Head, Department of Physics (Autonomous), University of Mumbai, Santacruz (east), Mumbai, India- 400098
   Email: anuradha.misra@gmail.com

I hereby declare that the above mentioned information is correct up-to my knowledge and I bear the responsibility for correctness of the above mentioned particulars.

Place: **Mumbai** **(Anil Narayan Raghav)**