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| Present Position | Assistant Professor (UGC) |
| Research Interests | Astrophysics & Cosmology, Cosmic Reionization and Cosmic Dawn, HI 21cm radiation through cosmic history, Radio Astronomy, Post Reionization, Large scale structure of Universe. |
| Experience | <p>September, 2014 – Present Assistant Professor (UGC Faculty Recharge Programme)</p> <p>October, 2013-September, 2014 Postdoctoral Fellow (DST fast track Scheme for Young Scientists), National Centre for Radio Astrophysics-TIFR, Pune</p> <p>April, 2013-October, 2013 Postdoctoral Fellow, National Centre for Radio Astrophysics-TIFR, Pune</p> <p>October, 2009-March, 2013 Postdoctoral Fellow, Department of Astronomy & Oskar Klein Centre, Stockholm University, Sweden</p> <p>February, 2009-August, 2009 Visiting Fellow, Harish Chandra Research Institute, Allahabad</p> |
| Education | <p>January, 2004- 2009 PhD Indian Institute of Technology (IIT), Kharagpur, West Bengal, India (degree awarded on May, 2009) Thesis Title: Probing Cosmological Reionization through Radio-interferometric Observations of Neutral Hydrogen " Advisor: Prof. Somnath Bharadwaj</p> |

Education

2001-2003

MSc in Physics, 2003
Burdwan University, Burdwan, West Bengal, India

1998-2001

BSc in Physics, 2001
Labpur S.N. College (Burdwan University), Labpur, West Bengal, India

Teaching Experience

Waves & Oscillations (UG), Presi Univ, 2015-17
Electronics Lab (UG), Presi Univ., 2015
UG I lab (2016-17)
Astrophysics & Cosmology I (PG) 2015-17, Presidency University
Special Relativity (UG), 2014, 2015, Presidency University
Teaching Assistant: B. Tech (1st year), Waves & Oscillation, IIT Kharagpur, W.B., India, 2008
Practical Lab class: B. Tech(1st year), IIT Kharagpur, W.B., India, 2004- 2007, total 5 semesters
Practical Lab class: Integrated MSc(2nd year), IIT Kharagpur, W.B., India, 2006, one semester
Practical Lab class: Two year MSc(1st Year), IIT Kharagpur, W.B., India, 2007

Supervision

PhD student

1. **Rakesh Das (Since Sept., 2017..)**

JRF

2. **Dhruba Dutta Chowdhury** (JRF at Presidency University, Sept. 2015 -August 2016)
Currently a graduate student at Yale Univ.

Apart from that, I have jointly supervised (although not as a official supervisor) a PhD student at the NCRA-TIFR, Pune.

1. **Raghunath Ghara** (published three papers) (Supervisor: Dr. Tirthankar Roy Choudhury)
Currently a postdoc at Stockholm University, Sweden

PG students I supervised

1. Sioree Ansar, 2. Mani Shankar Dey, 3. Madhusudan Maity, 4. Himadri Roy (Jointly with Dr. Saamyadeep Samui, (Currently a PhD student at IIT Kanpur), 5 Joy Chakraborty (PG) (Currently scientific officer at BARC, Mumbai), Shrijita Banerjee (PG)

UG Students supervised

1. Chandra Sekhar Murmu, 2. Subham Roy, 3. Utsav Biswas

Earlier I helped

1. **Hannes Jensen** -published two papers (Astronomy Dept., Stockholm University) (Defended thesis in June, 2015) , (Supervisor: Prof. Garrelt Mellema)
2. **Martina Friedrich** -published one paper (Astronomy Dept., Stockholm University) (Defended thesis in 2012), (Supervisor: Prof. Garrelt Mellema)
3. **Suman Majumdar** -published two papers (Currently postdoc at Imperial College, London) (Supervisor: Prof. Somnath Bharadwaj)

Project

DST fast track project for young scientists (2013 -2016)

Project title: Unveiling cosmic reionization through radio interferometric observations of neutral hydrogen

UGC start-up research grant (2016-18)

Conferences/workshops
organised

Chairman (SOC) and member of LOC, Conference on “Universe after the first 200 million years”, 11-13th December, 2017, Presidency University

Member, SOC, Workshop on Epoch of Reionization, 18th -22nd July, 2016, CTS, IIT Kharagpur

Chairman (SOC) and member of LOC, Young Astronomers' Meet, IIT Kharagpur, India, 14th-16th March, 2009

Member, LOC -Reionization and Cosmic Dawn with SKA, 18th -20th January, 2012, Stockholm

Members

(i) Square Kilometer Array (SKA) **international science working** group on “Reionization and Cosmic Dawn”

(ii) **Cordinator**, SKA-India science working group on “Reionization and Cosmology”.

(iii) Member, SKA -India science sub committee

Awards

1. UGC Assistant Professor position (Faculty Recharge Scheme, 2013)

2. Fast track fellowship for Young Scientists (DST, India), 2012

3. Oskar Klein Postdoctoral Fellowship, 2009 by Oskar Klein Center, Stockholm, Sweden

4. IUCAA associate for the period 2016-2019

5. Selected for CTS, IIT KGP visiting programme (2016-17)

6. CSIR-UGC Junior Research Fellowship (JRF) and Lecture ship, 2003, 2004 (ranked within top 20% of all NET successful candidates with JRF in 2003)

7. Graduate Aptitude Test (GATE), India (2003): All India rank 129

8. Joint Entrance Screening Test (JEST), India, 2003: All India rank 196

9. National Merit Scholarship (twice) at school level

Publications

Total publications:

In refereed international journals: 28

Book chapters: 6

Conference proceedings: 4

Impact factors:

MNRAS -5.521 , JCAP -6.03, PRL-7.94, Experimental Astronomy -2.969

h-index: 16, h10-index: 21

Total citation: 642 (source- NASA ADS, as on 6.10.2017)

: 704 (source -google scholar: <https://scholar.google.co.in/citations?user=5PTMr0EAAAAJ&hl=en>)

In refereed journal (International)

2017

28. Imaging the redshifted 21 cm pattern around the first sources during the cosmic dawn using the SKA

Ghara, Raghunath; Choudhury, T. Roy; **Datta, Kanan K.**; Choudhuri, Samir, MNRAS, 2017, Volume 464, Issue 2, p. 2234-2248

2016

27. Probing Individual Sources during Reionization and Cosmic Dawn using Square Kilometre Array HI 21-cm Observations

Datta, Kanan K.; Ghara, Raghunath; Majumdar, Suman; Choudhury, T. Roy; Bharadwaj, Somnath; Roy, Himadri; Datta, Abhirup, Journal of Astrophysics and Astronomy (SKA-India special issue), 2016, Vol. 37, Issue 4, article id.27, 16 pp.

26. Modelling the 21-cm Signal from the Epoch of Reionization and Cosmic Dawn

Choudhury, T. Roy; **Datta, Kanan**; Majumdar, Suman; Ghara, Raghunath; Paranjape, Aseem; Mondal, Rajesh; Bharadwaj, Somnath; Samui, Saumyadip, Journal of Astrophysics and Astronomy (SKA-India special issue), 2016, Vol. 37, Issue 4, article id.29, 15 pp.

25. Line-of-Sight Anisotropies in the Cosmic Dawn and Epoch of Reionization 21-cm Power Spectrum

Majumdar, Suman; **Datta, Kanan K.**; Ghara, Raghunath; Mondal, Rajesh; Choudhury, T. Roy; Bharadwaj, Somnath; Ali, Sk. Saiyad; Datta, Abhirup, Journal of Astrophysics and Astronomy (SKA-India special issue), 2016, Vol. 37, Issue 4, article id.32, 21 pp.

24. The redshifted HI 21 cm signal from the post-reionization epoch: Cross-correlations with other cosmological probes

Tapomoy Guha Sarkar, **Kanan K. Datta**, Somnath Bharadwaj, T. Roy Choudhury, Journal of Astrophysics and Astronomy (SKA-India special issue), 2016, Volume 37, Issue 4, article id.26, 20 pp

23. 21-cm signature of the first sources in the Universe: Prospects of detection with SKA

Ghara, Raghunath; Choudhury, T. Roy; **Datta, Kanan K.**, 2016, MNRAS, 460, Issue 1, p.827-843

22. Effects of the sources of reionization on 21-cm redshift-space distortions

Majumdar, Suman; Jensen, Hannes; Mellema, Garreht; Chapman, Emma; Abdalla, Filipe B.; Lee, Kai-Yan; Iliev, Ilian T.; Dixon, Keri L.; **Datta, Kanan K.**; Ciardi, Benedetta; Fernandez, Elizabeth R.; Jelić, Vibor; Koopmans, Léon V. E.; Zaroubi, Saleem, 2016, MNRAS, Volume 456, Issue 2, p.2080-2094

2015

21. 21 cm signal from cosmic dawn – II. Imprints of the light-cone effects

Raghunath Ghara, **Kanan K. Datta**, and T. Roy Choudhury, MNRAS, 453, 3143–3156 (2015)

20. On using large scale correlation of the Ly-alpha forest and redshifted 21-cm signal to probe HI distribution during the post reionization era

Tapomoy Guha Sarkar, **Kanan K. Datta**, 2015, JCAP, Issue 08, article id. 001, arXiv:1501.02308

19. Cross-correlating 21cm intensity maps with Lyman Break Galaxies in the post-reionization era

Villaescusa-Navarro, Francisco; Viel, Matteo; Alonso, David; **Datta, Kanan K.**; Bull, Philip; Santos, Mario G., 2015, JCAP, Issue 03, article id. 034, arXiv:1410.7393

18. 21 cm signal from cosmic dawn: Imprints of spin temperature fluctuations and peculiar velocities,

Ghara, Raghunath; Choudhury, T. Roy; **Datta, Kanan K.**, 2014, MNRAS, 2015, 447, 1806, arXiv:1406.4157

2013-14

17. Light cone effect on the reionization 21-cm signal - II. Evolution, anisotropies and observational implications

Datta, Kanan K.; Jensen, Hannes; Majumdar, Suman; Mellema, Garreht; Iliev, Ilian T.; Mao, Yi; Shapiro, Paul R.; Ahn, Kyungjin, MNRAS, 2014, Volume 442, Issue 2, p.1491-1506, (arXiv:1402.0508)

16. On the use of seminumerical simulations in predicting the 21-cm signal from the epoch of reionization

Majumdar, Suman; Mellema, Garreht; **Datta, Kanan K.**; Jensen, Hannes; Choudhury, T. Roy; Bharadwaj, Somnath; Friedrich, Martina M., 2014, MNRAS, Volume 443, Issue 4, p.2843-286, (arXiv:1403.0941)

15. Modeling the neutral hydrogen distribution in the post-reionization Universe: intensity mapping

Villaescusa-Navarro, Francisco; Viel, Matteo; **Datta, Kanan K.**; Choudhury, T. Roy, JCAP, 2014, Issue 09, article id. 050

14. Probing reionization with LOFAR using 21-cm redshift space distortions,

Jensen, Hannes; **Datta, Kanan K.**; Mellema, Garrelt; Chapman, Emma; Abdalla, Filipe B.; Iliev, Ilian T.; Mao, Yi; Santos, Mario G.; Shapiro, Paul R.; Zaroubi, Saleem; Bernardi, G.; Brentjens, M. A.; de Bruyn, A. G.; Ciardi, B.; Harker, G. J. A.; Jelić, V.; Kazemi, S.; Koopmans, L. V. E.; Labropoulos, P.; Martinez, O.; Offringa, A. R.; Pandey, V. N.; Schaye, J.; Thomas, R. M.; Veligatla, V.; Vedantham, H.; Yatawatta, S., MNRAS, 2013, Volume 435, Issue 1, p.460-474, (arXiv: 1303.5627)

13. Reionization and the Cosmic Dawn with the Square Kilometre Array

Mellema et al (including **Kanan K. Datta**), Experimental Astronomy, 2013, Volume 36, Issue 1-2, pp. 235-318

12. Hunting for dark halo substructure using submilliarcsecond-scale observations of macrolensed radio jets

Zackrisson, Erik; Asadi, Saghar; Wiik, Kaj; Jönsson, Jakob; Scott, Pat; **Datta, Kanan K.**; Friedrich, Martina M.; Jensen, Hannes; Johansson, Joel; Rydberg, Claes-Erik; Sandberg, Andreas, MNRAS, 2013, Volume 431, p. 2172

11. Will Nonlinear Peculiar Velocity and Inhomogeneous Reionization Spoil 21 cm Cosmology from the Epoch of Reionization?

Shapiro, Paul R.; Mao, Yi; Iliev, Ilian T.; Mellema, Garrelt; **Datta, Kanan K.**; Ahn, Kyungjin; Koda, Jun, PRL, 2013, vol. 110, Issue 15, id. 151301

2011-12

10. Light cone effect on the reionization 21-cm power spectrum

Kanan K. Datta, Garrelt Mellema, Yi Mao, Ilian T. Iliev, Paul R. Shapiro, MNRAS, 2012, 424, 1877, arXiv:1109.1284

9. Prospects of observing a quasar HII region during the Epoch of Reionization with redshifted 21cm

Kanan K. Datta, Martina M. Friedrich, Garrelt Mellema, Ilian T. Iliev, Paul Shapiro, MNRAS, 424 (2012), 762, arXiv: 1203.0517

8. The impact of anisotropy from finite light travel time on detecting ionized bubbles in redshifted 21-cm maps

Suman Majumdar, Somnath Bharadwaj, **Kanan K. Datta**, T. Roy Choudhury MNRAS, 413 (2011), 1409, arXiv: 1006.0430

7. Cross-correlation of the HI 21-cm signal and Ly -alpha forest: a probe of cosmology

Guha Sarkar, Tapomoy; Bharadwaj, Somnath; Choudhury, Tirthankar Roy; **Datta, Kanan K.** MNRAS, 2011(accepted), arXiv:1002.1368

2009-10

6. HI as a probe of the large-scale structure in the post-reionization universe

Bagla, J. S.; Khandai, Nishikanta; **Datta, Kanan K.**, MNRAS, 407(2010), 567, arXiv:astro-ph/0908.3796

5. The optimum redshift for detecting ionized bubbles in 21-cm maps

Kanan K. Datta, Somnath Bharadwaj, T. Roy Choudhury MNRAS: Letters, 399 (2009), L132, arXiv:0906.0360

4. The CMBR ISW and HI 21-cm Cross-correlation Angular Power Spectrum

Tapomoy Guha Sarkar, **Kanan K. Datta**, Somnath Bharadwaj, JCAP, Issue 08, pp. 019 (2009), arXiv:0810.3649

3. Simulating the impact of HI fluctuations on matched filter search for ionized bubbles in redshifted 21 cm maps

Kanan K. Datta, Suman Majumdar, Somnath Bharadwaj, T. Roy Choudhury, MNRAS, 391, 1900 (2009), arXiv:astro-ph/0805.1734

2007-08

2. Detecting ionized bubbles in redshifted 21 cm maps

Kanan K. Datta , Somnath Bharadwaj, T. Roy Choudhury, MNRAS , 382 (2007), 809, arXiv:astro-ph/0703677

1. The multi-frequency angular power spectrum of the epoch of reionization 21 cm signal

Kanan K. Datta , T. Roy Choudhury, Somnath Bharadwaj, MNRAS , 378, 119- 128 (2007), arXiv:astro-ph/0605546

Submitted Manuscript:

1. Towards simulating and quantifying the light-cone EoR 21-cm signal

Mondal, Rajesh; Bharadwaj, Somnath; **Datta, Kanan K.**, positive review report, arXiv170609449M

2. Enhanced 21-cm Power Spectrum due to inhomogeneous CMB heating of gas during Dark Ages

Sioree Ansar, **Kanan K. Datta**, Dhruba Dutta Chowdhury

Book Chapters

1. Probing individual sources during reionization and cosmic dawn using SKA HI 21- cm observations

Datta et al, SKA -India Science book-version 2, 2016

2. Modelling the 21 cm Signal From the Epoch of Reionization and Cosmic Dawn

T. Roy Choudhury, Kanan Datta et al, SKA -India Science book-version 2, 2016

3. The redshifted HI 21 cm signal from the post-reionization epoch: Cross-correlations with other cosmological probes

T. Guha Sarkar, K. K. Datta, A. K. Pal, T. Roy Choudhury and S. Bharadwaj, SKA -India Science book-version 2

4. Line of sight anisotropies in the cosmic dawn and EoR 21-cm power spectrum

Suman Majumdar, Kanan K. Datta et al, SKA -India Science book-version 2

5. HI tomographic imaging of the Cosmic Dawn and Epoch of Reionization with SKA

Garrelt Mellema, León Koopmans, Hemant Shukla, **Kanan K. Datta**, Andrei Mesinger, Suman Majumdar, on behalf of the CD/EoR Science Working Group

(Accepted for publication in the SKA Science Book 'Advancing Astrophysics with the Square Kilometre Array',)

6. The Cosmic Dawn and Epoch of Reionization with the Square Kilometre Array,

Koopmans et al (including **Kanan K. Datta**), Accepted for publication in the SKA Science Book 'Advancing Astrophysics with the Square Kilometre Array, arxiv: 1505.07568

In conference proceedings

4. Simulating cosmic reionization and the radiation backgrounds from the epoch of reionization
Shapiro, Paul R.; Iliev, Ilian T.; Mellema, G.; Ahn, Kyungjin; Mao, Yi; Friedrich, Martina; **Datta, Kanan** ; Park, Hyunbae; Komatsu, Eiichiro; Fernandez, Elizabeth; Koda, Jun; Bovill, Mia; Pen, Ue-Li, 2012AIPC.1480..248S

3. The Impact of Peculiar Velocity and Reionization Patchiness on 21cm Cosmology from the Epoch of Reionization

Mao, Yi; Shapiro, P. R.; Iliev, I. T.; Mellema, G.; Ahn, K.; **Datta, K.** AAS Meeting, 2012

2. Searching for Ionized Bubbles in 21-cm Maps

Kanan K. Datta, Suman Majumdar, Somnath Bharadwaj, T. Roy Choudhury, The Low-Frequency Radio Universe ASP Conference Series, Vol. 407, p. 39 (2009)

1. Frequency decorrelation properties of the epoch of reionization 21 cm signal

Kanan K. Datta, XVII DAE- BRNS High Energy Physics Symposium, December 11- 15, 2006, IIT Kharagpur, Page 217

My Research

Introduction:

Understanding the evolutionary history of our Universe is one of the major goals in modern cosmology. Precise measurements of the Cosmic Microwave Background Radiation (CMBR), the relic radiation from the early Universe, discovery of the dark energy, observations of large number of galaxies, quasi-stellar objects (QSOs) have revolutionized our understanding about the Universe. All these observations give us with detailed pictures of our present and very early Universe and thus made cosmology very exciting, rapidly growing field of science research.

One of the most important missing pictures in the evolutionary history of our Universe is the epoch of reionization, the intermediate period when the first sources of light such as first stars, QSOs formed in the Universe. These first light sources reionized the neutral hydrogen in the intergalactic medium and marked the end of dark ages. Observations of redshifted 21-cm radiation are considered to constitute the most promising tool to probe the reionization epoch. A huge effort all over the world including India (National Center for Radio Astrophysics, TIFR, Raman Research Institute) has been going on in the last few years both on theoretical and observational sides to understand what exactly happened during the period.

My scientific work has been, to a large extent, revolving on modeling the reionization 21 cm signal and bridge the gap between observations and theory. Apart from that, I work on cross-correlations of the 21 cm signal and CMBR, Lyman alpha to study the post-reionization Universe. Below I highlight my current research and then give a brief description of my research proposal.

Highlights of my current research

[How does the light Cone effect affect the reionization 21-cm signal?](#) We used numerical simulations to investigate, for the first time, the light cone effect on the 3D 21-cm reionization power spectrum.

[Detection of redshift distortion effect on reionization 21 cm signal using LOFAR:](#) We have been assigned this project from LOFAR. A PhD student (Hannes Jensen) in Stockholm and me have been leading this project. We are using numerical simulations to investigate the detectability of the redshift distortion effect on reionization 21 cm signal and what can we learn from this.

[Can we detect QSOs, galaxies individually in reionization 21 cm maps?](#) We developed a matched filter technique to detect QSOs, galaxies individually in 21 cm maps during the reionization epoch. Through a series of simulations we showed, for the first time, that the 1st generation of low frequency radio telescopes such as LOFAR, GMRT, MWA should be able to detect high redshifts QSOs, galaxies individually. Based on our results, this is now one of the major science goals of LOFAR reionization experiment.

[What can we learn from 21 cm observations of QSO ionized regions?](#) In our recent work we proposed a well defined method to constrain the QSO parameters such as the luminosity, age using 21 cm observations of QSO ionized region.

[MAPS:](#) In our work in 2007, we developed a formalism (MAPS: Multi-frequency angular power spectrum) to characterize, statistically, the reionization 21 cm signal. Since then it has been used in literature many times to characterize the observed and simulated data.

[Sensitivity of the first generation radio interferometers :](#) One of the major components in the observed 21 cm signal is the system noise. The detectability of the 21 cm signal will ultimately be decided by the system noise. We have developed a code which calculates the sensitivity of any interferometric experiments (GMRT, LOFAR, MWA etc.) to the statistical quantities such as the power spectrum, rms of H I 21 cm signal.

[An Independent probe of Cosmology:](#) We proposed a completely new independent tool i.e, cross-correlations between 21 cm signal and Ly-alpha to probe the large scale structure and cosmology in the post reionization epoch.

Recent Conferences, Workshops & meetings:

Invited

8. Peering towards Cosmic Dawn IAU Symposium 333, 2nd-6th October 2017, Dubrovnik, Croatia
Talk title: Towards simulating and quantifying the light-cone EoR 21-cm signal (presented remotely)
link: <https://iaus333.irb.hr/Programme2>

7. XXXV Meeting of Astronomical Society of India B. M. Birla Auditorium, Jaipur 6 - 10 March 2017

Invited plenary talk

Talk title: Probing the universe with the HI 21cm line

link

<http://astron-soc.in/asi2017/index.php/programme-details>

6. Workshop on Epoch of Reionization

CTS, IIT Kharagpur, 18th -22nd April, 2016

Talk: Matched filter search for ionised bubbles in 21-cm maps

link: <http://www.cts.iitkgp.ernet.in/EoR/>

5. SKA Science Workshop (organised as a part of the 20th SKA Board Meeting),
NCRA-TIFR, Pune on April 6, 2016.

4. “SKA Key Science Project meetings” in Stockholm, 24-27th August, 2015.

Attended in the meeting and participated in the discussion as a representative of the SKA-India
“Reionization & Cosmology science working group”.

link: <https://indico.skatelescope.org/event/342/>

3. Workshop on “Indian Participation in the SKA”, NCRA-TIFR, 16th February, 2015

Talk: SKA-India: A report from Reionization and Cosmology Group (presented on behalf of the SKA-India, Reionization and Cosmology science working group)

link: www.ncra.tifr.res.in:8081/~tirth/SKA-India/Workshop-2015/Schedule.pdf

2. Workshop on Galaxies and Cosmology, NCRA-TIFR, July 7-18, 2014

Talk: Cosmic Dawn and Epoch of Reionization: Lessons from Simulations

link: www.ncra.tifr.res.in:8081/~galaxy/seminar-schedule.pdf

1. National Workshop on Cosmology with the HI 21-cm line, June 23-26, 2015, Raman Research Institute, Bangalore, India.

Talk: Simulating HI 21-cm Signal from Cosmic Reionization

link: <http://www.rri.res.in/21cm-cosmology.html>

Contributory

4. TCGCA -ER5: 5th Topical Conference on Gravity, Cosmology, Astronomy and Astrophysics (Eastern Region), 19th March, 2015, IIT KGP

Talk: "Unveiling Cosmic Dawn and Epoch of Reionization with Square Kilometer Array".

link: http://www.isical.ac.in/~tcgca_er5/

3. Advanced workshop on Cosmological Structures from Reionization to Galaxies: Combining efforts from analytical and numerical methods, 12-15 May, 2015, Trieste, Italy (<http://indico.ictp.it/event/a14279/>)

Talk: Can the First Generation of Low Frequency Radio Telescopes Detect Individual Quasar HII Region during the Epoch of Reionization with Redshifted 21-cm?

link: <http://indico.ictp.it/event/a14279/other-view?view=ictp timetable>

2. Workshop on Statistical Applications to Cosmology and Astrophysics (STATCOSMO15), ISI, Kolkata, 10th-13th February, 2015

Talk: Cosmic Dawn and Epoch of Reionization: Light Cone Effect on the HI 21-cm Power Spectrum

link: www.isical.ac.in/~statcosmo15/#page1

1. TCGC: Topical Conference on Gravity and Cosmology (Eastern Region), 28th February, 2015, IIT KGP

Talk: Reionization 21 cm signal in Redshift Space

link: www.cts.iitkgp.ernet.in/tcgc/programme.html