

**ACADEMIC STAFF COLLEGE**  
**CHRIST(Deemed to be University)**  
**Quality Improvement Programme: 20-28 May 2019**  
**Theme: Research as a culture of the Department and Consultancy**  
**Department of Mathematics**

**The Department of Mathematics, Christ (Deemed to be University) organized five days QIP from 20<sup>th</sup> May 2019 to 22<sup>nd</sup> May 2019 and 27<sup>th</sup> May 2019 to 28<sup>th</sup> May 2019 at CHRIST (Deemed to be University).**

**Date: 20 May 2019**

**Session: 1**

**Time: 9.00 am – 10.30 am**

**Topic:** Research as a culture of the department

**Resource Person:** Dr. Aravinda, TIFR

The speaker spoke regarding how to promote research in the minds of young generation. He discussed about how some of the problems were posed by few mathematicians and how those problems were solved later. As an example, how the Poincare conjecture was stated in 1904 and it was solved in the year 1982 by Richard Hamilton. He pointed out the importance of discussing open problems with others and conducting seminars where the people can come together and share their research knowledge. He also suggested motivating the students to read the biography and films based on the achievements of mathematicians.

**Date: 20 May 2019**

**Session : 2**

**Time: 10.45 am – 12.15 pm**

**Topic:** Research as a culture of the department

**Resource Person:** Dr. Aravinda, TIFR

The speaker extended the talk by quoting the movie “Man Who Knew Infinity” based on the book about Ramanujan’s achievements. Later he quoted the open problems like Kakey needle problems etc. Also he was talking about how to create awareness on recent achievements of mathematics and the reputed rewards like Fields medal and Abel prize. Further he talked about the NGO which works on creating the awareness through magazine like Bhavana. It publishes the achievements and rewards of the mathematicians, for example, Akshaya Venkatesh got Fields medal in 2018 for remarkable results in the field of Number theory.

**Date: 20 May 2019**

**Session: 3**

**Time: 1.15 pm – 2.45 pm**

**Topic:** Ethics in Research

**Resource Person:** Fr. Joseph Varghese

Speaker talked about three important aspects in the research i.e. Truth, Goodness and Justice. He also talked about the three stages of research, namely,

1. Doing research: Here it is very important to adhere to the following aspects like motivation, progress of the society, love of knowledge, search for truth etc.

2. Guiding research: Here speaker mentioned that important characters of research supervisor. Supervisor has to follow ethics in understanding the scholar, vocabulary for communication, never assign any personal work to students, never engage in monetary transactions etc.

3. Communicating research: Speaker talked about the ethics to follow in authorship, plagiarism and citations.

**Date: 20 May 2019**

**Session: 4**

**Time: 3.00 pm – 4.30 pm**

**Topic:** Applied Research

**Resource Person:** Dr. Arun Kumar N, CHRIST (Deemed to be University)

The speaker gave a session on the importance of forming research centres/groups within the department on few disciplines and their activities. Mentioned below are the few highlighted points of the talk

- Highlighted on research groups and their activities in the abroad universities
- Mentioned about the different projects with lab facility through funded projects
- Discussed about few trending research methods in convection problems, CFD and Discretization techniques.
- How to introduce open problems to UG/PG students through research groups
- Importance of interdisciplinary research with other departments
- Significant of doing experimental study and comparing the results with the theoretical study through computational labs.

The speaker also focused on various new applied methods of solving differential equations. One of the applied methods of solving differential equation is discretization techniques, which involves finite element method and finite volume method. He mentioned that by using discretization techniques, we can solve and understand the physical importance of diffusion, heat and wave equations. Speaker is concluded the sessions by giving the answers for the certain open problems.

**Date: 21 May 2019**

**Session : 1**

**Time: 9.00 am – 10.30 am**

**Topic:** Interdisciplinary Research

**Resource Person:** Dr Daya Sagar, ISI

Speaker talked about the Mathematical Morphology-Shape of Science. Also he explained about the Mining Engineering and its applications in data sciences. He further discussed about data science which includes: Retrieval of Information from the Spatial Data, Information

Analysis, Information Reasoning, Information Modelling and Simulation, Information Visualization. He suggested dealing spatial data science with Mathematical Morphology. The mathematical morphological transformations are useful to develop elegant algorithms to address the challenges in relation to Image Analysis and Spatial Informatics which includes: Morphological Erosion, Morphological Dilation, Morphological Opening, Morphological Closing, Multi scale Morphological Operations etc.

Speaker deeply discussed about the Mathematical Morphology and its various categories namely,

- Binary Mathematical Morphology
- Grayscale Morphology
- Graph Mathematical Morphology
- Adaptive Mathematical Morphology

**Date: 21 May 2019**

**Session: 2**

**Time: 10.45 am – 12.15 pm**

**Topic:** Interdisciplinary Research

**Resource Person:** Dr Daya Sagar, ISI

In the second session speaker discussed in detail about each Mathematical Morphology, namely Binary Mathematical Morphology: He explained about Binary erosion transformation, Binary dilation transformation, Multi scale erosions and dilations, Greyscale Mathematical Morphology: Greyscale dilation and erosion operations corresponds to expansion and contractions respectively. He explained that eroding foreground pixels is equivalent to dilating the background pixels.

Applications: Important problems like feature detection and characterisation often require analysing greyscale functions at multiple spatial resolutions. Recently, non-linear filters have been used to obtain images at multi-resolution due to their robustness in preserving the fine details. Advantages of mathematical morphology transformations are popular in object recognition and representation studies whereas the non-linearity property is used in preserving the fine details. He concluded the session by quoting the applications in different areas like Network extraction, Quantitative Characterization, Roughness characterization, Spatial reasoning, Spatio-Temporal Modeling, Visualization via Variable-Specific Cartograms.

**Date: 21 May 2019**

**Session: 3**

**Time: 1.15 pm – 2.45 pm**

**Topic:** Introduction to Book Writing

**Resource Person:** Dr Sudev N K, CHRIST (Deemed to be University)

The speaker started the session by posing the question why do you write books? He highlighted the fact that writing a book is not an easy task and if anybody is planning to write a book, it needs to be done with commitment. He also discussed regarding the different types

of academic books that can be published namely, book chapters, text books/reference books, edited books, monographs, technical reports and dissertations, conference proceedings etc. The speaker gave some initial tips that need to be considered before you plan to write an academic book. He also discussed in detail about different stages of book writing like creating a writing plan, preparation for writing, writing the content, reading the material, editing the content, publishing the book and launching the book.

**Date: 21 May 2019**

**Session: 4**

**Time: 3.00 pm – 4.30 pm**

**Topic:** Research at Undergraduate Level

**Resource Person:** Dr. Anirban Roy, CHRIST (Deemed to be University)

The session on Research in Undergraduate Level was contemplation on the emerging need of running a research based course in this level. He has outlined the contemporary curriculum of other premier institutes and then devised a strategic road map to implement the research based course during undergraduate studies. He also highlighted the need and challenges to be faced in order to implement the program.

The overall session was quite interactive and it leaves the forum of QIP with a tremendous amount of optimism.

**Date: 22 May 2019**

**Session: 1**

**Time: 9.00 am – 10.30 am**

**Topic:** Socially Relevant Research

**Resource Person:** Dr Gadadhar Misra, IISc

The speaker started the session by stating the ethics in science. He mentioned that science is an attempt to understand the natural world around us. He also told that any scientific research need to be socially relevant and the places where scientific research is done. He also discussed about the conflicts, carefulness and openness while doing the scientific research. He also stated the Baltimore affair.

**Date: 22 May 2019**

**Session: 2**

**Time: 10.45 am – 12.15 pm**

**Topic:** Socially Relevant Research

**Resource Person:** Dr Gadadhar Misra, IISc

Speaker continued the second session by stating the issues that are possible while doing the research. He also discussed the authorship issues, plagiarism and matters of policy. He continued his talk with Hotspot conjecture in a triangle, the zeros of polynomial etc. He also mentioned Doubly Stochastic Matrices where “all entries are non – negative, every row sums to one and every column sums to one”. He gave the definition of real stability and also discussed about a Lower Bound for the Derivative at Zero, Restriction, Hurwitz’s Theorem, and Differentiation. Further he continued with Permanent and concluded with AM-GM Inequality and Applications Zeroes of polynomials.

**Date: 22 May 2019**

**Session: 3**

**Time: 1.15 pm – 2.45 pm**

**Topic: Consultancy**

**Resource Person: Mr Y Shekar, Consultant IIM**

Speaker was talking about what are consultant and the important skills of consultant, like

- Knowledge & expertise
- Communication and ability to interact with people.
- Problem identification and problem solving capabilities.
- Understanding technical and managerial issues – scaling the picture – being able to dig deep and see the big picture too.
- Neutrality and Confidentiality

Later he described about important points in understanding the Consulting Engagement like Understanding Industries, Understanding Organization Structures, Understanding Cultures.

He specifically pointed out the use of Mathematics in different areas as:

MLL/AI / Algorithm, Routing and Optimization, Forecasting / Inventory Management

Dynamic Pricing and reprising, Business Models – how and when to discount/promote and to whom?

He also explained about how academicians and researchers can be a consultant by quoting the examples as Genius Mathematics Consultant and MIT Technology.

**Date: 22 May 2019**

**Session: 4**

**Time: 3.00 pm – 4.30 pm**

**Topic: Network Building**

**Resource Person: Dr. Manjunath N. CHRIST (Deemed to be University)**

The speaker gave a full insight about how to build a network in Research and Consultancy. Mentioned below are the few highlighted points of the talk

- Methods to maintain Network
- Using every opportunity in Academia/Professional Sector in building a Network by attending conferences/Seminars/Workshops
- To Build Network in Industry and other reputed academic institutions.
- Attaining heights in the Academia Sector based upon Networks.
- Maintaining the built Network using e-methods.

Finally, the speaker concluded the session by doing activities about Network Building and quoted a saying “Don’t burn any Bridges”. A colleague or the person whom you deny the relationship would be a competitor tomorrow in the academic or professional sector when you want to reach for higher positions. Overall the topic Network Building was a great help for all the faculties so that they can build their own Networks.

**Date: 27 May 2019**

**Session: 1**

**Time: 9.00 am – 10.30 am**

**Topic: Research Projects**

**Resource Person: Dr. Meenakshi DSouza, IIIT**

The speaker delivered a talk on research proposals, projects and collaboration. When a person is doing research, it is also important to understand work elements in a University. As per the study conducted by the Harvard University, Teaching and Research are two sides of a coin. But there is another side for the same coin, namely, Administrative Work. After that she discussed regarding the variation in time spent for teaching in different institutions and how it affects the research. In abroad, research and teaching positions are different like exclusive research positions, research + teaching positions and exclusive teaching positions. Also in India there exist many exclusive research labs where there is no teaching except for courses for their research scholars. Research also has several aspects viz. guiding research students, collaborations, projects and funding, publications, patents etc.

**Date: 27 May 2019**

**Session: 2**

**Time: 10.45 am – 12.15 pm**

**Topic: Research Projects**

**Resource Person: Dr. Meenakshi DSouza, IIIT**

The speaker continued the second session by asking to focus on one or two core areas within the subject. She also advised to gain fundamental knowledge in the areas of research, constantly update the knowledge by reading latest publications in journals and conferences and strive to publish in competitive venues. She mentioned that the time and quality of research varies based on the institutions. She mentioned the top product companies like Microsoft, IBM, Google, TCS etc have their own research labs and product companies like Honeywell, Intel, GE etc. have research divisions. Nature of research is very different between top tier institutions and other institutions. In most of the places research happen in silos, i.e., one does not interact with the other and also challenges are different. There are several top end institutions where the Research projects are funded nationally by the Govt. and the competitions are very high. She gave details of the topmost funding agencies like SERB, DST etc. She also mentioned what are the details required while submitting the research proposals and the success rate of the proposal also depends on the past research background of the proposal author. She concluded the session by talking about the importance of requesting your colleagues or peers to review the proposal, especially for technical merit and state of art before submitting the proposal to any funding agencies.

**Date: 27 May 2019**

**Session: 3**

**Time: 1.15 pm – 2.45 pm**

**Topic:** Project Proposal Writing

The faculty members were divided into different teams as per their research area and discussed about various possibilities of their research to collaborate and searched new places to submit the research proposals.

**Date:** 27 May 2019

**Session:** 4

**Time:** 3.00 pm – 4.30 pm

**Topic:** Project Proposal Writing

Faculty members prepared the research proposals to submit to various funding agencies.

**Date:** 28 May 2019

**Session:** 1

**Time:** 9.00 am – 10.30 am

**Topic:** Teacher as Researcher: Role modelling Excellence and Empathy

**Resource Person:** Dr. Meenakshi Shivaram, Corporate Trainer

The speaker started the session by stating that Teacher as Researcher should have self awareness i.e., one should recognise one's belief – systems, the ego states and understand what drives us. She also discussed about the transactional analysis, philosophy of that and different life positions. Ego – states is a consistent pattern of feeling and experience directly related to a corresponding consistent pattern of behaviour. There is Parent ego state, Adult ego state and Child ego state in every individual. She also talked about drivers and strokes. There are various types of strokes – verbal and non verbal, positive and negative, conditional or unconditional. Gave a self analysis test to understand which our drivers are and how we can change it. As a conclusion, she mentioned that our research students are not students – they are adults, independent, autonomous thinkers and beings. So it is important to know which ego-state would we like to operate from when we deal with our research students. Whether giving strokes diminish our efforts towards more creative collaboration or not. Moreover, we should also think, are we directing, delegating, supporting, or collaborating?

**Date:** 28 May 2019

**Session:** 2

**Time:** 10.45 am – 12.15 pm

**Topic:** Research Initiatives

**Resource Person:** Dr. S Pranesh, CHRIST (Deemed to be University)

The speaker started the session by defining research as careful and systematic inquiry or investigation into a subject in order to discover or revise facts, theories and applications. He also mentioned that research and teaching should go hand in hand and the key role of any institution is to advance knowledge. He also discussed about different benefits that the research can contribute to an institution like better students, highly qualified and motivated teachers, more research funding etc. The research can be promoted among teachers and students by taking part in group projects, summer fellowship conducted by IISc, IAS, NIAS etc., participation in seminars, workshops, conferences as a resource person. He also

suggested all should apply for guideship in their respective subjects in different institutions. The department should also focus on recognized research centre, minor and major projects, research grant from external agencies, industry based research, research articles published in reputed and refereed journals etc. He talked about collaborative research and the importance of collaboration. He said, if collaborate, the researchers can combine their strengths and do sophisticated mathematical analyses of the topic / statistical analyses of the data from the field experiments. As teachers, we can promote research among students by adding a research topic to every course, identifying advanced learners and give paper review assignments or research problems to study, encouraging students to attend research discussion forums like ADMA and ICTS. As a department we should encourage research by creating platforms for researchers to present newly obtained results in the department level, by critically reviewing the work and by giving collective feedback, by appreciating the star presentation performers with certificates and acknowledging in small informal get together etc. He also discussed about how a person can improve the quality of publications and increase the number of publications. He also talked about the initiatives the department can take to raise standards of research and consultancy.

**Date: 28 May 2019**

**Session: 3 & 4**

**Time: 1.15 pm – 4.30 pm**

**Topic: Report Writing**

The faculty completed the report writing in this slot.

















