IISER BHOPAL

Centre for Science and Society (CS²)

Information Booklet
June 2022

भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान भोपाल
Indian Institute of Science Education and Research Bhopal

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Director's Foreword

I am pleased to release the first information booklet of IISER Bhopal's Centre for Science and Society (CS^2).

IISER Bhopal recognized the need for a dedicated Centre to help realize its vision, especially as it relates to tangible societal contributions. The CS^2 is now spearheading our effort to pass on the benefits of various activities we are engaged in, as an Institute, to the society.

Over the last year, CS^2 has undergone a major re-structuring and has re-defined the nature and range of activities, to strengthen our connect with the general public, industry, and media. We have also set-up state-of-the art infrastructure and administrative systems that not only encourage, but also support IISER Bhopal community, in contributing to our larger societal goals. CS^2 encompasses State and Central Government initiatives from schools to colleges and universities, through various schemes, such as, NPTEL, RAA, EBSB, PMMMNMTT, and the smart village program under the MoPR. CS^2 embraces an universal approach to contributing to the society, not only in a targeted manner to the needy in the society, but also by identifying qualified and motivated faculty and students of IISER Bhopal as resource persons. This booklet presents an overview of several such initiatives while also outlining proposals for new activities to enhance our societal reach.

At this time, we are excited to explore partnerships with philanthropic foundations, industry corporate social responsibility initiatives, governmental/non-governmental organizations, and individuals, who share our cherished goals of strengthening the society.

I am confident that IISER Bhopal through CS^2 will deliver on our promise to extend the benefits of STEAM education and research to the society. I welcome you all to be a part of this exciting journey.

Jai Vigyan ! Jai Hind !!

Prof. Siva Umapathy
Director, IISER Bhopal

1. About CS²

The Centre for Science and Society (CS²) is amongst the many Centres at the Indian Institute of Science Education and Research Bhopal (IISER Bhopal). These bodies were set-up to strengthen various themes in teaching, research, and service pursued by the Institute. IISER Bhopal itself was set-up in 2008 and is amongst the seven IISERs that were created through a proclamation of the Ministry of Education, Government of India, to promote quality education and research in science and related areas. IISER Bhopal's vision is to provide high quality education to undergraduate, postgraduate, and doctoral students. The Institute also aspires to contribute to the society through teaching and research to help achieve global sustainability. Further, the Institute aims to produce leaders in science and related disciplines.

Establishing a dedicated Centre whose philosophical underpinnings and activities aligned with the Institute's vision for contributions to society was essential. Thus, the CS² (estb. Aug 2019) was recently re-structured (June 2021) to set-up mechanisms for activities that will not only benefit IISERB and the society, at large, but also to be self-reliant and sustainable in the long run. Specifically, CS² leverages and extends the benefits of STEAM (Science, Technology, Engineering, Arts, and Mathematics) teaching and research conducted at IISER Bhopal to the society at large. To this end, an indicative list of the activities that CS² initiates, facilitates, coordinates and sustains include the conduct of SWAYAM-NPTEL courses, mentoring and participating in social activities such as the Government of India initiatives - Rashtriya Avishkar Abhiyan (RAA), Unnat Bharat Abhiyan (UBA), Ek-Bharat Shrest Bharat (EBSB), activities of the Institute, PMMMNMTT Teaching and Learning Centre and others. Several of these activities are interrelated and CS² ensures synergistic interactions between them and enhances the reach of these activities to the society.

2. Focus Areas

2.1 Education

The immediate and tangible way in which CS^2 seeks the achieve its aims is by leveraging the teaching and research expertise of IISER Bhopal. The centre utilises the Institute's pedagogic expertise and research facilities to make various kinds of educational interventions and knowledge dissemination in society.

Activities

❖ **Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) Teaching Learning Center (TLC)**

The TLC was established at IISER Bhopal in December 2015 under the PMMMNMTT scheme of the Ministry of Education, Government of India. Financial support for setting up infrastructure to seed and sustain technology-enabled instruction and learning was made available through the scheme. The key tasks of TLC included the development and deploying of technology enabled classrooms and content/pedagogy development. The facilities developed under this scheme support sever CS^2 initiatives and institute-level activities that are also available to users outside IISER Bhopal.

Using technology to make education accessible to masses and improve pedagogy is the central purpose of TLC. Several flagship projects have been accomplished since the Centre's inception in December, 2015. The centre has made great strides in its primary vision of developing new core technologies to aid teaching and learning, to create new knowledge resources, to develop new technology-based pedagogies, and to develop a sustainable platform for creating, sharing and delivering knowledge. TLC organized several events and activities. Through all of its activities and products, the center has reached out to over 30000 students and teachers. The brief achievements of the TLC are listed below.

◈ Conducted "Basics of C Programming", a 4 week course with video tutorials in Hindi offered on MOOKIT platform has helped over 400 students learn programming.

◈ Identified as a National Resource Centre for "ICT for Science and Maths Teaching". Successfully developed and launched "ICT for STEM Education" course on SWAYAM with 362 faculty participants.

◈ Organized several programmes for higher education faculty and approximately 2000 faculty members from various universities/institutes participated in the workshops.

❖ **Faculty Development Programme (FDPs)**

Having highly trained teachers and faculty are crucial for making a positive impact on the students as it makes education more innovative and creative. Faculty Development Programmes (FDPs) conducted/planned by CS^2 aim at both professional and personal development of faculty members (both within and outside IISER Bhopal) as well as school teachers. With primary thrust on equipping the participants with contemporary research and teaching skills, FDPs are undertaken to facilitate upgradation of knowledge and skill through a variety of learning settings like classrooms, seminars, workshops, hands on training, as well as the use of contemporary participant-centric pedagogies and teaching methods. Various FDPs aim at enhancing the academic and intellectual environment at IISER Bhopal as well as other Institutes of higher studies, colleges and schools.
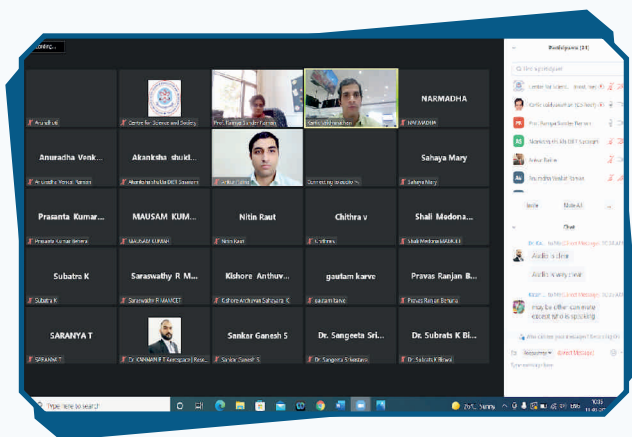

❖ **National Programme on Technology Enhanced Learning (NPTEL)**

NPTEL, a project of the Ministry of Education, Govt. of India, initiated in 2003 by seven IITs and IISc Bangalore, provides recorded lectures taught by its member institutes online

for open access. NPTEL has one of the world's largest online repositories of courses in basic sciences, engineering and selected humanities and social sciences subjects. The online portal has more than 1.3 billion views and its YouTube Channel is one of the most subscribed educational channels, with more than 2.3 million subscribers. With 3500+ courses, it is the one of the most accessed online libraries of peer-reviewed educational content in the world. Since 2019, IISER Bhopal has joined this giant program and has been spreading awareness about MOOCs among the students.

A state of the art Audio-Visual recording facility has been set up under the umbrella of CS^2 for content creation related to NPTEL/SWAYAM courses. In addition to providing video recording facility the staff members of CS^2 helps in editing and documentation of all the created contents.
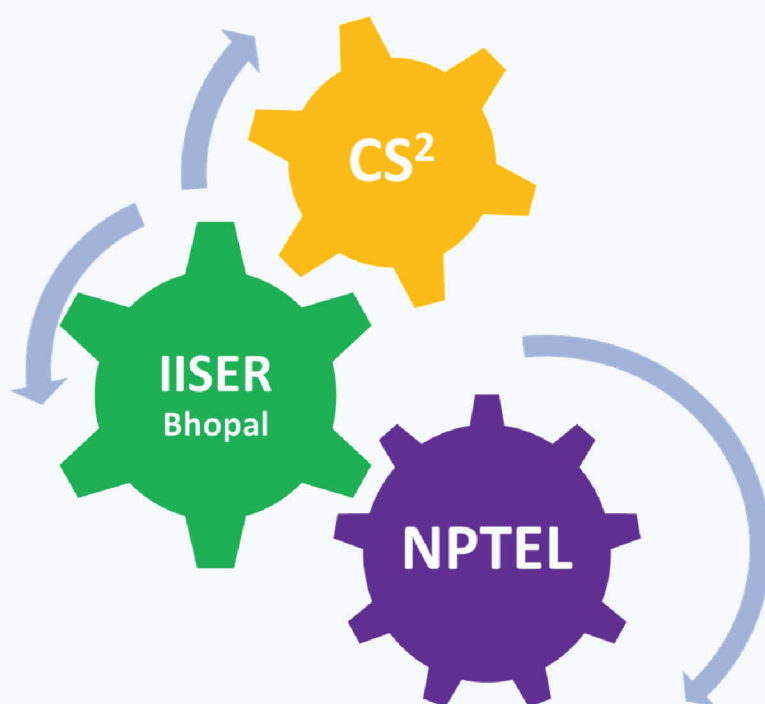
Any faculty or content creator for NPTEL/SWAYAM platform, both within and outside the Institute, can utilize this modern, state-of-the-art recording facility available at CS^2. Massive open online courses (MOOCs) offered by the faculty members of IISER Bhopal, cater to thousands of students from various disciplines focusing on Science, Engineering, and Humanities subjects. Starting from January 2020 semester, a total of 9 different courses have been offered, which have been run for 18 times including the reruns. During the academic year 2022-2023, IISER Bhopal will be offering 9-10 additional courses. For the very first time at IISER Bhopal, two NPTEL summer workshops have been scheduled for July 2022. In these workshops more than 100 students will stay on-campus at IISER Bhopal (for one week) from different parts of the country and they will conduct the experiments physically at IISER Bhopal labs. CS^2 facilitates these workshops and provides logistic help.

Between 2019 and 2022, more than 53000 students have taken 18+ IISER Bhopal courses which resulted in about 2000 exam registrations and about 900 final certifications.
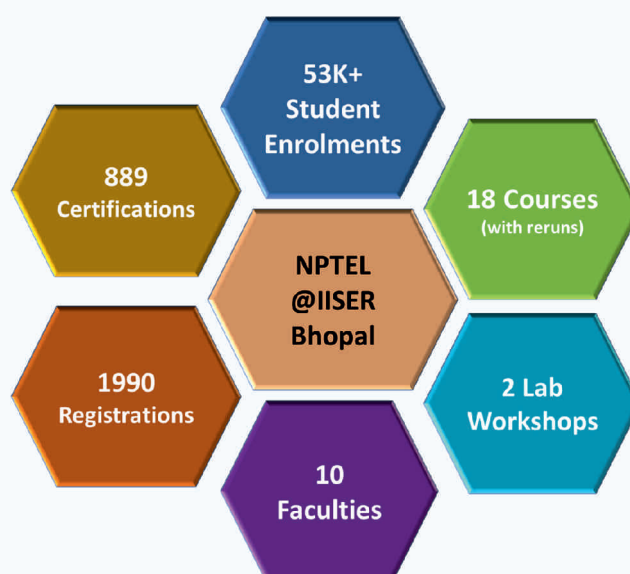
❖ **Rashtriya Avishkar Abhiyan (RAA)**

CS^2 co-ordinates IISER Bhopal's mentorship of the RAA program in Madhya Pradesh. In collaboration with Rajya Shiksha Kendra of Madhya Pradesh Government, CS^2 organizes Rashtriya Avishkar Abhiyan lectures. These are activity-based learning webinars focused on STEAM subjects for the students of class 6 to class 8. Well-known experts, both from IISER Bhopal and other national institutes, have delivered these lectures.

These lectures can be accessed via:
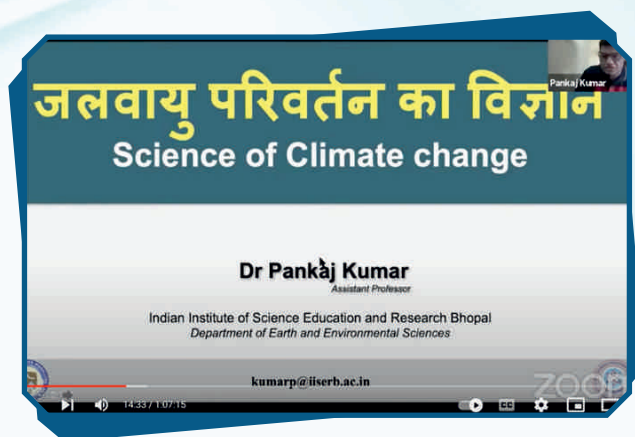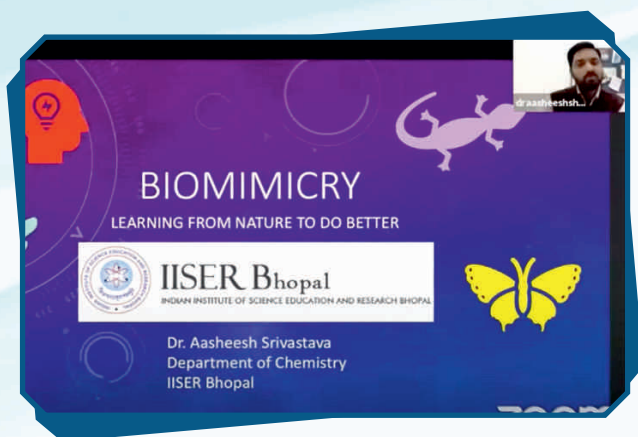
❖   **Summer Outreach Camp for School Students**

CS^2 organizes an annual summer camp at our campus in Bhauri, Bhopal. Students studying in classes IX, X, XI and XII participate in this camp. The summer outreach camp is intended to help participants understand the central role of science in society. This camp introduces participants to fascinating topics in natural and engineering sciences through lectures and hands-on laboratory exercises. This exposure is also supplemented with critical perspectives from Humanities and Social Sciences. Additionally, there are fun activities in the evening such as 'painting with science', quiz contests, open mic, sports activities and others through which the participants can interact with one another and senior students on campus in an informal setting.

The 2022 summer outreach camp resumed after a two-year COVID 19 induced break, and was conducted between 16 and 21 May, 2022. About 100 students from across the country participated in this camp and left with an enriching experience. The week-long program involved various interesting lectures such as natural and engineering science through highly interactive lectures and hands-on laboratory activities.

❖   **All Year-round School Outreach Programmes**

IISER Bhopal is committed to reach out to the schools and colleges to promote science amongst high school students and to inculcate an aptitude to appreciate the role and contribution of science in the betterment of mankind. In the past, IISER Bhopal has hosted numerous day visits from schools/colleges from Bhopal and nearby cities. These visits include lectures, demo experiments, and department tours. During the pandemic, when visits were not possible, CS^2 was still engaged in outreach activities through webinars. One such webinar was conducted on 12th of January, 2022 in collaboration with Navodaya Vidyalaya Samiti, where teachers/educators and approximately 100 students from various Navoday Schools attended presentations/talks by IISER Bhopal faculty members.

❖ Open Day

CS^2 plans to host the first IISER Bhopal "Open Day" in the first week of November 2022. This will be an annual event where we plan to show-case the teaching, research and outreach activities carried out at IISER Bhopal. This event will be open to all (school/college students as well as the general public). CS^2 plans to organize department visits, exhibitions/demonstrations, interactive sessions with faculty.

❖ Professional Development Visits to the Campus

In addition to school visits, CS^2 also organizes professional development visits to the campus. For example, recently, 25 students of M.Sc. chemistry final year from the various institute/university and 5 faculty members from Madhya Pradesh Council of Science and Technology visited IISERB. The main objective of the visit was to orient the participants to state-of-the art instrumentation on campus and review their use as tools in various applications.

2.2 Industry

Technology Development Centre (TDC), a wing of the CS^2, is a gateway to filing for intellectual property protection and technology licensing. CS^2 also ensures that the value of knowledge being generated at the Institute is leveraged, by responsible licensing, for the benefit of the Institute and to the society at large.

CS^2 facilitates the filing and maintenance of patents to protect the intellectual property rights generated through the research and development work done at the Institute. It also acts as a connecting link to industry partners for the technology transfer and licensing activities.

❖ **Technology Development Activities**

CS^2 supports and facilitates the following activities:

◈ Filing of Intellectual Property (IP)

◈ Technology transfer and commercialization of inventions

◈ Industry-academia engagement/integrations

◈ Intellectual property protection and management.

◈ Institute's inventions outreach etc.

◈ Conducting events to sensitize the faculty and students about IPR and technology transfer.

❖ **Number of Patents Filed and Granted (upto May 2022)**

◈ Number of Patents Filed : 24 (National: 17, International: 7)

◈ Number of Patents Granted : 5 (National: 4, International: 1)

❖ **Technology Transfer to Industries**

◈ The affordable Oxygen Concentrator Technology "Oxycon" developed using the open-source technology and material at IISER Bhopal to tackle shortage of oxygen in the amid covid surge was successfully transferred through MoU to 5 of industries namely:

    i. Shakti Model Works

    ii. E-star Global Private Limited

    iii. Grid Engineers Private Limited

    iv. Linkage Technologies Inc.

    v. Servotech Power Systems Limited

◈ Agreement signed between M/s Techinvention Lifecare Private Limited, Mumbai and Dr. Ajit Chande, Assistant Professor, Biological Sciences, IISER Bhopal (on behalf of IISER Bhopal) for virus neutralization assay

❖ **Events and Activities for IP Awareness**

In addition to patent filing and maintenance, CS^2 conducts IP awareness programs targeted towards faculty members and students.

2.3 Society

CS^2 envisions to go beyond it's current focus area of education and industry by working on projects that will have a direct impact on society at large. CS^2 leverages IISERB's expertise in science, economics, social science and humanities to address social issues that require multi-disciplinary perspectives.

In this regard, CS^2 collaborates with other stakeholders of the society like local civic bodies and government institutions to design and implement policies that have meaningful impact at the grassroots. For instance, CS^2 intends to work closely with the urban development authorities of Bhopal on framing policies on water management, agriculture, traffic management systems, pollution control, health and medicine, and other sensitive areas that have direct bearing on the public's everyday life.

Some initiatives along these lines have already been successfully carried out by the IISERB student bodies like the Ek Bharat Shresta Bharat, Unnat Bharat Abhyan (UBA), Environmental and Social Initiative Council, Prayaas and others. These clubs carry out wide-ranging social outreach activities like medicine and health sensitization in the

villages around the institute, information dissemination to farmers, plantation drive, free food distribution, cloth donation, encourage women of the nearby village to earn their own living through making paper bags from newspapers and other initiatives. Several of these student initiatives will soon be mentored and augmented by CS^2.

❖ **Initiative to Build an Institute-wide Climate Action Plan**

There are several examples of local actions contributing to mitigating global issues. Several of these actions rely heavily on cyclization of material and energy resources and displacing fossil fuel derived energy with renewable sources of energy. The Institute is committed to environmental and climate stewardship. To the end, several on-campus activities are geared to meet the goal of achieving a sustainable and climate resilient future. Campus-wide initiatives are accessible via https://cs2.iiserb.ac.in/assets/file/CAP.pdf

At IISER Bhopal, although we are a young Institution that is just emerging from a major infrastructure building phase, several initiatives are already in-place to ensure maximal utilization of material resources, responsible waste handling and disposal, and initiatives that reduce energy demand as well as projects to enhance renewable energy share to meet our power requirements. In fact, pro climate and environment initiatives were an integral part of infrastructure and services design. Beyond the physical infrastructure, we have built teaching and research programmes that are cognizant of the needs of our time. We engage in inter-and transdisciplinary teaching and research aimed specifically at addressing the science, technology, and socio-cultural, policy aspects of climate change. In addition to developing knowledge tools, we also aspire to build affordable technological solutions that help manage, mitigate, and adapt to climate change, not only

for our campus but for the country and the global community, at large. CS^2 will continue to lead the effort to build a comprehensive Climate Action Plan for the Institute as implementable in the near, medium and long terms.

2.4 Media Outreach

The Institute's media outreach cell disseminates information related to the institute, achievements of faculty, students and staff or any other significant development at the institute to create awareness through various forms of media such as, Print Media, Electronic Media and Social Media. Social media and technology have drastically changed how people consume news, while the journalists have also changed the way they source stories. Media outreach helps the IISER community to come up with an effective outreach related to their work that helps in overall branding of the Institute. With the increasing penetration of social media platforms, the media outreach cell facilitates targeted approach to share the information with target audiences in an efficient manner. At times, the need is felt to use alternative strategies to reach people who are not connected with social media, therefore the media outreach is also facilitated through the print media platforms for assured reach. The media outreach is being streamlined to maximize the impact of various media platforms.

Apart from the mentioned outreach approaches, IISER Bhopal has its presence in different social media platforms such as Facebook, LinkedIn, Twitter, and YouTube. Important and significant news, developments, and events are disseminated through the social media channels for higher and better visibility.

3. Facilities at CS²

❖ **AV Recording Studio**

The CS² maintains and augments necessary infrastructure to facilitate audio-video recording and editing to enable the production of online-courses, that are disseminated through a variety of platforms including the SWAYAM-NPTEL. The studio infrastructure was constructed to be soundproof to achieve a sonically controlled ambience with predictable quality for recording. The studio is equipped with the latest recording camera, writing pads with a digital pen, microphone, Apple mini. In addition to this, the centre also has two Apple iMac Pro (Intel Xeon processor, 32 GB DDR4 RAM and 8 GB Graphic card). Both systems use for video editing and graphic design purpose. The centre also has a subscription to Adobe CS, Apple Final Cut Pro and CAMTASIA, which are used for video editing and graphic designing. For more details please visit www.cs2.iiserb.ac.in/studio.

❖ **Multimedia Classroom**

The CS² manages a technology-enabled classroom set-up under the Ministry of Education, PMMNMTT scheme (For more details please visit www.nmtt.gov.in). This classroom promotes adaptive, immersive and reactive (AIR) teaching and learning. This prototype classroom is the first of its kind in the country which aims to implement most of the modern teaching methodologies already available as well as that developed by IISER

Bhopal. This multimedia classroom supports teaching and learning by enhancing technology-human interaction and improving content quality.

This classroom enables improved learning in a class which has a wide spectrum of students with varying backgrounds. It provides technological diversity to the teacher so that the teacher has freedom to choose the tools and pedagogy that suits the subject and their style. The course structure and content in this classroom imposes itself upon a student thus giving little opportunity to the student to escape the material or lose his/her interest. Moreover, constant active interaction with the course material keeps the interest and motivation alive for students and ensures that learning goals begin in the classroom. Strong emphasis remains on active interaction with the course material, group discussions, problem solving and instant quizzing rather than simply making notes from the board. Instant feedback of the students' work to the instructor throughout the lecture is guaranteed by the technology employed, thereby enabling him/her to adapt the lecture catering to the specific needs of the class. In this special classroom instructor can induce peer-to-peer learning by group problem solving and group discussions. Inclusion of real and virtual demonstrations as teaching aids, small tabletop experiments, virtual experiments, teamwork and game play creates an immersive and reactive environment for learning. For further details visit www.cs2.iiserb.ac.in.

Display: An array of 18 64" 4k HD displays divided into 9- X 4k HD displays divided into 9- X type and 9- Y type to show two different types of displays are arranged around the classroom.

Tablet: Each seat has a Tablet with a custom app installed for in-class polling or to view past lectures.

Instructor's hub: In the centre of the room is the Instructor's Kiosk. It houses equipment like a document camera, microphone etc., and all the controls of the room like lighting & power sockets. The document camera can be used for x-ray films, to demonstrate small circuit boards or any other small experiment or sample that the instructor wants to demonstrate in the classroom.

iPad: iPad can be used in many different ways like screen casting, Interactive whiteboard etc., which makes sharing of information much easier. Several apps are also available for efficient use of technology in teaching. Many subject-specific applications are available which if the instructor wishes to use, can also be used for effective teaching. The iPad can be mounted on a tripod for a hands free experience and it can be moved around the classroom easily. Applications like Stage Pro help you to shoot anything on the iPad and broadcast it live on the displays.

❖ **Poster Printing Facility**

A HP DesignJet Z5600 plotter printer enables on-campus printing of various materials, to disseminate scientific research carried out on campus. This facility also caters to the printing needs that support science popularization and outreach. This facility is available to all community members for a nominal charge.

4. Collaborate with CS²

CS² has worked for prominent organisations to execute their key initiatives. Also, several organisations have partnered with CS² to successfully accomplish their projects. For instance, Rajya Shiksha Kendra under the Ministry of Education of Madhya Pradesh Government collaborates with CS² to carry out their educational initiatives. Atal Bihari Vajpayee Institute of Good Governance and Policy Analysis, Bhopal has partnered with IISERB.

A Memorandum of Understanding has been executed to foster collaboration, and provide opportunity for professional, scholarly and academic interaction in matters relating to Public Policy, Governance, Administration, Science education and related areas, and to facilitate advancement of knowledge in these areas, based on reciprocity and mutual benefit.

CS² actively seeks partners to collaborate on projects in the above mentioned focus areas and other allied areas. Given the expertise in niche science-society areas, CS² is deeply committed to work with organizations and companies – both private and public – to come up with innovative solutions for their socially-responsible projects. To this end, we are happy to co-develop projects that help achieve our overall goals while also catering to the Corporate Social Responsibility (CSR) mandate of organizations and/or helping philanthropic foundations strengthen their programs.

The CS² organizes various workshops for students and faculty and several faculty developments and teacher training programmes. IISER Bhopal teaching and non-teaching staff can submit a proposal for conducting a teacher training/workshop. The Centre will help and provide all the assistance and support needed to conduct the workshop. The proposal can be submitted through email office_cs2@iiserb.ac.in and head_cs2@iiserb.ac.in. The proposal also can be submitted via a google form available on the CS² website.

5. Team and Contact Information

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Convener, TLC

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Assistant Professor, HSS
Convener, Societal Outreach

Prof. Deepak Chopra
Professor, Chemistry
Convener, TDC

Dr. Mitradip Bhattacharjee
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Convener, Media Outreach

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Scan to collaborate with us

We are looking forward to
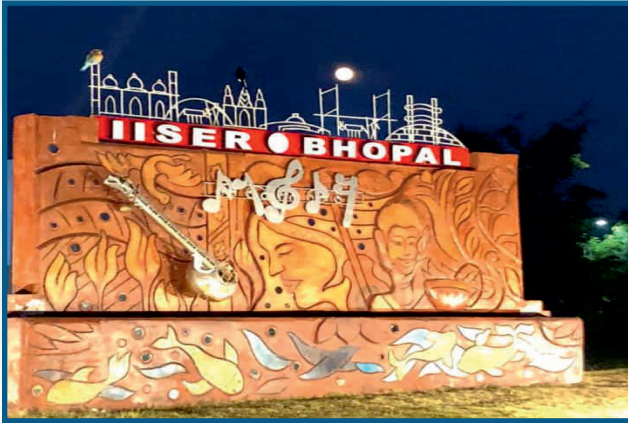
- Philanthropic Initiatives
- Industry Initiatives (CSR Activity)
- Any other Social Activities

Scan the code and let us know your thoughts. We are eager to work with you.

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