



इलेक्ट्रॉनिकी एवं
सूचना प्रौद्योगिकी मंत्रालय
MINISTRY OF
**ELECTRONICS AND
INFORMATION TECHNOLOGY**

**Ministry of Electronics & Information Technology, India
and
National Science Foundation, USA**
NSF-MeitY Dear Colleague Letter

NSF 23-139

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Joint call for proposals under **MeitY-NSF Research Collaboration**

Semiconductor Research, Next-generation communication technologies/networks/systems, Cyber Security, Sustainability and green technologies; and Intelligent transportation systems.

Important dates:-

- Joint call announced on 21st August,2023
- 1st Webinar held on 08th Sept,2023
- 2nd Webinar 13th Oct,2023
- Workshop at New Delhi 2nd -3rd Nov,2023
- Last date of Proposal Submission 05th Jan,2024

Questions about this Call for Proposal may be directed to

nsf-jointresearch@meity.gov.in and india-collaboration@nsf.gov



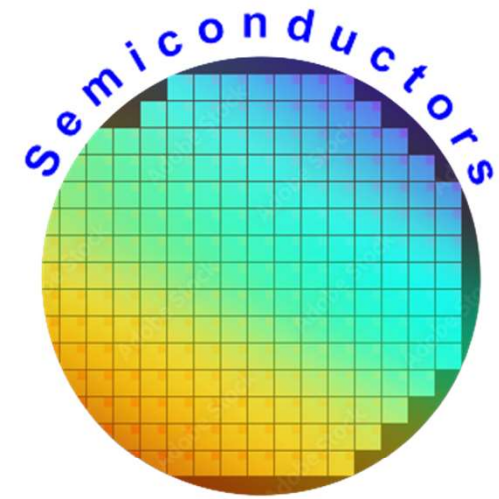
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MeitY Participating Groups and Division

- R&D in Electronics Group
 - Microprocessor Development Division
 - Electronics Materials and Component Division
 - Electronic System Development and Application division
- R&D in Cyber Security Group
- R&D in Communication Convergence and Broadband Technologies Group



• Semiconductor Research



Development of **Next-gen Semiconductor Circuits (IP Cores/ Chips/ SoCs), Materials, Processes & Devices** in the areas of semiconductor design, manufacturing, and packaging to provide thrust to key growth areas, including, but not limited to:

1. Circuits for next-gen computing & communication technologies (*AI Chips, Processors, Memory, Interconnects, RF/ mmWave/ THz etc.*)
2. Chiplet Packaging & Heterogeneous integration.
3. Semiconductor Equipment & EDA tools development.
4. Novel Semiconductor Processes, Design methodologies, Flows, and approaches leading to the development of advance capabilities & inter-regional collaboration.



- **Cyber Security R&D**

- **Cyber Security R&D** aimed at development of indigenous technology, products/ solutions and building security testing and certifications capabilities. During this call for proposal following sub-areas is preferred :-

- Embedded Systems and IoT Security, Cyber Forensics, Mobile Device Security, Threat Intelligence and AI /ML based Threat Modelling ,Network and System Security, Critical Infrastructure / Industrial Security, Detection & Mitigation of Malware and Risk Assessment & Mitigation.

- **Expectation from U.S. researchers -**

- Technology development/demonstrations may be in terms of development of prototypes, pilot scale demonstrations, field deployment, and other efforts to accelerate technology transfer.

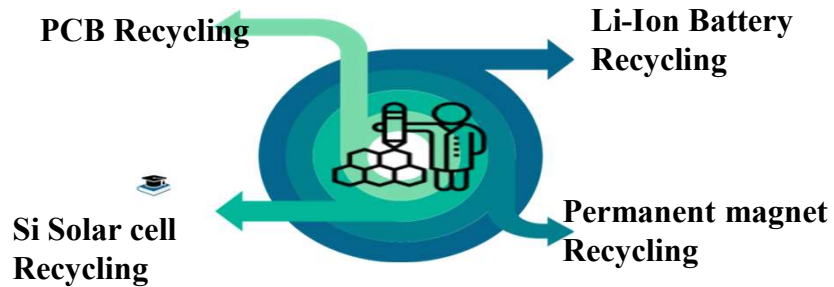
- **Expectation from Indian researchers:-**

- In addition to the above, Proposals submitted with industry collaborations (including cash and in-kind contributions) will be encouraged.



Sustainability and Green Technology

E-waste Management



Proposed Area:

- Technology to recover rare earths from Catalytic converter
- Identification, segregation of e-waste components using AI
- Solar grade Silicon from spent solar panels
- Waste to Energy
- Eco-design and Green products (less hazardous materials)
- Cost effective recycling technologies

Green/renewable Energy Generation and Storage

Energy generation

- Fuel Cell
- Solar Cell
- Hydropower

Energy Storage

- Rechargeable batteries (Li-ion/Na-ion)
- Super-capacitors
- Hybrid batteries (Li-ion and Super-capacitors)

Hydrogen Generation & Storage



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Sustainability and Green Technology

- Development of Electric vehicle Sub-System: Aimed R&D and development of high performance, cost effective, quality competitive Electric Vehicle solutions i.e. Motor/Controller/Converter/ Charger/ BMS etc.
- Development of Power Electronics for Sustainability and Green Energy Solution i.e Micro-grid for Villages for improvised off grid and on grid applications, Solar Power Plant , Backup Diesel power source, metering infrastructure, telecom power supply solution, water pump, energy efficient street lighting and EV Charging
- Green Energy systems for Community/ school buildings such as LVDC technology
- Expectation from U.S. researchers -
 - Joint Development of prototype pilot scale demonstrations, field deployment and technology transfer in the areas of Intelligent power conditioning systems for green energy sources and storage, power hardware and control systems for distributed energy resources and microgrid systems, smart management and control of power network, LVDC technologies for green building, V2G, G2V, V2B etc.
 - PM/SRM/MPM/WBG devices based drives system/ WBG based Charger etc,
 - Joint contributions to Global standards

- **Expectation from Indian researchers:-**

In addition to the above, Proposals submitted with industry collaborations (including cash and in-kind contributions) will be encouraged.



- **Next generation communication technologies/networks/systems** during this call following sub-areas is preferred :

➤ Connected and Autonomous Vehicles (CAVs) & Communication, 6G Communication systems, THz systems. Non-Terrestrial networks, Full Duplex, Visual Light Communication, Advanced AI /ML in communication, sensing & communication, THz building blocks, Intelligent reflecting surfaces, Innovative Antenna systems, Cell free MIMO. Ultra massive MIMO, Spectrum sensing, channel models and channel sounding, Drone based communication, Reconfigurable systems.

- **Expectation from U.S. researchers -**

- Joint development of sub systems and systems with Indian research partners
- Mutual exchange programs of researchers, Technology development/demonstrations may be in terms of development of prototypes, pilot scale demonstrations, field deployment, and other efforts to accelerate technology transfer.
- Joint workshops and conferences, Joint test beds for Nxg Technologies, Joint contributions to Global standards

- **Expectation from Indian researchers:-**

- In addition to the above, Proposals submitted with industry collaborations (including cash and in-kind contributions) will be encouraged.



Intelligent Transportation Systems (ITS)

- To improve transportation efficiency, safety, and sustainability. during this call following sub-areas of ITS is preferred but not limited to :-
 - Connected and Autonomous Vehicles (CAVs), Advanced Driver Assistance Systems (ADAS), Traffic Management Systems, Advanced Traffic Information Systems, Vehicle-to-Infrastructure/ Vehicle(V2X) Communication, Intelligent Traffic Lights, Emergency Management and Response, Data Management and Analytics, Traveler Information Services etc.
- **Expectation from U.S. researchers -**
 - Technology development/demonstrations may be in terms of development of prototypes, pilot scale demonstrations, field deployment, and other efforts to accelerate technology transfer.
- **Expectation from Indian researchers:-**
 - In addition to the above, Proposals submitted with industry collaborations (including cash and in-kind contributions) will be encouraged.



Workshop on 2nd -3rd November,2023

- Location:- Sushma Swaraj Bhawan, Chanakya Puri, New Delhi
- It is expected that more than 100 researchers from both side will participate for better understating and writing the joint proposal.
- Specific sessions and break-out session on different on the areas of this Joint call for proposal it includes semiconductors, next generation communication, cyber security, sustainability and green technologies and intelligent transportation systems
- Additional session is planned in the areas of Quantum Technologies
- One specific session on IUCRC/ Industry
- Link to register for webinar: <https://ism.gov.in/meity-nsf>



NSF PARTICIPATING PROGRAMS

- Directorate for Computer and Information Science and Engineering (CISE)
- Multi-directorate Programs
 - Cyber-Physical Systems (CPS)
 - Secure and Trustworthy Cyberspace (SaTC)
- Directorate for Mathematical and Physical Sciences (MPS)
- Directorate for Engineering (ENG)

*Please refer to the [**OISE International Collaborations – India**](#) webpage for the full list of NSF participating programs*



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NSF Directorate for Engineering

**Chemical,
Bioengineering,
Environmental, and
Transport Systems
(CBET)**

Environmental
engineering and
sustainability

**Civil,
Mechanical, and
Manufacturing
Innovation
(CMMI)**

Communications,
circuits, and sensing
systems

Electronics,
photonics, and
magnetic devices

Energy, power,
control, and
networks

**Electrical,
Communications,
and Cyber Systems
(ECCS)**

Advanced
manufacturing

Operations and
design



NSF Directorate for Mathematical and Physical Sciences

- Division of Materials Research (DMR)
 - **Topical Materials Research Programs (TMRP)**
 - Disciplinary
 - Condensed Matter **Physics** (CMP)
 - Condensed Matter & Materials **Theory** (CMMT) – AI/ML
 - Solid State and Materials **Chemistry** (SSMC)
 - Focused
 - Electronic & Photonic Materials (EPM)

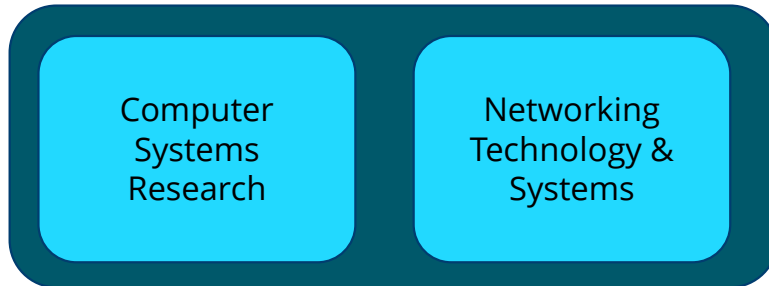
Primary Initial Focus Areas = *SEMICONDUCTORS*



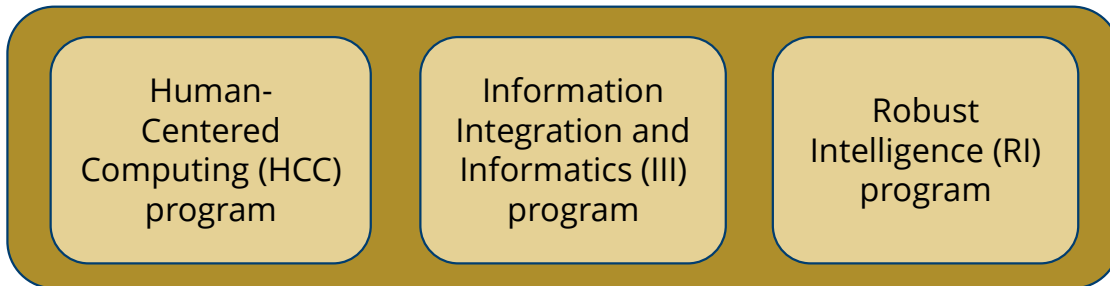
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CISE CORE PROGRAMS

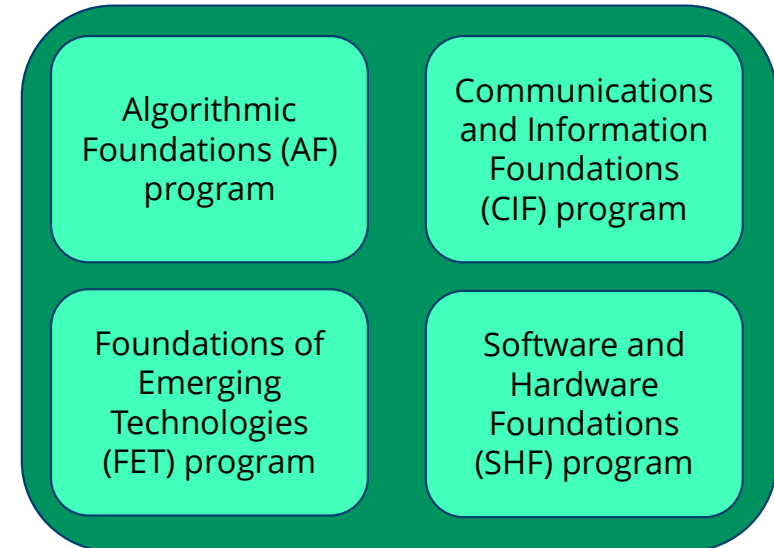
Computer and Network Systems (CNS)



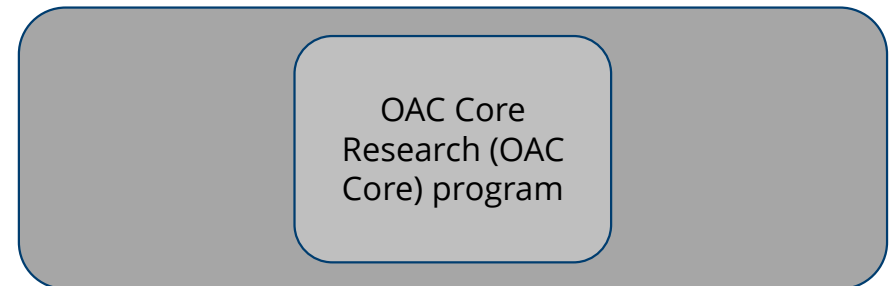
Information and Intelligent Systems (IIS)



Computing and Communication Foundations (CCF)



Office of Advanced Cyberinfrastructure (OAC)



<https://beta.nsf.gov/funding/opportunities/computer-information-science-engineering-core>



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CYBER-PHYSICAL SYSTEMS

Deeply integrating computation, communication, and control into physical systems everywhere

Characteristics of CPS

- Pervasive computing, sensing and control
- Networked at multi-&-extreme scales
- Dynamically reorganizing/reconfiguring
- High degrees of automation
- Dependable trustworthy operations
- High assurance and formal verification
- Scalable, interoperable, safe, usable
- Autonomy & human-in/on-the-loop
- Conventional and unconventional substrates / platforms

Application Domains



Critical Infrastructures



Energy & Industrial Automation



Healthcare and Biomedical



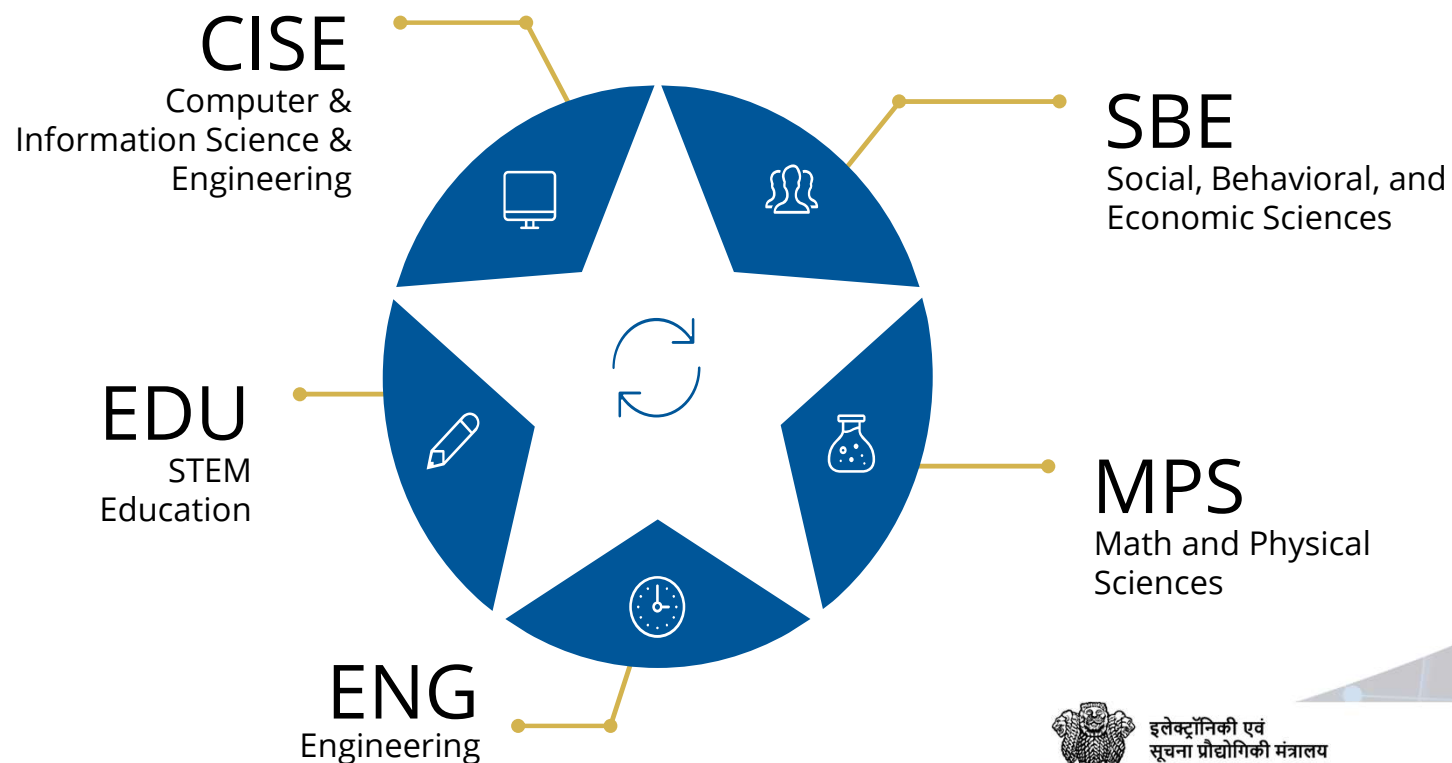
Transportation Systems



SECURE AND TRUSTWORTHY CYBERSPACE (SaTC)

One of NSF's Largest Research Programs

SaTC approaches security and privacy as a **socio-technical** problem involving deep scientific and engineering problems as well as vulnerabilities that arise from human behaviors



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IMPORTANT INSTRUCTIONS

- Proposals are expected to **adhere** to the proposal page limitations, research areas, funding limitation, and award durations for the participating NSF programs from which funding is sought.
- U.S. proposers submitting to CISE Core, CPS and SaTC programs, must submit their proposals to the **Small Project class**. **Budget limit is different for different programs.**
- For U.S. Investigators, involvement in a joint international proposal will count towards the limitation on the number of submissions, as specified in the NSF program webpage or program solicitation to which the proposal is submitted.
- Areas of focus and participating programs
 - Proposals should be relevant to and expected to advance knowledge



PROPOSAL SUBMISSION

- U.S. investigators submit proposals to NSF
 - Research.gov (<https://www.research.gov>)
 - Grants.gov (<https://www.grants.gov/>)
- A separate copy of the **same** proposal to be submitted by the India investigators to MeitY
 - Identical – Title, Summary, Description and References
 - Agency specific – Budget, Supplementary and other documents
 - <https://www.mygov.in/task/joint-call-proposal-under-meity-nsf-research-collaboration/>
- Proposals to be submitted by January 5, 2024



PROPOSAL REVIEW

- MeitY will check that the Indian investigators have active and appropriate roles and confirm their eligibility at the onset of the process
- Proposals will be reviewed by experts contacted by NSF
 - MeitY may recommend experts from India
 - Proposals will compete with other proposals received for the same funding round of the program to which the proposal is submitted
- MeitY officials may attend and observe any discussions as part of the merit review
 - A parallel review will NOT be conducted by MeitY



PROPOSAL FUNDING

- NSF will share outcome of review process with MeitY
- MeitY will honor the NSF review process
- NSF will honor MeitY inputs and insights
- NSF intends to make awards to the U.S. investigators
- MeitY intends to make awards to the Indian investigators
- Submission outcomes expected ~ July 2024



NSF FREQUENTLY ASKED QUESTIONS

- When and where will the slides and video recording be available?
 - Check this site (after 2-3 days) <https://www.nsf.gov/od/oise/IntlCollaborations/India.jsp>.
- Will additional areas and programs be included in the future?
 - Additional areas and programs may be included in the future – look out for announcements
- Can a PI be part of more than one proposal ?
 - Limits on number of proposals per PI, co-PI or senior personnel articulated in individual NSF program solicitations apply to all proposals submitted to those individual solicitations.
- What is the budget limit?
 - CISE Core Programs or Secure and Trustworthy Cyberspace program - U.S. budget limit is **\$600,000** (Small Project Class or OAC Core Class).
 - Cyber-Physical Systems program - U.S. budget limit is **\$500,000**
 - MPS and ENG – Please check corresponding solicitation



MeitY Frequently Asked Questions:-

- When and where will the slides and video recording be available?
 - Check this site (after 2-3 days) <https://www.meity.gov.in/content/announcement-1st-joint-call-porposal-under-meity-nsf-research-colaboration>
- Will additional areas and programs be included in the future?
 - Additional areas and programs may be included in the next Joint call of Proposal
- Can a PI be part of more than one proposal ?
 - Number of proposal submission for Indian investigators as PI is limited to one per call while they can involve as Co-PIs in maximum of two proposals.
- What is the budget limit?
 - Selected Projects of Indian CIs will be supported up-to 50 million Indian rupees (i.e. 5.0 Crore) by MeitY
- What is the Industry requirement?
 - Proposals submitted with industry letters of collaborations (including cash and in kind contributions) will be encouraged.





Digital India
Power To Empower

Thank You