Department of Computer Science and Engineering
IIT Kharagpur 721302 INDIA

भारतीय प्रौद्योगिकी संस्थान खड़गपुर
Indian Institute of Technology Kharagpur

Dr. Soumya K. Ghosh
Professor

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To

December 20, 2019

Shri P S Acharya
Head & Chief Executive Officer
National Spatial Data Infrastructure (NSDI)
Department of Science & Technology, Government of India,
Technology Bhawan, New Mehrauli Road, New Delhi - 110 016

Sub: **Submission of proposal for funding of organization of the "Workshop on Geospatial Data Science" to be held in conjunction with the CODS-COMAD 2020 Conference, 5-7 January 2019, Hyderabad, India**

Dear Sir,

The proposal for organization of the Workshop on "Geospatial Data Science" [to be held in conjunction with the *ACM India Joint International Conference on Data Science & Management of Data 7th ACM IKDD CoDS and 25th COMAD* (CODS-COMAD 2020), 5-7 January 2019, Hyderabad, India] is attached for possible funding from NSDI, DST, New Delhi.

The following documents are attached for your kind considerations:
1. Endorsement certificate from *Head of the Institute*
2. Workshop Proposal

Kindly do the needful and oblige.
Yours sincerely,

Soumya K. Ghosh

भारतीय प्रौद्योगिकी संस्थान, खड़गपुर
खड़गपुर-७२१ ३०२, भारत
Indian Institute of Technology, Kharagpur
Kharagpur - 721 302, India

Dean, Continuing Education

Endorsement from the Head of Institution

Project Title:**Workshop on "Geospatial Data Science"**

1. Certified that the Institute welcomes participation of **Dr. SoumyaK. Ghosh, Professor, Department of Computer Science and Engineering, IIT Kharagpur,** as the Co-ordinator of the **Workshop on "Geospatial Data Science"** be held in conjunction with the *ACM India Joint International Conference on Data Science & Management of Data 7th ACM IKDD CoDS and 25th COMAD (CODS-COMAD 2020), 5-7 January 2020, Hyderabad, India,* to besponsored by **NSDI, Department of Science & Technology (DST), New Delhi.**

2. Certified that the equipment and other facilities, if any, as enumerated in Section 420 and such other administrative facilities as per terms and conditions of the grant, will be extended to the investigator(s) throughout the duration of the project.

3. Institute assumes to undertake the financial and other management responsibilities of the project.

4. It is hereby agreed that any patent or intellectual property right on the inventions arising out of the projects shall be taken in the name of IIT Kharagpur and the intellectual property rights shall be shared by IIT Kharagpur and Department of Science & Technology, Government of India as per the rules of the Institutes.

20th December 2019
Kharagpur

A. Goswami

**Dean (Continuing Education)
IIT Kharagpur**

Prof. A. Goswami
Dean
Continuing Education
Indian Institute of Technology
Kharagpur-721302

<u>Workshop Proposal</u>

Workshop on "Geospatial Data Science"

To be held in conjunction with the
ACM India Joint International Conference on Data Science & Management of
Data 7th ACM IKDD CoDS and 25th COMAD (CODS-COMAD 2020),
5-7 January 2019, Hyderabad, India

Submitted by

Dr. Soumya K. Ghosh

Professor
Department of Computer Science and Engineering
Indian Institute of Technology, Kharagpur
Kharagpur 721302, West Bengal

Submitted to

National Spatial Data Infrastructure (NSDI)
Department of Science & Technology (DST)
Government of India, Technology Bhawan,
New Mehrauli Road, New Delhi - 110 016
[East Block - 7 Level – 5, R.K. Puram, New Delhi – 110066]

Department of Science & Technology (DST)

Submission of Project Proposal

101	Project Title	**Workshop on "Geospatial Data Science"**
102	Broad Subject	**Interdisciplinary/ Workshop** [Computer Science / Information technology + Earth Science]
103	Sub-Area	**None**
104	Duration (in months)	**3 months**
105	Total Cost	**INR 6.875 Lakhs (Rupees Six Lakhs and Eighty Seven Thousands Five Hundred only)**
106	FE Component	**Nil**
107	Project Category	**Workshop**
111	Principal Investigator	**Dr. Ghosh, Soumya K**
112	Designation	**Professor**
113	Department	**Department of Computer Science and Engineering (CSE)**
114	Institute Name	**Indian Institute of Technology, Kharagpur**
115	Institute Address	**Department of Computer Science and Engineering (CSE), IIT Kharagpur 721302, West Bengal**
116	Date of Birth	**19-09-1967 Sex : Male**
117	Telephone, FAX, Email	**+91-3222-282332 ; +91-3222-282700 skg@cse.iitkgp.ac.in, skgkgp@gmail.com**

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Section 101: Project title

Workshop on "Geospatial Data Science"

Section 102: Broad Subject

Workshop [Computer Science / Information technology + Earth Science]

Section 103: Sub-Area

None

Section 104: Duration

3 Months

Section 105 & 106: Total cost & FE Component

Total Cost: INR 6.875 Lakhs (Rupees Six Lakhs and Eighty Seven Thousands Five
           Hundred only)
FE Component : NIL

Section 107: Project Category

Research Workshop / Applied Research

Section 111 to 117: Investigator and Principal Implementing Institution

Investigator :   **(Dr.) GHOSH SOUMYA K.**
(P.I.)   **Professor**
                 Department of Computer Science and Engineering (CSE)
                 I.I.T. Kharagpur 721302, W.B.

Date of Birth (PI) :   **19-SEP-1967**

Implementing Institute : **INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR**
Status   : **ACADEMIC INSTITUTION (GOVERNMENT)**

Section 118 to 138 : Collaborating Investigators/Institutions

Not Applicable

Section 191 : Project summary

National Resource Data Management System Programme of the Department of Science and Technology has evolved in the last four decades and has provided an impetus to the research and development efforts in geospatial technologies while facilitating the development and use of *geo applications*. Most notably, with the establishment of the Indian National Spatial Data Infrastructure, the focus on geospatial data, information, products, services and solutions with an emphasis information transparency and sharing has helped identify new challenges and possibilities. Multifarious projects, supported by the Department of Science and Technology, have advanced the state-of-art of geospatial technology both in terms of deployment of evolving computational advances as well in novel applications across various domains of governance and planning. There is an increasing need of discussion about the achievements in the last decade and the way forward. In this context we have recently published an edited book "Geospatial Infrastructure Applications and Technologies: India Case Studies". It is important to lead this discussion forward with a series of Tutorials and Workshops that help to make computer science researchers familiar with computing challenges of geospatial technology and applications, and to lead them to resources and funds that may be available.

Section 192 : Subject Keywords

Spatial Data Modeling, Spatial Database, Geographical Information System (GIS), OGC standard, GeoSMS, Enterprise GIS, Spatial web services.

Section 211: Origin of the Proposal

A workshop proposal has been accepted by the organizing committee of the CODS-COMAD 2020 conference [ACM India Joint International Conference on Data Science & Management of Data 7th ACM IKDD CoDS and 25th COMAD (CODS-COMAD 2020)], to be held in Hyderabad (Jan 7-10th). The workshop to be organized jointly by IIT Kharagpur, IIT Bombay, and NSDI New Delhi (Soumya K Ghosh, Umesh Bellur, PS Acharya, Sumit Sen) will be an opportunity for young researchers in data science to hear keynote lectures and research talks by leading academics, government agencies and industry on the challenges of geospatial data science, both local and global.

It is expected that this workshop will lead to

- new proposal of research by academics and researchers in India
- alignment of current data science research efforts in the context of the problems being faced by industry and government agencies to facilitate the use of geospatial data and services for the various missions in the development of the nation, especially under the various themes and subthemes of the five to ten-year vision outlined by UNCGGIM.

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- development of a shared research goals for geospatial data science that would naturally help better planning of resource sharing, funding programs and medium-long term research projects.

Researchers in India will be requested to send extended abstracts and the organizing committee will select and invite presentations from relevant topics.

Section 212: Definition of the Problem

A workshop on "Geospatial Data Science" has been planned to organize in in conjunction with the *ACM India Joint International Conference on Data Science & Management of Data 7th ACM IKDD CoDS and 25th COMAD (CODS-COMAD 2020),* during 5-7 January 2019, Hyderabad, India

Section 213: Objectives

The broad objective of the workshop is to promote Geospatial Data Science among the academicians, research communities and facilitate industrial collaborations. The workshop will involve:
- Keynote lectures that will cover major advances in geospatial data sciences and provide both the industry and research perspective.
- Invited R&D talks researchers in India working on geospatial data science problems.
- Overview of R&D challenges/opportunities delivered by experts and practitioners from Government agencies.

Section 223: Importance of the Proposed Workshop

National Spatial Data Infrastructure (NSDI) focuses on development and maintenance of spatial data infrastructure at national level, which involves management of geospatial data, information, products, services and solutions with an emphasis information transparency and sharing. Multifarious projects, supported by the Department of Science and Technology, have advanced the state-of-art of geospatial technology both in terms of deployment of evolving computational advances as well in novel applications across various domains of governance and planning. There is an increasing need of discussion about the achievements in the last decade and the way forward. In this context we have recently published an edited book "Geospatial Infrastructure Applications and Technologies: India Case Studies". It is important to lead this discussion forward with a series of Tutorials and Workshops that help to make computer science researchers familiar with computing challenges of geospatial technology and applications, and to lead them to resources and funds that may be available.

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Section 231: Methodology

The workshop will offer several sessions/ invited talks to different aspects of geospatial data science, to be delivered by eminent academicians/ scientists/ industry experts. The tentative schedule of the workshop is as follows:

- Introductory Remarks (Umesh Bellur, Sumit Sen)
- Keynote Lecture - Siva Ravada (Oracle)
- KS Rajan (IIIT Hyderabad)
- Keynote Lecture - Mohamed Mokbel (QCRI/UMN)
- Uttam Kumar (IIIT Bangalore)
- Vishwanath Gunturi (IIT Ropar)
- Biplab Bhattacharya (CSRE, IITB)
- Binod Bothale (ISRO)
- Pattabhi Rao (INCOIS)
- Concluding Remarks (PS Acharya, Soumya K Ghosh)

Section 232: Work Elements

The major work elements are as follows
- Keynote lectures
- Invited talks
- Brainstorming sessions
- Discussion on new proposals of research by academics and researchers in India

Section 233: Time schedule of activities giving milestones

Total duration of the Project: **3 months**

January 1-5, 2020:   Preparation for the workshop
January 6, 2020:   Workshop on Geospatial Data Science (event date)
January 7 – March 31, 2020: Report preparation, Financial settlement

Section 234: Utilization of Research Result

The expected outcomes of the workshop are:

- Developing new proposals of research on geospatial data science by academics and researchers in India

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- Facilitate alignment of current data science research efforts in the context of the challenges of geospatial data and services for the various research and development activities.
- Development of shared research goals for geospatial data science that may help in better planning of resource sharing, funding programs and medium-long term research projects.
- Promoting collaborations between academic institutes, research organizations and industry

Section 300: Budget Estimates

Total = 6.875 Lakhs (Rupees Six Lakhs and Eighty Seven Thousands Five Hundred only)

Heads	Sub-Heads			Total (Rupees in Lakh)
Non- Recurring	Electronic Notebook			0.75
Recurring	Honorariums etc.			0.50
	Consumables			0.75
	Contingency/ Others			1.00
	Travel			2.50
Total (Rupees)				**5.50**
IIT Kharagpur Overhead	20% of the *Grand Total*			**1.375**
Grand Total (Rupees)	**(Rupees Six Lakhs and Eighty Seven Thousands Five Hundred only)**			**6.875 Lakhs**

Section 310 & 311: Budget for Research Manpower & Justification for their salaries & wages

- *Not Applicable*

Section 320 & 321: Budget for Consumable materials / Contingencies with justification for the use of costly consumable, if any.

Item	Amount (INR in lakhs)
Registration Fees, Printer Cartridge, Storage devices (Pen drive, Ext HDD), Stationary (Papers, Transparencies etc), Internet bandwidth/ Mobile recharge, Facility charges, Incidental expenses	
TOTAL	**1.75**

No costly consumables

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Section 330 & 331: Budget for travel within India and justification for intensive travel on projects, if any

Travel : INR 2,50,000/-

Justification: To support the national travels (including air-travel) of the delegates and participants (including research scholars, students)

Section 340 & 341 : Budget for other costs and justification for the same

Not Applicable

Section 350 & 351 : Budget for permanent equipment and justification for the same

Equipment	Total (Rupees in Lakh)
Equipment • Electronic Notebook – 1no.	0.75
TOTAL	**0.75**

Justification
• For management of documents/ presentations related to the workshop

Section 420 : Existing facilities

Following facilities will be made available by CODS-COMAD
• Presentation venue – hall/ seminar room
• Audio-visual facilities

Section 430 : Biodata of Investigator

Refer Annexure-I

Section 450 : Other research projects with investigators

Refer Annexure-I

Soumya K. Ghosh, PhD

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Email: skg@cse.iitkgp.ac.in | Phone: +91-3222-282332 | Web: http://www.iitkgp.ac.in/department/CS/faculty/cs-skg

Professional Preparation

2002	PhD	Computer Science & Engineering	Indian Institute of Technology (IIT) Kharagpur, India
1996	M Tech	Computer Science & Engineering	Indian Institute of Technology (IIT) Kharagpur, India
1990	BE	Electronics & Communication	National Institute of Technology (formerly, REC), Durgapur, India (*University Gold Medal*)

Appointments

2014–Present	Professor, Computer Science & Engineering, Indian Institute of Technology Kharagpur, India
2009–2014	Associate Professor, School of Information Technology, Indian Institute of Technology Kharagpur, India
2003–2009	Assistant Professor, School of Information Technology, Indian Institute of Technology Kharagpur, India
1999–2003	Computer Operation Manager, Computer & Informatics Centre, Indian Institute of Technology Kharagpur, India
1991–1999	Scientist, Indian Space Research Organization, Department of Space, Government of India

Research Interests

Spatial Informatics, Spatial Data Science, Geographic information system, Cloud computing

Publications (*Recent, Selected*)

- Rajesh P Barnwal, Nirnay Ghosh, Soumya K Ghosh, Sajal K Das, Publish or Drop Traffic Event Alerts? Quality-aware Decision Making in Participatory Sensing-based Vehicular CPS, ACM Transactions on Cyber-Physical Systems, 4(1), 2019

- Monidipa Das, Soumya K Ghosh, FB-STEP: a fuzzy Bayesian network based data-driven framework for spatio-temporal prediction of climatological time series data, Expert Systems with Applications, Springer, vol. 117, pp. 211-227, 2019

- Moumita Mishra, Sayan Kumar Roy, Anwesha Mukherjee, Debashis De, Soumya K Ghosh, Rajkumar Buyya, An energy-aware multi-sensor geo-fog paradigm for mission critical applications, Journal of Ambient Intelligence and Humanized Computing, Springer, pp. 1-19, 2019

- Shreya Ghosh, Anwesha Mukherjee, Soumya K Ghosh, Rajkumar Buyya, Mobi-IoST: Mobility-aware Cloud-Fog-Edge-IoT Collaborative Framework for Time-Critical Applications, IEEE Transactions on Network Science and Engineering, 2019

- Shreya Ghosh, Soumya K Ghosh, Exploring the association between mobility behaviours and academic performances of students: a context-aware traj-graph (CTG) analysis, Progress in Artificial Intelligence, Springer, 7(4), pp. 307-326, 2018

- Harshit Gupta, Amir Vahid Dastjerdi, Soumya K Ghosh, Rajkumar Buyya, iFogSim: A toolkit for modeling and simulation of resource management techniques in the Internet of Things, Edge and Fog computing environments, Software: Practice and Experience, Wiley, pp. 1275-1296, 47(9), 2017

- Monidipa Das, Soumya K Ghosh, Pramesh Gupta, VM Chowdary, Ravoori Nagaraja, Vinay K Dadhwal, "FORWARD: A Model for FOrecasting Reservoir WAteR Dynamics Using Spatial Bayesian Network (SpaBN)", IEEE Transactions on Knowledge and Data Engineering, pp. 842-855, 29(4), 2017

- Shreya Ghosh, Soumya K Ghosh, "Modeling of Human Movement Behavioral Knowledge from GPS Traces for Categorizing Mobile Users", Proceedings of the 26th International Conference on World Wide Web Companion (WWW-2017), pp.51-58, Perth, Australia, April 3-7, 2017

- Suman Samui, Pragya Sahu, Indrajit Chakrabarti, Soumya K. Ghosh, "FPGA Implementation of a Phase-Aware Single-Channel Speech Enhancement System", Circuits, Systems, and Signal Processing, Springer, pp 1–28, 2017

- Shrutilipi Bhattacharjee, Soumya K Ghosh, "Measuring semantic similarity between land-cover classes for spatial analysis: an ontology hierarchy exploration approach", Innovations in Systems and Software Engineering, 12 Page: 193-200, 2016
- Monidipa Das, Soumya K Ghosh, "Deep-STEP: A Deep Learning Approach for Spatiotemporal Prediction of Remote Sensing Data", IEEE Geoscience and Remote Sensing Letters, 13 Page: 1984-1988, 2016
- Nirnay Ghosh, D Chatterjee , Soumya K Ghosh, Sajal K Das, "Securing loosely-coupled collaboration in cloud environment through dynamic detection and removal of access conflicts", IEEE Transactions on Cloud Computing, pp. 349-362, 2016
- Shreya Ghosh, Soumya K Ghosh, "THUMP: Semantic Analysis on Trajectory Traces to Explore Human Movement Pattern", Proceedings of the 25th International Conference Companion on World Wide Web (WWW-2016), Montreal, Canada, pp. 35-36, 2016
- Shrutilipi Bhattacharjee, Monidipa Das , Soumya K Ghosh, Shashi Sekhar, "Prediction of Meteorological Parameters: An A-posteriori Probabilistic Semantic Kriging Approach", 24th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, California, USA, 2016
- Nirnay Ghosh, Soumya K Ghosh, Sajal K Das, "SelCSP - A Framework to Facilitate Selection of Cloud Service Providers", IEEE Transactions on Cloud Computing (TCC), vol. 3, no. 1, pp. 66-79, 2015
- Nirnay Ghosh, Ishan Chokshi, Mithun Sarkar, Soumya K Ghosh, Anil K Kaushik, Sajal K Das, "NetSecuritas - An Integrated Attack Graph-based Security Assessment Tool for Enterprise Networks", 16th ACM SIGCOMM International Conference on Distributed Computing and Networking (ICDCN 2015), pp. 1- 10, Goa, India, 4-7 January, 2015
- Shrutilipi Bhattacharjee, Soumya K. Ghosh, "Performance evaluation of semantic kriging: a Euclidean vector analysis approach", IEEE Geoscience and Remote Sensing Letters (IEEE GRSL), vol. 12, no. 6, pp. 1185-1189, February, 2015
- Soumya Maity, Soumya K Ghosh, "PoliCon: A policy conciliation framework for heterogeneous mobile ad hoc networks", Wiley: Security and Communication Networks, vol. 8, no. 3, pp. 418-430, February, 2015

Research Collaborations

- Prof. Sajal K Das, IEEE Fellow, Chair, Department of Computer Science, Daniel St. Clair Endowed Chair Professor at Missouri University of Science and Technology, Rolla, Missouri, USA
- Prof. Rajkumar Buyya, IEEE Fellow, Director, Cloud Computing and Distributed Systems (CLOUDS) Laboratory, Department of Computing and Information Systems, The University of Melbourne, Australia
- Prof. Stephan Winter, Discipline Leader, Geomatics, Department of Infrastructure Engineering, The University of Melbourne, Australia

Synergistic Activities (Invited Talk / Committee Member)

- Invited Talk, Spatial Data Science at Indian Statistical Institute (ISI) Kolkata, India, March 2017
- Invited Talk, Integrated Security Risk Management System for an Enterprise Network using Attack Graph; Vehicular Ad-hoc Network at IIT Bhubaneswar, India, August 2016
- Invited Talk, Geospatial Cloud as Enabling Platform for Smart City Development at DST, INSA, New Delhi, India September 2016
- Invited Talk, Geo-Spatial Cloud and Spatial-Temporal Data Analysis at Jadavpur University, Kolkata, India, July 2016
- Invited Talk, Spatial Data Infrastructure for Accident Reporting and Management in the 1-Day Workshop on New Accident Recording and Reporting Format, Department of Civil Engineering, IIT Kharagpur, March 2017
- Invited Talk, Spatial Data Infrastructure (SDI), Department of Mining, IIT Kharagpur, December, 2016
- Invited Talk, Indo-Tunisia Workshop on Geo-spatial Science and Technology, January 19-23, 2015, Bangalore, India
- Invited talk, Cloud Computing and Distributed Systems (CLOUDS) Laboratory, University of Melbourne, Australia, July 16, 2013
- Invited Talk, Advanced Wireless and Mobile Network Technologies, NIT Warangal, India, October 2013.
- Invited Talk, Center for Secure Information Systems, George Mason University, Arlington, USA, December, 2012 (Title: Risk-based Permission Authorization for Interoperations in Loosely-coupled Geospatial Cloud)

- Invited Talk, Department of Computer Science and Engineering, University of Texas, Arlington, USA, December, 2012 (Title: Securing Collaboration between Loosely-coupled Geospatial Clouds)
- Invited Talk, Department of Software & Information Systems, University of North Carolina, Charlotte, USA, May 2011 (Title: Geospatial Data Sharing and Integration)
- Invited Talk, 10th National Spatial Data Infrastructure (NSDI-10) Workshop, December 23-24, 2010, New Delhi, India
- Member, Technical Advisory Committee, State Spatial Data Infrastructure (SSDI), West Bengal, India
- Chairman, DST Technical Committee (TC) for up-gradation of National Spatial Data Infrastructure (NSDI) Data Nodes using state-of-art Geo-Spatial Cloud

Institute Responsibilities, Professional Activities

- Head, Institute Information Cell, IIT Kharagpur
- Vice-Chairman, Institute ERP, IIT Kharagpur
- Senior Member IEEE, Member ACM

Graduate Advising

- PhD Thesis (Completed - 14nos; Ongoing – 10nos)
    - T. Tuithung (IIT Kharagpur) – Image Processing
    - Raj Kumar PV (IIT Kharagpur) – Information Security
    - Padmalochan Bera (IIT Kharagpur) - Information Security
    - Sobhana N.V. (IIT Kharagpur) – Text Mining
    - Pushpita Chatterjee (IIT Kharagpur) – Sensor Network
    - Rashmi Ranjan Rout (IIT Kharagpur) – Sensor Network
    - Soumya Maity (IIT Kharagpur) – Information Security
    - Nirnay Ghosh (IIT Kharagpur) – Cloud Security
    - Anant V Nimkar (IIT Kharagpur) – Cloud Security
    - Partha Goswami (IIT Kharagpur) – Optical Networks
    - Shrutilipi Bhattacharjee (IIT Kharagpur) – Spatial Informatics
    - Chinmay Chakrabarty (BIT Mesra) – Medical Image Processing
    - Parantapa Bhattacharya (IIT Kharagpur) – Social Networks
    - Monidipa Das (IIT Kharagpur) – Spatio-temporal Analysis

- MS/MTech/BTech Thesis (70+ nos)

Research Projects (Selected)

- Design and Development of Training Modules for Geospatial Data and Process Standardization (Sponsored by: DST, New Delhi)
- Development of a GeoSMS Framework to facilitate Location based Services (Sponsored by: DST, New Delhi)
- Polarimetric Analysis of SAR Images for Segmentation, Classification and Recognition of Objects (Sponsored by: ISRO)
- Decision Support System for Transportation of Hazardous Materials/Waste in City Region of Kolkata (Sponsored by: MHRD, New Delhi)
- AI driven Real Time Traffic incident Prediction and Traffic Management (Sponsored by: MHRD, New Delhi)
- Decision Support System for Infrastructure Planning and Management in Coastal Areas of West Bengal (Sponsored by: MHRD, New Delhi)
- Artificial Intelligence for Societal Needs: Knowledge Discovery and Intelligent Decision Making for Solving Problems in Indian Context Related to Energy, Climate, Water, Disaster Management and Traffic (Sponsored by: MHRD, New Delhi)
- Design & Development of a Penetration Testing and Security Assessment Tool (Sponsored by: MoD, New Delhi)
- Development of a Systematic Method to Enhance Road Safety in Indian Cities through Improved Accident Data Collection, Advanced Statistical Analysis and Innovative Design (MHRD, New Delhi)
- Design and Development of an Integrated Security Risk Management System of an Enterprise Network (DeitY, MCIT, New Delhi)