

Annexure-I
Year 2015-16 (From 01 April, 2015 to 31 March, 2016)

Academic Staff: 21

Student Admitted: M.Tech : 47

Ph.D. : 8

Publications in : Journals : 68 conferences : 27

Books/Books Chapters: 2

Projects: Research (Rs. In Lacs): **148.314** Consultancy (Rs. In Lacs): **613.829**

Format for Preparation of Information by Academic Department/Centres

1. Salient Features

Department of Earthquake Engineering at the Indian Institute of Technology Roorkee (erstwhile University of Roorkee) was established in 1960 as School of Research and Training in

Earthquake Engineering. Four major areas of earthquake engineering viz., Structural Dynamics, Soil Dynamics, Engineering Seismology and Seismotectonics, and Instrumentation have been nurtured for the last fifty years. The department provides Master's degree in three specializations namely, Structural Dynamics, Soil Dynamics, and Seismic Vulnerability and Risk Assessment. The major functions of the Department include teaching and research, and rendering expert advice to various organizations in the area of earthquake resistant design of structures and systems, such as dams, bridges, power plants, etc. The Department has played a key role at the national level in the formulation of Indian Standard Codes of Practice for earthquake resistant design of Structures.

Several major facilities have been developed in the Department to conduct experiments related to earthquake engineering. Some of the major facilities include: a low cost railway wagon shock table for dynamic testing of structural models, a computer controlled shake table to stimulate strong ground motion, a quasi static testing laboratory having servo-controlled dynamic actuator systems and servo-controlled compression testing machine, a soil dynamics laboratory equipped with liquefaction table, cyclic triaxial testing system, and resonant column apparatus, a seismological observatory having state of the art broadband seismograph to record earthquake ground motion, a strong motion network of 300 digital accelerographs deployed in the Himalayan region to measure strong ground motion due to moderate and major earthquakes and a state-of-the-art 12-station telemetered network to monitor local seismicity in the environs of Tehri Dam.

2. Faculty List

a. Professors

Singh Yogendra, Ph. D. (IITD)

Head

Structural Earthquake Engineering, Performance Based Design, Seismic Risk Assessment

Sharma M. L., Ph. D. (IITR)

Engineering Seismology & Seismotectonics

Kumar Ashok, Ph. D. (IITR)

Instrumentation

Sinvhal Amita (Ms.), Ph. D. (IITR)

Engineering Seismology & Seismotectonics

Pal Kirat , Ph. D. (IITR)

Instrumentation

Narayan J. P., Ph. D. (BHU)

Engineering Seismology & Seismotectonics

Shrikhande M., Ph. D. (IIT K)

Structural Dynamics

Maheshwari B. K. , Ph. D. (Japan)

Soil Dynamics

Agarwal Pankaj, Ph. D. (IITR)

Structural Dynamics

b. Associate Professors

Das, Josodhir, Ph.D. (IITR)

Seismotectonics and Remote Sensing

c. Assistant Professors

Pandey, A.D., ME(IITR)

Structural Dynamics

Shanker, Daya, Ph.D.(BHU)

Engineering Seismology & Seismotectonics

Dubey, Ramanand, Ph.D.(IIR)

Structural Dynamics

Jakka, Ravi Shankar, Ph.D. (IITD)

Soil Dynamics

d. Scientific Officer Grade-II

Gupta, S.C., Ph.D. (IITR)
Seismology and Seismotectonics

e. Emeritus Professor

Prof. A. S. Arya, Ph.D. (Illinois)
Structural Dynamics

f. Emeritus Fellow

Paul D. K., Ph. D. (Swansea)
Soil Dynamics, Earthquake Risk Mitigation, Structural Earthquake Engineering

Kumar Ashwani, Ph.D. (IITR)
Engineering Seismology & Seismotectonics

Wason H. R., Ph. D. (KU)
Engineering Seismology & Seismotectonics

g. Visiting Faculty

Mukerjee, Shyamal, Ph.D.(IITR)
Soil Dynamics

h. Honorary Fellow

Gupta, I. D., Ph.D. (Pune)
Seismic Hazard Assessment, Engineering Seismology

3. Honours and Awards to Faculty Members (earned during the year under report).

Maheshari, B.K.

- a. Delivered key note lecture entitled “Earthquake Induced Landslides: Evaluations and Protection Measures” in a National Conference on Natural Disaster and Management. Being invited by IGS’s Indore Chapter, also attended the meeting of TC-3 (Natural Disaster Management) of IGS on September 12, 2015.
- b. Invited as a Guest of Honor at Govt. P.G. College, Kotdwar, Uttarakhand in a workshop on IPR on September 19, 2015
- c. Delivered key note lecture entitled “Numerical Modeling for Seismic Soil-Structure Interaction” in a National Conference at Ludhiana. Being invited by IGS’s Ludhiana Chapter. Also attended the meeting of TC-8 (Physical and Numerical Modeling) of IGS on October 03, 2015.
- d. Invited at Rail Bhawan by Ministry of Railways to address the prospective candidates going to Japan for attending training-cum studies in Japanese Universities on October 07, 2015. Also delivered a presentation on behalf of Saitama University (alma-matter for Ph.D.) who requested to represent them.

Singh, Y.

- a. Member, Technology Sub-Mission on Sustainable Technological Solutions for Faster & Cost Effective Construction of Houses Suiting to Geo-Climatic and Hazard Conditions of the Country, Housing for All Mission, Ministry of Housing and Urban Poverty Alleviation, Govt. of India.

Kumar, Ashwani

- a. Member of Project Advisory Committee on “Civil and Environmental Engineering”, Science and Engineering Research Board, Government of India (up to July 2015).
- b. Co-opted member of the “Young Scientist Expert Committee” in the area of Engineering Sciences, Science and Engineering Research Board, Government of India (from 2015 to 2018).
- c. Member of the Project Evaluation committee on Indo-Canada Joint Project in the area of self and Sustainable Infrastructure. Ministry of Science and Technology, Govt. of India. Meeting was held in May 19-20, 2015 at CSIR-CBRI Roorkee.

Agarwal, Pankaj

- a. The Department of Earthquake Engineering, IIT Roorkee is the first prize winner for Young Scientist Poster Presentation in the 6th Annual Conference of the **International Society for Integrated Disaster Risk Management (IDRiM 2015)**, entitled “**Disaster Risk Reduction: Challenges and Opportunities for Sustainable Growth**” conducted by Technology Information, Forecasting and Assessment Council (TIFAC) during October 28-30, 2015 at the Scope Convention Centre, New Delhi. The prize was given for the research work entitled "**Seismic Performance Evaluation of Innovative Interlinked Concrete Block Masonry System with Energy Dissipator Visco-Elastic Links**" by **Amit Goyal and Pankaj Agarwal**. The conference was supported by several national and international organizations including, the Disaster Prevention Research Institute (DPRI), Japan and the International Institute for Applied Systems Analysis (IIASA), Austria.

4. Participation of Faculty in Conferences/Seminar/Symposia/Workshop/Guest Lectures

Name of Faculty	Details of Conf./Semi./Symp./Workshop/Guest Lecture	Venue	Date
Y. Singh	Regarding Nepal Earthquake	Nepal	May 11-15, 2015
Ashok Kumar	Guest Lecture at Theme meeting on “ Advances in Seismic Monitoring”	BARC Mumbai	May 18, 2015
Ashwani Kumar	To attend Project Evaluation Committee Meeting on Indo-Canada joint Project	CSIR-CBRI Roorkee	May 19-20, 2015

Y. Singh	Two days capacity building programme for Engineers and Architects on 'Earthquake Resistant Structures and Retrofitting of Buildings'	Panchkula, Haryana	May 22-23, 2015
H.R.Wason	2015 Global Conference on Teaching and Learning with Technology (CTLT 2015)	100 Orchard Road #04-100 Concorde Hotel, Singapore	June 11-12, 2015
Daya Shanker	IUGG-1503. XXVI IUGG 2015 General Assembly	International Convension Center , Czech Republic, Prague	22 June - 02 July 2015
Amita Sinvhal	Engineering Mechanics Institute	Stanford University, California	June, 2015
Y. Singh	SECED 2015 Conference: Earthquake Risk and Engineering towards a Resilient World	Cambridge, U.K.	July, 9-10 2015
Ashwani Kumar	To attend PAC meeting	College of Technology and Engineering, Udaipur	July 10-11, 2015
Ashok Kumar, R.S. Jakka	Workshop on Earthquake Early Warning System for Senior Officials of Uttarakhand Government chaired by Honorable Governor of Uttarakhand	Raj Bhawan, Dehradun	July 15, 2015
M.L. Sharma	Attended PAC meeting	THDC India Ltd	July 17, 2015.
Y. Singh	Silver Jubilee International Conference Society Of Structural Engineers - Sri Lanka	Colombo, Sri Lanka	August, 24-26, 2015
M.L. Sharma	Chaired meeting on instrumentation of BBMB projects	Bhakra Beas Management Board Nangal	Sept. 2-3, 2015.
M.L. Sharma	Lecture in Nepal on "Seismic instrumentation of geotechnical investigations"	Nepal	Sept. 18, 2015.
Daya Shanker	Workshop on slow Earthquake 2015. 2015	Nagoya University, Nagoya, Japan	22-26 September, 2015,
M.L. Sharma	Attended AOGS and Presented an invited talk	Asia Oceania Geosciences Society Singapore (AOGS),	Oct. 01-09, 2015.
Y. Singh	Imprint Workshop on Sustainable Habitat	IIT Roorkee	October 12, 2015

M.L. Sharma	Chaired session at International Golden Jubilee conference on “Engineering Geology in New Millennium” at IIT Delhi	New Delhi	Oct. 27-29, 2015.
Y. Singh	5 day Indo-Norway joint studio on Spatial Mapping to Assess Urban Risk at Rishikesh	IIT Roorkee	October 28, 2015
B.K. Maheshwari	TIFAC-IDRiM international conference on Disaster Management in New Delhi as a member of organizing committee	New Delhi	October 28-30, 2015
H.R.Wason	Vith Annual conference of the International Society for Integrated Disaster Risk Management- Disaster risk reduction challenges and opportunities for sustainable growth ,organized by TIFAC-IDRIM	New Delhi	Oct. 28-30, 2015
Dr. R.S. Jakka	6th International Conference on Earthquake Geotechnical Engineering (6ICEGE)	Christchurch, New Zealand	1-4 Nov., 2015
Y. Singh	Disaster Mitigation and Management Strategies	COER Roorkee	Nov 04, 2015
M.L. Sharma	Workshop on INDO Norwegian Workshop	New Delhi	Dec 02, 2015.
Y. Singh, Manish Shrikhande and B.K. Maheshwari	Visited, to conduct the damage survey of recent Manipur Earthquake of January 04, 2016	Manipur	Jan 6-11, 2016
Y. Singh	CPWD Training Course on Retrofitting and Rehabilitation of Buildings	CPWD Training Institute Ghaziabad	Jan 18-19, 2016
M.L. Sharma	Visited NCREE in Taiwan under sponsored research project funded by DST	Taiwan	Jan 23-31, 2016.
Pankaj Agarwal	Make In India	Mumbai	Feb. 11-18, 2016
Y. Singh	National Workshop on Seismic Performance Based Design of Building Structures	Jamia Millia Islamia, New Delhi	Feb 27, 2016
Y. Singh	Structural Issues in Prefab. Housing	CBRI, Roorkee	March 11, 2016
Y. Singh	International Seminar on Emerging Building Materials & Construction Technologies	India Habitat Center, New Delhi	March 21-22, 2016

5. Total Number of Faculty Members Participated in short Term Courses: NIL

National	
International	

6. Distinguished Visitors to the Department (National/International):

Name	Designation and Affiliation	Purpose	Dates
Dr. Abdelghani Meslem,	Research Earthquake Engineer, NORSAR, Norway	Collaborative Research	27 May to 04 June, 2015
Mr. Tashi Dorjee	Hydro-power Specialist from Thimphu, Bhutan	Visited	Sept, 04, 2015
Mr. Cheki Gyeltshen	Head, Contracts Management from Thimphu, Bhutan Division	Visited	Sept, 04, 2015
Mr. Chador Tenzin	Head, Druk Green Consultancy from Thimphu, Bhutan	Visited	Sept, 04, 2015
Mr. Gorab Dorji	Head, Planning & Design Division from Thimphu, Bhutan	Visited	Sept, 04, 2015
Prof. S.Prakash	Emeritus Professor, Missouri University of Science & Technology Rolla, USA	Visited	Nov, 2015

7. (a) Internship by IIT Roorkee Students

SI. No.	Name of Student	Name of the Internship Programme	Post Graduate	Name of Institute	Period
1	Jyoti Agarwal	DAAD	M.Tech	Universität Stuttgart	8 months
2	Aman Garg	DAAD	M.Tech	Universität Stuttgart	8 months
3	Abhimanyu Yadav	DAAD	M.Tech	Universität Stuttgart	8 months

7.(b) Internships to Other Students in IIT Roorkee: No

Name of Student	Name of Supervisor	Under Graduate	Post Graduate	Name of Institute	Period

8. Academic Activities Organized by the Department

Name of Conf./Seminar/Symp./Workshop	Name of the Chairman	Sponsored by	Dates
Workshop on Developing Suitable Pedagogical Methods for Various Classes, Intellectual Calibers and Research in e-learning	Amita Sinvhal	MHRD	April 16, 17 2015
Indo-Norwegian Training Programme on Seismic Design of Multi-storey Buildings: IS 1893 vs. Eurocode 8, India Habitat Centre, New Delhi.	Y. Singh (Coordinator)	NORSAR, Norway and BMTPC New Delhi	May 27-29, 2015
GIS Concept and Application	J.Das (Coordinator)	CEC, IIT Roorkee	June 22 to June 27, 2015
2-Day National Workshop on Assessment & Mitigation of Liquefaction Hazards for Seismic Microzonation'		AIMIL	Nov. 27-28, 2015
Geoinformatics in Earthquake Studies	J.Das (Coordinator)	QIP center, IIT Roorkee	Nov. 28, 2015
Indo-Norwegian Training Programme on Nonlinear Modelling Analysis and Performance based Design of Multistorey Buildings, India Habitat Centre, New Delhi.	Y. Singh (Coordinator)	NORSAR, Norway and BMTPC New Delhi	Dec. 3-5, 2015

9. Sponsored Research Projects:

Sl. No.	Project Status	Total No. of Projects	Amounts (Rs. In lacs)
1	Completed Projects	2	57.82
2	Ongoing Projects	3	26.60
3	New Projects	3	63.894

10. Service to Industries

a. Consultancy Project

Sl. No.	Project Status	Total No. of Projects	Amount (Rs. In Lacs)

1	Completed Projects	25	117.591
2	Ongoing Projects	11	152.023
3	New Projects	44	344.214

b. Testing Services: NIL

Sl. No.	No. of Industries Served	Total Outlay (Rs. In lacs)

11. Summary of Major Sponsored Research Schemes and Consultancy Projects(>Rs. 20 lacs) (A brief Write-up upto 100 words) (New Projects during the year 2015-16)

a. Uncertainty in Site Characterization Using surface wave Techniques and Its Implication – Dr. R. S. Jakka (27.58 Lacs)

Surface wave methods which are increasingly being used in site characterization, suffer from several uncertainties from the time of data acquisition to processing. Near-field effects, data uncertainty and inverse problem solution are the major sources of uncertainty and play an important role in the resulting shear-wave velocity profiles. Uncertainty due to data measurement and inversion may provide several equivalent profiles resulting in comparable approximation of the experimental dispersion curve. Further these equivalent profiles may contribute variable ground motion in seismic ground response analysis. This current proposed research is aimed at studying these uncertainties to quantify and account the effects of these uncertainties on seismic hazard estimation.

b. Site Characterization and Attenuation Studies for Garhwal-Kumaun Himalaya and Delhi Region – Dr. R. S. Jakka(PI); Prof. Ashok Kumar; & Prof. M.L. Sharma (23.3 Lacs)

The objective of this study is to account the influence of local site conditions on strong ground motion recordings in two different settings namely Garhwal-Kumaun Himalaya and Delhi region. The comparison and the results will be used to study the attenuation characteristics of the two regions and recommend GMPE for Garhwal-Kumaun Himalaya and Delhi region. Around 60 strong ground motion instrumentation sites located in the study region will be considered for the study. The proposed study consists of comprehensive site characterization of each of the strong ground motion station using both Geophysical and Geotechnical tests. MASW tests with HVSr using ambient noise data will be carried out to obtain shear wave velocity profiles of the sites upto bedrock level. SPT tests will be carried out to obtain information about in-situ subsurface soil layers and their characteristics. Samples will also be collected for further laboratory testing to obtain their Index properties as well as dynamic properties. Finally, site specific ground response analysis will be carried out using Pro SHAKE to deconvolute local site effects from the surface strong ground motion

recordings to obtain bedrock motion. Results obtained will be further used to obtain GMPE and conducting seismic hazard assessment of various towns in the study region.

c. Seismological Network around Tehri region-

Dr. M.L. Sharma, Dr. J.P. Narayan, Dr. Ashwani Kumar, A.D. Pandey, Dr. S.C. Gupta

A 12-station seismological network in the environs of 260.5 meter high earth and rock-fill Tehri dam, is under operation for the purpose of monitoring contemporary local seismicity of the region around Tehri dam in the Garhwal Himalaya. The 6-station network was started in Sept. 1993 which later upgraded and expanded to 12-station network in Nov. 2007. The study is conducted by the Department of Earthquake Engineering, IITR and is sponsored by the Tehri Hydro Development Corporation India Ltd. (THDCIL) since July 1995 under a MoU. The MoU is renewed after every three years. The present MoU, from 2013 to 2016, is seventh in the series of such MoUs. The main objective of the study is to monitor continuous local seismicity around the Tehri dam, and to observe any changes in seismicity level during the filling of Tehri dam reservoir. Other important objectives of the study include: to delineate the active seismic source zones, and to study source and path characteristics. Till date more than twenty one year's continuous local earthquake data has been collected and interpreted. Eighty two quarterly seismological bulletins, containing earthquake phase data, and nineteen annual technical reports, containing results and interpretation, have been submitted to the THDCIL till Dec. 2015. The earthquake data recorded by this network is being used extensively for research work covering various aspects of seismicity. Till date, four Ph.Ds have been completed and four are in progress. In addition seventeen M.Tech. thesis have been produced and two are in progress. 15 research papers are published in refereed journals and 21 in conference/proceedings.

d. Seismological network around Lakhwar HE Project: Recently, a five-station seismological network has been deployed around 206 m high concrete multipurpose hydro elective project on river Yamuna in the Garhwal Himalaya to monitor contemporary local earthquake seismicity of the region. The project falls in the seismic zone IV as per the seismic zoning map of India as incorporated in Indian Standard Criteria for earthquake Resistant Design of Structures (IS 1893-2002). The study has been sponsored by the UJVN Ltd., Dehradun. The studies includes, selection of sites for the seismological station, construction of sites and deployment of instrumentation at these stations for operation a period of six months. The present status of the study is, the deployment of five-station network has been completed on April 25, 2016 and recording of local

earthquake data has been started.

12. Scientific and Technical Reports

Title of the Projects	Participants	Authors	Remarks
Proceedings of 2-Day National Workshop on 'Assessment & Mitigation of Liquefaction Hazards for Seismic Microzonation'	90	Proceedings Volume	
Report on 2015 Twin Earthquakes of Nepal (25 April 2015 and 12 May 2015), Report submitted to the National Disaster Management Authority, Government of India, New Delhi, May 2015.	C. V. R. Murty (IIT Jodhpur), Y. Singh (IIT Roorkee), R. Pradeep Kumar (IIIT Hyderabad), Ajay P. Chourasia (CBRI, Roorkee) and Arun Menon (IIT Madras)	C. V. R. Murty (IIT Jodhpur), Y. Singh (IIT Roorkee), R. Pradeep Kumar (IIIT Hyderabad), Ajay P. Chourasia (CBRI, Roorkee) and Arun Menon (IIT Madras)	National Expert Team constituted by NDMA, Govt. of India
Kendriya Vidyalaya Buildings, Embassy of India, Kathmandu: Assessment of Damages after 25 April 2015 and 12 May 2015 Nepal Earthquakes, Report submitted to the National Disaster Management Authority, Government of India, New Delhi, May 2015.	C. V. R. Murty (IIT Jodhpur), Y. Singh (IIT Roorkee), R. Pradeep Kumar (IIIT Hyderabad), Ajay P. Chourasia (CBRI, Roorkee) and Arun Menon (IIT Madras)	C. V. R. Murty (IIT Jodhpur), Y. Singh (IIT Roorkee), R. Pradeep Kumar (IIIT Hyderabad), Ajay P. Chourasia (CBRI, Roorkee) and Arun Menon (IIT Madras)	National Expert Team constituted by NDMA, Govt. of India
Seismic Strengthening of India House, Indian Embassy, Kathmandu. Report submitted to the National Disaster Management Authority, Government of India, New Delhi, June 2015.	Ajay P. Chourasia (CBRI, Roorkee), Y. Singh (IIT Roorkee), R. Pradeep Kumar (IIIT Hyderabad)	Ajay P. Chourasia (CBRI, Roorkee), Y. Singh (IIT Roorkee), R. Pradeep Kumar (IIIT Hyderabad)	National Expert Team constituted by NDMA, Govt. of India
A Report on Visual Survey of Buildings Damaged during Manipur Earthquake of January 04, 2016.	Y. Singh, M. Shrikhande, B.K. Maheshwari	Y. Singh, M. Shrikhande, B.K. Maheshwari,	Report submitted to The PWD, Government of Manipur, India, January 2016.

(a) Scientific/technical reports prepared under Sponsored Research Projects

1. Sharma, M.L., J.P. Narayan, Ashwani Kumar. A.D. Pandey and S.C. Gupta, EQ: 2015-17 (2015),“Seismological Network Around Tehri Region”, Report on Processing and Interpretation of seismological data collection from January 2013 to December 2013. Department of Earthquake Engineering, IIT Roorkee.
2. Sharma, M.L., J.P. Narayan, Ashwani Kumar. A.D. Pandey and S.C. Gupta, EQ: 2016-03 (2016),“Seismological Network Around Tehri Region”, Report on Processing and Interpretation of seismological data collection from January 2014 to December 2014.Department of Earthquake Engineering, IIT Roorkee.
3. Sharma, M.L., J.P. Narayan, Ashwani Kumar. A.D. Pandey and S.C. Gupta, EQ: 2015-11 (2015),“Seismological Network Around Tehri Region, (from Jan 2015 to Mar 2015), Department of Earthquake Engineering, IIT Roorkee
4. Sharma, M.L., J.P. Narayan, Ashwani Kumar. A.D. Pandey and S.C. Gupta, EQ: 2015-13 (2015),“Seismological Network Around Tehri Region, (from April 2015 to June 2015), Department of Earthquake Engineering, IIT Roorkee
5. Sharma, M.L., J.P. Narayan, Ashwani Kumar. A.D. Pandey and S.C. Gupta, EQ: 2015-16 (2015),“Seismological Network Around Tehri Region, (from July 2015 to Sept 2015), Department of Earthquake Engineering, IIT Roorkee
6. Sharma, M.L., J.P. Narayan, Ashwani Kumar. A.D. Pandey and S.C. Gupta, EQ: 2016-09 (2016),“Seismological Network Around Tehri Region”, Report on Processing and Interpretation of seismological data collection from Ocotber 2015 to December 2015, .Department of Earthquake Engineering, IIT Roorkee.
7. Kumar, Ashok (2015). Strong Ground Motion Studies and its Applications, Department of Earthquake Engineering, IIT Roorkee.
8. Singh, Y. M.L. Sharma and B.K. Maheshwari (2015).Earthquake Hazard and Risk Reduction on the Indian Subcontinent (RRISC), Department of Earthquake Engineering, IIT Roorkee.

(b) Scientific/technical reports prepared under Consultancy Projects

1. Sharma. M.L., Y. Singh, M. Shrikhande, J. P. Narayan, B. K. Maheshwari and J. Das EQ: 2016-13 (2016), Site Specific Design Earthquake Parameters for Sankosh HE Project, Bhutan, Department of Earthquake Engineering, IIT Roorkee
2. Sharma. M.L., M. Shrikhande, B. K. Maheshwari and J. Das EQ: 2016-12 (2016), Site Specific Design Earthquake Parameters for Kiratpur Bridge Project, Department of Earthquake Engineering, IIT Roorkee
3. Sharma. M.L., Y. Singh, M. Shrikhande, J. P. Narayan, B. K. Maheshwari and J. Das, EQ: 2016-11 (2016), Site Specific Design Earthquake Parameters for Durgapur TPP Project, West Bengal, Department of Earthquake Engineering, IIT Roorkee
4. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and R.S. Jakka, EQ: 2016-10 (2016), Site Specific Design Earthquake Parameters for Harduaganj TPP Project, Uttar Pradesh., Department of Earthquake Engineering, IIT Roorkee
5. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and S.C. Gupta, EQ: 2016-

- 06 (2016), Site Specific Design Earthquake Parameters for Parnai HE Project, Jammu & Kashmir, Department of Earthquake Engineering, IIT Roorkee
6. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and S.C. Gupta, EQ: 2016-04 (2016), Seismic Hazard Studies for Infield Pipe Luine Route (West Block). M.P., Department of Earthquake Engineering, IIT Roorkee
 7. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and Daya Shanker, EQ: 2016-02 (2016), Site Specific Design Earthquake Parameters for Vamsadhara-Hiramandalamj HE Project, Andhra Pradesh, Department of Earthquake Engineering, IIT Roorkee
 8. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and S.C. Gupta, EQ: 2016-01 (2016), Site Specific Design Earthquake Parameters for Hardwaganj HE Project, Uttar Pradesh, Department of Earthquake Engineering, IIT Roorkee
 9. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and S.C. Gupta, EQ: 2015-14 (2015), Site Specific Design Earthquake Parameters for Vyaso HE Project, Uttarakhand, Department of Earthquake Engineering, IIT Roorkee
 10. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and S.C. Gupta, EQ: 2015-12 (2015), Site Specific Design Earthquake Parameters for Kwar HE Project, Jammu & Kashmir, Department of Earthquake Engineering, IIT Roorkee
 11. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and R.S. Jakka, EQ: 2015-10 (2015), Site Specific Design Earthquake Parameters for Kuri-I HE Project, Bhutan, Department of Earthquake Engineering, IIT Roorkee
 12. Sharma. M.L., M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and R.N. Dubey, EQ: 2015-09 (2015), Site Specific Design Earthquake Parameters for Tagurshit HE Project, Arunachal Pradesh, Department of Earthquake Engineering, IIT Roorkee

13. Research Publications during the year under report (To be listed on the basis of first author only, as given below). Separate group for Conference/Symp./Papers and Books/Monographs be made.

(a) Journals :

Year 2015

1. Bhardwaj, Rakhi, M. L. Sharma and Ashok Kumar (2015). Multi-parameter algorithm for Earthquake Early Warning, Geomatics, Natural Hazards and Risk, 1-23.
2. Bhattacharya, Atanu, Kriti Mukherjee, Manoj Kuri, Malte Vöge, M.L. Sharma, M.K. Arora and Rejinder K. Bhasin (2015). Potential of SAR intensity tracking technique to estimate displacement rate in a landslide-prone area in Haridwar region, India. Natural Hazards,79(3), 2101-2121.
3. Dadi, Surya Kumar, V. V. S. and Pankaj Agarwal (2015). Comparative Post-Yield Performance Evaluation of Flexural Members under Monotonic and Cyclic Loadings based on Experimental Tests. Structures (Elsevier), Vol. 2, pp. 72-80
4. Dadi, VVS Surya Kumar and Pankaj Agarwal (2015). Nonlinear cyclic performance evaluation of soft storey RC frame buildings based on different characteristics of reinforcement, KSCE Journal

of Civil Engineering, 1-9.

5. Desai, Aniket, D. Shanker and R.S. Jakka (2015). Earthquake Induced Landslide Hazard Zonation of Nainital Region; *Geosciences* 2015, 5(2): 62-69.
6. Jain, S. K., S. C. Gupta, Ashwani Kumar (2015). Attenuation of coda waves in the Garhwal Lesser Himalaya, India, *Journal of Seismology*, Vol. 19, No. 2, pp. 355-369.
7. Jakka, R. S., Md. Hussain and M.L. Sharma (2015), Effects on amplification of strong ground motion due to deep soils, *Geomechanics and Engineering*, 8(5), 663-674.
8. Jakka, R.S. and S. Garg (2015). Suitable Triggering Algorithms for Detecting Strong Ground Motions using MEMS Accelerometers. *Earthquake Engineering and Engineering Vibrations* (Springer), 14(1):27-35.
9. Joshi, A., Chun-Hsiang Kuo, Piu Dhibar, M.L. Sharma, Kuo-Liang Wen and Che-Min Lin (2015). Simulation of the records of the 27 March 2013 Nantou Taiwan earthquake using modified semi-empirical approach, *Natural Hazards*, pp. 1-26.
10. Joshi, S.G., I.D. Gupta and P.B. Murnal(2015). Analyzing the effect of foundation inhomogeneity on the seismic response of gravity dams, *Int. Jour. Civil and Struct. Engg.*, 6(1), 11-24.
11. Kadam, Sachin B, Y. Singh and Bing Li (2015). Out-of-plane behaviour of unreinforced masonry strengthened using ferrocement overlay. *Materials and Structures*, 48(10), 3187-3203.
12. Kamal and J.P. Narayan (2015). 3D basin-shape-ratio effects on frequency content and spectral amplitudes of basin-generated surface waves and associated spatial ground motion amplification and differential ground motion, *Jr. Seism.*, 19, 293-316.
13. Kamal and J.P. Narayan (2015). A study of effects of curvature of synclinal basement topography on ground motion characteristics, *Geofizika*, 32, 1-25.
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(c) Books, Monographs, Lab or Design Manuals - Authored/ Edited : In progress (One)

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