

Annual Report
Department of Earthquake Engineering
2018-2019



Indian Institute of Technology Roorkee

Roorkee, Uttarakhand

India - 247667

Table of Contents

1. Introduction.....	3
2. Academic Programs.....	4
3. Significant Awards/ Distinctions of Faculty Members.....	4
4. R&D Activities.....	5
4.1 Sponsored Research.....	5
4.2 Consultancy Work.....	6
5. Extension Activities.....	6
5.1 CEP Short-Term Courses.....	6
5.2 GIAN Course.....	6
6. Visitors to the Department and Their Presentations.....	7
7. Organization/ Participation in Conference/ Symposia/ Workshops/ Seminars.....	9
8. Invited Lectures.....	12
9. Honorary Work.....	12
10. (1) Scientific and Technical Reports.....	12
(2) Academic Activities Organized by the Department.....	16
11. Publications.....	16
11.1 Books/ Book Chapters.....	16
11.2 Papers in Refereed Journals.....	17
11.3 Papers in Proceedings of Conference/ Symposium/ Seminars.....	21
12. Faculty Members and Their Specializations.....	28

Academic Staff: 12, Students Admitted: M.Tech: 62; Ph.D: 45,
Publications in: Journals: 43, Conferences: 49, Book: 01,
Projects: Research (Rs. in Lacs): 1183.75, Consultancy (Rs. in Lacs): 1202.37

1. Introduction

The 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: recently commissioned full scale pseudo-dynamic structural test facility having 8 m tall reaction walls, a low cost shock table on railway wagons, 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. Academic Programs

The Department of Earthquake Engineering offers postgraduate M.Tech. (admission through GATE/sponsorships) and PhD (through selections/ sponsorships) programs in following three specializations:

- Soil Dynamics
- Structural Dynamics
- Seismic Vulnerability and Risk Assessment

At present the annual intake into M.Tech. and Ph.D. programs stands at _____ During 2017-18, ____ M.Tech. degrees and ____ Ph.D. degrees were awarded from the Department.

3. Significant Awards / Distinctions of Faculty Members.

Prof. Pankaj Agarwal

- Best Paper Award in Structural Engineering, 2018 in National Conference on “Next Frontiers in Civil Engineering – Sustainable and Resilient Infrastructure” organized by Department of Civil Engineering, Indian Institute of Technology, Bombay on 30th November – 1st December, 2018.

Prof. B. K. Maheshwari

- Conferred as a Life Fellow of Institution of Engineers (India) with effective February 20, 2019.
- Nominated as a member of CED 39 Subcommittee of IS:1893 (part 3) of Bureau of Indian Standards (BIS) with Effective November, 2018.
- Invited to Chair a Session on Geotechnical Earthquake Engineering during 16th European Conference on Earthquake Engineering, held at Thessaloniki, Greece, June 18-21, 2018.

Prof. Manish Shrikhande

- Member of ISO Working Group on Seismically Isolated Structures.

Prof. Ravi Jakka

- A paper on “Near-Field Effects on Site Characterization using MASW Technique” was adjudged as the best paper published in the area of Soil Dynamics from India by Indian Geotechnical Society.

- Elected as Secretary of Indian Society of Earthquake Technology (ISET) for the term 2019-2021 (2 years).
- Elected as National Executive Committee member of Indian Geotechnical Society for the term 2018-2020 (2 years).

4. R& D Activities

4.1 Sponsored Research

Sponsored Projects	
No. of Ongoing Projects	11
No. of Complete Projects	
Faculty Involved	

Department received 6 new sponsored projects with a sanctioned outlay of Rs. 1,95,00,000/-. The list of new sponsored projects is as given below:

Sr. No	P.I. Name (Prof.)	Project Title	Agency Name	Start Date	Sanctioned Amount (Rs.)	Status
1	Prof. Yogendra Singh	Next Generation Tool for Seismic Risk Assessment in Hilly Regions	IMPRINT -II	2019	68.12 Lakhs	Running
2	Prof. Yogendra Singh	Seismic Safety Measures for RC Frame Buildings with Different Types of Infill Panels	NBCC	2018	38.16 Lakhs	Running
3	Prof. Pankaj Agarwal	Feasibility study on low cost passive control devices to retrofit soft storey RC buildings with experimental verification	MoES, New Delhi		15 Lakhs	Running
4	Prof. Pankaj Agarwal	Seismic safety of hill buildings by using low cost Energy dissipating Device	NMHS Almora		18.96 Lakhs	Running
5	Prof. B. K. Maheshwari	Dynamic Properties of Soils using Resonant Column Tests	MoES, New Delhi			Running
6	Prof. M. L. Sharma	Development of Low Cost Indigenous Earthquake Early Warning System	IMPRINT -II		112.78 Lakhs	Running

4.2 Consultancy Work

Consultancy Works	
No. of Jobs	
Faculty involved	
Income generated	

5. Extension Activities

5.1 CEP Short-Term Courses

Prof. Pankaj Agarwal

- “Seismological Aspects related to Design of Concrete Gravity Dams”, Training Program under DRIP program of CWC Delhi, Continuing Education Centre, Indian Institute of Technology Roorkee, Roorkee, India, October 29-31, 2018.
- “Seismic Design and Safety Evaluation of Concrete Gravity Dams”, Training Program under DRIP program of CWC Delhi, Continuing Education Centre, Indian Institute of Technology Roorkee, Roorkee, India, November 01-03, 2018.

Prof. P. C. Ashwin Kumar

- “Stability analysis of concrete gravity dams as per IS 6512”, Continuing Education Centre, Indian Institute of Technology Roorkee, Roorkee, India, November 01, 2018.
- Typical Failure modes of RCC and masonry Buildings in Earthquakes, Continuing Education Centre, Indian Institute of Technology Roorkee, Roorkee, India, January 31, 2019.

5.2 GIAN Courses

6. Visitors to the Department

Name Designation & Affiliation	Purpose	Date(s)
Prof. A. Boominathan <i>Professor, IIT Madras, Chennai</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Mr. Jitendra K. Bothara <i>Technical Director, Miyamoto International NZ Ltd., New Zealand</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Henry V. Burton <i>Assistant Professor, UCLA, USA</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Sreekanta Das <i>Professor, University of Windsor, Canada</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. S.K. Deb <i>Professor, IIT Guwahati</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Rajesh Dhakal <i>Professor, Univ. of Canterbury, New Zealand</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Amit Kanvinde <i>Professor, University of California, Davis, USA</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Dr. Dominik Lang <i>Director Natural Hazards, NGI, Norway</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Bing Li <i>Professor, NTU, Singapore</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Gopal S.P. Madabhushi <i>Professor, University of Cambridge, U.K</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. H. Mutsuyoshi <i>Professor, Saitama University, Japan</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018

Prof. S.K. Nath <i>Professor, IIT Kharagpur</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Taichiro Okazaki <i>Professor, Hokkaido University, Japan</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. M. Saitoh <i>Professor, Saitama University, Japan</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. M.P. Singh <i>Professor, Virginia Tech., USA</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. T.G. Sitharam <i>Professor, IISc Bangalore</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Ikuo Towhata <i>Professor, Tokyo University, Japan</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Dr. K.L. Wen <i>Professor, NCREE, Taiwan</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. J.H. Yin <i>Professor, Hong-Kong Polytechnic University, Hong Kong</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Dr. N Gopalakrishnan <i>Director, CSIR-CBRI</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Vincent Lee <i>Professor, USC, University of Southern California</i>	Keynote Lecture, 16 th Symposium on Earthquake Engineering, IIT Roorkee	20-22 Dec, 2018
Prof. Ahmed Mebarki <i>Professor, University of Paris, France</i>	Guest Lecture and Department Visit	24-26, Feb, 2019
Dr. Demin Feng <i>Chief Researcher, Fujita Corporation</i>	Guest Lecture and Department Visit	19 Mar, 2019

7. Organization/ Participation in Conference/ Symposia/ Workshops/ Seminars

Prof. Pankaj Agarwal

- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

Prof. B. K. Maheshwari

- Attended and delivered a presentation entitled “Models for Research Collaborations for Geo-hazard Disaster Risk Reduction” in Third Indo-Japan Workshop on Disaster Risk Reduction, Vigyan Bhawan, New Delhi, March 18, 2019.
- Visited to deliver two lectures in a short-term course on “Geotechnical Earthquake Engineering”, Indian Institute of Technology Kanpur, Kanpur, India, February 18-19, 2019.
- Visited to deliver a lecture in 3rd National Workshop on “Reliability and Structures”, Aligarh Muslim University (AMU), Aligarh, India, September 22, 2018.
- Invited to deliver a Keynote Lecture in National Symposium on “Disaster Mitigation and Management” DIT University, Dehradun, India, April 12, 2018.
- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

Prof. J. P. Narayan

- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

Prof. M. L. Sharma

- Presented the EEW proposal in the Indo Japan workshop, New Delhi, India, April 20, 2018.
- MoES Meeting, New Delhi, India, April 21, 2018.
- 33rd Meeting of the National Committee on Seismic Design Parameters (NCSDP), New Delhi, India, April 25, 2018.
- DRIP Meeting, Dehradun, India, May 03-05, 2018.

- SDMA Meeting EEW, Dehradun, India, July 24, 2018.
- NDMA Meeting, New Delhi, India, August 09, 2018.
- NTA Meeting, New Delhi, India, August 29, 2018.
- Meeting with MoES, New Delhi, India, January 28, 2019.
- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

Prof. Manish Shrikhande

- “NIAS-DST Training Program on Science & Technology: Global Developments and Perspectives”, National Institute of Advanced Studies, IISc Campus, Bengaluru, January 21- February 01, 2019.
- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

Prof. Yogendra Singh

- IITR-EPICONS Friends of Concrete WORKSHOP-73 “Performance Based Design of Multistorey RC Buildings”, Mumbai, India, March 23-24, 2018.
- IITR-EPICONS Friends of Concrete WORKSHOP-74 “Performance Based Design & Provisions of Tall Building Code IS 16700:2017”, Mumbai, India, May 25-26, 2018.
- IITR-EPICONS Friends of Concrete WORKSHOP-77 “High-End Design of Tall Buildings”, Mumbai, India, March 29-30, 2019.
- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

Prof. R. N. Dubey

- “16th European Conference on Earthquake Engineering”, Thessaloniki, Greece, June 18-21, 2018.
- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

- Visited to deliver a lecture at the Institute for Infrastructure and Environment at School of Engineering, The University of Edinburgh, Edinburgh, Scotland, United Kingdom, June 2018.
- Visited IIT Bombay for project meeting research discussion, Powai, Mumbai, India, February 18-19, 2018.

Prof. S. C. Gupta

- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.
- One week Training cum inspection of Equipment for Seismological station network at M/s Guralp Systems Limited, Aldermaston, RG7 8EA England, December 01-08, 2018.

Prof. Ravi Shankar Jakka

- Stayed two months at Georgia Tech., Atlanta, USA for a mutual research collaboration, Georgia Tech., Atlanta, United State of America, June-July, 2018.
- Chaired a session at Indian Geotechnical Conference IGC 2018, IISc. Bangalore, India, December 13-15, 2018.
- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

Prof. Daya Shanker

- “16th Symposium on Earthquake Engineering (SEE)”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.
- Workshop on “Slow Earthquake-2018”, Across Fukuoka, Japan, December 20-23, 2018.
- “10th International Conference Monitoring of Nuclear Test and their Consequences”, Almaty, Kazakhstan, August 06-10, 2018.
- International Conference for the Decade Memory of the Wenchuan Earthquake with the “4th International Conference on Continental Earthquakes”, Chengdu, China, May 12-14, 2018.

- Workshop on “*Drilling Investigation of Seismogenic Crust in Oklahoma (DISCO)*”, Oklahoma, United State of America, May 03-05, 2018.

Prof. P. C. Ashwin Kumar

- “*16th Symposium on Earthquake Engineering (SEE)*”, Department of Earthquake Engineering, Indian Institute of Technology Roorkee, December 20-22, 2018.

8. Invited Lectures

Prof. Ravi Jakka

- “Recent Advances in Geotechnical Earthquake Engineering” *From Theory to Practice* at *National Workshop*, Manipal University, Jaipur, February 09, 2019.
- “A New Perspective on Natural Hazard, Risk & Insurance” *at a workshop*, Indian Institute of Technology Roorkee, May 02, 2018.

9. Honorary Work

10. (1) Scientific and Technical Reports

1. Kumar. A., A.D. Pandey, M.L. Sharma, J.P. Narayan and S.C. Gupta, EQ: 2019-12 (2019), “Seismological Network Around Tehri Region, Preliminary Seismological and Strong Motion Ground Bulletin (from July 2018 to Sept 2018), Department of Earthquake Engineering, IIT Roorkee.
2. Singh. Y., M. L. Sharma, S. C. Gupta, B. K. Maheshwari and J. Das, EQ: 2019-11 (2019), Site Specific Earthquake Parameters for Chhatrapati Shivaji Maharaj Memorial Mumbai, Project, Mumbai, Department of Earthquake Engineering, IIT Roorkee.
3. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das, J.P. Narayan, S.C. Gupta, r.S. Jakka, Daya Shanker and R. N. Dubey, EQ: 2019-10 (2019), Site Specific Earthquake Parameters for 16 Bridges of Karanpryag Railway Rishikesh, Project, Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.

4. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das, J.P. Narayan, S.C. Gupta, R.S. Jakka, Daya Shanker and R. N. Dubey, EQ: 2019-09 (2019), Site Specific Earthquake Parameters for Rishikesh-aKaranprayag railway Bridge, Project, Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
5. Sharma, M. L., S.C. Gupta, J. Das and A. K. Jindal, EQ: 2019-08 (2019), Microearthquake Studies around Umngot H.E. Project, Meghalaya, Report on processing and interpretation of Seismological Data collected from January to August 2018., Department of Earthquake Engineering, IIT Roorkee.
6. Kumar. A., A.D. Pandey, M.L. Sharma, J.P. Narayan and S.C. Gupta, EQ: 2019-07 (2019), “Seismological Network Around Tehri Region, Report on processing and interpretation of Seismological Data collected from January 2017 to December 2017, Department of Earthquake Engineering, IIT Roorkee.
7. Singh. Y., M. L. Sharma, M. Shrikhande, J. Das, R.S. Jakka and R. N. Dubey, EQ: 2019-06 (2019), Site Specific Earthquake Parameters for Jakol Sankri H.E. Project, Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
8. Singh. Y., M. L. Sharma, M. Shrikhande, J.P. Narayan, B. K. Maheshwari and J. Das, EQ: 2019-04 (2019), Site Specific Earthquake Parameters for Battisa Nalla Multipurpose Project Site, Rajasthan, Department of Earthquake Engineering, IIT Roorkee.
9. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and S.C. Gupta, EQ: 2019-03 (2019), Site Specific Earthquake Parameters for Navnera Barrage Project Site, Rajasthan, Department of Earthquake Engineering, IIT Roorkee.
10. Singh. Y., M. L. Sharma, M. Shrikhande, J. Das, R.S. Jakka and Daya Shanker, EQ: 2019-02 (2019), Site Specific Earthquake Parameters for Parwan Major Irrigation and Drinking Water Project Site, Rajasthan, Department of Earthquake Engineering, IIT Roorkee.
11. Singh. Y., M. L. Sharma, M. Shrikhande, J. P. Narayan, J. Das and R.S. Jakka, EQ: 2019-01 (2019), Site Specific Earthquake Parameters for Ujh Multipurpose Hydroelectric Project Site, J & K, Department of Earthquake Engineering, IIT Roorkee.

12. Kumar. A., A.D. Pandey, M.L. Sharma, J.P. Narayan and S.C. Gupta, EQ: 2018-23 (2018), “Seismological Network Around Tehri Region, (from April 2018 to June 2018), Department of Earthquake Engineering, IIT Roorkee.
13. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-22 (2018), Site Specific Earthquake Parameters for Mawblei H.E. Project, Meghalaya, Department of Earthquake Engineering, IIT Roorkee.
14. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-21 (2018), Site Specific Earthquake Parameters for Sunni Dam Project Site, Himachal Pradesh, Department of Earthquake Engineering, IIT Roorkee.
15. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-20 (2018), Site Specific Earthquake Parameters for Srinagar Railway Bridge (Ganga Bridge), Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
16. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-19 (2018), Site Specific Earthquake Parameters for Lachmali Railway Bridge (Ganga Bridge), Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
17. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-18 (2018), Site Specific Earthquake Parameters for Gauchar Railway Bridge, Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
18. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-17 (2018), Site Specific Earthquake Parameters for Dhari Devi Project Site, Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
19. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-16 (2018), Site Specific Earthquake Parameters for Karanprayag Railway Bridge (Ganga Bridge), Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
20. Kumar. A., A.D. Pandey, M.L. Sharma, J.P. Narayan and S.C. Gupta, EQ: 2018-15 (2018), “Seismological Network Around Tehri Region, (from Jan 2018 to March 2018), Department of Earthquake Engineering, IIT Roorkee.

21. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-14 (2018), Site Specific Earthquake Parameters for Neyveli TPP Project, Tamil Nadu, Department of Earthquake Engineering, IIT Roorkee.
22. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-13 (2018), Seismic Hazard Analysis for Dr. Ambedkar Statue & Menorial at Dadar, Mumbai, Department of Earthquake Engineering, IIT Roorkee.
23. Sharma, M.L., S.C. Gupta, Ashwani Kumar and A.K. Jindal EQ: 2018-11 (2018), “Study of Koldam site, Himachal Pradesh, (based on the data collected from May 2016 to June 2017), Department of Earthquake Engineering, IIT Roorkee.
24. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-09 (2018), Site Specific Earthquake Parameters for Mytndu Leshka H.E. Project, Meghalaya, Department of Earthquake Engineering, IIT Roorkee.
25. Kumar. A., A.D. Pandey, M.L. Sharma, J.P. Narayan and S.C. Gupta, EQ: 2018-08 (2018), “Seismological Network Around Tehri Region, (from Oct 2017 to Dec 2017), Department of Earthquake Engineering, IIT Roorkee.
26. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-07 (2018), Site Specific Earthquake Parameters for DLF-UPL Building in Motinagar, New Delhi, Department of Earthquake Engineering, IIT Roorkee.
27. Kumar. A., A.D. Pandey, M.L. Sharma, J.P. Narayan and S.C. Gupta, EQ: 2018-05 (2018), “Seismological Network Around Tehri Region, (from July 2017 to Sept 2017), Department of Earthquake Engineering, IIT Roorkee.
28. Singh. Y., M. L. Sharma, M. Shrikhande, B. K. Maheshwari, J. Das and R. N. Dubey, EQ: 2018-03 (2018), Site Specific Earthquake Parameters studies for Song Dam Project, Uttarakhand, Department of Earthquake Engineering, IIT Roorkee.
29. Singh. Y., M. L. Sharma, M. Shrikhande, J. P. Narayan, B. K. Maheshwari, J. Das and R. S. Jakka, EQ: 2018-02 (2018), Site Specific Earthquake Parameters for Pudimadaka TPP Project, Andhra Pradesh, Department of Earthquake Engineering, IIT Roorkee.

30. Kumar. A., A.D. Pandey, M.L. Sharma, J.P. Narayan and S.C. Gupta, EQ: 2018-01 (2018), “Seismological Network Around Tehri Region, (from April 2017 to June 2017), Department of Earthquake Engineering, IIT Roorkee.

(2) Academic Activities Organized by the Department

Name of the conf./seminar/symp. /workshop	Name of the Chairman	Sponsored by	Dates
16 th Symposium on Earthquake Engineering	Prof. Yogendra Singh		20-22, Dec, 2018
Central Dam Safety Organisation Dam Rehabilitation and Improvement Project (DRIP) Training Program on Seismic Design and Safety Evaluation of Concrete Gravity Dams	Prof. M.L. Sharma	CWC	28 Oct - 4 Nov, 2018
A New Perspective on Natural Hazard, Risk & Insurance, A workshop on challenges and innovations	Prof. M.L. Sharma	UDRP, Uttarakhand Government	2, May, 2018

11. Publications

Research Publications	
No. of National Conference	40
No. of International Conference	09
No. of National Journals	01
No. of International Journals	42
No. of Books/Book Chapters	01

11.1 Books/ Book Chapters

Prof. M. L. Sharma & Prof. Manish Shrikhande

M.L. Sharma, Manish Shrikhande and H. R. Wason (2018). Advances in Indian Earthquake Engineering and Seismology: Contributions in Honour of Jai Krishna.

11.2 Papers in Refereed Journals

a. National Journals

1. Sangeeta and Maheshwari B.K. (2019), "Earthquake Induced Landslide Hazard Assessment of Chamoli District, Uttarakhand, India Using Relative Frequency Ratio Method", Indian Geotechnical Journal. Vol. 49, No.1, pp. 108-123.

b. International Journals

1. Neeraj Kumar and J.P. Narayan (2019) Quantification of fundamental frequencies of 3D basins and structures and site city interaction effects on responses of structures, Pure & Applied Geophysics, 176, 1-26 (doi.org/10.1007/s00024-019-02158-8).
2. D. Shanker and Shubham (2018). On the seismic hazard in Himachal Pradesh and Uttarakhand States; Geosciences 2018, 8(2), 21-31.
3. Nijhawan Rahul, Das Josodhir, and Raman Balasubramanian (2018) A hybrid of deep learning and hand-crafted features based approach for snow cover mapping. International Journal of Remote Sensing, DOI: 10.1080/01431161.2018.1519277.
4. M. M Rout, J. D. Das and Kamal (2018) "Probabilistic seismic hazard for Himalayan region using kernel estimation method (zone-free method)". Natural Hazards, doi.org/10.1007/s11069-018-3336-6.
5. Nijhawan, Rahul, Josodhir Das, and Balasubramanian Raman (2018) " A Hybrid CNN+Random Forest Approach to Delineate Debris Covered Glaciers using Deep Features" Journal of Indian Society of remote sensing, 46, 981-989.
6. Nijhawan, Rahul, Raman Balasubramanian, and Josodhir Das (2018) "Proposed Hybrid-Classifer Ensemble Algorithm to Map Snow Cover Area" Journal of Applied Remote Sensing, 12, 016003 (2018), doi: 10.1117/1.JRS.12.016003.
7. Dhiraj Raj, Yogendra Singh and Amir M. Kaynia (2019), "V–H–M Seismic Capacity Envelopes of Strip Foundations on Slopes for Capacity Design of Structure-Foundation System," Bulletin of Earthquake Engineering, DOI: 10.1007/s10518-019-00577-5.

8. Sergio Molina, Dominik H. Lang, Yogendra Singh, and Abdelghani Meslem (2019), “A Period-Dependent Topographic Amplification Model for Earthquake Loss Estimation,” *Bulletin of Earthquake Engineering*, DOI: 10.1007/s10518-019-00608-1.
9. Dhiraj Raj, Yogendra Singh and Amir M. Kaynia (2019), “Behavior and Critical Failure Modes of Strip Foundations on Slopes under Seismic and Structural Loading,” *International Journal of Geomechanics*, ASCE, DOI: 10.1061/(ASCE)GM.1943-5622.0001427.
10. Padalu, P. K. V. R., Singh, Y., and Das, S. (2018) “Efficacy of Basalt Fibre Reinforced Cement Mortar Composite for Out-of-Plane Strengthening of Unreinforced Masonry”, *Construction and Building Materials*, 191, 1172-1190.
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11.3 Papers in Proceedings of Conferences/ Symposium/ Seminars

a. National Conferences

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7. Bhav P. and Maheshwari B.K., "Dynamic Properties of Solani Sand in Low Strain Range: Effect of Saturation", Proc. of 16th Symposium on Earthquake Eng., IIT Roorkee, December 2018.
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13. Firoj M. and Maheshwari B.K., "A Review on Soil-Structure Interaction for Nuclear Power Plants", Proc. of 16th Symposium on Earthquake Engineering, IIT Roorkee, December 2018.
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31. Kuri, Manoj, Manoj Arora and M.L. Sharma (2018). Slope Stability Analysis in Nainital Town Using PS and QPS Technique, International Geoscience and remote sensing symposium, IGRASS-2018.
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33. Patel, K. and Dubey, R.N., Effect of Opening on the Strength of the Masonry Wall, 16th Symposium on Earthquake Engineering, IIT Roorkee, Roorkee, December 20-22, 2018.
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36. Kranthikumar, A., Jakka, R. S., and Singh, Y. Dynamic Response Analysis of a Concrete Dam under Seismic Loading Conditions, 16th Symposium. On Earthquake Engineering 16SEE, IIT Roorkee, India, December 20-22, 2018.
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39. Rajput, S. S., Jakka, R. S. and Sinvhal, A. Identification of Seismo-tectonically Susceptible Area in North Western Himalaya using Pattern Recognition, Indian Geotechnical Conference IGC2018, IISc Bangalore, India, 13-15 December 2018.
40. Rathore, G., Kumar, A., Jakka, R.S. and Chamoli, B.P. Development of Earthquake Early Warning Siren for Regional Earthquake Early Warning System in India, 16th Symposium. On Earthquake Engineering 16SEE, IIT Roorkee, India, 20-22 December 2018.

b. International Journals

1. D. Shanker (2018). Why earthquake may become a disaster for Man? International Conference for the Decade Memory of the Wenchuan Earthquake with the 4th International Conference on Continental Earthquakes- Open session: Regional Cooperation in Seismo-geodesy: An ASC Initiative (Co-organized by: Asian Seismological Commission (ASC), 12-14 May in Chengdu, China.
2. D. Shanker and A. Panthi (2018). Earthquake Hazard forecast in the northeast India Himalaya and its Vicinity. International Conference for the Decade Memory of the Wenchuan Earthquake with the 4th International Conference on Continental Earthquakes -Improving earthquake occurrence and hazard forecasts (Co-organized by: APEC Cooperation for Earthquake Simulation (ACES), 12-14 May in Chengdu, China,
3. D. Shanker and A. Panthi (2018). Are burst of seismic activities observed in Eastern Himalayas (Syntaxis) indication of impending earthquake? International Conference for the Decade Memory of the Wenchuan Earthquake with the 4th International Conference on Continental Earthquakes -Earthquake science experiment and large earthquake forecasting (Co-organized by: South California Earthquake Center (SCEC), 12-14 May in Chengdu, China.

4. Padalu, P. K. V. R., Singh, Y., and Das, S. (2018). “Uni-axial Monotonic Compressive Properties of Brick Masonry in India”, Proceedings of 10th International Masonry Conference (10th IMC), Paper ID: 639, 1st Edition, 1639-1655, July 9-11, Milan, Italy.
5. Gwalani, P., and Singh, Y. (2018). “Comparative Study on RC Component Modelling using Lumped Plasticity and Fiber Models,” Proc. 16th Symposium on Earthquake Engineering, December 20-22, Indian Institute of technology, Roorkee, India.
6. Swanand Patil and Pankaj Agarwal (2018) "Low-Damage Seismic Design of RC Buildings with Supplemental Energy Dissipation Systems," Urbanization Challenges in Emerging Economies © ASCE.
7. Sangeeta and Maheshwari B.K. (2018), "Earthquake Induced Landslide Hazard Assessment of Chamoli District, Uttarakhand, India Using Weighted Overlay Method", Proc. of 16th European Conference on Earthquake Engineering, held at Thessaloniki, Greece, June 2018.
8. Patra, P., Kumar, P. C. A., and Sahoo, D. R. (2018). “Cyclic performance of gusset plate connections in special concentrically braced frames”, Ninth International Conference on Behaviour of Steel Structures in Seismic Areas (STESSA), Christchurch, New Zealand.
9. Bharathi, M., Raj, Dhiraj and Dubey, R.N., Numerical Evaluation of Undrained Seismic Limiting Pressure Behind Soil Gaps in Contiguous Pile Walls, 16th European Conference on Earthquake Engineering, Thessaloniki, Greece, June 18-21, 2018.

12. Faculty Members and their Specializations

Pankaj Agarwal [Ph.D.: IIT Roorkee] – Structural Dynamics

Designation: Professor and Head

Research Interests: Earthquake Resistant Design of Structures, Low-strength masonry buildings, Repair and retrofitting of masonry and reinforced concrete buildings

B. K. Maheshwari [Ph.D.: Japan] – Soil Dynamics

Designation: Professor

Research Interests: Geotechnical Earthquake Engineering, Soil Dynamics, Finite Element Method, Seismic Soil-Structure Interaction, Liquefaction, Dynamic Soil Properties, Landslide Hazard, Slopes

J. P. Narayan [Ph.D.: BHU] – Engineering Seismology & Seismotectonics

Designation: Professor

Research Interests: Earthquake Ground Motion Simulation, Development of viscoelastic Finite-difference Algorithms, Seismic microzonation & local site effects, Basin & topography effects, Site-city interaction and seismic metamaterials

M. L. Sharma [Ph.D.: IIT Roorkee] – Engineering Seismology & Seismotectonics

Designation: Professor

Research Interests: Engineering Seismology, Seismotectonics, Seismic hazard analysis, Digital telemetered seismic arrays, SAR Interferometry, Strong ground motion prediction, Seismic Microzonation

M. Shrikhande [Ph.D.: IIT Kanpur] – Structural Dynamics

Designation: Professor

Research Interests: Computational mechanics, Random vibrations, Structural Reliability, Strong Motion Studies, Soil-Structure Interaction, Vibration Control, Probabilistic mechanics

Yogendra Singh [Ph.D.: IIT Delhi] – Structural Dynamics

Designation: Professor

Research Interests: Performance Based Seismic Design, Performance Based Design of Buildings and Bridges, Seismic Response Evaluation of Structures, Non-Linear Modelling and Analysis of RC Structures, Seismic Evaluation and Retrofitting of Structures, Seismic Evaluation and Retrofit of Hospitals and Schools, Seismic Vulnerability and Risk Evaluation, Seismic Vulnerability and Risk Analysis of Indian Housing Stock, Dynamic Soil-Structure Interaction, Effect of Soil on Seismic Performance of Buildings, Towers, and Bridges, Seismic Risk In Hilly Areas, Seismic Fragility Analysis of Hill Buildings, Seismic Risk In Hilly Areas, Slope-Building Interaction under Seismic Action.

J. Das [Ph.D.: IIT Roorkee] – Seismotectonics and Remote Sensing

Designation: Associate Professor

Research Interests: Seismo-Tectonics, Remote Sensing, GIS, Seismic Hazards, and Related to these areas

Ramanand Dubey [Ph.D.: IIT Roorkee] – Structural Dynamics

Designation: Associate Professor

Research Interests: Static and dynamic analysis of structures, Finite element method, Earthquake resistant design, Static and dynamic analysis of structures, Finite element method, Earthquake resistant design

S. C. Gupta [Ph.D.: IIT Roorkee] – Seismology and Seismotectonics

Designation: Associate Professor

Research Interests: Observational Seismology, seismological arrays and networks, Observational Seismology, seismological arrays and networks

Ravi Shankar Jakka [Ph.D.: IIT Delhi] – Soil Dynamics

Designation: Associate Professor

Research Interests: Geotechnical Earthquake Engineering, Foundation Design, Slope Stability, Landslides, Dynamic Site Characterization & Soil Liquefaction;, Seismic Hazard Assessment, Local Site Effects, & Earthquake Early Warning;, Ground Improvement

Techniques, Geosynthetics & Reinforced Slopes;, Machine Foundations, & Earthquake Resistant Design of Foundations

Daya Shanker – Seismology and Seismotectonics

Designation: Associate Professor

Research Interests: Engineering Seismology and Seismotectonics, Seismotectonic of Himalaya, Seismology and Seismotectonics,, Seismology and Seismotectonics, Seismic risk analysis, Earthquake data analysis, Statistical seismol, Seismic hazard and Earthquake prediction / Earthquake Disaster Management, Earthquake prediction in Himalaya, NE India, Prediction of Ground Motion studies and seismic Microzonation, Microzonation of Kochi City India, Applied Geophysics/ Theoretical seismology, Gravity and Magnetic Survey In Mandala Na Jabalpur India, Geophysical application in Civil Engineering and tunneling Technology, In situ stress estimation, Landslide/Earthquake Control and Hill development, Landslide hazard estimation, Marine geophysics/Tsunami study, Tsunami Survey and hazard studies

P.C. Ashwin Kumar [Ph.D.: IIT Delhi] – Structural Dynamics

Designation: Assistant Professor

Research Interests: Structural Engineering, Seismic response and design of steel and reinforced concrete structures, Structural Engineering, Supplemental damping and energy dissipating devices, Structural Engineering, Seismic rehabilitation and retrofitting of steel and concrete structures., Structural Engineering, Large scale testing and simulation study of structural systems., Structural Engineering, Non-destructive assessment of structures

A. S. Arya [Ph.D.: Illinois] – Structural Dynamics

Designation: Emeritus Professor

Research Interests: Structural

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