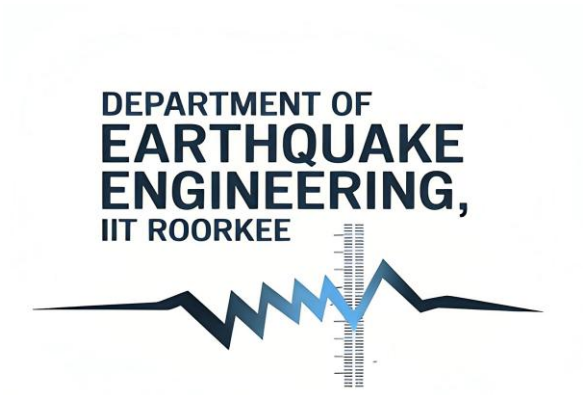
ANNUAL REPORT 2022-23



Department of Earthquake Engineering
Indian Institute of Technology Roorkee
Uttrakhand-247667

ANNEXURE-I

Academic Staff: 16; Students Admitted: M.Tech: 30 ; Ph.D: 12
Publications in: Journals: 34 , Conferences: 56 , Book/Books Chapters: 06
Projects: Research (Rs. in Lacs): 1788.1 , Consultancy (Rs. in Lacs): 928.47

1. SALIENT FEATURES

The department of Earthquake Engineering at the Indian Institute of Technology Roorkee (erstwhile University of Roorkee) was established in 1960 as the School of Research and Training in Earthquake Engineering. Four significant areas of Earthquake Engineering, viz., Structural Dynamics, Soil Dynamics, Engineering Seismology and Seismotectonics, and Instrumentation, have been nurtured for last fifty years. The Department provides Master's degree in three specializations: 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 vital role at the national level in formulating the 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 full scale pseudo-dynamic structural test facility having 8m tall reaction walls, a low-cost shock tables on railway wagons for dynamic testing of structural models, a computer-controlled shake table to stimulate 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.

Academic Program

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

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

2. LIST OF FACULTY MEMBERS (Alphabetical)

i. Professors

- Dr. Pankaj Agrawal
- Dr. Josodhir Das
- Dr. B.K. Maheshwari
- Dr. J.P. Narayan
- Dr. M.L. Sharma
- Dr. Manish Shrikhande
- Dr. Yogendra Singh

ii. Associate Professors

- Dr. R.N. Dubey
- Dr. S.C. Gupta
- Dr. R.S. Jakka
- Dr. Daya Shankar

iii. Assistant Professors

- Dr. P.C. Ashwin Kumar
- Dr. Ritesh Kumar
- Dr. Sohom Ray
- Dr. Saurabh Shiradhonkar
- Dr. Varun Kumar Singla

3. HONOURS AND AWARDS TO FACULTY MEMBERS

Dr. B.K.Maheshwari	**IACMAG "John Baker Medal"** presented during 16th Int. Conference of the Int. Association for Computer Methods & Advances in Geomechanics, **Torino, Italy,** on Sept. 1, 2022.
	Part of a **multi-institutional team** constituted by USDMA (Uttarakhand State Disaster Management Authority) to undertake geological and geotechnical investigation around **Joshimath** town in Chamoli district of Uttarakhand. Had field visit to Joshimath during August 16-18, 2022 and January 5-7, 2023.
	Participated in a NDMA project on "Development of Resource Material on Earthquake Engineering" at Dept. of Civil Eng., **IIT Bombay**. Visited IITB in Oct. 2022 and Feb. 2023.
	Elected as an **Executive Committee** Member of Indian Geotechnical Society **(IGS)** for a term of 2 years (since January 2023).
Dr. Ravi S Jakka	Received quadranial 'ISET TG Sitharam Mid-career Research Award for Innovations in Geotechnical Earthquake Engineering' in the year 2022 from the Indian Society of Earthquake Technology.
	Appointed as a member of two international technical committees of Geo-Institute, American Society of Civil Engineers (ASCE) on Earthquake Engineering & Soil Dynamics, and Engineering Geology & Site

	Characterization.
	Elected as a National Executive Committee member of Indian Geotechnical Society for the term 2023-2024 (2 years).
	Chaired a technical session of Indian Geotechnical Conference 2022 held at Kochin, during Dec. 14-17, 2022.
	Chaired a technical session of 17th Symposium on Earthquake Engineering (17SEE) held in Roorkee during 14-17 Nov. 2022.
	Reappointed as an NCS-MoES expert review committee member for a national project on 'Seismic Microzonation of 30-cities in India', Ministry of Earth Sciences, Govt. of India (Order No. MoES/P.O.(Seismo)/8(12)/2023 (microzonation) dated 23rd March, 2023).
Dr. Ritesh Kumar	Awarded E4F Fellowship from Imperial College London, UK

4. PARTICIPATION OF FACULTY IN CONFERENCES/SEMINAR/SYMPOSIA/WORKSHOP/GUEST LECTURES.

Name of Faculty	Details of Conf./Semi./Symp./ Workshop/Guest Lecture	Venue	Date
Dr. B.K.Maheshwari	Delivered online presentation entitled "Seismic Behavior of Strip Footings on Slopes", in 20th International Conf. on Soil Mechanics and Geotechnical Engineering.	Sydney, Australia	May 1-5, 2022
	Delivered a talk entitled "Nonlinear SSI Analysis for Nuclear Power Plants on Raft, Pile Group and CPRF" as an **invited speaker** during Symposium on Socio-Technological Aspects of Seismic Disaster Management.	IIT Guwahati	June 23, 2022
	Attended 16th International Conference of IACMAG (International Association of Computer Methods and Advances in Geomechanics). Delivered **a research presentation** entitled "Seismic Settlement of CPRF of NPP on Soft Soil" in both oral and poster sessions. Also **chaired two sessions** on "Applications in Geotechnical Engineering: Earthquake and Dynamics" on Sept. 2, 2022 along with Prof. S. Foti, Politechnico Di Torino.	Torino, Italy	August 30 to September 2, 2022
	Presented a research paper entitled "Spring Constants of Soil for Raft	IIT Roorkee	Nov. 14-16, 2022

	and Pile Groups of Nuclear Power Plants", in 17th Symposium on Earthquake Eng., **IIT Roorkee**, Nov. 14-16, 2022.		
Dr. Daya Shankar	1. 17th Symposium on Earthquake Engineering	Department of Earthquake Engineering, Indian Institute of Technology Roorkee	Nov 14-17,2022
	2. International workshop on Slow-to-Fast Earthquake 2022.	Nara, Japan	September, 14-18 2022.
	3. 3rd Europen Conference on Earthquake Engg. &Seismology & 38ESC	Bucharest, Romania.	September,04-09, 2022,
	4. USGS NGA-Sub Workshop	(Virtually)	July 20, 2022
	5. China and the World Forum ;A balancing act: India-China relations amidst a new global order.	(Virtually)	July 20, 2022
	6. SPMA Food Security Webinar	(Virtually)	July, 18, 2022
	7. Restorative Justice In India: Activating Community Values & Embracing Differences 2:	(Virtually)	July 16, 2022
	8. Seminar "Recent advances on structural analysis of unreinforced masonry buildings"	(Virtually)	July 14, 2022
	9. Computational Infrasture for Geodynamics: Seismic Cycle: Heimisson & Dublanchet	(Virtually)	July 08, 2022
	10. Rocky Worlds II Conference, Oxford UK,	Online	July 04-08,2022
	11. VCDNP Webinar on Nuclear Technology for Research and Sustainable Development: The Benefits of Accelerator and X-Ray Technologies,	Online	July 07, 2022
	12. Global Leaders Series event featuring a conversation with the Honorable Kevin Rudd on his newest book The Avoidable War: The Dangers of a Catastrophic Conflict Between the U.S. and Xi Jinping's China,	(Virtually)	July 07, 2022
	13. "Landers Earthquake 30th Anniversary: Lessons, Lore, and Legacies,	Online	June 28, 2022

	14. Global Center's virtual roundtable on "Applying a transitional justice approach in terrorism-related contexts to ensure sustainable peace",	Virtually	June 28, 2022
	15. Brazil's Energy Transition and the Women Leading It, GPI Quad Forum Invites You to Episode 2 of Quad Café,	Virtually	June 25, 2022
	16. IUGG 33rd CMG Online Conference 2022,	Virtually	June 20-24, 2022
	17. Virtual Conference on QUAD - Cohesion or Conflict?	Virtually	June, 14, 2022
	18. Earth Treasure Vase Global Healing Meditation	Virtually	June 14, 2022
	19. Multi-scale Laboratories (MSL) seminar: Magnetic expression of submarine Hydrothermal Sites in Back Arc environments: Insight from marine geophysical investigations in the Southern Tyrrhenian Sea,	Virtually	June 14, 2022
	20. Computational Infrasture for Geodynamics: Seismic Cycle Webinar 5:	Virtually	June 10, 2022
	21. 37th Meeting of the Board on Science Education,	Virtually	June 09, 2022
	22. UN, EU, and NATO Approaches to the Protection of Civilians: Policies, Implementation, and Comparative Advantages	Virtually	June 08, 2022
	23. 27th Meeting of the NASA Small Bodies Assessment Group,	Virtually	June 7-9, 2022
	24. COSMOS Ground-Motion Simulation Working Group Workshop .	Virtually	June7-8, 2022
	25. Egypt-Greece Joint-workshop on the Eastern Mediterranean Sea: Tectonics and Seismicity,	Virtually	May 17, 2022
	26. Online seminars in earth tides and geodynamics: Gravity measurements as a useful tool to	Online	May 10, 2022

	model Karst hydrology,		
	27. Computational Infrasture for Geodynamics: Seismic Cycle Webinar 2	Virtually	May 13, 2022
Dr. J.P. Narayan	17th Symposium on Earthquake Engineering	IIT Roorkee	Nov.14-18,2022
Dr. M.L. Sharma	EGU Conference	Vienna, Austria	April 24-30, 2023
	Meeting about the future prospects of Earth Quake	Taiwan	March 25-30, 2023
	To attend a week-long Visit to earthquake Seismology Laboratory at the Tel-Aviv University	Israel	26-30 October, 2022
	17 Symposium on Earthquake Engg.	Department of Earthquake Engineering, IIT Roorkee	14-17 Nov, 2022
Dr. P.C.Ashwin Kumar	17th Symposium on Earthquake Engineering	DEQ, IITR	Nov.14-17,2022
Dr. Ravi.S. Jakka	Participated in Indian Geotechnical Conference 2022	Cochin	14-17, Dec. 2022
Dr. Ritesh Kumar	1. Centrifuge Modeling and Reliability Assessment of a Hybrid Foundation to Mitigate Liquefaction-Induced Effects	IIT Palakkad, India	Sep 22, 2022
	2. Risk and sustainability of built environment under climate change induced geohazards	One Concern, USA	Dec 13, 2022
	3. Serviceability assessment of a monopile foundation for an offshore wind turbine	Indo-UK International Workshop for Offshore foundation	Feb 04, 2023
	4. SPH-based numerical investigation to evaluate the effects of debris flow on the associated built environment	Indo-Italian International workshop on Landslide Hazard	Feb 10, 2023
	5. Development of debris flow model	DRDO	Mar 13, 2023
	6. Development of spring coefficients for bridge foundations	EQD, IIT Roorkee	Mar 24, 2023
	7. Physical Modeling and Reliability Assessment of Effectiveness of Granular Columns in the Nonuniform Liquefiable Ground to Mitigate the Liquefaction-induced Ground Deformation	PBD-IV China	Jul 16, 2022

Dr.Sohom Ray	1. Invited: IIT Kanpur, Department of Mechanical Engineering, Lecture Series on Fractures, Friction, and Faults, organized by Prof. Sumit Basu, IIT Kanpur.	IIT Kanpur	July 9-15, 2022
	2. Geophysical Advances - Natural Resource Exploration, Energy Security and Geohazards. Interfacial sliding at faults: from aseismic creep to earthquakes (solo)	IIT (ISM) Dhanbad	24-26 March
	3. Geophysical Advances - Natural Resource Exploration, Energy Security and Geohazards. Slow and fast slip in glacier-bed rock interface (N. Lokesh, Pulak Biswas, Sohom Ray)	IIT (ISM) Dhanbad	24 March 2023
	4. Geophysical Advances - Natural Resource Exploration, Energy Security and Geohazards. Identification of governing PDEs for interface slip rate evolution and frictional heterogeneities on landslide from forward simulation data. (Pulak Biswas, Sohom Ray)	IIT (ISM) Dhanbad	24 March 2023
	5. Institute Research Day, IIT Roorkee,Identification of governing PDEs for basal slip and distribution of frictional properties in landslide models from (synthetic) data	IIT Roorkee	13 Mar 2023
	6. Invited: Computational Infrastructure for Geodynamics (CIG), Seminar, Many ways to slip: aseismic fault creep and its transition to dynamic rupture.	CIG Online	May 13, 2022
	7. Finding governing PDEs of quasi static fault slip and basal slip evolution from (synthetic) slip rate and shear traction data. (With Pulak Biswas, Earthquake Engineering, IIT Roorkee)	EGU General Assembly	28 April 2023
	8. Aseismic rupture on rate-weakening faults before slip instability (With Dmitry Garagash, Dalhousie University, Halifax, Canada)	AGU Fall Meeting	15 December 2022
	9. Data-Driven Identification of Governing Equations for Aseismic Fault Slip and Frictional Heterogeneities. (With Pulak	AGU Fall Meeting	16 December 2022

	Biswas, Earthquake Engineering, IIT Roorkee)		
Dr. Varun Kumar Singla	1. Oral Presentation in "EGU General Assembly 2022" conference	Online	23–27 May, 2022
	2. Expert Lecture on "The Science of Earthquakes" in Short Term Program on "Earthquake Risk Management"	Online (organized by NITTTR, Chandigarh)	12 October, 2022
	3. Participation in "17th Symposium on Earthquake Engineering" symposium	IIT Roorkee, Uttarakhand, India	14–17 November, 2022
	4. Poster Presentation in "AGU Fall Meeting 22" conference	Chicago, Illinois, U.S.A.	12–16 December, 2022

5. TOTAL NUMBER OF FACULTY MEMBERS PARTICIPATED IN SHORT TERM COURSES

NATIONAL	**5**
INTERNATIONAL	**1**

6. DISTINGUISHED VISITORS TO THE DEPARTMENT (NATIONAL/INTERNATIONAL)

NATIONAL			
Name	**Designation and Affiliation**	**Purpose**	**Dates**
Dr. S.L.Kapil	Executive Director, NHPC, Faridabad	Keynote Speakers in 17th Symposium of Earthquake Engineering organized at IIT Roorkee	November 14-17, 2022
Dr.Shailesh Kr. Agrawal	Executive Director, BMTPC, Delhi		
Dr. Kalachand Sain	Director, Wadia Institute of Himalayan Geology, Dehradun		
Prof. D.N.Singh	Professor, Indian Institute of Technology Bombay		
Dr. O.P.Mishra	Director, National Centre for Seismology, Ministry of Earth Sciences		
Prof. Ravi Sinha	Professor, Indian Institute of Technology Bombay		
Dr. Sumer Chopra	Director General, Institute of Seismological Research, Govt. of Gujarat		
Prof. Ananth Ramaswamy	Professor, IISc Bangalore		
Dr. Snurendra Nath Somala	Associate Professor, Indian Institute of Technology Hyderabad		
Prof. Durgesh C. Rai	Professor, Indian Institute of Technology Kanpur		
Prof. Dipti Ranjan Sahoo	Professor, Indian Institute of Technology Delhi		
Prof. B. V. S. Viswanadham	Professor, Indian Institute of Technology Bombay		
Dr. N. Purnachandra Rao	Director, National Centre for Earth Science Studies, Thiruvananthapuram		

INTERNATIONAL			
Name	**Designation and Affiliation**	**Purpose**	**Dates**
Prof. A. Stavridis	Associate Professor, University of Buffalo, NY, US	Keynote Speakers in 17th Symposium of Earthquake Engineering organized at IIT Roorkee	November 14-17, 2022
Prof.S.Foti	Professor, Politecnico di Torino, Italy		
Prof. Humberto Varum	Professor, University of Porto, Portugal		
Dr. Martijn Schildkamp	Director, SMARTnet		
Dr. Dominik Lang	Director, Natural Hazards at Norwegian Geotechnical Institute, Oslo		

7(a). INTERNSHIPS BY IIT – ROORKEE STUDENTS

Sl. No.	Name of student	Name of the Internship Programme	Under Graduate	Post Graduate	Name of Institute Visited	Period
	NA					

7(b). INTERNSHIPS OFFERED TO OTHER STUDENTS IN IIT – ROORKEE

Sl. No.	Name of student	Name of Supervisor	Under Graduate	Name of Collaborative Institute
1.	Nitarani Bishoyi	Dr. Ritesh Kumar	Yes	IISER Bhopal
2.	Ajitesh Pandey	Dr. Ritesh Kumar	Yes	IIT BHU

8. ACADEMIC ACTIVITIES ORGANIZED BY THE DEPARMENT

Name of the conf./seminar/symp./workshop	Name of the Chairman	Dates
17th Symposium on Earthquake Engineering	Prof. Manish Shrikhande Prof. Pankaj Agrawal (Co-Chairman)	Nov 14th-17th 2022
1st Webinar Series on Geotechnical Earthquake Engineering organized by IIT Roorkee and ISET	Prof. B.K.Maheshwari	December 2021 to December 2022
Offered Video Recorded **NPTEL Certification Course** on "Earthquake Resistant Design of Foundations",	Prof. B.K.Maheshwari	Spring 2022-23

9. SPONSORED RESEARCH PROJECTS:

Sl. No.	Project Status	Total No. of Projects	Amount (Rs. in lacs)
1	**Completed Projects**	1	112
2.	**Ongoing Projects**	10	1004.79
3.	**New Projects**	4	671.31

10. SERVICE TO INDUSTRIES

a. Consultancy Project

Sl. No.	Project Status	Total No. of Projects	Amount (Rs. in lacs)
1	**Completed Projects**	6	156.61
2.	**Ongoing Projects**	14	396.72
3.	**New Projects**	9	375.14

b. Testing Services

Sl. No.	No. of Industries Served	Total outlay (Rs. in lacs)
	NA	**NA**

11. SUMMARY OF MAJOR SPONSORED RESEARCH SCHEMES AND CONSULTANCY PROJECTS (Rs. 20 lacs) (A brief Write-up up to 100 words).

a. Micro mechanics-based fracture model for welded connection for avoiding brittle failure in steel member connections, Core Research Grant. Budget: 39.21 Lakhs
b. Corrosion test materials characterization of stainless steel, Indiawelds. Budget: 26.47 Lakhs
c. Prefabricated prefinished volumetric construction using recycled plastic, MoHUA. Budget: 583.63 Lakhs
d. Study the seismic performance of code-compliant (IS 1893) torsionally irregular buildings under the combined action of translational and torsional components of seismic ground motions.

12. PLEASE ALSO GIVE THE INFORMATION OF THE BENEFITS FOR THE PERSONS WITH DISABILITIES IN YOUR, if any.

NA

13. SCIENTIFIC AND TECHNICAL REPORTS

Title of the Projects	Participants	Authors	Remarks
Advances in Earthquake Geotechnics	Keynote Contributions of 7th ICRAGEE2021	T.G. Sitharam Ravi S. Jakka S. Kolathayar	Edited Book Volume in Springer Transactions in Civil Engg.
Theory and Practice in Earthquake Engineering and Technology	Contributions from the speakers of ISET webinar series	T.G. Sitharam S. Kolathayar Ravi S. Jakka Vasant Matsagar	Edited Book Volume in Springer Transactions in Civil Engg.
Earthquakes & Structures	Select Proceedings of 7th ICRAGEE	T.G. Sitharam S. Kolathayar Ravi S. Jakka	Edited Book Volume in Springer's 'Lecture Notes in Civil Engineering'
Earthquake Geotechnics	Select Proceedings of 7th ICRAGEE	T.G. Sitharam S. Kolathayar Ravi S. Jakka	Edited Book Volume in Springer's 'Lecture Notes in Civil Engineering'
MEQ Studies around	Department of Earthquake	Sharma, M.L,	EQ: 2023-03

Ratle, HE Project, Kishtwar, J & K	Engineering, IIT Roorkee	S. C. Gupta, J. Das, Dr. Arup Sen, Dr. Sanjay K. Jain Dr. A. K. Jindal	(2023)
Site Specific Earthquake Parameters for Kishau HEP, Himacha Pradesh	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L, Manish Shrikhande, J. Das, R.S. Jakka, S. C. Gupta, Saurabh Shiradhonkar	EQ: 2023-02 (2023)
"Seismological Network Around Tehri Region", Preliminary Seismological and Strong Motion Ground Bulletin (from October 2022 to December 2022)	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L., S. C. Gupta, J. P. Narayan	EQ: 2023-01 (2023)
"Seismological Network Around Tehri Region", Preliminary Seismological and Strong Motion Ground Bulletin (from July 2022 to September 2022)	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L, S. C. Gupta, J. P. Narayan	EQ: 2022-11 (2022)
"Seismological Network Around Tehri Region", Preliminary Seismological and Strong Motion Ground Bulletin (from January 2021 to December 2021)	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L, S. C. Gupta, J. P. Narayan	EQ: 2022-10 (2022)
MEQ Studies around ARUN-3, HEP, Nepal	Department of Earthquake Engineering, IIT Roorkee	Sharma, M.L., S. C. Gupta, J. Das, Dr. Arup Sen, Dr. Sanjay K. Jain Dr. A. K. Jindal	EQ: 2022-09 (2022)
MEQ Studies around Dugar, HEP, Himachal Pradesh	Department of Earthquake Engineering, IIT Roorkee	Sharma, M.L., S. C. Gupta, J. Das, Dr. Arup Sen, Dr. Sanjay K. Jain Dr. A. K. Jindal	EQ: 2022-08 (2022)
"Seismological Network Around Tehri Region", Preliminary Seismological and Strong Motion Ground Bulletin (from April 2022 to June 2022)	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L., S. C. Gupta, J. P. Narayan	EQ: 2022-07 (2022)
Site Specific Earthquake	Department of Earthquake	Sharma, M. L.,	EQ: 2022-06

Parameters for Doongri Dam, Rajasthan	Engineering, IIT Roorkee	Manish Shrikhande, J. Das, R.S. Jakka, S. C. Gupta Saurabh Shiradhonkar	(2022)
Site Specific Earthquake Parameters for Kunnu Barrage, Rajasthan	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L., Manish Shrikhande, J. Das, R.S. Jakka, S. C. Gupta Saurabh Shiradhonkar	EQ: 2022-05 (2022)
"Seismological Network Around Tehri Region", Preliminary Seismological and Strong Motion Ground Bulletin (from January 2022 to March 2022)	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L., S. C. Gupta, J. P. Narayan	EQ: 2022-03 (2022)
"Seismological Network Around Tehri Region", Preliminary Seismological and Strong Motion Ground Bulletin (from October 2021 to December 2021)	Department of Earthquake Engineering, IIT Roorkee	Sharma, M. L., S. C. Gupta, J. P. Narayan	EQ: 2022-01 (2022)

14. RESEARCH PUBLICATION

Sl. No.	Details	Total Number
a	**Conference/Symp./Seminars**	33
b	**International Conference**	23
c	**National Journals**	10
d	**International Journals**	24
e	**Book Chapters**	06

- **Conference/ Symp./ Seminars**

1. Vishal, Narayan, J.P., and Joshi, L. (2022) Effect of randomness of slip and source time function on pseudo-dynamically simulated ground motion characteristics, **17th SEE, IITR, 14-18 November, 2022**.
2. Vishal and Narayan, J.P. (2022) Quantification of Ridge-Weathering effects on the Simulated Ground Motion Characteristics across 2D and 3D Topography Models, **17th SEE, IITR, 14-18 November, 2022**.
3. Tewatia D, Kumar P.C.A. (2022). Post-installed Anchor Connection between Steel Brace and Existing RC Frame. In: **Socio-Technological Aspects of Seismic Disaster and its Mitigation (STASDM), Guwahati**.
4. Tewatia D, Kumar P.C.A. (2022). Connection Design Between Steel Brace and RC Frame Using Post-installed Anchors. In: **Proceedings of 17th Symposium on Earthquake Engineering (Vol 2). Roorkee: Springer Nature; 2022**.
5. Nambirajan, T., Abishek, G., Aggarwal, S. and Kumar, P.C.A. (2022). Effect of the high stress triaxiality on yield and ultimate tensile strength of E250 structural steel. **In Proceedings of 17th Symposium on Earthquake Engineering**.

6. Murari K., Kumar P.C.A., Shiradhonkar S. (2022). Seismic Behavior of Moment Resisting RCS Frame Systems. In: **Socio-Technological Aspects of Seismic Disaster and its Mitigation (STASDM), Guwahati**.
7. Gupta, Shivam, Dubey, R.N. (2022). "Effect of URM Infills on Seismic Behaviour of RC Frame Building: Part-1," **Proceedings of 17th Symposium on Earthquake Engineering (17SEE), IIT Roorkee, November 14-17, 2022**.
8. Patel, Kaushal P., Dubey, R.N. (2022). "Strength of Masonry Infill RC Frame Influenced by Weak and Strong Type RC Frames," **Proceedings of *17th Symposium on Earthquake Engineering* (17SEE), IIT Roorkee, November 14-17, 2022**.
9. Gupta, Shivam, Dubey, R.N. (2022). "Effect of URM Infills on Seismic Behaviour of RC Frame Building: Part-2," **Proceedings of 17th Symposium on Earthquake Engineering (17SEE), IIT Roorkee, November 14-17, 2022**.
10. Bharathi, M., Raj, D., Dubey, R.N. (2022). "Effect of Vibration induced by Dynamic Tests on an Adjacent Building – Finite Element Investigations," **Proceedings of *17th Symposium on Earthquake Engineering* (17SEE), IIT Roorkee, November 14-17, 2022**.
11. Borah, M., Sharma, M.L., Dubey, R.N. (2022). "Probabilistic Seismic Hazard Assessment for Assam, North-East India," **Proceedings of *17th Symposium on Earthquake Engineering* (17SEE), IIT Roorkee, November 14-17, 2022**.
12. Shukla, R.P., and Jakka, R.S., "Footing Resting on Clayey Slopes", Indian Geotechnical Conference IGC2022, pp. 217-227, 2022.
13. Pandey, B., Jakka, R.S., and Kumar, A., "Influence of Bedrock on Site Response", **Proceedings of the 7th Indian Young Geotechnical Engineers Conference, pp. 363-375, 2022**.
14. Padmanabhan G. and Maheshwari B.K. (2022), "Effect of Seismic Sequence on the Liquefaction Resistance of Sand using 1-g Shaking Table Experiments", **Proc. of Indian Geotechnical Conference, Kochi, Kerala, Dec. 15-17, 2022**.
15. Saraswat S. and Maheshwari B.K. (2022), "Seismic Analysis of Tunnels in Jointed Rock Mass in Himalaya", **Proc. of Indian Geotechnical Conference, Kochi, Kerala, Dec. 15-17, 2022**.
16. Firoj M. and Maheshwari B.K. (2022), "Linear Spring Constants of Soil for Pile Groups for the Nuclear Power Plants", **Proc. of 17th Symposium on Earthquake Engineering, IIT Roorkee, Nov. 14-16, 2022**.
17. Padmanabhan G. and Maheshwari B.K. (2022), "A Critical Review on Soil Reliquefaction Resistance using Physical Modelling Experiments", **Proc. of 17th Symposium on Earthquake Engineering, IIT Roorkee, Nov. 14-16, 2022**.
18. Sharma, M. L., S. C. Gupta, A. Sen, S. K. Jain, A. K. Jindal, R. K. Vishnoi, A. Jain, V. Singh and S.K. Saxena (2022). Attributes of Local Seismicity Around Tehri Dam, **ICOLD (International Commission on Large Dam)**.
19. Sharma, M. L., S. C. Gupta, J. P. Narayan, J. Das, A. Sen, S. K. Jain, A. K. Jindal, Subhash Patel, Prajawal Tandekar, Avichal Rastogi, Rajeev Visnoi, Atul Jain, Virendra Singh and S.K. Saxena (2022). Local Seismicity around Tehri Dam, Garhwal Himalaya, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
20. Rathore, Govind, P. Kumar, M. L. Sharma, Kamal, R. S. Jakka, and A. Kumar (2022). Development and Implementation of a Regional Earthquake Early Warning System in Northern India, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
21. Kumar, P., Govind Rathore, Kamal, M. L. Sharma, R. S. Jakka, Pratibha and A. Kumar (2022). Early Warning System: An Efficient Earthquake Disaster Mitigation Tool, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
22. Srivastava, M., and M. L. Sharma (2022). Assessment of Proxy-Based Vs30 Estimation in Roorkee, Uttarakhand, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee.**
23. Tyagi, A., R. R. Nath, M. L. Sharma and J. Das (2022). Seismically Induced Landslide Hazard Analyses for a Road Corridor in the Lower Himalayas, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.

24. Borah, M., M. L. Sharma and R. N. Dubey (2022). Probabilistic Seismic Hazard Assessment for Assam, North-East India, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
25. Ramhmachhuani, R., C. Lallawmawma, H. Laldintluanga, M. L. Sharma, K.S. Rao, A.K. Jain and Laldinpuia (2022). 2020 Tuipuiral Earthquake Review, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
26. Kumar, Deepak, G. Suresh, S.C. Gupta, M.L. Sharma and Hasbi Ash Shiddiqi (2022). 1D Velocity Model for NW India in and around Delhi, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
27. Lallawmawma, C., M. L. Sharma and J. Das (2022). Probabilistic Seismic Hazard Assessment of North East India, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
28. Modi. R., S. Mukhopadhyay and M. L. Sharma (2022). Three Dimensional crustal velocity structure of Tehri, Garhwal Himalaya, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
29. Mahanta, Rinku, Vipul Silwal and M.L. Sharma (2022). Body waves and Surface waves derived Moment Tensor Catalog for Garhwal-Kumaon Himalayas, **17th Symposium on Earthquake Engg., November 14-17, 2022, IIT Roorkee**.
30. Nadia Mubarak and Ritesh Kumar (2022), "Preliminary studies on developing a physics based smoothed particle hydrodynamics model for landslides", **17th Symposium on Earthquake Engineering 17 SEE 2022**
31. Nadia Mubarak and Ritesh Kumar (2022), "Applying Smoothed Particle Hydrodynamics to model landslides triggered by impulse loads a validation study to determine the optimum value of smoothing length", **National conference on landslide risk assessment and mitigation in India, Jamia Milia Islamia New Delhi**
32. Nadia Mubarak and Ritesh Kumar (2023), "Mitigating the Impact of Debris Flows on the Built Environment: A Case Study of Southern Himalayas", European Geosciences Union, 2023
33. Behavior of monopiles for offshore wind turbines in clayey soil for Gulf of Khambhat region (R. Sujawat and R. Kumar), **17th Symposium on Earthquake Engineering 17 SEE 2022**

- **International Conference**

1. Bahuguna, A., & Shanker, D. (2022), 3D Finite Element Application of Elastoplastic Constitutive Model for Intact Rock. In: Barla, M., Di Donna, A., Sterpi, D.,Insana, A. (eds.) Challenges and Innovations in Geomechanics. IACMAG 2022. Lecture Notes in Civil Engineering, vol. 288 pp52-62. Springer, Cham. https://doi.org/10.1007/978-3-031-12851-6_7
2. KARIM, Mir, SIKDER, Arif, RAHMAN, Md. Zillur, Shanker, Daya, (2022). Tectonic evolution of bengal basin: a paradigm shift of presumed blind megathrust and predicted great earthquakes, Geological Society of America (GSA); Volume 54, number 5 (https://doi.org/10.1130/abs/2022AM-381409).
3. D. Shanker and H. Paudyal (2022). Forecast of Location of Future Earthquake in South Central Tibet in Himalaya, 2. **3rd Europen Conference on Earthquake Engg. &Seismology & 38ESC, September,04-09, 2022, Bucharest, Romania**, O_2759.
4. D. Shanker and D. Kushwah (2022). On The Seismic Hazard in the Western Himalayas Using PSHA Methodology, **International workshop on Slow-to-Fast Earthquake 2022, Nara, Japan from 14-18 September, 2022**, P005.
5. Murari K., Kumar P.C.A., Shiradhonkar S. (2022). Seismic Performance Assessment of RCS System in Comparison with Steel and Reinforced Concrete Framed Structure. **2nd International Conference on Materials, Mechanics & Structures (ICMMS), Calicut**.

6. Zachariah, J.P., and Jakka, R.S., “Utilization of Bagasse Fibre and Ash—An Open Door for Sustainable Development: Review and Future Insights”, Earthquake Geotechnics: **Select Proceedings of 7th ICRAGEE 2021**, pp. 505-517, 2022.
7. Zachariah, J.P., and Jakka, R.S., “Reliable Estimation of Shear Wave Velocity Using Various VS—N Correlations”, Earthquake Geotechnics: **Select Proceedings of 7th ICRAGEE 2021**, Vol. 187, pp. 493, 2022.
8. Aswathi, T.S., and Jakka, R.S., “Parametric Study of Seismic Slope Stability of Tailings Dam”, **Conference on Performance-based Design in Earthquake**. **Geotechnical Engineering**, pp. 1914-1928, 2022.
9. Maheshwari B.K. (2022), "Seismic Behavior of Strip Footings on Slopes”, **Proc. of 20th Int. Conf. on Soil Mechanics and Geotechnical Eng., Sydney, Australia, May 1-5, 2022**.
10. Das S. and Maheshwari B.K. (2022), “Topographic Amplification of Seismic Ground Motion in Hills”, **Proc. of 4th International Conference on Performance-based Design in Earthquake Geotechnical Engineering (PBD-IV) Beijing, China, July 15-17, 2022**.
11. Padmanabhan G. and Maheshwari B.K. (2022), “Liquefaction Resistance of Solani Sand under Normal and Sequential Shaking Events”, **Proc. of 4th Int. Conference on Performance-based Design in Earthquake Geotechnical Engineering (PBD-IV) Beijing, China, July 15-17, 2022**.
12. Mayuri Borah, Ramanand Dubey, Josodhir Das (2023). Probabilistic Seismic Hazard Assessment of Assam, North-East India with the Incorporation of Topography Based VS30 Values, **EGU23 Vienna, Austria, EGU23-3077**.
13. Mudit Srivastava, Mukat Lal Sharma (2023). Comparison of Deterministic and Probabilistic framework for Vs30 estimation in data scarce region: a case study for Southern Bihar, India, **EGU23 Vienna, Austria, EGU23-4108**.
14. C. Lallawamama, Mukat Lal Sharma (2023). Scenario Seismic Risk assessment of 1934 Bihar-Nepal Earthquake, **EGU23 Vienna, Austria**, **EGU23-10932**.
15. Yaggesh Sharma, Arun Tyagi, Mukat Lal Sharma, Priyanka Sharma, Ashish Aggarwal (2023). Building Vulnerability Assessment using Artificial Intelligence for Landslide Susceptibility Zone in Champawat District, India, **EGU23 Vienna, Austria, EGU23-1957**.
16. Subhash Chandra Gupta, Mukat Lal Sharma, Sanjay Kumar Jain, Arup Sen (2023). Temporal variation of Qc and its implications in medium characterization, **EGU23 Vienna, Austria, EGU23-15028**.
17. Kumar, Pankaj, Kamal and M. L. Sharma (2022). Uttarakhand Earthquake Early Warning System: Performance and Validation, **International Conference in Taiwan**.
18. Gwalani, P., Singh, Y., and Varum, H. (2022). Seismic fragility analysis of RC dual system buildings designed for modern codes. ***Proc. 3rd European Conference On Earthquake Engineering & Seismology Bucharest,*** **Romania**.
19. Shiradhonkar S.*, Sinha R. A new strain-based member damage classification for post-earthquake visual assessment of RC frame buildings. **17th World Conference on Earthquake Engineering, 2020, Sendai, Japan.**
20. Banerjee S., Shiradhonkar S*. Estimation of Seismic Performance Parameters for RC-MR Frame Buildings of Different Occupancy Classes in Risk Framework. 9th Computational Methods in Structural Dynamics and Earthquake Engineering, 2023, Athens, Greece.
21. Krishna Murari, P.C. Ashwin Kumar, Banerjee S., Shiradhonkar S. *. Comparative Assessment of Reinforced Concrete Column-Steel Beam Frames and Steel Moment Frames, Canadian Conference - Pacific Conference on Earthquake Engineering, 2023, Vancouver, British Columbia.
22. Krishna Murari, P.C. Ashwin Kumar, Shiradhonkar S. *. Analytical investigations of seismic performance of different joint details for composite RCS frames, **EuroSteel, 2023, Amsterdam, Neatherland**

23. Physical Modeling and Reliability Assessment of Effectiveness of Granular Columns in the Nonuniform Liquefiable Ground to Mitigate the Liquefaction-induced Ground Deformation (R. Kumar, and A. Takahashi), "**Performance-based Design in Earthquake Geotechnical Engineering Beijing, China, July 2022**"

- **National Journals**

1. James Xavier Paul and **Shanker, D. (2022)**. Use of GIS for Hypsometric Analysis for Determining Erosion Proneness of Mandakini Watershed, Lesser Himalaya, Uttarakhand, North India.17th Symposium on Earthquake Engineering, Nov 14-17, 2022, Department of Earthquake Engineering, Indian Institute of Technology Roorkee.
2. Nazeel, Sabah and **Shanker D. (2022)**. Developing a comprehensive historical Tsunami database for the Indian Ocean. 17th Symposium on Earthquake Engineering, Nov 14-17, 2022, Department of Earthquake Engineering, Indian Institute of Technology Roorkee.
3. KARIM and **Shanker, D. (2022)**. Mir Understanding the structure and tectonic configuration of Bengal basin for earthquake magnitude prediction, 17th Symposium on Earthquake Engineering, Nov 14-17, 2022, Department of Earthquake Engineering, Indian Institute of Technology Roorkee.
4. Ram Krishna Tiwari, Harihar Paudyal and **D. Shanker (2022).** On the Spatio-temporal variation in b-value After 25 April 2015 Gorkha, Nepal earthquake; *Geodesy and Geodynamics* 13, pp 525-533.
5. Ashish Bahuguna and **D. Shanker (2022).** Simulation of Intra-Plate Stress Distribution of Indian Tectonic Plate using Finite Element Method, *Pure and Applied Geophysics 179 (1), 125-148.*
6. Desai, A. and Jakka, R.S.*, "Role of A-priori Information in Minimizing Uncertainties in MASW Testing", IGT Journal (Springer), 52(5):1182-1196(2022).
7. Maheshwari B.K. and Sangeeta (2022), "Earthquake-Induced Permanent Displacements of Landslides in Himalaya using Simplified Methods and Nonlinear FE Dynamic Analysis", Indian Geotechnical Journal. https://doi.org/10.1007/s40098-022-00634-y
8. Shiradhonkar, Saurabh R., and Ravi Sinha. "Seismic damage classification for axially-loaded well-detailed reinforced concrete frame members based on compressive strain." Bulletin of Earthquake Engineering (2023): 1-24.
9. Probabilistic Estimation of Earthquake Source Location and Magnitude Using Inverse Analysis of Regional Paleoliquefaction Studies (A. Kanth, N. Bishoyi, and R. Kumar*). Natural hazards.
10. Design of PY curves for monopile under extreme operational conditions in the region of Gujarat considering the uncertainty of ground (R. Sujawat and R. Kumar*). Georisk.

- **International Journals**

1. Lav Joshi and J.P. Narayan (2022) Quantification of the Effects of an Urban Layer on Rayleigh Wave Characteristics and Development of a Meta-City, **Pure & Applied Geophysics**, 179(13), 3253–3277.
2. Patel, Kaushal P., Dubey, R.N. (2022). Effect of Flanges on the In-plane Behavior of the Masonry Walls, *Engineering Structures*, 273, **Elsevier, UK**.
3. Bharathi, M., Dubey, R. N. and Shukla, S.K. (2022). Numerical Simulation of Batter Piles and Pile Groups, *Bulletin of Earthquake Engineering*, 20, pp. 3239-3263, **Springer**
4. Bharathi, M., Dubey, R. N. and Shukla, S.K. (2022). Dynamic Response of Underreamed Batter Piles Subjected to Vertical Vibrations, **International Journal of Geotechnical Engineering**, 16:8, pp. 991-999, Taylor and Francis
5. Bharathi, M., Dubey, R. N. and Shukla, S.K. (2022). Behaviour of Batter Piles under Machine Induced Vibrations, *Prof. D.K. Paul Commemorative Book Volume,* **Springer**
6. Naveen Kumar Kothapalli, R Siva Chidambaram, Pankaj Agarwal (2022). Experimental Evaluation of Steel Bracings and Metallic Yield Damper as Retrofit Techniques for Severely

Damaged RC Building Frames, **Journal of Earthquake Engineering**, DOI: 10.1080/13632469.2022.2141373

7. NS Pachappoyil, P Agarwal (2023). Out-of-plane Performance Evaluation of Energy-Dissipating Hysteretic Infill Wall System under Cyclic Loading, **Earthquake Spectra,** Volume 39, Issue 1; 77-99; 2023.
8. Rajput, S.S., Jakka, R. S.*, and Sinvhal, A., "A Spatiotemporal Risk Scenario for a Predictive Earthquake in Western Himalaya", **Journal of Earthquake Engineering (Taylor & Francis)** , 27(3), 736-768, (2023).
9. Kumar, P., Kamal, Sharma, M.L., Jakka, R.S. et al., "Successful Alert Issuance with Sufficient Lead Time by Uttarakhand State Earthquake Early Warning System: Case Study of Nepal Earthquakes**", J Geol Soc India** 99, 303–310 (2023).
10. Rathore, G., Kamal, Kumar, A., Jakka, R.S., and Sharma, M.L. "Design and Implementation of Earthquake Early Warning Dissemination Mobile App for Uttarakhand (India)", **J Seismology**, 27, 203–217 (2023).
11. Pandey, B., and Jakka, R.S.*, "Selection of an Appropriate Bedrock for Site Amplification Studies", **Natural Hazards (Springer),** 112, 2167–2195 (2022).
12. Shukla, R.P. and Jakka, R.S.*, "Bearing Capacity and Failure Mechanism of Skirted Footings", **Geomechanics and Engineering (Techno-Press),** 30(1):51-66 (2022).
13. Sangeeta and Maheshwari B.K. (2022), "Landslide Susceptibility, Social Vulnerability and Risk Assessment in Kumaun Himalaya, Uttarakhand, India", **Arabian Journal of Geosciences**, 15:1600, https://doi.org/10.1007/s12517-022-10869-x
14. Firoj M. and Maheshwari B.K. (2022), "Effect of CPRF on Nonlinear Seismic Response of an NPP Structure considering Raft-Pile-Soil-Structure-Interaction", **Soil Dynamics and Earthquake Engineering**, https://doi.org/10.1016/j.soildyn.2022.107295
15. Sangeeta and Maheshwari B.K. (2022), "Spatial Predictive Modeling of Rainfall- and Earthquake-Induced Landslide Susceptibility in the Himalaya Region of Uttarakhand, India", **Environmental Earth Sciences**, 81(237), pp. 1-24.
16. Muley P., Maheshwari B.K. and Kirar B. (2022), "Liquefaction Potential of Sites in Roorkee Region Using SPT-Based Methods", **International J. of Geosynthetics and Ground Eng**. https://doi.org/10.1007/s40891-022-00374-2
17. Gwalani, Payal, Singh, Y. & Varum, Humberto (2023). "Seismic vulnerability of reinforced concrete buildings with discontinuity in columns. ***Earthquake Engng Struct Dyn***. 2023; 52: 204–225. DOI: 10.1002/eqe.3757
18. Kedia, N. K., Kumar, A., & Singh, Y. (2022). Development of Empirical Relations to Predict Ground Vibrations due to Underground Metro Trains. **KSCE Journal of Civil Engineering**. DOI: 10.1007/s12205-022-0529-z
19. Kedia, N. K., Kumar, A., & Singh, Y. (2022). Assessment of Dynamic Behaviour and Performance of Existing Composite Railway Bridges Under the Impact of a High-Speed LHB Train Using a Coupled Approach. **Journal of Vibration Engineering & Technologies**. DOI: 10.1007/s42417-022-00761-z
20. Amit Kumar, Dominik. H. Lang, Hasibullah Ziar & Yogendra Singh (2022) Seismic Vulnerability Assessment of Non-Structural Components - Methodology, Implementation Approach and Impact Assessment in South and Central Asia, **Journal of Earthquake Engineering**, 26:3, 1300-1324, DOI: 10.1080/13632469.2020.1713930
21. Padalu, P.K.V.R., Singh, Y., (2022) Seismic safety evaluation methodology for masonry building and retrofitting using splint and bandage technique with wire mesh," **Front. Struct. Civ. Eng**., https://doi.org/10.1007/s11709-022-0817-1
22. Gwalani, Payal, Singh, Y. & Varum, Humberto (2022). "Effect of Proportioning of Lateral Stiffness in Orthogonal Directions on Seismic Performance of RC Buildings," ***Journal of Earthquake Engineering***, Vol. 26, No. 14, 7568–7586, DOI: 10.1080/13632469.2021.1964649.

23. Probabilistic Estimation of Earthquake Source Location and Magnitude Using Inverse Analysis of Regional Paleoliquefaction Studies (A. Kanth, N. Bishoyi, and R. Kumar*). **Natural hazards**.
24. Design of PY curves for monopile under extreme operational conditions in the region of Gujarat considering the uncertainty of ground (R. Sujawat and R. Kumar*). **Georisk**.

Book Chapters (6)

1. Maheshwari B.K. and Firoj M., "Applications of DSC and HISS soil models in Nonlinear Finite Element Dynamic Analyses of Soil-Structure Interaction Problems" accepted for publication in the book: DSC/HISS Modeling Application to Problems in Mechanics, Geomechanics and Structural Mechanics, Editors: Chandrakant Desai, Yang Xiao, Musharraf Zaman and John Carter, Publisher: CRC Press
2. Reddy, G., & Shrikhande, M. (2022). Effects of frequency content of ground motions on seismic response of concrete gravity dams with varying reservoir levels. In Current Perspectives and New Directions in Mechanics, Modelling and Design of Structural Systems (pp. 240-245). CRC Press.
3. Ritu Raj Nath, Mukat Lal Sharma, Naveen Pareek, Shilpa Pal, Shweta Bajaj, Neha Kumari (2023), Earthquake Induced Landslide Hazard Evaluation for Seismic Microzonation: A Case Study of the Garhwal Himalayas, Earthquake Engineering and Disaster Mitigation: Contributions in the Honour of Late Professor DK Paul, Springer Nature Singapore, 59-83.
4. Neetu Goswami, SC Gupta, Ashwani Kumar, M. L. Sharma (2022). Source and Path Characteristics of Chamoli Region, India, Advances in Geophysics, Tectonics and Petroleum Geosciences: Proceedings of the 2nd Springer Conference of the Arabian Journal of Geosciences (CAJG-2), Tunisia 2019, Springer International Publishing, 187-190.
5. Ritu Raj Nath, Shilpa Pal and M. L. Sharma (2022). Use of Probabilistically Generated Scenario Earthquakes in Landslide Hazard Zonation: A Semi-Qualitative Approach, 247-274.
6. Efficacy of a hybrid foundation to mitigate liquefaction-induced effects under strong sequential ground motions (R. Kumar* and A. Takahashi). "Springer: Earthquake Engineering and Disaster Mitigation: Contributions in Honour of Prof. DK Paul ".