

Himachal Pradesh University
(NAAC Accredited “A” Grade University)
Summerhill, Shimla-171005,
Himachal Pradesh, India

Plan, Scheme, and Course Work Syllabus

Doctor of
Philosophy (Ph.D.)

in

Disaster Risk Reduction and
Resilience

under the

Faculty of Engineering & Technology

(Himalayan Centre for Disaster Risk Reduction and Resilience)

(Effective for batch 2026-2027 and onwards)



Himalayan Centre for Disaster Risk Reduction and Resilience
Himachal Pradesh University
Summerhill, Shimla-171005

Vision of University:

The vision of the University is to promote and advance knowledge, wisdom, and understanding through teaching, research, and its academic and institutional activities.

Mission of University:

To work towards its vision, the University is committed to its mission to:

1. Promoting learning and knowledge through teaching, research, and extension activities.
2. Providing leadership in various fields of life.
3. Promote in the students and teachers an awareness and understanding of the social needs of the country and prepare them for fulfilling such needs.
4. Promoting interdisciplinary studies at the University.
5. Foster the composite culture of India and establish such departments or institutions as may be required for the study and development of the languages, arts and culture of India.
6. Make such provision for integrated courses in Humanities, Sciences and Technology in the educational programs of the University.

Vision of Centre:

To become a premier center of excellence in the Himalayan region for disaster risk reduction, climate resilience, sustainable development, and capacity building through interdisciplinary research, innovation, education, and community engagement, thereby contributing to safer, resilient, and disaster-prepared societies.

Mission of Centre:

1. To strengthen disaster resilience through training, awareness programs, and capacity-building initiatives for students, professionals, policymakers, and local communities.
2. To conduct cutting-edge research on natural and human-induced hazards affecting the Himalayan region, including landslides, earthquakes, cloudbursts, floods, avalanches, and climate change impacts.
3. To develop innovative technologies, decision-support systems, and risk assessment frameworks for disaster prevention, preparedness, mitigation, response, and recovery.
4. To promote the use of geospatial technologies, artificial intelligence, remote sensing, and data analytics for disaster monitoring and early warning systems.

5. To support evidence-based policymaking and contribute to national and regional disaster risk reduction strategies.
6. To encourage sustainable and resilient infrastructure development in ecologically sensitive Himalayan environments.

Programme Vision:

To develop competent professionals, researchers, capable of addressing disaster risks, enhancing resilience, and promoting sustainable development in the Himalayan region and beyond through innovation, scientific knowledge, and community engagement.

Programme Mission:

1. To impart interdisciplinary education and training in disaster risk reduction, resilience, climate change adaptation, and emergency management.
2. To equip students with technical, analytical, and decision-making skills for assessing and managing disaster risks.
3. To promote research, innovation, and application of emerging technologies for disaster preparedness, mitigation, response, and recovery.
4. To strengthen collaboration with government agencies, industries, research institutions, and communities for effective disaster management practices.
5. To foster leadership, ethical responsibility, and community-oriented approaches for building resilient societies.
6. To support sustainable development and disaster-resilient infrastructure in vulnerable mountain and urban ecosystems.
7. To encourage evidence-based policymaking and capacity building through outreach, training, and knowledge dissemination.

**Programme Outcomes (POs) for Ph.D. under the Faculty of Engineering & Technology
(Himalayan Centre for Disaster Risk Reduction and Resilience)**

- PO1: Develop advanced knowledge in disaster risk reduction, hazard assessment, climate resilience, and sustainable recovery.
- PO2: Apply modern research tools such as GIS, Remote Sensing, AI/ML, statistical analysis, and modeling for disaster prediction and resilience planning.
- PO3: Promote community-based disaster preparedness, indigenous knowledge integration, and livelihood resilience.
- PO4: Support implementation of the Sendai Framework, SDGs, climate adaptation, and resilient infrastructure development.

PO5: Integrate interdisciplinary approaches and contribute to academia, government, industry, and international organizations through research, consultancy, and community engagement.

General Instructions/Guidelines for Execution of Curriculum

1. All candidates admitted to the Ph.D. programme under the Faculty of Engineering & Technology (Himalayan Centre for Disaster Risk Reduction and Resilience) must complete a minimum of 12 credits.
2. There will be three courses in Ph.D. Programme. The students must take 2 compulsory courses [RPE-PhD and CDR-PhD-RM-101] and at least one additional course out of elective courses [CDR-PhD-102(i-vii)].
3. The detailed syllabi for the courses offered by the Department are appended with a list of suggested readings.

Academic Regulations:

These regulations are framed under the Ordinances of Himachal Pradesh University and are fully aligned with the University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022 or as revised from time to time. They apply to all candidates admitted to the Ph.D. programme under the Faculty of Engineering & Technology offered by the Himalayan Centre for Disaster Risk Reduction and Resilience, HPU.

1. Eligibility and Admission

- 1.1 The Centre will admit the Ph.D. candidate from interdisciplinary field of Engineering and Technology, Architecture, Social Sciences, Environmental Sciences, Physical Sciences, Management.
- 1.2 A candidate must hold a Master's degree (M.Sc. / M.Tech. / M.E. / M.Arch. / M.A. / Int. M.Sc. (5 years integrated)) in all relevant field of Civil / Environmental / Geotechnical / Structural / Water Resources Engineering / Remote Sensing & GIS / Geology / Applied Geology / Geography / Environmental Science / Disaster Management / Climate Science / Earth Sciences / Urban and Regional Planning / Computer Science and Data Analytics, M.Planning or equivalent, or M.C.A. or M.B.A. (with a Bachelor's in Engineering and Technology or Sciences with Mathematics as a subject at least in one semester), Masters in Social Work and other allied/equivalent disciplines from a recognized university, with minimum marks/grades as prescribed by HPU & UGC time to time.

- 1.3 Admission shall be based on the University's notified process involving an entrance test (where applicable), research proposal/statement of purpose, and interview.
- 1.4 Reservation policy, fee structure, and documentation requirements shall follow HPU rules.

2. Registration and Allocation of Supervisor

- 2.1 After admission, candidates shall be registered as per university ordinances.
- 2.2 Supervisors shall be allotted as per HPU norms, considering eligibility, research specialization, and permissible limits of Ph.D scholars to the research supervisor.
- 2.3 Co-supervisors (internal or external) may be appointed as per university guidelines.

3. Duration of the Programme

- 3.1 Minimum period: Three years, including coursework.
- 3.2 Maximum period: As prescribed by HPU/UGC, with extensions allowed only under approved conditions.
- 3.3 Any break, leave or extension must comply with university rules.

4. Ph.D. Course work Requirements

- 4.1 All candidates must complete **a minimum of 12 credits.**
- 4.2 The course work shall consist of:
 - **Research and Publication Ethics (RPE-PhD): 2 Credits**
 - **Research Methodology (CDR-PhD-RM-101): 5 Credits**
 - **At least one elective from the approved list [CDR-PhD-102(i-vii)]: 5 Credits. Coursework must normally be completed within the first semester of registration.**
- 4.3 Evaluation, passing, and completion of coursework shall be as per the applicable Himachal Pradesh University (HPU) norms and regulations.

5. Attendance and Academic Performance

- 5.1 Candidates must meet the attendance requirements stipulated by the Department/University for all coursework, seminars, and research meetings.
- 5.2 Poor performance or non-participation may result in probation or cancellation of registration based on evaluation by the Research Degree Committee (RDC).

6. Research Progress Monitoring

- 6.1 Research progress shall be reviewed periodically by the Research Degree Committee (RDC), with progress reports submitted to the RDC as per HPU norms.
- 6.2 A **pre-synopsis seminar** must be conducted before submission of the synopsis.
- 6.3 Continuation of registration each year depends on satisfactory progress.

7. Research Publication Requirement

The candidate shall fulfil the publication requirements as per applicable HPU norms and regulations.

8. Ethics, Plagiarism and Research Integrity

- 8.1 All research must comply with ethical standards applicable to the relevant research area, field studies, and data handling.
- 8.2 The thesis, synopsis, and related submissions must undergo plagiarism checking as per HPU/UGC/INFLIBNET similarity thresholds.
- 8.3 Submissions exceeding the permissible similarity limit shall be returned for revision.

9. Synopsis Submission

- 9.1 Synopsis may be submitted only after completion of coursework and fulfilment of all progress requirements.
- 9.2 Supervisor recommendation and Research Degree Committee (RDC) approval are mandatory before submission to the University.

10. Thesis Submission, Evaluation and Viva-Voce

- 10.1 The Ph.D. thesis must be prepared in the prescribed format and submitted both in hard copy and electronic form as required by HPU.
- 10.2 The thesis shall be evaluated by at least two external examiners appointed as per HPU norms.
- 10.3 A candidate may appear in the open viva-voce only after receiving favourable reports from examiners.
- 10.4 Decisions on acceptance, corrections, or rejection shall follow University procedures.

11. Corrections and Resubmission

- 11.1 Candidates must complete examiner-recommended corrections within the

specified time frame.

11.2 Resubmission and re-evaluation rules shall follow HPU ordinances.

12. Award of Degree

12.1 The Ph.D. degree shall be awarded upon:

- successful completion of coursework
- satisfactory progress reviews
- fulfilment of applicable publication requirements, if any, as per HPU guidelines
- acceptance of thesis
- successful viva-voce defence
- completion of all University formalities

12.2 An e-copy of the thesis must be deposited in INFLIBNET/Shodhganga as per national requirements.

13. Leave, Suspension and Cancellation

13.1 Leave rules (casual, medical, maternity/paternity) follow HPU rules.

13.2 Unauthorized absence or prolonged non-performance may lead to suspension or cancellation of registration.

14. Joint, Collaborative or Sandwich Ph.D. Provisions

14.1 Any collaborative, interdepartmental, inter-university, or industry-linked component must receive prior approval from the University.

14.2 All such arrangements must comply with UGC and HPU norms.

15. Part Time Admissions

As per applicable HPU norms

Outline of the Course Work for Ph.D. in Disaster Risk Reduction & Resilience

Code	Title of Paper	Max Marks	Credits
RPE-PhD	Research and Publication Ethics	50	2
CDR-PhD-RM-101	Research Methodology	100	5
Discipline-Specific Elective Subject, i.e., CDR-PhD-102(i-vii)		100	5
CDR-PhD-102(i)	Disaster Risk Reduction and Resilience		
CDR-PhD-102(ii)	Disaster Governance, Policy and Institutional Frameworks		
CDR-PhD-102(iii)	Geoinformatics in Disaster Management		
CDR-PhD-102(iv)	Hazard Vulnerability and Risk Assessment		
CDR-PhD-102(v)	Advanced Disaster Response and Recovery		
CDR-PhD-102(vi)	Climate Change and Disaster Risk		
CDR-PhD-102(vii)	Landslide Analysis and Control		
Total Marks/Credits		250	12

Name of the Course		Research and Publication Ethics	
Course Code: RPE-PhD		Credits-2, MM: 50	L-2, T-0, P-0
Course Objectives - Promote the importance of research integrity. - Discuss the principles of publication ethics. - Educate on identifying research misconduct and predatory publishing. - Discuss indexing and citation databases. - Provide information on open-access publications and research metrics. - Introduce various plagiarism detection tools.			
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (50 marks). 1. Students who have at least 75% attendance in classes will be considered eligible for the final written examination. 2. The exam will be conducted for a three-hour duration Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).			
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.</i>			
Units	Syllabus		
Unit 1	1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions		
Unit 2	1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data		
Unit 3	1. Publication ethics: definition, introduction, and importance 2. Best practices/standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributor ship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals		
Unit 4	1. Open-access publications and initiatives 2. SHERPA/ROMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal, etc.		

Unit 5	A. Group Discussions 1. Subject-specific ethical issues, FFP, authorship 2. Conflicts of interest 3. Complaints and appeals: examples and fraud from India and abroad B. Software tools Use of plagiarism software like Turnitin, Urkund, and other open-source software tools
Unit 6	A. Databases 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. B. Research Metrics 1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics
Course Outcomes (COs) At the end of the course, students will be able to: CO1: Demonstrate conceptual understanding of philosophy of science, ethical reasoning, and research integrity, and relate these principles to responsible scientific practice. CO2: Evaluate various forms of research and publication misconduct, including FFP, redundant publishing, authorship issues, conflict of interest, and selective reporting. CO3: Apply ethical guidelines, open-access principles, journal evaluation tools, and plagiarism-detection software to ensure high-quality, ethical, and compliant research publication.	
Suggested Readings: • Beall, J. (2012). Predatory publishers are corrupting open access. Nature, Vol. 489(7415), 179. https://doi.org/10.1038/489179a. • Bird, A. (2006). Philosophy of Science. Routledge. • Bretag, Tracey (2016). The Handbook of Academic Integrity. Springer. • Chaddah, P. (2018). Ethics in Competitive Research: Do not get scooped; do not get Plagiarized. ISBN:978-9387480865. • Grudniewicz, Agnes, D. Moher, Kelly D. Cobey+32 authors (2019). Predatory journals: no definition, no defense. Nature, Vol. 576. • Indian National Science Academy (2019). Ethics in Science Education, Research and Governance (2019). ISBN:978-81-939482-1- 7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf • Israel, Mark, Iain Hay (2006). Research Ethics for Social Scientists. London. • Lang, James M. (2013). Cheating Lessons: Learning from Academic Dishonesty. Harvard University Press. • MacIntyre, Alasdair (1967). A Short History of Ethics. London. • National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). On Being a Scientist: A Guide to Responsible Conduct in Research. Third Edition. National Academies Press. • Resnik, D. B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm • Whitley Jr., Bernard E. & Patricia Keith-Spiegel (2001). Academic Dishonesty: An Educator's Guide. Psychology Press.	

Name of the Course	Research Methodology	
Course Code: CDR-PhD-RM-101	Credits-5, MM-100	L-5, T-0, P-0
Course Objectives - To equip researchers with fundamental concepts of research design, problem formulation, hypothesis development, and literature review. - To develop competence in experimental design, analytical tools, research instrumentation, scientific writing, and proposal development.		
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). - Students who have at least 75% attendance in classes will be considered eligible for the final written examination. - The exam will be conducted for a three-hour duration Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).		
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.</i>		
Units	Syllabus	
Unit 1	Foundations of Research: Meaning, objectives of research; criteria of good research; basic steps of research; types of research. Problem Identification & Formulation: selection of research problem. Hypothesis: Qualities of a good Hypothesis, Null & Alternative Hypothesis, Hypothesis Testing, Logic & Importance Review of related literature: Meaning, necessity and sources.	
Unit 2	Research Process and Experiment Design: Concept and Importance in Research, features of a good research design. Exploratory Research Design concept, types and uses, Descriptive Research Designs concept, types and uses, Concept of Independent & Dependent variables. Research Report: Writing preliminaries, main body of research, references and bibliography, technical writing.	
Unit 3	Research and Development of Projects: Project formulation, National and international funding agencies for R & D projects, proposal submission. Sources and methods of data collection- Primary and secondary data sources, field survey, questionnaire design, Participatory rural Appraisal (PRA), Community based disaster assessment, Government and institutional dataset: IMD, NDMA, ISRO, Geological survey dataset, Census data.	
Unit 4	Search engines: NCBI, PubMed, Google Scholar, Thomson Reuters, SCI etc, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office.	
Unit 5	Writing Innovation: Introduction to Intellectual Property Rights (IPR), Basic forms of IPRs: — Patent, Copyright, Trademark, Designs, Process patent versus product patent, Art of writing a	

	patent/innovation and claims, Preliminary patent. Intellectual Property, Patent Database Search and Patent.
Course Outcomes (COs) At the end of the course students will be able to: CO1: Identify appropriate research designs, sampling methods, data collection approaches, and analytical techniques for scientific investigations. CO2: Apply core principles of research methodology to design, conduct, document, and communicate high-quality research work. CO3: Develop research and development project proposals and apply appropriate scientific paper-writing and reporting methods.	
Suggested Readings: • Effective Writing for Engineers, Managers, Scientists: Tichy AJIO. • Scientific and Technical papers: Tribcase SF. • How to write and publish a scientific paper: Day RA • Kothari, C. R. (2004). Research Methodology- Methods and Technique (New Age International, New Delhi).	

Name of the Course	Disaster Risk Reduction and Resilience	
Course Code: CDR-PhD-102(i)	Credits-5, MM-100	L-5, T-0, P-0
Course Objectives This course provides an interdisciplinary foundation in Disaster Risk Reduction and Resilience for Ph.D. scholars. The course is structured to avoid overlap among units by separately covering conceptual foundations, governance frameworks, risk assessment methods, engineering and geological mitigation approaches, and emerging technologies with field-based applications.		
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). 1. Students who have at least 75% attendance in classes will be considered eligible for the final written examination. 2. The exam will be conducted for a three-hour duration Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).		
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.</i>		
Units	Syllabus	
Unit 1	Meaning and significance of disaster, disaster risk reduction and resilience; basic terminology: hazard, vulnerability, exposure, capacity, risk, disaster and resilience; classification of disasters: natural, human-induced and technological; evolution from relief-centric disaster management to disaster risk reduction; disaster management cycle; culture of safety, prevention, preparedness and recovery.	
Unit 2	National disaster management framework; Disaster Management Act and related national/state policies and plans; roles of NDMA, NIDM, SDMA, DDMA, NDRF, police, civil administration, PRIs, ULBs and community institutions; role of scientific and technical agencies; international frameworks including Sendai Framework, Sustainable Development Goals and Paris Agreement; institutional coordination and emergency response governance.	
Unit 3	Elements at risk; physical, social, economic, environmental, institutional and infrastructural vulnerability; risk perception, acceptable risk and residual risk; qualitative, semi-quantitative and quantitative risk assessment; hazard, vulnerability and exposure mapping; use of field data, GIS and remote sensing for risk assessment; participatory risk assessment; interpretation of risk assessment outputs for planning.	
Unit 4	Engineering and geological aspects of landslides, earthquakes, floods, GLOFs, rockfall, debris flow, avalanches and slope instability; geological and geomorphological controls on hazards; infrastructure vulnerability in hilly, mountainous, urban and hazard-prone regions; slope stability, drainage control, retaining systems, rockfall protection, flood protection, seismic safety and hazard-resistant infrastructure design.	

Unit 5	Applications of artificial intelligence, machine learning, drones, sensors, Internet of Things and early warning systems in DRR; digital decision-support systems and disaster databases; post-disaster damage assessment and needs assessment; Build Back Better and resilience planning; field visits, field reconnaissance, site observations, community interaction, field documentation and preparation of technical field reports.
Course Outcomes (COs) At the end of the course students will be able to: CO1: Understand the conceptual foundations, terminology and evolution of disaster risk reduction and resilience. CO2: Explain national and international disaster governance, policy and institutional frameworks. CO3: Apply hazard, vulnerability, exposure and risk assessment methods for disaster risk analysis. CO4: Understand engineering and geological approaches for disaster risk mitigation and infrastructure resilience. CO5: Use emerging technologies, AI-based tools and field reconnaissance methods for resilience planning and disaster risk reduction.	
Suggested Readings: • Natural Disasters by Alexander D., 2018; Routledge. • Geological Hazards and Hydro-meteorological Hazards” www.nidm.gov.in • Natural Hazard & Disaster Management Vulnerability and mitigation by R.B. Singh 2012 Rawat Publication. • An introduction to Disaster Management by S. Vaidyanathan. • Earthquake and Natural Disasters; Manik Kar, Motilal Bonarsidass Publisher Private limited. • Sphere Handbook for humanitarian response standards. Link: https://spherestandards.org/handbook/ • Health emergency and disaster risk management framework (Health EDRM), WHO. Link: https://www.who.int/publications/i/item/9789241516181 • NDMA Awareness Booklets: https://ndma.gov.in/Resources/booklets Official illustrated booklets on various disaster types.	

Name of the Course	Disaster Governance, Policy and Institutional Frameworks	
Course Code: CDR-PhD-102(ii)	Credits-5, MM-100	L-5, T-0, P-0
Course Objectives This course provides an interdisciplinary foundation in disaster governance, policy formulation, and institutional mechanisms for effective disaster risk reduction and management. The course is structured to develop an understanding of national and international disaster management frameworks, legal provisions, policy approaches, administrative structures, and the role of government, non-governmental organizations, community institutions, and international agencies.		
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). 1. Students who have at least 75% attendance in classes will be considered eligible for the final written examination. 2. The exam will be conducted for a three-hour duration. Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).		
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100. .</i>		
Units	Syllabus	
Unit 1	Foundations of Disaster Governance and Risk Management Concepts and principles of disaster governance; hazard, vulnerability, risk and resilience; disaster risk reduction (DRR) and disaster risk management (DRM); disaster management cycle; governance approaches and institutional structures; role of policy, planning and ethics in disaster governance; resilience-based and multi-hazard approaches; integration of disaster risk management with sustainable development and climate adaptation.	
Unit 2	International Frameworks, Policies and Legal Instruments Global disaster governance systems; international disaster laws and humanitarian principles; role of United Nations agencies and international organizations; Sendai Framework for Disaster Risk Reduction 2015–2030, Hyogo Framework for Action 2005–2015, Paris Agreement and Sustainable Development Goals; transboundary disaster cooperation; global best practices and policy implementation mechanisms.	
Unit 3	National and State-Level Disaster Management Systems National and state disaster management frameworks; disaster management legislation and institutional mechanisms; disaster management authorities and emergency operation systems; policy integration with development planning; urban and regional disaster governance; disaster financing, insurance and risk transfer mechanisms; coordination among government agencies, local bodies and stakeholders; governance challenges in mountainous, urban and hazard-prone regions.	

Unit 4	Community-Based Governance, Capacity Building and Inclusive Policies Community-based disaster risk management (CBDRM); participatory governance and local institutional mechanisms; role of Panchayati Raj Institutions, NGOs and civil society; gender-sensitive and inclusive disaster policies; indigenous knowledge and local adaptation practices; disaster education, training and awareness; communication strategies and social resilience; capacity building for preparedness, response and recovery.
Unit 5	Emerging Challenges, Technology and Policy Innovations in Disaster Governance Climate change and disaster governance; governance of cascading and compound hazards; GIS, remote sensing, AI, IoT and big data applications in disaster management; smart governance and early warning systems; post-disaster recovery and “Build Back Better” strategies; policy monitoring and evaluation; disaster diplomacy, regional cooperation and future trends in disaster governance and resilience planning.
Course Outcomes (COs) At the end of the course, students will be able to: CO1: Understand the concepts, principles, and evolution of disaster governance and disaster risk reduction policies. CO2: Explain national and international disaster management frameworks, including legal, policy, and institutional arrangements. CO3: Analyze the roles and responsibilities of government agencies, local bodies, NGOs, community organizations, and international institutions in disaster management. CO4: Evaluate disaster management policies, plans, and governance mechanisms for preparedness, response, recovery, and mitigation. CO5: Apply governance and policy-based approaches to strengthen institutional coordination, accountability, resilience planning, and disaster risk reduction.	
Suggested Readings: 1. Natural Disasters by Alexander D., 2018; Routledge. 2. Introduction to International Disaster Management by Damon P. Coppola, Elsevier. 3. Disaster Management Act, 2005, Government of India. Link: https://ndma.gov.in 4. National Disaster Management Plan, NDMA, Government of India. Link: https://ndma.gov.in 5. Sendai Framework for Disaster Risk Reduction 2015–2030, UNDRR. Link: https://www.undrr.org 6. Disaster Risk Reduction in India: Status Report, UNDRR / Government of India. 7. Sphere Handbook for humanitarian response standards. Link: https://spherestandards.org/handbook/ 8. Health Emergency and Disaster Risk Management Framework, WHO. Link: https://www.who.int/publications/i/item/9789241516181 9. NDMA Awareness Booklets on various disaster types. Link: https://ndma.gov.in/Resources/booklets 10. NIDM training modules and publications on disaster governance, policy and institutional mechanisms. Link: https://nidm.gov.in	

Name of the Course		Geoinformatics in Disaster Management	
Course Code: CDR-PhD-102(iii)		Credits-5, MM-100	L-5, T-0, P-0
Course Objectives This course provides an interdisciplinary foundation in applying geoinformatics to disaster management. The course is structured to develop an understanding of remote sensing, Geographic Information Systems (GIS), Global Navigation Satellite Systems (GNSS), and spatial data analysis for disaster risk assessment, hazard mapping, vulnerability analysis, preparedness, response, recovery, and mitigation. It emphasizes using geospatial technologies for monitoring natural and human-induced disasters, decision-making, early warning systems, and field-based applications in disaster risk reduction and resilience planning.			
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). - Students who have at least 75% attendance in classes will be considered eligible for the final written examination. - The exam will be conducted for a three-hour duration. Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).			
Note for Paper Setting The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.			
Units	Syllabus		
Unit 1	Basics of Remote Sensing, development, definition, concept and principles of remote sensing; electromagnetic radiation and its characteristics; wavelength regions and significance; interaction of EMR with atmosphere and earth's surface; atmospheric windows; spectral, spatial, temporal and radiometric resolutions; concept of satellite, sensor and orbit; image interpretation and digital image processing.		
Unit 2	Data Acquisition, Platforms such as balloon, rocket, helicopter, aircraft and spacecraft; aerial versus satellite remote sensing; satellites and their specifications; sensors and their characteristics; open data sources.		
Unit 3	Basic Concepts of GIS: definition, philosophy and evolution; spatial versus non-spatial data; raster and vector data models; data structures and file formats; topology; DBMS in GIS; data input and projections; geometric transformation of raster and vector data.		
Unit 4	Satellite Positioning System – An Overview, Introduction to GNSS; global and regional satellite constellations; GPS signals and basic concepts; pseudo range and phase difference measurement; sources of GNSS errors; datum/ellipsoid; global versus Indian geodetic datum; coordinate systems; transformation of coordinates; GNSS remote sensing.		
Unit 5	Applications of GIS and RS in DRR, Hazard evaluation and zonation; risk and vulnerability assessment; damage assessment; land-use planning and regulation for sustainable development; applications in hydrological, environmental and health risk management; case studies.		

Course Outcomes (COs)

At the end of the course, students will be able to:

CO1: Understand the concepts, principles, and scope of geoinformatics in disaster management.

CO2: Explain the role of Remote Sensing, GIS, GNSS, and spatial data in disaster risk assessment and management.

CO3: Apply geospatial techniques for hazard mapping, vulnerability assessment, exposure analysis, and disaster risk zonation.

CO4: Analyze satellite imagery, spatial datasets, and GIS-based models for disaster preparedness, response, recovery, and mitigation planning.

CO5: Use geoinformatics tools, field data, and emerging technologies for early warning, decision-making, resilience planning, and disaster risk reduction.

Suggested Readings:

1. Remote Sensing and Image Interpretation by Lillesand T.M., Kiefer R.W. and Chipman J.W.; Wiley.
2. Geographic Information Systems and Science by Longley P.A., Goodchild M.F., Maguire D.J. and Rhind D.W.; Wiley.
3. Principles of Geographical Information Systems by Burrough P.A., McDonnell R.A. and Lloyd C.D.; Oxford University Press.
4. Remote Sensing of the Environment: An Earth Resource Perspective by Jensen J.R.; Pearson.
5. Remote Sensing and GIS by Bhatta B.; Oxford University Press.
6. Geoinformatics for Disaster Management by NIDM / related training modules. Link: <https://nidm.gov.in>
7. UN-SPIDER Knowledge Portal for space-based information for disaster management. Link: <https://www.un-spider.org>
8. ISRO-Bhuvan Geoportal for satellite-based geospatial data and disaster-related applications. Link: <https://bhuvan.nrsc.gov.in>
9. Copernicus Emergency Management Service for disaster mapping and early warning applications. Link: <https://emergency.copernicus.eu>
10. NDMA guidelines and reports on hazard mapping, risk assessment and disaster management. Link: <https://ndma.gov.in>

Name of the Course	Hazard Vulnerability and Risk Assessment	
Course Code: CDR-PhD-102(iv)	Credits-5, MM-100	L-5, T-0, P-0
Course Objectives 1. Develop a comprehensive understanding of risk concepts, risk perception, vulnerability, and disaster risk reduction frameworks. 2. Introduce methodologies and analytical tools for risk analysis, assessment, evaluation, and management across different hazard scenarios. 3. Examine the social, economic, environmental, and institutional dimensions of vulnerability and resilience.		
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). 1. Students who have at least 75% attendance in classes will be considered eligible for the final written examination. 2. The exam will be conducted for a three-hour duration. Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).		
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.</i>		
Units	Syllabus	
Unit 1	Risk concepts, elements of risk, risk perception, acceptable risk and introduction to risk evaluation; fundamentals and methodologies for risk analysis, assessment, evaluation and management; definitions and overview of risks and dangers; assessment of risks for different disaster types, extreme events and environmental health risks; selected case studies.	
Unit 2	Risk analysis techniques; process of risk assessment; analytical systems for risk assessment; natural hazard risk assessment; understanding climate risk; mapping of risk assessment; decision-making for risk reduction; problems in participatory risk assessment; relation to people's participation and civil society action; mainstreaming risk and role of science and technology.	
Unit 3	Observation and perception of vulnerability; vulnerability identification; vulnerability types and dimensions; social and economic factors; vulnerability in shanty settlements and cities; risk in urban areas; issues in urban planning; initiatives for risk reduction in India.	
Unit 4	Data models for collection of information; risk assessment applications for disaster mitigation and management problems; crisis-management training; physical and social infrastructure for vulnerability reduction; policy making; hazard-resistant design and construction; systematic management and strategic planning for vulnerability reduction.	
Unit 5	Prevention and response mechanisms; emergency management teams; national and international disaster recovery policies and programmes; institutional framework and policies.	

Course Outcomes (COs)

At the end of the course, students will be able to:

- CO1:** Explain and evaluate the concepts of risk, hazard, vulnerability, resilience, and their role in disaster management.
- CO2:** Apply qualitative and quantitative methods for disaster risk assessment, analysis, and mapping.
- CO3:** Assess social, economic, environmental, and infrastructural vulnerabilities influencing disaster risk.
- CO4:** Utilize analytical tools, data models, policies, and participatory approaches for disaster risk reduction and decision-making.
- CO5:** Develop integrated strategies for disaster preparedness, resilience building, sustainable development, and disaster governance.

Suggested Readings:

1. At Risk: Natural Hazards, People's Vulnerability and Disasters – Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (Routledge).
2. Disaster Risk Reduction: Cases from Urban Africa – Birkmann, J. (Springer).
3. Handbook of Disaster Research – Rodriguez, H., Quarantelli, E. L., & Dynes, R. R. (Springer).
4. Introduction to International Disaster Management – Coppola, D. P. (Butterworth-Heinemann).
5. Climate Change Adaptation and Disaster Risk Reduction – Integrating climate adaptation and risk reduction approaches.
6. Geographic Information Systems and Science – Applications of GIS in hazard and risk assessment.
7. Natural Hazards and Disaster Risk Reduction – Contemporary approaches to hazard and vulnerability reduction.

Name of the Course	Advanced Disaster Response and Recovery	
Course Code: CDR-PhD-102(v)	Credits-5, MM-100	L-5, T-0, P-0
Course Objectives 1. To understand advanced concepts and frameworks of disaster response and recovery. 2. To analyze emergency management systems and humanitarian operations. 3. To evaluate post-disaster recovery, reconstruction, and resilience-building strategies. 4. To examine institutional, technological, and governance mechanisms for effective disaster management. 5. To develop research-oriented understanding of recovery planning and sustainable development.		
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). 1. Students who have at least 75% attendance in classes will be considered eligible for the final written examination. 2. The exam will be conducted for a three-hour duration. Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).		
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.</i>		
Units	Syllabus	
Unit 1	Concepts, principles, and evolution of disaster response and recovery, Disaster management cycle and continuum of response and recovery, Emergency management systems and incident command structures, international frameworks: Sendai Framework, Sustainable Development Goals (SDGs), Humanitarian principles and standards, Case studies of major disaster response operations	
Unit 2	Emergency preparedness and contingency planning, Emergency communication systems and crisis information management, Logistics and supply chain management during disasters, Emergency Operations Centres (EOCs), Use of geospatial technologies, drones, AI, and decision-support systems in disaster response	
Unit 3	Humanitarian coordination mechanisms, Relief distribution systems and camp management, public health emergencies and medical response, Water, sanitation, and hygiene (WASH) in disaster situations, Protection of vulnerable populations, Community participation and volunteer management, humanitarian organizations and their role	
Unit 4	Recovery frameworks and recovery planning, Damage, loss, and needs assessment methodologies, Build Back Better (BBB) concept and implementation, Infrastructure rehabilitation and resilient reconstruction, Recovery financing and disaster insurance mechanisms	
Unit 5	National and international disaster recovery policies, Institutional frameworks for disaster response and recovery, Climate-resilient recovery planning, Public-private partnerships in disaster recovery, Smart technologies and digital transformation in disaster management, Monitoring and evaluation of recovery programmes, global and Indian disaster recovery case studies	

Course Outcomes (COs)

At the end of the course, students will be able to:

- CO1:** Critically evaluate theories, frameworks, and practices of disaster response and recovery.
- CO2:** Analyze emergency management systems and humanitarian response mechanisms in diverse disaster scenarios.
- CO3:** Assess post-disaster impacts and formulate recovery and reconstruction strategies.
- CO4:** Apply advanced technologies and decision-support tools in disaster response and recovery planning.
- CO5:** Evaluate governance structures, policies, and institutional mechanisms for resilient recovery.
- CO6:** Develop research-based solutions for sustainable and climate-resilient disaster recovery.

Suggested Readings:

1. Introduction to International Disaster Management by Damon P. Coppola, Butterworth-Heinemann (Elsevier)
2. Disaster Recovery by Ian Davis, Routledge
3. Emergency Management: Principles and Practice for Local Government by William L. Waugh Jr., Kathleen Tierney, ICMA Press
4. Disaster Management and Preparedness by Nidhi Bhasin, CBS Publishers & Distributors
5. At Risk: Natural Hazards, People's Vulnerability and Disasters by Ben Wisner, Piers Blaikie, Terry Cannon, Ian Davis, Routledge
6. Post-Disaster Reconstruction and Change, by Robert B. Olshansky, Laurie A. Johnson, Routledge

Name of the Course	Climate Change and Disaster Risk	
Course Code: CDR-PhD-102(vi)	Credits-5, MM-100	L-5, T-0, P-0
Course Objectives - To develop an advanced understanding of climate change science and its implications for disaster risk. - To examine the interactions between climate variability, extreme events, and socio-economic vulnerabilities. - To analyze climate-induced hazards and their impacts on ecosystems, infrastructure, and communities.		
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). - Students who have at least 75% attendance in classes will be considered eligible for the final written examination. - The exam will be conducted for a three-hour duration. Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).		
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.</i>		
Units	Syllabus	
Unit 1	Climate system and components of the Earth system, Greenhouse effect, global warming, and climate variability, Climate change drivers: natural and anthropogenic factors, Evidence and indicators of climate change, Linkages between climate change and disaster risk.	
Unit 2	Trends in extreme weather and climate events, Heat waves, droughts, floods, cyclones, cloudbursts, and landslides, Glacial retreat, glacier lake outburst floods (GLOFs), and cryosphere changes, Sea-level rise and coastal hazards, Compound and cascading disaster events, regional impacts of climate change with special reference to the Himalayan region, Case studies of major climate-related disasters.	
Unit 3	Climate risk concepts, Climate risk modeling and scenario analysis, Use of GIS, Remote Sensing, and climate data in risk assessment, Climate projections and uncertainty analysis., Participatory approaches to climate risk assessment.	
Unit 4	Nature-based solutions and ecosystem-based adaptation, Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) integration, climate-resilient infrastructure and urban planning, Community-based adaptation and indigenous knowledge systems, Climate mitigation strategies and low-carbon development pathways, Financing climate adaptation and resilience initiatives.	
Unit 5	Climate governance at global, national, and local levels, National Adaptation Plans (NAPs) and climate policies, Institutional mechanisms for climate risk management. Early warning systems and climate services, Artificial Intelligence, Big Data, and digital technologies for climate risk reduction.	

Course Outcomes (COs)

At the end of the course, students will be able to:

- CO1:** Explain the scientific basis of climate change and its relationship with disaster risk.
- CO2:** Analyze climate-induced hazards and their impacts on natural and human systems.
- CO3:** Apply advanced methodologies and tools for climate risk and vulnerability assessment.
- CO4:** Evaluate adaptation, mitigation, and resilience-building measures for reducing disaster risk.
- CO5:** Critically assess climate policies, governance frameworks, and emerging technologies for climate-resilient development.

Suggested Readings:

1. IPCC (2023). *Climate Change 2023: Synthesis Report*, Intergovernmental Panel on Climate Change, Geneva, Switzerland.
2. Mark Pelling (2011). *Adaptation to Climate Change: From Resilience to Transformation*, Routledge, London.
3. Neil Adger, Irene Lorenzoni and Karen O'Brien (Eds.) (2009). *Adapting to Climate Change: Thresholds, Values, Governance*, Cambridge University Press.
4. Rajib Shaw, Juan Pulhin and J. J. Pereira (Eds.) (2010). *Climate Change Adaptation and Disaster Risk Reduction: Issues and Challenges*, Emerald Group Publishing.
5. David Alexander (2013). *Resilience and Disaster Risk Reduction: An Etymological Journey*, Springer.
6. Damon P. Coppola (2020). *Introduction to International Disaster Management* (4th Edition).
7. C. B. Field, V. Barros, T. F. Stocker et al. (Eds.) (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX Report)*, Cambridge University Press.

Name of the Course	Landslide Analysis and Control	
Course Code: CDR-PhD-102(vii)	Credits-5, MM-100	L-5, T-0, P-0
Course Objectives 1. To understand fundamental aspects of landslide hazard and risk. 2. To understand the influence of rainfall and stress conditions on slope stability and shear-strength parameters. 3. To understand numerical modelling of landslides.		
Evaluation Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions in accordance with HPU norms. The end-semester written examination will carry the maximum marks specified for the course (100 marks). 1. Students who have at least 75% attendance in classes will be considered eligible for the final written examination. 2. The exam will be conducted for a three-hour duration. Note: The passing marks for Ph.D. course work will be 55% aggregate with minimum 50% in each individual course (All three courses).		
Note for Paper Setting <i>The question paper shall consist of 11 questions covering all five units. Questions 1–10 shall include two 12-mark questions from each unit, of which students shall attempt one question from each unit. Question 11 shall contain ten short-answer questions of 5 marks each covering all units, of which students shall attempt any eight. The total marks shall be 100.</i>		
Units	Syllabus	
Unit 1	Landslide hazard and risk. Landslides in earth systems. Earthquake and seismically induced landslides. Stability analysis of soil and rock slopes; global and Himalayan perspectives on landslide occurrence.	
Unit 2	Seismic hazards and earthquake-triggered landslides, Ground motion characteristics and slope response, Dynamic loading effects on soil and rock slopes, Principles of slope stability analysis, Stability assessment, Factor of safety concepts and uncertainty in stability evaluation.	
Unit 3	Rainfall analysis and rainfall-induced landslides. Risk assessment, Landslide hazard zonation, Rainfall threshold models and susceptibility analysis, Quantitative and qualitative risk assessment methods, Multi-criteria decision analysis (MCDA) and GIS-based zonation	
Unit 4	Numerical modelling of landslides. Remote sensing techniques, Groundwater system analysis for landslides, Slope deformation and failure simulations	
Unit 5	Remediation techniques; early warning systems; disaster mitigation, sustainability and environmental issues; disaster mitigation and preparedness planning; community-based landslide risk reduction; sustainability and environmental considerations in slope management; policy frameworks, climate change impacts, and future challenges in landslide risk management.	

Course Outcomes (COs)

At the end of the course, students will be able to:

- CO1: Identify and discuss the role and importance of landslides in earth systems.
- CO2: Identify and discuss the issues and concepts salient to stability analysis of soil and rock slopes.
- CO3: Identify and discuss the remediation techniques for landslide control.
- CO4: Identify and discuss the role and importance of sustainability and environmental issues.

Suggested Readings:

Text Books:

1. Singh, B. and Goel, R.K., "Rock Mass Classification – A Practical Engineering Approach", (2011)
2. Hoek, E. and Bray, J.W., "Rock Slope Engineering", Institute of Mining Engg, 1981.
3. Singh, B. and Goel, R.K., "Software for Engineering Control of Landslide and Tunneling Hazards", A.A. Balkema, 2002.

Reference Books:

1. Landslides: Analysis and Control, Special Report 176, Transportation Research Board, National Research Council (U.S.), 1978.
2. Giani, G.P., "Rock Slope Stability Analysis", A.A. Balkema, 2002.
3. Deoja, B., Dhital, M., Thapa, B., Wagner, A., "Mountain Risk Engineering Handbook", ICIMOD, Kathmandu, 2002.