Department of Environmental Sciences

Matrix of Courses Offered and Opted by M.Sc. Env. Sc. Students

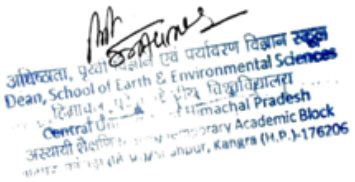
Dec 2016	June 2017	Dec 2017	June 2018	Dec 2018	June 2019	Dec 2019	June 2020	Dec 2020	June 2021
I Sem	**II Sem**	**I Sem**	**II Sem**	**I Sem**	**II Sem**	**I Sem**	**II Sem**	**I Sem**	**II Sem**
ENV 402A	ENV 408	ENV 402A	ENV 408	ENV 402A	ENV 408	ENV 402A	ENV 408	ENV 401	ENV 411
ENV 403	ENV 422	ENV 403	ENV 422	ENV 403	ENV 422	ENV 403	ENV 411	ENV 402A	ENV 422
ENV 404	ENV 424	ENV 404	ENV 424	ENV 404	ENV 424	ENV 404	ENV 422	ENV 403	ENV 424
ENV 434	ENV 432	ENV 434	ENV 432	ENV 434	ENV 432	ENV 434	ENV 424	ENV 444	ENV 428
ENV 435	ENV 436	ENV 435	ENV 436	ENV 435	ENV 436	ENV 435	ENV 432	ENV 501	ENV 432
ENV 437	ENV 503	ENV 439	ENV 503	ENV 437	ENV 441	ENV 443	ENV 436	ENV 560	ENV 443
ENV 516	ENV 535	ENV 516	ENV 508	ENV 443	ENV 528	ENV 560	ENV 501		ENV 445
	ENV 569		ENV 528	ENV 516	ENV 535		ENV 508		ENV 535
			ENV 535		ENV 569A		ENV 553		ENV 553
III Sem	**IV Sem**	**III Sem**	**IV Sem**	**III Sem**	**IV Sem**	**III Sem**	**IV Sem**	**III Sem**	**IV Sem**
ENV 410	ENV 409	ENV 411	ENV 409	ENV 524	ENV 409	ENV 411	ENV 428	ENV 410	ENV 428
ENV 523	ENV 412	ENV 524	ENV 412	ENV 530	ENV 412	ENV 412	ENV 509	ENV 412	ENV 431
ENV 524	ENV 428	ENV 528	ENV 428	ENV 536	ENV 428	ENV 524	ENV 536	ENV 503	ENV 509
ENV 536	ENV 521	ENV 530	ENV 521	ENV 537	ENV 521	ENV 547	ENV 537	ENV 524	ENV 536
ENV 537	ENV 528	ENV 531	ENV 561	ENV 547	ENV 546	ENV 557	ENV 575	ENV 564	ENV 575
ENV 550	ENV 561	ENV 550	ENV 575	ENV 550	ENV 561	ENV 564	ENV 583	ENV 571	ENV 583
ENV 557	ENV 562	ENV 559	ENV 577	ENV 559	ENV 569A	ENV 571	ENV 586	ENV 573	ENV 586
ENV 564	ENV 575	ENV 571	ENV 580	ENV 571	ENV 575	ENV 573	ENV 587	ENV 582	ENV 610
ENV 571	ENV 577	ENV 578	ENV 613	ENV 578	ENV 580	ENV 582		ENV 588	
ENV 578	ENV 579	ENV 611		ENV 581					
ENV 611	ENV 580			ENV 611					
	ENV 613			ENV 614					
				ENV 615					

Details of Courses Taught in M.Sc. Environmental Sciences during 2016-2021

ENV 401	*Introduction to Ecology*
ENV 402A	*Introduction to Earth Processes*
ENV 403	*Environmental Chemistry*
ENV 404	*Energy and Environment*
ENV 408	*Biodiversity and wildlife Management*
ENV 409	*Environmental Microbiology*
ENV 410	*Environmental Biotechnology*
ENV 411	*Waste Management*
ENV 412	*Analytical Techniques*
ENV 422	*Basics of Natural Resource Conservation*
ENV 424	*Fundamentals of Remote Sensing*
ENV 428	*Himalayan Geology*
ENV 431	*Environmental Data Analysis*
ENV 432	*Introduction to Statistical Techniques*
ENV 434	*Fundamentals of Ecology and Environment*
ENV 435	*Environmental Sciences Laboratory – I*
ENV 436	*Environmental Sciences Laboratory – II*
ENV 437	*Earthquake awareness*
ENV 439	*Principles of Biodiversity and Wildlife Conservation*
ENV 441	*Water resource Conservation in Hilly Region*
ENV 443	*Basics of climate change*
ENV 444	*Environmental Geo Science Laboratory*
ENV 445	*Environmental Chemistry Laboratory*
ENV 501	*Environment Pollution and Human Health*
ENV 503	*Environmental Legislation National and International*
ENV 509	*Glaciology*
ENV 516	*Atmospheric Science*
ENV 521	*Geo Engineering*
ENV 523	*Toxic and Hazardous Waste Management*
ENV 524	*Environmental Impact Assessment*
ENV 528	*Nanotechniques and Environment*
ENV 530	*Analytical Techniques for Air, Water, Soil and Plant Lab*
ENV 531	*Toxicology lab*
ENV 535	*Natural Hazard*
ENV 536	*Disaster Management*
ENV 537	*Environmental Engineering*
ENV 546	*Renewable and Non- Renewable Energy Potential In HP State*
ENV 547	*Contemporary Environmental Issues*
ENV 550	*Microbial Ecology*
ENV 553	*Environmental Thermodynamics*
ENV 557	*Bio-resources and Environmental Biotechnology*
ENV 559	*Environmental Geophysics*
ENV 560	*Meteorology and Climatology*
ENV 561	*Science of Climate Change*
ENV 562	*Analytical Techniques (Biological Sciences)*
ENV 564	*Near Surface Geophysics*
ENV 569	*Environmental Pollution and Health issues*
ENV 569A	*Environmental Pollution and Health issues*
ENV 571	*Remote sensing and GIS lab*
ENV 573	*Water resource management*
ENV 575	*MSC Dissertation*
ENV 577	*Carbon management*
ENV 578	*Introduction to Glaciology*
ENV 579	*Recent trends in Environmental Biotechnology*
ENV 580	*Recent trends in Glaciology*
ENV 581	*Methods in Scientific Research*
ENV 582	*Atmospheric Chemistry and Physics*
ENV 583	*Soil Science*
ENV 586	*Nano-Techniques and Applications in En*
ENV 587	*Regional (Indian) Environmental Policie*

ENV 588	*Advanced Environmental Nanotechnology*
ENV 610	*Applied biotechnology and Bioremediation*
ENV 611	*Atmospheric Chemistry*
ENV 613	*Atmospheric Physics*
ENV 614	*Advanced Waste Management Techniques*
ENV 615	*Advance Microbial Technologies*

Note: Courses highlighted have been revised during 2016-2021 time-period.



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Examples of Revisions made in the content of different courses

List of courses offered in 2020-22---Prof A.K. Mahajan and other Revision in course content is reflected with yellow highlighted shade and green colour

Course code: ENV 617 Credit =04 Ph.D Course

Course Name: Research Methodology in Natural Sciences

Teacher: Prof A.K. Mahajan; Prof Deepak Pant, Dr Ankit Tandon, Dr Anurag Linda, Dr Dilbag Singh

Course Objective

The course is designed to equant students with research steps to be followed for undertaking research activity in their Ph.D programme in concordance with UGC guidelines. Student should understand how to undertake research and collect data in the field by using different instruments and techniques. How to identify a problem by identify different research papers related to the problem in mind and then to make them understand how to search different research papers and identify the problem. The student should also understand defining and drafting a research proposal by undergoing this course.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50 %
3. Continuous Internal Assessment : 25% (Breakup is following)

Course outcome

- Student will be in a position to start his research
- Development of his/her analytical skill
- Enhance in report writing
- Understand different reference style for thesis / research papers
- Understand different methods to be used in research data collections

Course Content

Unit-I [Prof. A K. M

Foundations of Research: Meaning, Objectives, Motivation, Utility.

Concept of theory, empiricism, deductive and inductive theory

Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process

Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance

Unit-II

[Prof Deepak Pant]

Research Design: Concept and Importance in Research

Exploratory Research Design

Concept, types and uses, Descriptive Research Designs

Experimental Design: Concept of Independent & Dependent variables

Qualitative research and Quantitative research

Concept of measurement, causality, generalization, replication

Levels of measurement – Nominal, Ordinal, Interval, Ratio.

Unit-III **[Dr. Dilbag Singh]**

Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

Methods of field data collection – Primary data and secondary data

Survey methods used for data collections

Unit-IV **[Dr. Ankit Tandon]**

Summarising and exploring the environmental data using descriptive statistics:

- Organizing and summarizing information through construction of Graphs, Charts and tables and the calculation of various descriptive measures such as averages, measures of variation and percentile.

Prediction and generalisation of inferences drawn from the environmental data:

- Drawing and measuring the reliability of conclusions through methods like hypothesis testing based on probability theory
- Correlation and regression analysis

Unit-V **[Dr. Anurag Linda]**

Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Satellite data acquisition, Image processing and interpretation. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases.

CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 618 (Course Code: CPE-RPE)

Course Name: Research and Publication ethics

Credit: 02

Name of Teacher: Dr Shubanker Chatterjee/ Prof Deepak Pant

Pedagogy: Class room teaching, guest lectures, group discussions, and practical sessions.

Course Objective

The course is designed to aware student with the ethical issues and misconduct related to the research and equant students with research steps to be followed for undertaking research activity in their Ph.D programme in concordance with UGC guidelines. Student will have hands on session to identify misconduct and predatory publications. Tutorial classes and assignments will help them to check plagiarism in the documents and to understand its implications in their thesis writing and research article preparation and publications.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria: Continuous assessment will be done through tutorials, assignments, quizzes, and group discussions. Weight age will be given for active participation. Final written examination will be conducted at the end of the course.

Mid Term Examination: 25%

End Term Examination: 50 %

Continuous Internal Assessment : 25% (Breakup is following)

Course outcome

- Student will be in a position to start his research with right spirit
- Development of his/her writing skill
- Enhance in report writing
- Understand how to identify plagiarism using different software's and its implications in their research carrier.
- Understand different software's to be used in research data collections/indexing references data citations and research metrics

Course contents

Overview

• This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Course structure

• The Course comprises of six modules listed in table below. Each module has 4-5 units.

Modules	Unit Title	Teaching Hours
Theory		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
Practice		
RPE 04	Open Access Publishing	4
RPE 05	Publication misconduct	4
RPE 06	Databases and Research Matrices	7
	Total	**30**

Syllabus in details

Theory

• RPE-01: Philosophy and Ethics (3hrs.)

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

• RPE-02: Scientific Conduct (5hrs.)

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

• RPE-03: Publication Ethics (7hrs.)

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 behaviour 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

• RPE-04: Open Access Publishing (4hrs.)

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 Suggested, etc.

RPE 05: Publication Misconduct (4hrs)

A Group discussion (02 hrs)

1. **Subject specific ethical issues, FFP , authorships**
2. **Conflicts of interest**
3. **Complaints and appeals : examples and fraud from India and abroad**

B. Software Tools (2hrs)

Use of plagiarism software like Turnitin, Urkund and other open source software tools

RPE 06: Databases and Research Metrics (7hrs)

A. Databases (4hrs)

a. **Indexing databases**

b. **Citation databases: web of sciences, Scopus etc**

B. Research Metrics (3hrs)

1. **Impact factor of journals as per Citation Reports, SNIP, SJR, IPP, cite score**
2. **Metrcis : h-index, g index, i10 index, altmetrics**

References

Bird, A. (2006). Philosophy of Science. Routledge.

MacIntyre, Alasdair (1967) A Short History of Ethics. London.

P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865

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. Retrieved

from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm

Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. https://doi.org/10.1038/489179a

Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance(2019), ISBN: 978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf

CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

List of courses offered in 2019-22---Prof A.K. Mahajan and other

Course code: FHM-14 (ENV 437) **---valued added Course**

Course Name: Earthquake awareness FHM -14 (Human Making course-new course)

Teacher: Prof A.K. Mahajan

Course Objective

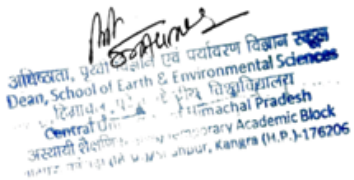
Why this course is important: Trends for disaster losses are increasing rapidly, and earthquake disasters are among the highest threats. Projected losses are unsustainable, and there must be greater emphasis placed on mitigation of hazards, as opposed to the traditional approach that placed most emphasis on response and recovery. This course is intended to help create a new generation of earthquake hazard managers who are better informed and better prepared to make decisions, obtain relevant information, and better understand how to make effective impacts on reduction of earthquake hazards. Since the students are from different field i.e. sciences and Humanities group so the information is provided accordingly.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

4. Mid Term Examination: 25%
5. End Term Examination: 50%
6. Continuous Internal Assessment : 25% (Breakup is following)



Course outcome

- Inculcate the culture of measurements amidst the student
- To aware the students and in turn their parents to how to know about the intensity of an earthquake
- To make them understand the impact of any earthquake by goining through this course
- How to have safer world in earthquake prone region
- To work in association with UNO and related NGO'S working in earthquake awareness programmes

- To get employment in national/state disaster management authorities

Lecture Topics (approximate Duration): 20 hrs

Unit-1

1. Introduction: purpose of course, requirements (1 hrs.)

2. Causes of Earthquakes: basic cause of earthquakes (2 hrs.)

3. Distribution of Earthquakes: where earthquakes tend to occur (1 hrs.)

Unit-2

4. Characteristics of Earthquakes: measuring sizes of earthquakes, etc. How to measure an earthquake magnitude and intensity. What are different magnitude scales like Richter scale, body wave magnitude, surface wave magnitude and moment magnitude. What are different intensity scales explain ach intensity scale i.e. Rossi Forel scale, MMI Intensity scale, MSK-64 intensity scale and EMS -98 scale. (2 hrs.)

5. Earthquake Research and Information: Why is earthquake research important for hazard reduction, what do we know and what are the contemporary research issues (prediction, etc.)? (2 hrs.)

Unit-3

6. The Nature and Effects of Earthquake Hazards: How earthquake hazards are unique and what affects they produce (2 hrs.)

Unit-4

7. Seismic zonation of India, criteria for seismic zonation, different seismic zoning map of India 2Hrs

8. Awareness and preparedness: public awareness, awareness derives earthquake preparedness, medical preparedness, disaster management plans and schedule for awareness activities. Disaster Phases and Earthquake Policies: review of earthquake disaster phases and history and current status of earthquake policy (2 hrs.)

Unit 5

9. Mitigation: what mitigation involves, typical mitigation procedures, and the importance of this concept what mitigation involves, typical mitigation procedures, and the importance of this concept (1 hrs.)

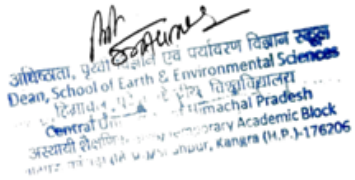
11. Earthquake Disaster Response and Recovery: a brief on overview and basic principles and issues associated with earthquake response and recovery (1 hrs.)

12. Nature of Earthquake Disaster Vulnerability: what factors affect earthquake vulnerability and why is there a growing trend for disaster losses? Community participation for outreach programme. (2 hrs.)

Books Recommended:

1. Srivastava H.N. 2004. Earthquakes, Forecasting and Mitigation Natioanl Book Trust pub. 399p
2. NDMA Report: Earthquake disaster guidelines 48p http://www.ndma.gov.in/en/guidelines.html
3. GSI 1992. Uttarkashi Earthquake October, 20, 1991. Geol. Surv. Spec. l Uttarkashi earthquake .

4. Sharma K.K, et al., 2006. Environmental Geohazards: Science and society Research India press. 455pp.
5. Notes to be provided by the teachers from time to time. As the topic does not have one books for all lectures.



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course Code: ENV 536

Credit: 02

Course Name: Disaster Management

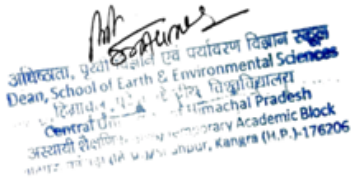
Teacher: Prof. A.K. Mahajan

Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objectives: The course is designed to:

- Understand different natural and manmade disasters
- Explore the reason of its origin and the possible antidotes so that it can dwindle to some extent.
- Implement environmentally sound strategies in this concern

Course Outcome: The student who learns disaster management will be in a position to understand devastating effects of any disaster especially natural hazards and its impact. Today when country is heading towards disaster risk reduction, the capacity building of students in this filed will help the nation to have a trained manpower who can contribute to Disaster Management of different states and country as a whole**. The trained student can work in different organisation as disaster management is one of the important part of any organization for risk reduction.**



Course Outcome

Explain disaster management theory (cycle, phases, risk, crisis, emergency, disasters, and resilience)

Compare hazards, disasters and associated natural phenomena and their interrelationships, causes and their effects - developing humanitarian Assistance before and after disaster

Compare anthropogenic hazards, disasters and associated activities and their interrelationships of the subsystems - Green House Effect, Global warming, Causes and their effects and development of humanitarian assistance before and after disaster

Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction

Evaluate DM study including data search, analysis and presentation as a case study.

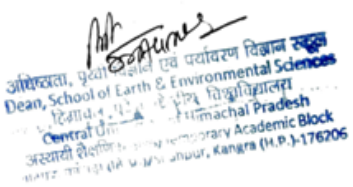
Create Technological innovations in Disaster Risk Reduction: Advantages and problems

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

7. Mid Term Examination: 20%
8. End Term Examination: 60%
9. Continuous Internal Assessment : 20% (Breakup is following)
    a. Assignment/Quiz/Term Paper: 20%
    b. Presentation/Seminar/Field work: 20%
    c. Practical: 60%



Course outcome

Course Contents:

Unit-1: 4 hrs

Introduction to Disaster Management, Farmer curve showing significance and frequency of different natural disaster, Scope and Objectives of Disaster Management, Disaster Managers, Elements of Disaster Management

Assignement-1: To prepare historical archive of Cyclone for last 20 years and their disastrous effects

Assignement-2: To prepare historical archive of Flood disaster in India for the last fifty years and their disastrous effect

Unit 2: 4 hrs

Concepts and Terms in Disaster Management, Natural Disasters ,Man-made Disasters, Disaster Victim, Disaster Relief Systems, Phases of Disaster Response, Phases of Relief Operations, Case study of Kashmir Flood 2014.

Assignment -3: list different earthquake of Himalayan region with their magnitude and explain the disastrous effect of 1905 Kangra earthquake

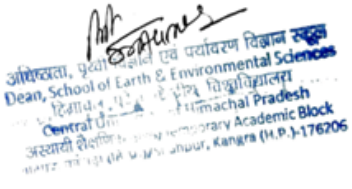
Unit-3 4 hrs

The Hyogo Framework for Action 2005-2015: Building the Resilience of Nations, and Communities to Disasters : Case *study of earthquake disaster and landslide disaster*

Assignement-4 Write down about Yokahama strategy and plan of action for the safer world

Unit-4 4 hrs

The Tools and Methods of Disaster Management, Prevention and Mitigation Tools, Preparedness Tools, Tools of Post-Disaster Management, Case studies



Assignment -5: write down different methods to be used for mitigation of landslide and earthquake disaster as a preparedness part of disaster management cycle.

Unit-5 **4 hrs**

Technologies of Disaster Management, Mapping, Aerial Photography and Remote Sensing Communications, Information Management, Logistics, Epidemiology

Suggested Readings:

Material prepared by teachers and the following reference will be useful

Harsh K. Gupta, (2004): Disaster management, **Universities Press**, ISBN: 9788173714566

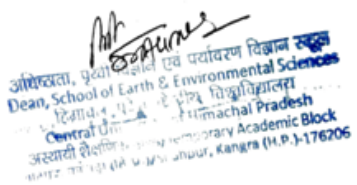
R.B. Singh, (2000): Disaster Management, **Rawat Publication**, New Delhi.

H.K. Gupta (2003): Disaster Management, **Universities Press, India**, ISBN: 9788173714566

Satender, (2003): Disaster Management in Hills, **Concept Publishing Co., New Delhi,** ISBN: 9788180690143

Bhandani, R.K., (2000): An overview on Natural & Manmade Disaster & their Reduction, **CSIR, New Delhi.**

Gupta, (2001): Manuals on Natural Disaster management in India, National Centre for Disaster Management, IIPA, New Delhi, 2001



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 428 **(More than 50% Change in revision of syllabus is reflected in the courses ENV 428 since 2016; change is shown in Yellor colour)**

Course Name: HIMALAYAN GEOLOGY:

Teacher: Prof A.K. Mahajan

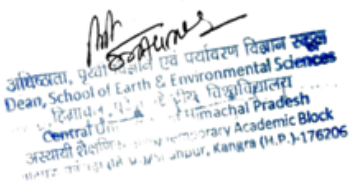
Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.) Aim: The main thing is to introduce the student to concepts and applications of geophysics to solving environmental and engineering problems.

How course activities and course structure help students achieve these goals:

The course is designed to give them the background knowledge and practice using several methods in order to encourage them to think about the utility of geophysics in the solution to problems of an environmental nature. The student will also summarize and critique recent publications in the fields of Himalayan geology.

Course Objective

The course is intended to provide a holistic approach to study the surficial features and the processes with emphasis on Himalayan region. The subject will serve as a dynamic and physical based account of the processes at planets surface with an integrated approach involving the principles of geomorphology and sedimentology. The student will deal with different aspects of Himalayan Geology and how Himalaya has been originated and formed. How they have been shaped to the present form. The student will analyze and integrate the physical features, field methodology, and interpretation of structural and tectonic features to conclude how Himalaya has been formed.



Course Outcomes:

- The student will understand how Himalayan has been formed
- Learning about different river system how they have been originated from Himalayan and why Himalaya is named as Third pole.
- Will understand different rock type and how they have been formed and what the relationship between different rock types is.
- What is the role of tectonics in generating earthquake in Himalayan region?

- How sediments are deposited and how river are changing their course after years and what could be their consequences.
- Learning about the sedimentary flux: origin, transport and deposition.
- Learning about the geomorphic and sedimentological processes related to fluvial, coastal, aeolian, and glacial regimes.
- Learning about the environmental changes and its impact on surface processes and landforms.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

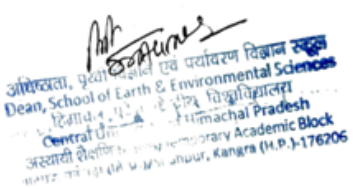
Evaluation Criteria:

10. Mid Term Examination: 25%

11. End Term Examination: 50%

12. Continuous Internal Assessment : 25% (Breakup is following)

a. Assignment/Quiz/Term Paper: 20%
b. Presentation/Seminar/Field work: 20%
c. Practical: 60%



Course content

Unit-1 Introduction, importance and significance of Himalaya, their morphology, What is faults, folds, their definitions and their types and classifications.

4 **hrs**

Unit-2 Internal structure of Earth, Internal structure of Earth, fundamental characteristics of crust, mantle, core; fundamentals on rock-forming minerals; weathering and erosion of rocks and minerals. Concept of plate tectonics, types of plate boundaries, features of convergent and divergent boundaries, causes of plate motion, dynamic evolution of continental and oceanic crust, Sea floor spreading, morphological features of ocean floor.

Assignment:1 a) What do you understand by continental drift theory? Explain its pros and cons
b) What do you understand by plate tectonic theory and how this theory supports the formation of Himalaya 4 hrs

Unit-3 Sedimentary rocks their types and classification, metamorphic rocks their classifications. Geosynclines: Classification and evolution of Geosyncline, causes of subsidence and upliftment.

4 **hrs**

Assignment: 2 What do you understand by sedimentary rock and metamorphic, how they are formed and explain their texture with example.

Unit-4 Origin of Himalaya, different phases in evolution of Himalaya. Study of major groups and formations of Himalaya, lithology and thrust boundaries – HFF (Himalayan frontal fault), MBT(main boundary

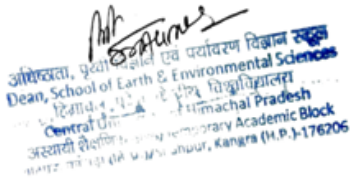
thrust), MCT(main central thrust), STD(south Tibetan detachment), indo-Tsangpo suture zone. **4 hrs**

Assignment 3: Draw neat and clean Geological Time Scale

Unit-5 Earth's Earthquake seismology, palaeoseismology, seismites, Seismology: seismic waves, intensity and isoseismic lines, earthquake belts. Earthquake zones of India, Seismograph, causes of earthquake in Himalaya. 2 **hrs**

Recommended Books

1. Condie, K.C. (1984). Plate Tectonics & crustal Evolution. Pregamon Press, London.
2. A.K., Biyani, (2007), Dimensions of Himalayan Geology.
3. Earth: Introduction to Physical Geology, Fifth addition. Prentice Hall Pub.
4. The Geology of earthquake by Robert Yeats, Kerry Sieh and Clarence R. Allen Oxford University Press.
5. Geology of India and Burma M.S. Krishnan 1968 addition, Higginbothams (p) limited
6. Earthquake (forcasting and mitigation) by H.N. Srivastava , National Book Trust, India



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 564

Course Name: Near Surface Geophysics **Credit ---- 04 credit**

Teacher: Prof A.K. Mahajan

Course Objective

The student will identify which geophysical methods are used by industry and academia to solve environmental problems, as most of the sub-surface methods are being used in geotechnical industry for characterizing the near surface sediments. The idea of having general exposure of students in mainly two geophysical techniques i.e. seismic methods (active and passive) and Ground penetration Radar so that they can have basic knowledge and about field configurations. The students will also be exposed to Instruments in the field as the University has Micro tremor system and 24 channel engineering seismograph. Under the specialized project the student will process the data using seismic data analysis software. The student will also summarize and critique recent publications in the fields of engineering and environmental geophysics.

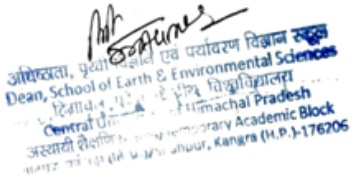
Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

- Mid Term Examination: 25%
- End Term Examination: 50%
- Continuous Internal Assessment : 25% (Breakup is following)

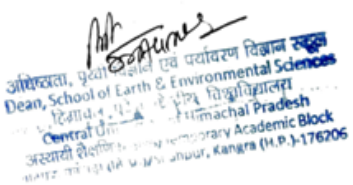
Course Outcome



Students should be able to:

- understand the fundamental concepts that result in the variation of seismic velocities and earth resistivity at or near the surface of the earth
- to use various geophysical instruments including ground penetration radar, Seismic exploration for site characterisation and exploration, engineering seismometers (primarily for reflections and refraction surveys) both active and passive methods
- design, conduct and complete a total field project involving these methodologies
- able to relate the interpretation of the geophysical information to local geology and structure.

- Through a sequence of laboratory exercises in conjunction with intensive field projects the students learn by doing.
- Besides learning the methodologies, the projects teach the students how to work in groups, both for data collection and analysis and interpretation and reporting.
- While there are tests, these are entirely "take home" requiring the students to work through processing and interpretation problems. These are designed to provide a foundation for the processing and interpretation of the information collected from the field projects.



Course Contents:

Unit-1

Definition of hazards, General introduction to landslide hazard, earthquakes, flash floods and floods. Plate tectonics theory, continental drift theory, Transverse and longitudinal division of Himalaya.

Introduction to Applied Geophysics: what are applied and environmental geophysics, matching geophysical methods to applications, planning a geophysical survey, planning survey and survey constraints, survey design, optimum configuration?

Introduction to Applied Seismology, Introduction, seismic waves, their path of propagations, seismic intensity, magnitude, macroseismic scales and general introduction to seismographs

8 hrs

Assignment 1: write different geophysical method used for sub-surface studies and their applications

Unit 2

Seismic Refraction Surveying: Introduction, General principles, Snells law, Field survey arrangements, geometry of refracted ray paths, Interpretational methods, applications and case histories.

Seismic Reflection Surveying Introduction, reflection survey general considerations, reflection principles, Direct wave, refracted wave, critical distance and overtaking distance, T-D curves two layer case and three layer case. **8 hrs**

Assignment 2: Write general principle of seismic reflection, refractions and draw ray diagrams for single layer, two layer and multilayer model with their equations.

Unit-3

Introduction to Shear wave methods: Spectral analysis of surface waves (SASW); Continuous surface waves methods (CSWS) and Cross hole methods

Multichannel analysis of surface waves (MASW), active and passive seismic methods, field configuration, optimum field configuration, source receiver geometry, data acquisition, data analysis using seismic surfseis

software, dispersion analysis, data interpretation and its applications. **8 hrs**

Assignment 3: Draw field arrangement for data collection using MASW methodology along a linear line using three roll with 24 channels as per instruction in the class room.

Unit-4

Introduction to Ground Penetration Radar (GPR), Principle of GPR, , propagation of radiowaves, dielectric properties of earth material, modes of data acquisition, data processing, interpretational techniques and Applications of GPR. **8 hrs**

Assignment 4 : Write down principles of GPR, antenna used for various investigations and its application for detections of different subsurface utilities.

Unit-5

Site amplification:

What is site response, Site response studies, and application of MASW in site response, Shake analysis, its applications, Cases study, training of students in Grapher and Surfer. **08 hrs**

Assignment: Hand on Practice : Training of students in Grapher and Surfer

Books Recommended:

1. **An introduction to applied and Environmental Geophysics by John M. Reynolds Wiley-Blackwell publcations**
2. Principles of applied Geophysics by D.S.Parasnis **Springer publications**
3. Telford, W.M. et.al. Applied Geophysics: **Cambridge publication**
4. Geotechnical Earthquake Engineering by Sreven L. **Kramer**
5. Earthquakes (forecasting and mitigation by H.N. Srivastava
6. Recent advances in Earthquake geotechnical Engineering and microzonation by Atila Ansal, 2004

CENTRAL UNIVERSITY OF HIMACHAL PRADESH

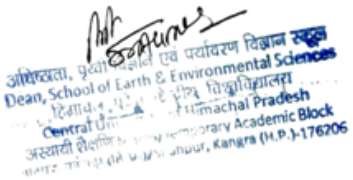
[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 607- **New course added in 2020**

Credit 02 **Ph.D course**



Course Name: Site amplification

Teacher: Prof A.K. Mahajan

Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 10 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)
Aim: The main thing is to introduce the student to concepts and applications of geophysics to solving environmental and engineering problems.

How course activities and course structure help students achieve these goals:

The course is designed to give them the background knowledge and practice using several methods in order to encourage them to think about the utility of geophysics in the solution to problems of an environmental nature.

Course Objective

The student will understand how different building and structures will behave during strong ground motion identify. The basic idea of providing this course to students of Ph.D aspirant is to undertake research in the field of earthquake risk assessment and to take part in Indian endeavors for disaster risk reduction as a goal of India mission for risk reduction under Sendai framework 2015-30. The student will analyze and integrate the physical theory, field methodology, and interpretation of each method with geologic and engineering information to solve problems using real data sets. The student will also summarize and critique recent publications in the fields of engineering and environmental geophysics.

Course Outcome

- The students will understand the importance of site amplification in seismic risk reduction
- To understand topics to choose research problem for undertaking research in the direction of disaster risk reduction
- Will enable them to work in any geotechnical company

- To undertake research in the field of seismic microzonation, which is a prestigious project of Govt. of India

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

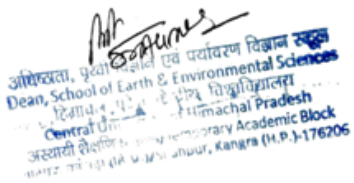
Evaluation Criteria:

13. Mid Term Examination: 25%

14. End Term Examination: 50%

15. Continuous Internal Assessment : 25% (Breakup is following)

d. Assignment/Quiz/Term Paper: 40%
e. Presentation/Seminar/Field work: 40%
f. Attendance: 10%



Course Contents:

Unit-1 **4hrs**

What is seismic hazard, what are different stages for seismic hazard analysis, seismic source, recurrence relations, attenuation relations, effects of local soil conditions and NEHRP classification

Units -2 4hrs

Influence of scales on site amplification and impact studies, Different macroseismic scales and how they have developed since the development of first scale of Rossi Forel intensity scale, Modified Mercalli scale , MSK-64 intensity scale and EMS -98 European macroseismic scale.

Unit-3 4hrs

On which factors the strong Ground effects depends, Effects of earthquake source, transfer media, interaction between the building and soil, effect on depth of the source, effect of distance, near source and far source effects and basin response effect

Unit-4 **4hrs**

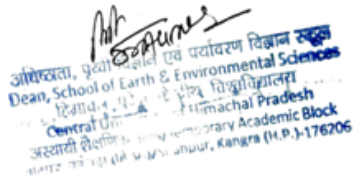
What are the parameters on which site amplification depends, How to measure the stiffness of the soil? What are different factor responsible for site amplification from near and far source. Different geophysical methods like Multichannel Analysis of surface waves and Microtremor method used to measure stiffness of the soil

and frequency of the soil.

Unit 5 **4hrs**

Methods to measure site effects

Standard spectral ration technique (SSR), Generalized Inversion Scheme Technique (GIS), Coda wave technique, Horizontal to Vertical Spectral Ration Technique (HVSR), site effects in horizontally layered soil deposits, one dimensional response of soil column.



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 608 **New course added in 2021**

Credit 02 Ph.D course

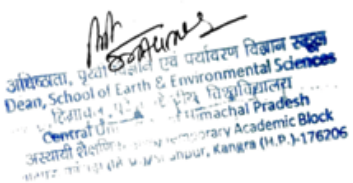
Course Name: Seismology

Teacher: Prof A.K. Mahajan

Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 10 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Aim: The main thing is to introduce the student to concepts and applications of geophysics to solving environmental and engineering problems.

How course activities and course structure help students achieve these goa



The course is designed to give them the background knowledge and practice using several methods in order to encourage them to think about the utility of geophysics in the solution to problems of an environmental nature.

Course Objective

The student will understand how different building and structures will behave during strong ground motion identify. The basic idea of providing this course to students of Ph.D aspirant is to undertake research in the field of earthquake risk assessment and to take part in Indian endeavors for disaster risk reduction as a goal of India mission for risk reduction under Sendai framework 2015-30. The student will analyze and integrate the physical theory, field methodology, and interpretation of each method with geologic and engineering information to solve problems using real data sets. The student will also summarize and critique recent publications in the fields of engineering and environmental geophysics.

Course Outcome

- The students will understand the importance of site amplification in seismic risk reduction
- To understand topics to choose research problem for undertaking research in the direction of disaster risk reduction
- Will enable them to work in any geotechnical company

- To undertake research in the field of seismic microzonation, which is a prestigious project of Govt of India

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

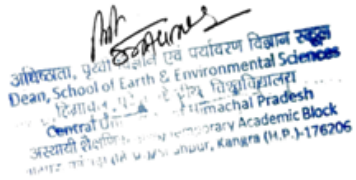
Evaluation Criteria:

Mid Term Examination: 25%

End Term Examination: 50%

Continuous Internal Assessment: 25% (Breakup is following)

g. Assignment/Quiz/Term Paper: 40%
h. Presentation/Seminar/Field work: 40%
i. Attendance: 10%



Unit-1

What is an earthquake, how does it occurs, distribution of earthquake in India and where do earthquake tends to occurs. What is elastic rebound theory, how the earthquake is measured in terms of magnitude and Intensity.

(4hrs.)

Unit- 2

Characteristics of Earthquakes: measuring sizes of earthquakes, etc. What are different magnitude scales likes Richter scale, body wave magnitude, surface wave magnitude and moment magnitude. What are different intensity scale explain ach intensity scale i.e. Rossi Forel scale, MMI Intensity scale, MSK-64 intensity scale and EMS-98 scale how intensity scale can be correlated with magnitude scale.

(4hrs.)

Unit-3

Seismology and plate tectonics, plate configuration as derived from seismicity pattern, inference of plate dynamics form focal mechanism studies, and what is asperity or seismic gap concept in seismology.

(4hrs.)

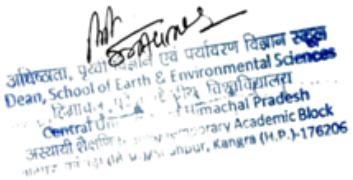
Unit-4

Quantification of earthquakes, Magnitude energy and intensity; basic principles of seismic rating, magnitude calibration, relation between magnitude and intensity and magnitude and energy; principal significance of earthquakes magnitude. (4hrs.)

Unit-5

Seismic zonation of India, criteria for seismic zonation, different seismic zoning map of India awareness and preparedness; public awareness, awareness' derives earthquake preparedness, medical preparedness

management plans and schedule for awareness activities. Disaster Phase and Earthquake Policies: review of earthquake disaster phases and history and current.



CENTRAL UNIVERSITY OF HIMACHAL PRADESH
[Established under the Central Universities Act 2009]
PO Box: 21, Dharamshala, District Kangra - 176215 (HP)
www.cuhimachal.ac.in

Course code: ENV 559

Course Name: Environmental Geophysics **02 credit**

Teacher: Prof A.K. Mahajan

Course Objective

The student will identify which geophysical methods are used by industry and academia to solve environmental and geotechnical problems. The student will analyze and integrate the physical theory, field methodology, and interpretation of each method with geologic and engineering information to solve problems using real data sets. The student will also summarize and critique recent publications in the fields of engineering and environmental geophysics.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

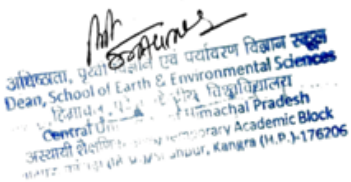
Evaluation Criteria:

Mid Term Examination: 25%

End Term Examination: 50%

Continuous Internal Assessment: 25% (Breakup is following)

a. Assignment/Quiz/Term Paper: 40%
b. Presentation/Seminar/Field work: 40%
c. Attendance: 10%



Course Outcome

Students should be able to:

- understand the fundamental concepts that result in the variation of seismic velocities and earth resistivity at or near the surface of the earth
- to use various geophysical instruments including ground penetration radar, Seismic exploration for site characterisation and exploration, engineering seismometers (primarily for reflections and refraction surveys) both active and passive methods
- design, conduct and complete a total field project involving these methodologies
- able to relate the interpretation of the geophysical information to local geology and structure.
- Through a sequence of laboratory exercises in conjunction with intensive field projects the students learn by doing.

- Besides learning the methodologies, the projects teach the students how to work in groups, both for data collection and analysis and interpretation and reporting.

- While there are tests, these are entirely "take home" requiring the students to work through processing and interpretation problems. These are designed to provide a foundation for the processing and interpretation of the information collected from the field projects.

Course Contents:

Unit-1 **2 hrs**

Introduction to Hazards definition of hazards, introduction to landslide hazard, earthquakes, flash floods and floods, a brief on longitudinal and transverse division of Himalayan.

Introduction to Applied Geophysics: what are applied and environmental geophysics, matching geophysical methods to applications, planning a geophysical survey, planning survey and survey constraints, survey design, optimum configuration?

Assignment 1: Write different geophysical method used for sub-surface studies and their applications

Unit-2 **4 hrs**

Seismic Refraction Surveying: Introduction, General principles, Snells law, Field survey arrangements, Interpretational methods, applications and case histories.

Seismic Reflection Surveying Introduction, reflection survey general considerations, reflection principles, reflection data processing using surfseis software (pre-processing, data filtering using muting technique- a practical, dispersion analysis and 1-D profiling and 2-D profiling.

Assignment 2: Write general principle of seismic reflection, refractions and draw ray diagrams for single layer, two layer and multilayer model.

Unit-3 **8 hrs**

Introduction to different methods i.e. Spectral analysis of surface waves (SASW); Continuous surface waves methods (CSWS) and Cross hole method

Multichannel analysis of surface waves (MASW), active and passive seismic methods, field configuration, optimum field configuration, source receiver geometry, data acquisition, data analysis using seismic surfseis software, dispersion analysis, data interpretation and its applications.

Assignment 3: Draw field arrangement for data collection using MASW methodology along a linear line using three roll with 24 channels as per instruction in the class room.

Unit-4 **4 hrs**

Introduction to Ground Penetration Radar (GPR), Principle of GPR, propagation of radiowaves, dielectric properties of earth material, modes of data acquisition, data processing, interpretational techniques and Applications of GPR

Assignment 4 : Write down principles of GPR, antenna used for various investigations and its application for detections of different subsurface utilities.

Unit-5

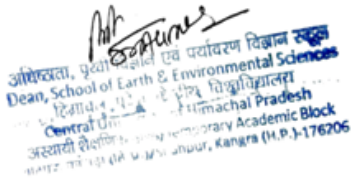
Site amplification: **2 hrs**

What is site response, Site response studies, and application of MASW in site response, Shake analysis, its applications?

Hand on Practice: Training of students in Grapher and Surfer

Books Recommended:

7. An introduction to applied and Environmental Geophysics **by John M. Reynolds Wiley-Blackwell publcations**
8. Principles of applied Geophysics by D.S.Parasnis **Springer publications**
9. Telford, W.M. et.al. Applied Geophysics: **Cambridge publication**
10. Geotechnical Earthquake Engineering by Sreven L. **Kramer**
11. Earthquakes (forecasting and mitigation by H.N. Srivastava
12. Recent advances in Earthquake geotechnical Engineering and microzonation by Atila Ansal, 2004.



CENTRAL UNIVERSITY OF HIMACHAL PRADESH
[Established under the Central Universities Act 2009]
PO Box: 21, Dharamshala, District Kangra - 176215 (HP)
www.cuhimachal.ac.in

Courses offered by Prof A.K. Mahajan from 2016-2018- more than 40-50 changes since last five years in the subjects taught by Prof A.K. Mahajan. Changes is shown as highlighted yellow colours

Course code: ENV 521 ---------- course dropped after 2019

Credit: 02

Course Name: Geo-Engineering

Teacher: Prof A.K. Mahajan

Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Aim: The main thing is to introduce the student to concepts and applications of geophysics to solving environmental and engineering problems.

How course activities and course structure help students achieve these goals:

The course is designed to give them the background knowledge and practice using several methods in order to encourage them to think about the utility of geophysics in the solution to problems of an environmental nature.

Course Objective

The student will deal with different geo-engineering techniques are used by industry and academia to solve environmental problems. The student will analyze and integrate the physical theory, field methodology, and interpretation of each method with geologic and engineering information to solve problems using real data sets. The student will also summarize and critique recent publications in the fields of engineering and environmental geophysics.

Course outcome

- The student will understand how to measure physical properties of the soil
- Student will understand how to identify landslide zones
- Students will know how the tunnel as being constructed and what are the issues and problem in tunnel construction as geological perspective
- Students will understand how to identify sites for dams construction
- The course will enable the student to prepare an environmental impact assessment report while being serving as Environmentalist
- Can help engineers in the field due to their basic knowledge in the construction activities related to geological and environmental issues in the project.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

16. Mid Term Examination: 25%

17. End Term Examination: 50%

18. Continuous Internal Assessment : 25% (Breakup is following)

d. Assignment/Quiz/Term Paper: 20%

e. Presentation/Seminar/Field work: 20%

f. Practical: 60%

Course content

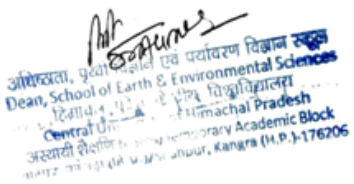
Unit-1 Importance of geology in civil engineering: geological properties of rocks used in civil engineering- porosity, density, absorption. Effects of load imposed on rocks and stones - compressive stress and strength of rocks, tensile stress, tensile strength, and elasticity of rocks. Geological properties of stones and road materials. **4 hrs**

Unit-2 Geological considerations in construction of dams, its parts and its types. Silting and de-silting of dam reservoirs. Types of bridges and tunnels and geological considerations for construction of tunnels and Bridges. **4 hrs**

Unit-3 Landslides and classification, its causes and effects. Slope ,slope angle, and slope analysis, angle of repose. **4 hrs**

Unit.-4 Problems of ground water in engineering projects. Geo technical study of Bhakra Nangal projects. **4 hrs**

Unit-5 Instrumentation in Geo-engineering like Standard penetration test, Spectral analysis of surface waves and Multichannel analysis of surface waves for shear wave velocity/ stiffness of the soil column and their applications Case studies with type example.**4 hrs**



Text Books:

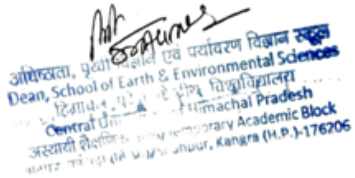
1. Parbin Singh: Engineering and General Geology. KatsonPubl House
2. Sharma, P.V., (1986). Geophysical Methods in Geology. Elsevier, London
3. Kryine, D.H. and Judd, W.R. (1998). Principles of Engineering Geology, CBS Edition, Delhi.

Additional Readings:

4. Valdiya, K.S., (1987). Environment Geology-Indian Context. Tata Mcgraw Hill. N.Delhi.
5. Geotechnical earthquake Engineering by Kamer S.L. 2003. Prentice Hall Publ.

Lectures	Topics	Prescribed Text Book
1	Importance of geology in civil engineering: geological properties of rocks used in civil engineering- porosity, density, absorption.	**Course content provided by teacher in addition to books recommended**
2	Effects of load imposed on rocks and stones - compressive stress and strength of rocks	**Course content provided by teacher in addition to books recommended**.

3	Stress, strain and tensile stress, tensile strength, elasticity of rocks	**Course content provided by teacher in addition to books recommended**.
4	Geological properties of stones and road materials.	**Course content provided by teacher in addition to books recommended**.
5	Geological considerations in construction of dams, its parts and its types	**Course content provided by teacher in addition to books recommended**.
6	Silting and de-silting of dam reservoirs.	**Course content provided by teacher in addition to books recommended**.
7	Types of bridges and tunnels	**Course content provided by teacher in addition to books recommended**.
8	Geological considerations for construction of Tunnels and Bridges.	**Course content provided by teacher in addition to books recommended**.
9-12	Landslides and classification, Its causes and effects, Slope ,slope angle, and slope analysis, angle of repose and finally case study	**Course content provided by teacher in addition to books recommended**.
13-16	Problems of ground water in engineering projects. Geo technical study of Bhakra Nangal projects. Instruments used in locating ground water in different environments, use of toposheet in locating water bodies, Use of Water resources information system.	**Course content provided by teacher in addition to books recommended**.
17-20	Instrumentation in Geo-engineering like Standard penetration test, Spectral analysis of surface waves and Multichannel analysis of surface waves for shear wave velocity/ stiffness of the soil column and their applications Case studies with type examples	**Course content provided by teacher in addition to books recommended**.



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 564

Course Name: Near Surface Geophysics

Teacher: Prof A.K. Mahajan

Credits Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Aim: The main thing is to introduce the student to concepts and applications of geophysics to solving environmental and engineering problems.

How course activities and course structure help students achieve these goals:

The course is designed to give them the background knowledge and practice using several methods in order to encourage them to think about the utility of geophysics in the solution to problems of an environmental nature.

Course Objective

The student will identify which geophysical methods are used by industry and academia to solve environmental problems, and be able to associate seismic, potential field, electrical and electromagnetic methods with the particular problems to which the methods are best suited. The student will analyze and integrate the physical theory, field methodology, and interpretation of each method with geologic and engineering information to solve problems using real data sets. The student will also summarize and critique recent publications in the fields of engineering and environmental geophysics.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

19. Mid Term Examination: 25%

20. End Term Examination: 50%

21. Continuous Internal Assessment : 25% (Breakup is following)

j. Assignment/Quiz/Term Paper: 20%

k. Presentation/Seminar/Field work: 20%

l. Practical: 60%

Course Contents:

Unit-1

Hazards definition of hazards, introduction to landslide hazard, earthquakes, flash floods and floods Himalayan orogeny, Structure and Tectonics of Himalaya.

Introduction to Applied Geophysics: what are applied and environmental geophysics, matching geophysical methods to applications, planning a geophysical survey, planning survey and survey constraints, survey design, optimum configuration

Introduction to Applied Seismology: Introduction, seismic waves, Raypath geometry in layered ground, reflection and refraction of obliquely incident rays, Critical reflection, diffraction, seismic energy source detection and recording of seismic waves, geophones and accleraometers, seismographs

8 hrs

Unit 2

Seismic Refraction Surveying: Introduction, General principles, Snells law, Field survey arrangements, geometry of refracted ray paths, Interpretational methods, applications and case histories.

Seismic Reflection Surveying Introduction, reflection survey general considerations, reflection principles, reflection data processing (pre-processing, static correction, convolution and deconvolution, stacking, filtering and migration

8 hrs

Unit-3

Introduction to Shear wave methods: Spectral analysis of surface waves (SASW); Continuous surface waves methods (CSWS) and Cross hole method

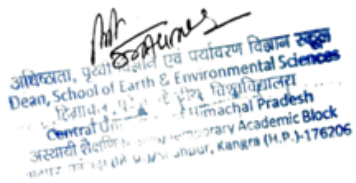
Multichannel analysis of surface waves (MASW), active and passive seismic methods, field configuration, optimum field configuration, source receiver geometry, data acquisition, data analysis using seismic surfseis software, dispersion analysis, data interpretation and its applications.

8 hrs

Unit-4

Introduction to Ground Penetration Radar (GPR), Principle of GPR, , propagation of radiowaves, dielectric properties of earth material, modes of data acquisition, data processing, interpretational techniques and Applications of GPR

8 hrs



Unit-5

Site amplification:

What is site response, Site response studies, and application of MASW in site response, Shake analysis, its applications, Cases study, training of students in Grapher and Surfer, SHAKE softwares

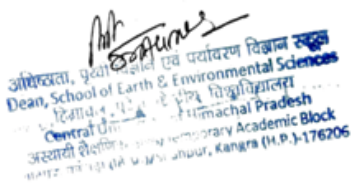
08 hrs

Books Recommended:

13. **An introduction to applied and Environmental Geophysics by John M. Reynolds Wiley-Blackwell publcations**
14. Principles of applied Geophysics by D.S.Parasnis **Springer publications**
15. Telford, W.M. et.al. Applied Geophysics: **Cambridge publication**
16. Geotechnical Earthquake Engineering by Sreven L. **Kramer**
17. Earthquakes (forecasting and mitigation by H.N. Srivastava
18. Recent advances in Earthquake geotechnical Engineering and microzonation by Atila Ansal, 2004
19.

Lecture Topic List

Date	**Topic**	**Readings**	**Prescriber books**
Unit-1	*Hazards*	*Lecture 1*	*5*
	Himalayan orogeny	*Lecture 2*	
	Structure and Tectonics of Himalaya	*Lecture 3*	
	Introduction to Applied Geophysics	*Lecture 4*	
	Introduction to Applied Seismology	Lecture 5, 6 and 7	
Unit-2	Seismic Refraction Surveying	Lecture 8, 9, 10 and 11	
	Seismic Reflection Surveying	Lecture 12 to 15	
Unit-3	*Multichannel Analysis of Surface waves*	Lecture 15 &17	
	Data analysis by surfseis software	18-20 lectures	
	Case study related to site response and seismic microzonation	21-23	
	Presentation by students	***Chapters 1 - 4***	
Unit-4	Introduction to Ground Penetration Radar (GPR)	*Lecture 23-24*	
	Principle of GPR, propagation of radiowaves, dielectric properties of earth material, modes of data acquisition, data processing, interpretational techniques.	Lecture 25-28	
	Applications of GPR	Lecture 29-32	
Unit-5	Site amplification studies	Lecture 32-34	
	Learning of Grapher	*35-36*	
	Learning of surfer software	*37-40 lectures*	



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 428

Course Name: HIMALAYAN GEOLOGY:

Teacher: Prof A.K. Mahajan

Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Aim: The main thing is to introduce the student to concepts and applications of geophysics to solving environmental and engineering problems.

How course activities and course structure help students achieve these goals:

The course is designed to give them the background knowledge and practice using several methods in order to encourage them to think about the utility of geophysics in the solution to problems of an environmental nature. The student will also summarize and critique recent publications in the fields of Himalayan geology.

Course Objective

The student will deal with different aspects of Himalayan Geology and how Himalaya has been originated. The student will analyze and integrate the physical features, field methodology, and interpretation of structural and tectonic features to conclude how Himalaya has been formed.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

22. Mid Term Examination: 25%

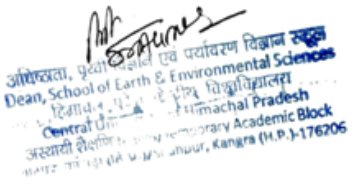
23. End Term Examination: 50%

24. Continuous Internal Assessment : 25% (Breakup is following)

m. Assignment/Quiz/Term Paper: 20%

n. Presentation/Seminar/Field work: 20%

o. Practical: 60%



Course content

Unit-1 Internal structure of Earth, Internal structure of Earth, fundamental characteristics of crust, mantle, core; fundamentals on rock-forming minerals; weathering and erosion of rocks and minerals. Concept of plate tectonics, types of plate boundaries, features of convergent and divergent boundaries, causes

of plate motion, dynamic evolution of continental and oceanic crust, Sea floor spreading, morphological features of ocean floor.

4 hrs

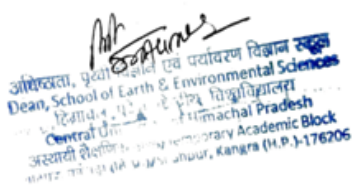
Unit-2 Geosynclines: Classification and evolution of Geosyncline, causes of subsidence and upliftment. Continental drift. Taylor's and Wegner's theories of continental drift, evidences of continental drift and polar wandering. **4 hrs**

Unit-3 Earth's surface features. Seismology: seismic waves, intensity and isoseismic lines, earthquake belts. Earthquake zones of India, Seismograph, causes of earthquake. Internal structure of the Earth.

4 hrs

Unit-4 Origin and structures of Alpine-Himalayan belt, different phases in evolution of Himalayas. Study of major groups and formations of Himalayas, lithology and thrust boundaries – HFF (Himalayan frontal fault), MBT (main boundary thrust), MCT(main central thrust), STD(south Tibetan detachment), indo-Tsangpo suture zone. **4 hrs**

Unit-5 Longitudinal and latitudinal division of Himalayas on map of India. Map of earthquake zones of India. Map of Orogenic belts of India. Construction of lithologs of a mapped unit. Study of topographic map, location , and orientation of toposheet. 4 hrs



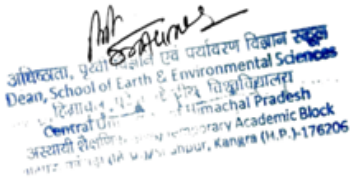
Recommended Books

7. Condie, K.C. (1984). Plate Tectonics & crustal Evolution. Pregamon Press, London.
8. A.K., Biyani, (2007), Dimensions of Himalayan Geology.
9. Earth: Introduction to Physical Geology, Fifth addition. Prentice Hall Pub.
10. The Geology of earthquake by Robert Yeats, Kerry Sieh and Clarence R. Allen Oxford University Press.
11. Geology of India and Burma M.S. Krishnan 1968 addition, Higginbothams (p) limited
12. Earthquake (forcasting and mitigation) by H.N. Srivastava , National Book Trust, India

Lecture Plan:

Lectures	Topics	Prescribed Text Book
1-4	Internal structure of Earth, Internal structure of Earth, fundamental characteristics of crust, mantle, core; fundamentals on rock-forming minerals; weathering and erosion of rocks and minerals. Concept of plate tectonics, types of plate boundaries, features of convergent and divergent boundaries, causes of plate motion, dynamic evolution of continental and oceanic crust, Sea floor spreading, morphological features of ocean floor.	**1, 2 &3**
4-8	Geosynclines: Classification and evolution of Geosyncline, causes of subsidence and upliftment. Continental drift. Taylor's and Wegner's theories of continental drift, evidences of continental drift and polar wandering.	**1, 2 &3**
9-12	Earth's surface features. Seismology: seismic waves, intensity and isoseismic lines, earthquake belts. Earthquake zones of	**6**

	India, Seismograph, causes of earthquake. Internal structure of the Earth.	
13-16	Origin and structures of Alpine-Himalayan belt, different phases in evolution of Himalayas. Study of major groups and formations of Himalayas, lithology and thrust boundaries - HFF(Himalayan frontal fault), MBT(main boundary thrust), MCT(main central thrust), STD(south Tibetan detachment), indo-Tsangpo suture zone.	**Course content provided by teacher in addition to books recommended**.
17-20	Longitudinal and latitudinal division of Himalayas on map of India. Map of earthquake zones of India. Map of Orogenic belts of India. Construction of lithologs of a mapped unit. Study of topographic map, location , and orientation of toposheet.	**5**



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

Course code: ENV 559
Course Name: Environmental Geophysics **02 credit**

Teacher: Prof A.K. Mahajan

Course Objective

The student will identify which geophysical methods are used by industry and academia to solve environmental and geotechnical problems. The student will analyze and integrate the physical theory, field methodology, and interpretation of each method with geologic and engineering information to solve problems using real data sets. The student will also summarize and critique recent publications in the fields of engineering and environmental geophysics.

Course Contents:

Unit-1 **2 hrs**

Introduction to Hazards definition of hazards, introduction to landslide hazard, earthquakes, flash floods and floods, a brief on longitudinal and transverse division of Himalayan.

Introduction to Applied Geophysics: what are applied and environmental geophysics, matching geophysical methods to applications, planning a geophysical survey, planning survey and survey constraints, survey design, optimum configuration?

Assignment 1: Write different geophysical method used for sub-surface studies and their applications

Unit-2 **4 hrs**

Seismic Refraction Surveying: Introduction, General principles, Snells law, Field survey arrangements, Interpretational methods, applications and case histories.

Seismic Reflection Surveying Introduction, reflection survey general considerations, reflection principles, reflection data processing using surfseis software (pre-processing, data filtering using muting technique- a practical, dispersion analysis and 1-D profiling and 2-D profiling.

Assignment 2: Write general principle of seismic reflection, refractions and draw ray diagrams for single layer, two layer and multilayer model.

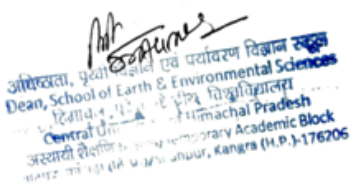
Unit-3 **8 hrs**

Introduction to different methods i.e. Spectral analysis of surface waves (SASW); Continuous surface waves methods (CSWS) and Cross hole method

Multichannel analysis of surface waves (MASW), active and passive seismic methods, field configuration, optimum field configuration, source receiver geometry, data acquisition, data analysis using seismic surfseis software, dispersion analysis, data interpretation and its applications.

Assignment 3: Draw field arrangement for data collection using MASW methodology along a linear line using three roll with 24 channels as per instruction in the class room.

Unit-4 **4 hrs**



Introduction to Ground Penetration Radar (GPR), Principle of GPR, propagation of radiowaves, dielectric properties of earth material, modes of data acquisition, data processing, interpretational techniques and Applications of GPR

Assignment 4 : Write down principles of GPR, antenna used for various investigations and its application for detections of different subsurface utilities.

Unit-5

Site amplification: **2 hrs**

What is site response, Site response studies, and application of MASW in site response, Shake analysis, its applications?

Hand on Practice: Training of students in Grapher and Surfer

Books Recommended:

20. An introduction to applied and Environmental Geophysics **by John M. Reynolds Wiley-Blackwell publcations**
21. Principles of applied Geophysics by D.S.Parasnis **Springer publications**
22. Telford, W.M. et.al. Applied Geophysics: **Cambridge publication**
23. Geotechnical Earthquake Engineering by Sreven L. **Kramer**
24. Earthquakes (forecasting and mitigation by H.N. Srivastava
25. Recent advances in Earthquake geotechnical Engineering and microzonation by Atila Ansal, 2004.