Course Type	Course Code	Name of Course	L	T	P	Credit
DP	NGPC506	Computational Seismology Practical	0	0	3	1.5

Course Objective
The course is designed to understand the concepts of seismology through their practical approach. Clear understanding of the seismogram data and the various use of the filtering techniques and how they modify the data that can be further used to derive the structure of the earth through seismological processes.
Learning Outcomes
Any student of modern seismology would be master of its fundamental knowledge and deepening his understanding with a coherent balance of theory, concepts and applications of the computer programs that are openly available for use.

Unit No.	Description of Lectures	Lecture Hrs.	Learning Outcomes
1.	Computation of Fourier Transform and Fast Fourier transform on some signals	3	Filter designing for waveform modelling and seismogram generation
2.	Understanding basic filter operations, computation of convolution of two time series	3	Filter designing for waveform modelling and seismogram generation
3.	Understanding basic filter operations, computation of cross correlations and autocorrelation	3	Filter designing for waveform modelling and seismogram generation
4.	Computation techniques to understand the wave propagation	3	Filter designing for waveform modelling and seismogram generation
5.	Computation of synthetic seismograms	3	Filter designing for waveform modelling and seismogram generation
6.	Mohr cycle and its application to understanding soil parameters	3	Understanding of stress variations and its application to near surface
7.	Field demonstration: How to set up a seismic station. And Data acquisition using broadband seismometers, and seismogram interpretation	3	Field Setup and data acquisition
8.	Field demonstration: How to set up a seismic station. And Data acquisition using Tromino, and seismogram interpretation	3	Field Setup and data acquisition

9.	Basic data processing techniques that can be applied to the seismogram. Identifying first arrivals etc.	**3**	Operation of open use softwares and tools used for data processing
10.	Extracting fundamental modes of surface waves and computation of 1-D velocity structure from surface wave dispersion curves	**3**	Understanding of the dispersive nature of the surface waves and inversion
11.	H/V calculations and generation of 1D velocity structures and applications to basement computations	**3**	Understanding of fundamental frequencies
12.	Determination of phase velocities from empirical Green's functions from noise cross-correlation	**3**	Use of cross-correlation filter
13.	Surface wave/Ambient Noise Tomography	**6**	Seismic tomography
	Total:	**42**	

Textbooks

1. Stein, S. and Wysession, M. 2003. An Introduction to Seismology, Earthquakes and Earth Structure, Oxford: Blackwell Publishing.
2. Agustin, U., 2000. Principles of Seismology, Cambridge: Cambridge University Press

Reference Books

1. Shearer, P. 1999. Introduction to Seismology, Cambridge: Cambridge University Press
2. Lowrie, W., 2007. Fundamental of Geophysics, Cambridge: Cambridge University Press
3. Bullen, K. E. and Bolt, B. A. 1985. An Introduction to the Theory of Seismology, Cambridge: Cambridge University Press
4. Gubins D., 1990. Seismology and Plate Tectonics, Cambridge University Press, pp. 348.
5. Igel H., 2016. Computational Seismology-A Practical Introduction: Oxford University Press.
6. Aki, K., P. G. Richards, 2002. Quantitative Seismology, 2nd edition, University Science Books, Sausalito, California.