



Centre of Excellence in Disaster Mitigation & Management, 3<sup>rd</sup> Floor,  
New Building, Opposite Biotechnology Department  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE, ROORKEE – 247667, UTTARAKHAND, INDIA  
Tel: 01332-28- 6616 (Office), E-mail: [coe\\_dmm@iitr.ernet.in](mailto:coe_dmm@iitr.ernet.in); [www.coedmm.org](http://www.coedmm.org)

**CENTRE OF EXCELLENCE IN DISASTER MITIGATION & MANAGEMENT, 3<sup>rd</sup> Floor,  
New Building, Opposite Biotechnology Department**

**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE, ROORKEE – 247667, UTTARAKHAND, INDIA**

Tel: 01332-28- 6616 (Office), E-mail: [coe\\_dmm@iitr.ernet.in](mailto:coe_dmm@iitr.ernet.in); [www.coedmm.org](http://www.coedmm.org)

1. Subject Code : **DM-604** Course Title : **Instrumentation and Data Mining Techniques**
2. Contact Hours: L: 3 T: 1 P: 2/2
3. Examination Duration (Hrs.) : Theory: 3 Practical: 0
4. Relative Weightage: CWS 15 PRS 15 MTE 30 ETE 40 PRE 0
5. Credits: 4 6. Semester: **Spring** 7. Subject Area: **PEC**
8. Pre-requisite: **Nil**
9. Objective: To impart knowledge of basic principles, methods, and applications of instrumentation, data processing and data mining
10. Details of Course :

Sl. No.	Particulars	Contact Hours
1.	Seismic instrumentation, ground motion measurement, instrumentation of structures	2
2.	Theory of seismic sensors - seismographs, strong motion accelerographs, SRRs; Equation of motion, characteristics, calibration and use	4
3.	Sampling theorem, anti-aliasing filter, recording system, networking and data transmission	4
4.	Processing of recorded data, noise, transducer correction, low pass and high pass filters	4
5.	Real time engineering seismology, shake maps, early warning systems	2
6.	Response spectra, Fourier spectra, spectrum compatible time history	4
7.	Introduction to data mining, seismic instrumentation, displacement, velocity, and accelerometers, adjustment and interpretation of recorded data	2
8.	Data preparation for knowledge discovery, data understanding, data cleaning, data transformation, discretization, feature selection	5
9.	Classification and regression - Maximum likelihood methods, Bayesian methods, Decision Tree classification; Neural Networks	8
10.	Clustering - K-means, hierarchical clustering, self organizing feature maps, principal component analysis	4
11.	Evaluation and visualization - Classification with train, test and validation sets, cross-validation, bootstrap, 1,2 and 3 D visualization of data	3
<b>Total</b>		<b>42</b>

**11. Suggested Books :**

Sl. No	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Stearns S.D., Digital Signal Processing with Examples in MATLAB, Prentice Hall	2003
2.	Hano D., Mamnila H and Synth P., Data Mining, Prentice Hall of India	2004
3.	Newnes , Digital Signal Processing : A Practical Guide for Engineers and Scientists, Elsevier Science	2003
4.	Agarwal P. and Shrikhande M., Earthquake Resistant Design of Structures, Prentice Hall of India	2006
5.	Dunham M.H., Data Mining: Introductory and Advanced Topics, Prentice Hall	2003