

# Linear Regression Analysis - Web course

## COURSE OUTLINE

The course focuses on the topics of linear regression analysis. The emphasis will be more on the development of tools from the statistical theories and concept along with their utility in real life data applications. The course starts with a description of need of regression analysis and lays the foundation of simple linear regression model.

This includes the details of least squares estimation and maximum likelihood estimation of parameters along with the topics of prediction, testing of hypothesis and confidence interval estimation related to regression parameters. Then the topic of multiple regression model is considered which extends the topics covered in earlier chapter in a case when the number of independent variables are more than one.

The tools for model adequacy checking like residual analysis, predictive residual sum of squares, outliers and lack of fit are discussed in the next chapter. The transformation and weighting methods to correct the model adequacies are discussed along with variance stabilizing transformation, and Box Cox transformation are discussed in the next chapter.

The generalized least squares estimation and its properties are discussed next. Various type of diagnostic tools to test for the leverage and influential points, polynomial regression model, dummy variable models, variable selection, problem of multicollinearity, problem of heteroskedasticity, Logistic regression models and Poisson regression model are the other topics to be discussed in the course.

## COURSE DETAIL

Sl.	Topic	Number of
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NP-TEL

# NPTEL

<http://nptel.iitm.ac.in>

## Mathematics

### Pre-requisites:

- Knowledge of basic statistics

### Additional Reading:

1. John F. Monahan, A Primer on Linear Models, CRC Press, 2008.
2. Andre I. Khuri: Linear Model Methodology, CRC Press, 2010.

### Coordinators:

**Prof. Shalabh**  
Department of Mathematics & Statistics IIT Kanpur

No		Lecture(s)
1	Introduction	1
2	Simple linear regression	7
3	Multipple linear regression	4
4	Model adequacy checking	4
5	Transformation to correct model inadequacies	2
6	Generalized least squares	1
7	Leverage and influential points diagnostics	2
8	Multicollinearity	3
9	Hetrokedasticity	3
10	Polynomial regression models	3
11	Dummy variable models	2
12	Variable selection and model building	3
13	Logistic regression model	2
14	Poisson regression model	1
15	Generalized linear model	2

	<b>Total</b>	<b>40</b>
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**References:**

1. Douglas C. Montgomery, Elizabeth A. Peck and G. Geoffrey Vining: Introduction to Linear Regression Analysis, Wiley, 2001.
2. Norman R. Draper and Harry Smith: Applied Regression Analysis, Wiley, 1998.
3. C.R. Rao, H. Toutenburg, Shalabh and C. Heumann: Linear Models and Generalizations - Least Squares and Alternatives, Springer, 2008.