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INDUSTRIAL STATISTICS LAB

In the two theory courses, namely, MSTE-001 (Industrial Statistics-I) and MSTE-002 (Industrial Statistics-II), you have studied the theoretical concepts and applications of different statistical tools in industries, viz., quality control, regression modelling and time series modelling.

In the Basic Statistics Lab course (MSTL-001), you have learnt how to perform basic statistical analysis using Excel 2007. This lab course has been designed to enable you to apply various statistical tools and techniques to analyse data related to industries and business using MS Excel 2007.

This course is divided into four parts comprising 17 lab sessions.

Part A (Control Charts for Variables) comprises five sessions. The sessions of Part A are aimed at developing your practical skills in constructing control charts for variables such as the \bar{X} -chart, R-chart and S-chart. In this part, you will learn how to compute control limits and plot control charts using Excel 2007.

Part B (Control Charts for Attributes) also comprises five sessions. We use the control charts for attributes for monitoring and controlling the quality characteristics that cannot be measured quantitatively. The control charts for attributes are of two types: control charts for defectives and control charts for defects. In this part, you will use Excel 2007 to construct various control charts for defectives such as the control chart for fraction defective (p-chart), control chart for number of defectives (np-chart), control chart for number of defects (c-chart) and the control chart for number of defects per unit (u-chart).

Part C (Regression Modelling) comprising four sessions will impart practical skills of using Excel 2007 for regression modelling. You will be able to perform simple and multiple regression analysis with qualitative or quantitative regressors using Excel 2007. You will also apply various variable selection methods to build a significant regression model using Excel 2007.

Part D (Time Series Modelling) comprises three sessions and will enable you to develop practical skills of predicting future values of observations with the help of Excel 2007. You will be using elementary methods of time series data analysis based on the past and present observations of a given variable. In this part, you will learn forecasting techniques for a given time series using Excel 2007. You will also be able to compute the trend values and seasonal indices, smooth (or filter) out the seasonal and irregular effects, and deseasonalise the data.

This lab course will help you develop practical skills of analysing industrial data using MS Excel 2007. You will learn how to use the basic features of the **Functions** and **Analysis ToolPak** in Excel 2007 for solving problems based on the elective courses MSTE-001 and MSTE-002. This will make it easier for you to explore Excel 2007 further on your own and apply it in your work.

Study Guide

This lab course is of 2 credits. It means that it requires a total of 60 hours to complete the 17 sessions prescribed in the course. In each lab

session, some activities are also given for practice. The results of each lab session would be evaluated as a part of your continuous assessment. At the end of each lab session, exercises for continuous assessment are also given which would be evaluated as well as graded. thirty per cent (30%) weightage is given to continuous assessment. The term-end examination carries seventy per cent (70%) weightage. It will be held on a common date for all students at designated examination centres. The date will be notified earlier.

We advise you to complete MSTE-001, MSTE-002 and MSTL-001 courses of the programme before you start doing this lab course. To derive maximum benefit from this lab course, you are advised to revise all prerequisite write-ups carefully so that you are well prepared to do the practicals. You should know all the formulae and procedures used in each lab session and follow all instructions given therein to acquire competence and skills in using MS Excel 2007 for industrial applications of statistics.

You may like to follow the instructions given in each laboratory session and solve the exercises on your own if you have a computer with MS Excel 2007 on it. **You may like to do the steps in each session and exercises for continuous assessment given therein on your own. In that case you are advised to take prior permission from the Programme and Course Coordinators giving due justification, and keep in touch with them at designated times.** You are also advised to submit your work to the designated Counsellor for continuous assessment and appear in the term-end examination on the pre-notified date. If you wish to learn these skills at your Study Centre under the guidance of the Counsellor, you will be required to be present in the Lab for 6 days (8 hours each day). The schedule will be decided by the Study Centre and intimated to you in advance.

You must carry the printed course materials of the theory courses MSTE-001 and MSTE-002 along with this lab course (MSTL-002) to your Study Centre while doing the lab course so that you can refer to them in case you have any doubts. Since the exercises of this course are computer based, **a working knowledge of computers is a prerequisite.** You must complete each exercise before going to the next one as the skills you learn in any exercise are essential for the subsequent exercises. Hence, you must complete all lab sessions sequentially to complete this lab course successfully.

Note that the following convention is used in the exercises:

Name of the menu/command – in ***bold, italics and blue colour***

Name of the keyboard command – in ***bold, italics and green colour***

Name of Excel sheet – in “***bold and inverted commas***”

Formula or text to be typed in a cell of Excel sheet - in “inverted commas”

The abbreviations being used are the same as for theory courses viz.

Fig. for Figure,

Figs. for Figures,

Sec. for Section and Sub-section, and

Secs. for Sections and Sub-sections.

For performing the exercises in this course, we advise you to create a folder named “**Industrial Statistics Lab**” on your computer. Use a new Excel file for each lab session and name each of these files as, e.g., LS1, LS2, ..., LS17 so that it becomes easy for you to manage the files you are dealing with.

For managing the problems, activities and continuous assessment given in each lab session, it would be a good idea to use a separate sheet in each Excel file and name them based on the activity and exercises. Then it will be easy for you to locate the files and sheets later.

Laboratory Record Book

An important part of scientific training is to maintain a complete and up to date record of the lab work. You need to prepare and submit a lab record book for writing and reporting the work you have carried out in each lab session. The record book should contain alternate pages of ruled and un-ruled pages. Buy a practical notebook for this purpose.

You are advised to prepare the page (such as title, exercise numbers, etc.) for recording the lab exercises before beginning a lab session. **For each session**, you should **write down the title of the session and the date** along with the interpretation of the results obtained and paste the final screenshot of the Excel sheet. What you need to submit and write in the record book is given at the end of each lab session.

You should record your work for each lab session in your record book in the following sections:

- Problem given
- Formulae and Procedures used for the problem
- Necessary Screenshots and Charts of the results
- Interpretation

Submission of Your Lab Record for Evaluation

You need to submit the lab record book to the Counsellor at the Study Centre for continuous assessment and grading. Marks will be allocated for successful completion of each exercise, interpretation of the results and screen shots of the final output pasted in the record book in a proper manner as directed above.

Activity

Some activities are given at the end of problems in each lab session. These activities have two purposes: To give you practice in the steps explained in the session and to make you think and explore the functions and tools available in Excel 2007 on your own. So, do complete all the activities yourself.

We hope that after studying this lab course and performing the activities and exercises given for continuous assessment, you will acquire the basic practical skills to use MS Excel 2007 and be able to apply them in your work. As far as possible, try to work independently. We hope that you enjoy doing the practicals given in this Industrial Statistics Lab course.

We wish you the best in this endeavour.