College of Engineering Pune
(An Autonomous Institute of Government of Maharashtra, Pune-411005)
Department of Mathematics
(MA 15005) Experimental Design Data & Qualitative Analysis
F.Y. M. Tech. Semester I
(Manufacturing Engg. & Automation, Mechatronics, Project Management (Prod.))

Teaching Scheme	Examination Scheme
Lectures : 3 hrs / week	Internal Test 1: 20 marks
Lab : 2 hrs / week	Internal Test 2: 20 marks
	End Sem. Exam: 60 marks

Unit I : Probability Theory and Sampling Distributions. Basic probability theory along with examples. **[04 Hrs]**

Unit II : Standard discrete and continuous distributions like Binomial, Poisson, Normal, Exponential etc. Central Limit Theorem and its significance. Some sampling distributions like $\chi 2$, t, F. **[06 Hrs]**

Unit III : One - and Two - Sample estimation problems: Introduction, statistical inference, classical methods of estimation, single sample: estimating the mean and variance, two samples: estimating the difference between two means and ratio of two variances. **[08 Hrs]**

Unit IV : One - and Two – Sample tests of hypotheses: Introduction, testing a statistical hypothesis, tests on single sample and two samples concerning means and variances, use of *P*-values for decision making in testing hypothesis, Goodness of Fit test. **[08 Hrs]**

Unit V : ANOVA: One – way, Two – way with / without interactions, Latin Squares ANOVA technique, Principles of Design Of Experiments, some standard designs such as CRD, RBD, LSD. **[08 Hrs]**

Unit VI : Statistical Quality Control: Introduction, nature of control limits, purpose of control charts, control charts for variables, control charts for attributes. **[06 Hrs]**

Text Book :

- Ronald E, Walpole, Sharon L. Myers, Keying Ye, Probability and Statistics for Engineers and Scientists (8th Edition), Pearson Prentice Hall, 2007.

Reference Books :

- Douglas C. Montgomery, Design and Analysis of Experiments (7th Edition), Wiley Student Edition, 2009.
- S. P. Gupta, Statistical Methods, S. Chand & Sons, 37th revised edition, 2008
- William W. Hines, Douglas C. Montgomery, David M. Goldsman, Probability and Statistics for Engineering, (4th Edition), Willey Student edition, 2006.
- The practice of Business Statistics by Manish Sharma and Amit Gupta, Khanna Publishing Company Private Limited, New Delhi.

Outcomes : Students will be able to

1. **determine** probability and conditional probability of simple events, **define** random variables.
2. **explain** standard discrete and continuous distributions, statistical inference, types of estimation and hypothesis.
3. **calculate** probabilities, **apply** tests of hypothesis for various population parameters.
4. **perform** one way, two way analysis of variance, **apply** principles of design of experiments.
5. **check** for verifiability in a process using statistical quality control techniques, **apply** probability theory and statistical inference to problems in Engineering and real life situations.

Note 1 :

- To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
- To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
- To measure CO3, questions will be based on applications of core concepts.

- To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
- To measure CO5, some questions may be based on self-study topics and also comprehension of unseen passages.

Note 2 :

1. All the Course outcomes 1 to 3 will be judged by 75% of the questions and outcomes 4,5, and 6 will be judged by 25 % of questions.
2. Lab sessions will be conducted by faculty of Dept of Production Engineering & Industrial Management.