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| Course Code | Course Title | L | P | U |
| **MA212** | **Probability and Statistics** | **3** | **0** | **3** |

**Course Objectives:**

1. To equip the students with the elements of probability and probability distributions.
2. To understand some fundamental principles and knowledge of statistics.
3. Applications of probability and statistical techniques are emphasized to solve practical problems in science and engineering.

**Course Outcomes:**

Upon successful completion, a student will be able to:

1. Recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields,
2. Recognize common probability distributions for discrete and continuous variables;
3. Apply methods from algebra and calculus to derive the mean and variance for a range of probability distributions;
4. Understand the concept of an estimator, common methods for evaluating an estimator's performance and properties of desirable estimators;

**Course Contents:**

Introduction to permutation and combination, sample space, events and counting. Probability of an event, additive rules, conditional probability, multiplicative rule, Bayes’ theorem and application. Discrete, continuous and joint probability distribution function. Mean, variance, co-variance of random variables, mean and variance of linear combinations of random variables. Study of some standard discrete and continuous probability distributions. Population, sample, central tendency in sample and sample variance. Sampling distributions of means and some standard sampling distributions. Classical methods of estimation, point estimate, interval estimate, proportion estimate, general concepts of statistical hypothesis. Simple linear regression, least square estimator, correlation.

**Textbook(s):**

T1: Probability and Statistics for Engineers & Statistics, R. E. Walpole, R. H. Myers, S. L. Myers, K. Ye, Pearson Education, 7th Edition, 2006.

**Reference book(s)**:

 R1: Miller & Freund's Probability & Statistics for Engineers, R. A. Johnson, PHI, 7th Edition, 2008.

 R2: Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Matt, A. Kandel and T. Baker, 2nd Edition, PHI, 2009.

**Lecture-wise plan**:

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| **Lecture No.** | **Learning objective** | **Topics to be covered** | **Reference (Ch./Sec./ Page Nos. of Text Book)** |
| 1-4 | Review of previous knowledge | Introduction to permutation and combination. | R2: Ch 2: 126-211 |
| 5 | Understand and describe sample spaces and events for random experiments | Sample space, events and counting | T1: Ch 2: 38-47 |
| 6-9 | To understand the basic concepts of probability and conditional probability | Probability of an event, additive rules, conditional probability, multiplicative rule, Bayes’ theorem and application | T1: Ch 2: 55-73 |
| 10-14 | Concepts of random variable and probability distribution functions | Discrete, continuous and joint probability distribution function | T1: Ch 3: 79-102 |
| 15-18 | To have the concept of mathematical expectation | Mean, variance, co-variance of random variables, mean and variance of linear combinations of random variables | T1: Ch 4: 104-130 |
| 19-26 | To find mean, variance from probability distribution function | Study of some standard discrete probability distributions | T1: Ch 5: 131-156 |
|  |  | Study of some standard continuous probability distributions | T1: Ch 6: 158-191 |
| 27-29 | Review of statistical components | Population, sample, central tendency in sample and sample variance | T1: Ch 8: 210-223 |
| 30-32 | To have the concepts of sampling distributions | Sampling distributions of means and some standard sampling distributions | T1: Ch 8: 224-244 |
| 33-37 | Understand the concept of estimation and testing hypothesis | Classical methods of estimation, point estimate, interval estimate, proportion estimate, general concepts of statistical hypothesis  | T1: Ch 9: 246-291 Ch 10: 300-320 |
| 38-40 | To estimate the parameters in linear regression model | Simple linear regression, least square estimator, correlation | T1:Ch 11: 366-406 |

**Evaluation Scheme**:

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| **Component** | **Duration** | **Weightage (%)** | **Remarks** |
| Internal I | 50 mins. | 10 | Closed Book |
| Mid term | 2 hrs. | 30 | Closed Book |
| Internal II | 50 mins. | 10 | Closed Book |
| Comprehensive Exam | 3 hrs. | 50 | Closed Book |

1. **Attendance Policy:** A Student must normally maintain a minimum of **75% attendance** in the course without which he/she shall be disqualified from appearing in the respective examination.
2. **Make-up Policy:** A student, who misses any component of evaluation for genuine reasons, must immediately approach the instructor with a request for make-up examination stating reasons. **The decision of the instructor in all matters of make-up shall be final.**
3. **Chamber Consultation Hours:** During the Chamber Consultation Hours, the students can consult the respective faculty in his/her chamber without prior appointment.