# DEPARTMENT OF MATHEMATICS

# NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

| COURSE PLAN – PART I | | | |
|---|---|---|---|
| **Name of the programme and specialization** | M.Tech. Industrial Safety Engineering | | |
| **Course Title** | Probability and Statistics | | |
| **Course Code** | MA611 | **No. of Credits** | 3 |
| **Course Code of Pre-requisite subject(s)** | Nil | | |
| **Session** | July 2018 | **Section (if, applicable)** | Nil |
| **Name of Faculty** | Mr. V.Tamilselvan | **Department** | Mathematics |
| **Email** | vtsmaths@yahoo.in | **Telephone No.** | |
| **Name of Course Coordinator(s) (if, applicable)** | Dr. P.Saikrishnan | | |
| **E-mail** | psai@nitt.edu | **Telephone No.** | |
| **Course Type** | ☑ Core course | ☐ Elective course | |

**Syllabus (approved in BoS)**

## MA 611 Probability and Statistics

Random variable – Two dimensional random variables – Standard probability distributions – Binomial, Poisson and Normal distributions - Moment generating function.

Special distributions – Uniform, Geometric, Exponential, Gamma, Weibull and Beta distributions – Mean, Variance, Raw moments from moment generating functions of respective distributions.

Sampling distributions – Confidence interval estimation of population parameters – Testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test.

Curve fitting - Method of least squares - Regression and correlation – Rank correlation – Multiple and partial correlation – Analysis of variance - One way and two way classifications – Time series analysis.

Basics concepts of reliability - Failure rate analysis – Reliability of systems – Series, Parallel – Maintenance - Preventive and corrective – Maintainability equation – Availability – Quality and Reliability.

Introduction to data analytical and data mining.

**ESSENTIAL READINGS: Textbooks, reference books Website addresses, journals, etc.**

**Reference Books:**
1. BOWKER and LIBERMAN, Engineering Statistics, Prentice - Hall.
2. GUPTA, S.C. and KAPOOR, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. SPIEGEL, MURRAY R., Probability and Statistics, Schaum's series.
4. SPIEGEL, MURRAY R., Statistics, Schaum's series.
5. TRIVEDI K.S., Probability and Statistics with Reliability and Queuing and Computer Science Applications, Prentice Hall of India.

## COURSE OBJECTIVES

✓ the concepts of probability and statistics to safety engineering problems.
✓ reliability engineering theory in determining the reliability of the safety systems

## COURSE OUTCOMES (CO)

| Course Outcomes | Aligned Programme Outcomes (PO) |
|---|---|
| 1. Apply standard and special probability distributions to safety engineering problems. | The Engineering Post - graduates will apply their knowledge of Distributions and Statistics to solve industrially applicable problems. |
| 2. Indicate data pictorially and numerically and analyse it. | |
| 3. employ sampling distributions in testing various hypotheses. | |
| 4. Use t - test, F - test and Chi square test in determining the validity of data. | |
| 5. Predict the relationship between parameters through correlation and regression analysis and compute the reliability of safety systems. | |

## COURSE PLAN – PART II

## COURSE OVERVIEW

1. To understand the Two dimensional random variable and discussing the most commonly used probability distributions like binomial, Poisson, Normal, Uniform, Geometric, Exponential, Gamma, Weibull and beta distribution. Also compute Mean, Variance and Moment Generating Functions.
2. To understand the Sampling distribution, Confidence interval, Testing of hypothesis.
3. To fit the curve by principle of least squares and compute Regression, Correlation, rank correlation, multiple and partial correlation.
4. To understand the Anova of One way and Two way classification, Time series analysis.
5. To learn the reliability theory and data analytical and data mining.

## COURSE TEACHING AND LEARNING ACTIVITIES

| S.No. | Week Hours | Topic | Mode of Delivery |
|---|---|---|---|
| 1 | Week - 1 | Introduction to random variables, Two dimensional random variables, Binomial, Poisson and Normal Distributions. | |
| | Week - 2 | Moment generating function, and Moment generating function of Standard distributions. | |
| 2 | Week - 3 | Uniform, Geometric, Exponential, Gamma, Weibull and Beta distributions. | |
| | Week – 4 | Mean, Variance, Raw moments from moment generating functions of respective distributions. | |
| 3 | Week - 5 | Introduction to sampling distributions, confidence interval estimation of population parameters, and concept of Testing of hypothesis. | |
| | Week - 6 | Large sample tests for mean and proportion, $t$ – test, $F$ – test and chi – square test. | Chalk and Talk |
| 4 | Week - 7 | Curve fitting – Method of least squares – Regression and Correlation, Rank correlation, Multiple correlation. | |
| | Week - 8 | Partial correlation, Analysis of variance – One way and Two way classification. | |
| 5 | Week - 9 | Time Series Analysis, Basic concepts of reliability, Failure rate analysis, Reliability of systems – Series. | |
| | Week - 10 | Parallel – Maintenance – Preventive and Corrective Maintainability equation. | |
| | Week - 11 | Availability – Quality and Reliability. | |
| 6 | Week - 12 | Introduction to data analytical and data mining. | |

## COURSE ASSESSMENT METHODS (shall range from 4 to 6)

| S.No. | Mode of Assessment | Week/Date | Duration | % Weightage |
|---|---|---|---|---|
| 1 | Assessment -1 | 4th week | 1 Hour | 20 |
| 2 | Assessment - 2 | 8th week | 1 Hour | 20 |
| 3 | Assessment - 3 | Seminar | | 10 |
| 4 | Assessment – 4 (End Semester) | | 3 Hour | 50 |
| CPA | Compensation Assessment* | 10th week | 1 Hour | |

**\*mandatory; refer to guidelines on page 5**

## COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

1. Feedback from the students during class committee meetings
2. Exit survey from the students at the end of the session through questionnaire

## COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

### MODE OF CORRESPONDENCE (email/ phone etc.)

1. All the correspondence regarding the course will be communicated through webmail or intimated during class hours.
2. Queries/ Clarifications (if necessary) may be e-mailed to kani@nitt.edu or can be communicated directly during Institute working hours.

### COMPENSATION ASSESSMENT POLICY

The students who are absent for assessment Tests will be allowed for compensation Assessment. Also compensation Assessment is not permitted for improvement.

### ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

➢ **At least 75% attendance in each course is mandatory.**
➢ **A maximum of 10% shall be allowed under On Duty (OD) category.**
➢ Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

### ACADEMIC DISHONESTY & PLAGIARISM

➢ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

➢ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

➢ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

## ADDITIONAL INFORMATION

Faculty is available for discussion after the class hours at the Department on the first floor of Lyceum Room No. 202.

## FOR APPROVAL

Course Faculty _____     CC-Chairperson _____     HOD _____

(P-SAIKRISHNAN)

## Guidelines:

a) The number of assessments for a course shall range from 4 to 6.

b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**

d) **The passing minimum shall be as per the regulations.**

| B.Tech. Admitted in | | | | P.G. |
|---|---|---|---|---|
| **2018** | **2017** | **2016** | **2015** | |
| 35% or class average/2 whichever is greater. | | Peak/3 or class average/2 whichever is lower | | 40% |

e) **Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**

f) **Absolute grading policy shall be incorporated if the number of students per course is less than 10.**

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.