



DEPARTMENT OF PHYSICS

COURSE PLAN – PART I			
Name of the programme and specialization	II SEMESTER - M.Tech. NDT		
Course Title	PROBABILITY, STATISTICS, QUALITY AND RELIABILITY		
Course Code	PH616	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL		
Session	Jan. 2020	Section (if, applicable)	
Name of Faculty	Dr. M. DHAVAMURTHY	Department	PHYSICS
Official Email	dhavam@nitt.edu	Telephone No.	NIL
Name of Course Coordinator(s) (if, applicable)	Dr. B. Karthikeyan		
Official E-mail	bkarthik@nitt.edu	Telephone No.	+91-431-2503612
Course Type (please tick appropriately)	<input type="checkbox"/> Core course	<input checked="" type="checkbox"/> Elective course	
<b>Syllabus (approved in BoS)</b>			
<p><b>Probability and Random Variable</b>            Concepts of probability – Random variables – Baye’s Theorem – Standard Probability Distributions – Binomial, Poisson, Normal, Geometric, Exponential distributions – Correlation and Regression.</p> <p><b>Statistical Quality Control</b>            Statistical basis for control charts – control limits – control charts and types – control charts for variables, defective and defects – introduction to six sigma – inspections by sampling – OC curves – acceptance sampling plans.</p> <p><b>Quality</b>            Basics of quality – Quality philosophy – quality control – quality assurance – design for quality management system – Quality certification and accreditation schemes – total quality management and Taguchi’s method – quality standards and procedures – ISO 9000 Series – 14000 Series.</p> <p><b>Reliability</b>            Basic concepts of reliability – Reliability Vs Quality – Hazard and failure rate analysis – mean time between failures (MTBF) – mean time to failure (MTTF) – Mathematical models for reliability studies - Normal, Exponential and Weibull failure laws – Reliability of systems – Series system, Parallel system, Series-Parallel system</p>			



**NDE Reliability**

Applications of reliability to systems - General Considerations: NDE response, NDE systems management and schedule – Procedure selection/development of NDE Engineering – System/process – performance characteristics - Conditional probability in NDE discrimination Signal/noise relationships, reference standards personnel – Modeling of NDE reliability– PoD– Benefits of PoD– approaches to modeling PoD– Applications (case studies) – Air frames – gas turbine engines – Space shuttle - Statistical nature of NDE process.

**COURSE OBJECTIVES**

1. To strengthen and improve the ability to use theory, design and techniques of quality control systems and to utilize reliability considerations in engineering design for an improved safety life.
2. To learn statistical tools and quality philosophy in order to control the quality in manufacturing and production engineering components.

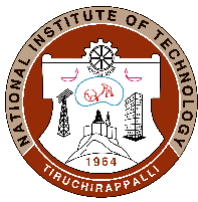
**MAPPING OF COs with POs**

<b>Course Outcomes</b>	<b>Programme Outcomes (PO) (Enter Numbers only)</b>
Understand the key concepts of life-cycle cost analysis and to make considered judgements regarding optimal maintenance and/or repair strategies.	1, 2, 4, 11
Apply simulation and sampling techniques to evaluate the reliability of structural components or systems qualitatively.	5, 10, 11
Perform simple calculation in SQC and reliability to real applications.	5, 8, 11
Evaluate the nominal probability of failure of a structure using a time-independent reliability formulation.	3, 4, 10, 11

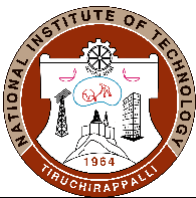
**COURSE PLAN – PART II**

**COURSE OVERVIEW**

- The PROBABILITY, STATISTICS, QUALITY AND RELIABILITY (PH616) is an elective course paper offered in the second semester to the M.Tech. NDT.
- The course paper has 3 credit.



<b>COURSE TEACHING AND LEARNING ACTIVITIES ( Add more rows)</b>			
<b>S.No.</b>	<b>Week/Contact Hours</b>	<b>Topic</b>	<b>Mode of Delivery</b>
1	6 – 10 Jan.2020	Concepts of probability – Random variables	Chalk & Talk, Class Discussion, PPT
2	20 – 24 Jan.2020	Baye’s Theorem – Standard Probability Distributions – Binomial, Poisson, Normal, Geometric.	Chalk & Talk, Class Discussion  PPT
3	27 – 31 Jan.2020	Exponential distributions – Correlation and Regression. Statistical basis for control charts – control limits	Chalk & Talk, Class Discussion, PPT
4	9 – 13 Sep. 2019	control charts and types – control charts for variables, defective and defects	Chalk & Talk, Class Discussion, PPT
5	3 – 7 Feb.2020	Introduction to six sigma – inspections by sampling – OC curves – acceptance sampling plans.	Chalk & Talk, Class Discussion, PPT
6	10 – 14 Feb.2020	Basics of quality – Quality philosophy – quality control – quality assurance – design for quality management system	Chalk & Talk, Class Discussion PPT
7	17 – 21 Feb.2020	Quality certification and accreditation schemes – total quality management and Taguchi’s method – quality standards and procedures	Chalk & Talk, PPT
8	2 – 6 Mar. 2020	ISO 9000 Series – 14000 Series. Basic concepts of reliability – Reliability Vs Quality – Hazard and failure rate analysis – mean time between failures (MTBF)	Chalk & Talk, PPT
9	9 – 13 Mar.2020	mean time to failure (MTTF) – Mathematical models for reliability studies – Normal, Exponential and Weibull failure laws – Reliability of systems	Chalk & Talk, PPT
10	16 – 20 Mar. 2020	Series system, Parallel system, Series-Parallel system. Applications of reliability to systems -	Chalk & Talk, Class Discussion



## NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

11	23 – 27 Mar.2020	General Considerations: NDE response, NDE systems management and schedule - Procedure selection/development of NDE Engineering	Chalk & Talk, PPT
12	1 – 10 Apr.2020	System/process – performance characteristics - Conditional probability in NDE discrimination Signal/ noise relationships, reference standards personnel	Chalk & Talk, PPT
13	13 – 17 Apr.2020	Modeling of NDE reliability– PoD– Benefits of PoD– approaches to modeling PoD- Applications (case studies)	Chalk & Talk, PPT
14	20 – 24 Apr. 2020	Air frames – gas turbine engines – Space shuttle - Statistical nature of NDE process.	Chalk & Talk, PPT

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

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	CYCLE TEST I	03 – 07, Feb.2020	60 min	20
2	QUIZ / SEMINAR	02 – 06, Mar.2020	45 min	10
3	CYCLE TEST - II	23 – 27, Mar.2020	60 min	20
CPA	Compensation Assessment*	02 – 06, Apr.2020	180 min	50
4	Final Assessment *	04 – 08, May.2020	180 min	50

**\*mandatory; refer to guidelines on page 4**

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

- Asking summary of each class at the end of class.
- Performance in the assessment methods.  
Questionnaire about the effectiveness of the delivery method, topics and the knowledge gained.

### **COURSE POLICY (including compensation assessment to be specified)**

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

- Both e-mail and phone

#### **COMPENSATION ASSESSMENT POLICY**

- It is a test with duration of 60 min. appropriate weightage will be calculated.



**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.

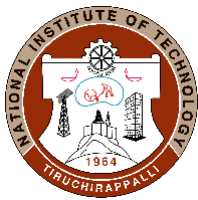
**ADDITIONAL INFORMATION, IF ANY**

**Books for References**

1. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004).
2. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2001).
3. Concepts of Modern Physics, Arthur Beiser, Tata McGraw-Hill, New Delhi (2010).
4. Fundamentals of Physics, R. Shankar, Yale University Press, New Haven and London (2014).
5. Fundamentals of Physics II, R. Shankar, Yale University Press, New Haven and London (2016).
6. Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007).
7. Introduction to Solid State Physics, 8th Edition, Charles Kittel, John Wiley & Sons, NJ, USA (2005).

**FOR APPROVAL**

Course Faculty\_\_\_\_(DS)\_\_\_\_\_CC- Chairperson\_\_\_\_(DS)\_\_\_\_\_HOD\_\_\_\_\_(DS)\_\_\_\_



**Guidelines**

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory 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



# NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI