

**DEPARTMENT OF PRODUCTION ENGINEERING**  
**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN- PART I			
Course Title	Tribology		
Course Code	PR 624	No. of Credits	03
Course Code of Pre-requisite subject(s)	-		
Session	July. 2018	Section (if, applicable)	-
Name of Faculty	Dr.M.DURAISELVAM	Department	Production
Email	durai@nitt.edu	Telephone No.	0431-2503509
Name of Course Coordinator(s) (if, applicable)	-		
E-mail	-	Telephone No.	-
Course Type	<input type="checkbox"/> Core course <input checked="" type="checkbox"/> Elective course		
<b>Syllabus (approved in BoS)</b>			
<p>Industrial significance of tribology - Strength and deformation properties of solids - physiochemical characteristics of solid surfaces –fracture-modes of fracture- ductile-brittle-Analysis of surface roughness - measurement.</p> <p>Friction - classification - Adhesion theory of friction - Elastic, plastic and visco - elastic effects in friction - rolling friction - friction of materials - alloys - ceramics - polymers - Interface temperature of sliding surfaces - measurement.</p> <p>Wear - forms of wear-abrasive wear –adhesive wear-erosive wear-cavitation wear-corrosive wear-oxidative wear-fatigue wear-melting wear-diffusive wear-mechanisms-wear of nonmetallic materials.</p> <p>Lubrication –types of lubrication-hydro dynamic lubrication - Reynolds equation - hydrostatic lubrication - bearing analysis – elasto-hydrodynamic lubrication - solid lubrication - boundary lubrication.</p> <p>Micro/nano tribology - Measurement techniques - Surface Force Apparatus (SFA) - Scanning Probe Microscopy - Atomic Force Microscopy (AFM)-Nano-mechanical Properties of Solid Surfaces and Thin Films - Computer Simulations of Nanometer-Scale Indentation and Friction.</p>			
<b>COURSE OBJECTIVES</b>			
<ul style="list-style-type: none"> <li>➤ Tribology is a highly interdisciplinary subject dealing with science and technology of interacting surfaces in relative motion. It encompasses the study of friction, lubrication and wears behaviour.</li> <li>➤ To measure the Micro/ Nano technology using industrial applications.</li> </ul>			

<b>COURSE OUTCOMES (CO)</b>	
<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>
1. Apply the knowledge of tribology in industries.	1,3,5
2. Identify the friction and its effect.	1,2,4
3. Identify the surface textures	1

### **COURSE PLAN – PART II**

#### **COURSE OVERVIEW**

- Studies the strength and deformation properties of solids.
- Statistical analysis of surface roughness.
- To reduce the Friction and interface temperature of sliding and rolling surfaces.
- Study the wear and wear mechanism of metal and non-metallic surfaces.
- Identify the hydrostatic and hydrodynamic lubrication.
- Analysis of Micro/Nano tribology which applied in industrial application.

#### **COURSE TEACHING AND LEARNING ACTIVITIES**

<b>S. No.</b>	<b>Week/Contact Hours</b>	<b>Topic</b>	<b>Mode of Delivery</b>
1.	1 <sup>st</sup> Week	Introduction of Tribology	Lecture - C&T/ PPT, Video
2.	1 <sup>st</sup> Week	Industrial significance of tribology	
3.	1 <sup>st</sup> Week	Strength and deformation properties of solids	
4.	2 <sup>nd</sup> Week	Physio- chemical characteristics of solid surfaces	
5.	2 <sup>nd</sup> Week	Fracture and mode of fracture	
6.	2 <sup>nd</sup> Week	Ductile and brittle fracture	
7.	3 <sup>rd</sup> Week	Analysis of surface roughness	
8.	3 <sup>rd</sup> Week	Surface measurement	
9.	3 <sup>rd</sup> Week	Friction and classification	
10.	4 <sup>th</sup> Week	Friction and classification	
11.	4 <sup>th</sup> Week	Adhesion theory of friction	
12.	4 <sup>th</sup> Week	Elastic, plastic and visco theory of friction	

13.	5 <sup>th</sup> Week	Sliding and rolling friction	Lecture - C&T/ PPT, Video Lecture - C&T/ PPT, Video
14.	5 <sup>th</sup> Week	Friction of materials alloys, ceramics and Polymers.	
15.	5 <sup>th</sup> Week	Interface temperature of sliding surfaces	
16.	6 <sup>th</sup> Week	Measurement of friction	
17.	6 <sup>th</sup> Week	<b>Cycle test 1</b>	
18.	6 <sup>th</sup> Week	Wear and forms of wear	
19.	6 <sup>th</sup> Week	Abrasive wear and adhesive wear	
20.	7 <sup>th</sup> Week	Erosive wear and cavitation wear	
21.	7 <sup>th</sup> Week	Corrosive wear	
22.	7 <sup>th</sup> Week	Oxidative wear fatigue wear	
23.	8 <sup>th</sup> Week	Melting wear and diffusive wear	
24.	8 <sup>th</sup> Week	Wear mechanisms	
25.	9 <sup>th</sup> Week	Wear of non-metallic materials	
26.	10 <sup>th</sup> Week	Reynolds equation	
27.	10 <sup>th</sup> Week	Hydrostatic lubrication	
28.	10 <sup>th</sup> Week	Bearing analysis	
29.	11 <sup>th</sup> Week	Elastohydrodynamic lubrication	
30.	11 <sup>th</sup> Week	Solid lubrication	
31.	11 <sup>th</sup> Week	Boundary lubrication	
32.	12 <sup>th</sup> Week	Micro and Nano tribology	
33.	12 <sup>th</sup> Week	Measurement techniques	
34.	12 <sup>th</sup> Week	Surface force apparatus (SFA)	

35.	12 <sup>th</sup> Week	Cycle test 2
36.	13 <sup>th</sup> Week	Scanning probe microscopy
37.	13 <sup>th</sup> Week	Atomic force microscopy (AFM)
38.	13 <sup>th</sup> Week	Nano mechanical properties of solid surfaces and thin films
39.	14 <sup>th</sup> Week	Computer simulations of nanometer
40.	14 <sup>th</sup> Week	Scale indentation and friction

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

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle Test 1	Week 6	1 hour	20 marks
2.	Cycle Test 2	Week 12	1 hour	20 marks
3.	Assignments	Week 6 & 12	1 week	10 marks
4.	Re-Test	Week 14	1 hour	20 marks
5.	Final Examination - Theory	Week 14	3 hours	50 marks
			Total	100 marks

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

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

1. Class committee meetings
2. Feedback through MIS

**COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)**

**Mode of Correspondence (email/ phone etc)**

[durai@nitt.edu](mailto:durai@nitt.edu)

0431-2503509

**Attendance**

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

**Compensation Assessment**

1. Attending all the assessments are MANDATORY for every student.
2. One Compensation Assessment (CPA) will be conducted for those students who are being physically absent due to valid reasons for any of the assessment and it covers the entire contents of the course.

3. At any case, CPA will not be considered as an improvement test.

**Academic Honesty & Plagiarism**

1. Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
2. Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
3. 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.
4. The above policy against academic dishonesty shall be applicable for all the programmes.

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**ADDITIONAL INFORMATION**

Contact the Course Teacher : Dr. Ing. M. Duraiselvam  
Room No.: MTB113 / Ground Floor / Manufacturing Technology Building  
Timings: Office Hours  
Email ID: [durai@nitt.edu](mailto:durai@nitt.edu)  
Telephone No.: 0431-2503509

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**FOR APPROVAL**



Course Faculty  
Dr. Ing. M. Duraiselvam



CC-Chairperson  
Dr. K. Panneerselvam



HOD  
Dr. P. Sathiya