



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF PRODUCTION ENGINEERING

COURSE PLAN- PART I

Name of the programme and specialization	M.Tech. MANUFACTURING TECHNOLOGY		
Course Title	Tribology		
Course Code	PR 624	No. of Credits	03
Course Code of Pre-requisite subject(s)	-		
Session	July. 2023	Section (if, applicable)	-
Name of Faculty	Dr.-ing. 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	Core course	Elective course ✓	

Syllabus (approved in BoS)

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.

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.

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.

Lubrication –types of lubrication-hydro dynamic lubrication - Reynolds equation - hydrostatic lubrication - bearing analysis – elastohydrodynamic lubrication - solid lubrication - boundary lubrication.

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.

COURSE OBJECTIVES

- To understand the importance of friction, wear and lubrication of contacting surfaces.
- To understand the mechanism of different forms of wear.
- To describe the various forms of lubrication.
- To measure the Micro/ Nano technology using industrial applications.

COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
1. Apply the knowledge of tribology in industries.	1, 3, 5, 11
2. Identify the friction and its effect.	2, 4, 7
3. Analyse wear of different forms	1, 2, 5, 8, 9, 10

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

S. No.	Week/Date	Topic	Mode of Delivery
1.	Week 1 23.08.2023	Introduction of Tribology	Classroom Teaching PPT
2.	Week 1 23.08.2023	Industrial significance of tribology	
3.	Week 2 28.08.2023	Strength and deformation properties of Solids	
4.	Week 2 30.08.2023	Physio- chemical characteristics of solid Surfaces	
5.	Week 2 30.08.2023	Fracture and mode of fracture	
6.	Week 2 01.09.2023	Ductile and brittle fracture	
7.	Week 3 04.09.2023	Analysis of surface roughness	
8.	Week 3 06.09.2023	Surface Roughness measurement	
9.	Week 3 06.09.2023	Friction and classification	
10.	Week 3 08.09.2023	Friction and classification	
11.	Week 4 13.09.2023	Adhesion theory of friction	
12.	Week 4 13.09.2023	Elastic, plastic and visco theory of friction	

13.	Week 4 14.09.2023	Elastic Effects in Friction	Classroom Teaching PPT
14.	Week 4 15.09.2023	Sliding and rolling friction	
15.	Week 5 20.09.2023	Friction of materials - alloys	
16.	Week 5 20.09.2023	Friction of materials - ceramics	
17.	Week 5 21.09.2023	Friction of materials - Polymers.	
18.	Week 5 22.09.2023	Interface temperature of sliding surfaces	
19.	Week 6 27.09.2023	Measurement of friction	
20.	Week 6 27.09.2023	Wear and forms of wear	
21.	Week 6 28.09.2023	Abrasive wear and adhesive wear	
22.	Week 6 29.09.2023	Erosive wear and cavitation wear	
23.	Week 7	Cycle test I	
24.	Week 8 11.10.2023	Corrosive wear	
25.	Week 8 11.10.2023	Oxidative wear fatigue wear	
26.	Week 8 12.10.2023	Melting wear and diffusive wear	
27.	Week 8 13.10.2023	Wear mechanisms	
28.	Week 9 18.10.2023	Wear of non-metallic materials	
29.	Week 9 18.10.2023	Reynolds equation	
30.	Week 9 19.10.2023	Hydrostatic lubrication	
31.	Week 9 20.10.2023	Bearing analysis	
32.	Week 10 25.10.2023	Elastohydrodynamic lubrication	
33.	Week 10 25.10.2023	Solid lubrication	
34.	Week 10 26.10.2023	Boundary lubrication	
35.	Week 10 27.10.2023	Micro and Nano tribology	

36.	Week 11 01.11.2023	Micro and Nano tribology	Classroom Teaching PPT
37.	Week 11 01.11.2023	Measurement techniques	
38.	Week 11 02.11.2023	Surface force apparatus (SFA)	
39.	Week 11 03.11.2023	Scanning probe microscopy	
40.	Week 12	Cycle test 2	
41.	Week 13 15.11.2023	Atomic force microscopy (AFM)	
42.	Week 13 15.11.2023	Nanomechanical properties of solid Surfaces	
43.	Week 13 16.11.2023	Nanomechanical properties of thin films	
44.	Week 13 17.11.2023	Computer simulations of nanometer	
45.	Week 14 22.11.2023	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 7	1 hour	20 marks
2.	Cycle Test 2	Week 12	1 hour	20 marks
3.	Assignment	Week 12	1 week	5 marks
4.	Seminar	Week 13	1 hour	5 marks
5.	Compensation test	Week 15	1 hour	20 marks
6.	Final Examination - Theory	Week 18	3 hours	50 marks
			Total	100 marks

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

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 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 programs.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

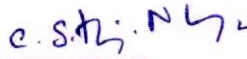


Course Faculty

CC- Chairperson



HOD



(Dr. M. DURAISIVAM)