Name of Institute: Indus Institute of Technology & Engineering
Name of Faculty: Rakesh Pani

Course Code: MT0704
Course Name: Material Testing and Standards
Pre-requisites: Students must be aware about the basic concept of destructive and non-destructive testing.
Credit points: 04
Offered Semester: VII

Course Coordinator (weeks 01–15)
Full Name: Rakesh Pani
Department with sitting location: Materials and Metallurgical Engineering Department, 3rdfloor, Bhanwar Building
Telephone: 9692363221
Email: rakeshpani.mt@indusuni.ac.in
Consultation times: 3:30 PM – 4:30 PM

Course Lecturer (weeks 01–15)
Full name: Rakesh Pani
Department with siting location:Materials and Metallurgical Engineering Department, 3rd floor, Bhanwar Building
Telephone: 9692363221
Email: rakeshpani.mt@indusuni.ac.in
Consultation times: 3:30 PM – 4:30 PM

Students will be contacted throughout the session personally via e-mail with important information relating to this course.

Course Objectives
1. To understand different types of Mechanical testing (i.e. destructive testing and non-destructive testing).
2. To understand different types of standards related to different mechanical testing.
3. To understand standard procedure for mechanical testing.

Course Outcomes (CO)
CO1. To develop the capability to analyze and select the various testing techniques for materials.
CO2. Identify the requirements of testing criteria as per material composition.
CO3. To understand the concept of non-destructive and destructive testing.
CO4. To understand the various Standard Test Methods for Metallic Material

Course Outline
The aim is to introduce students the overview of the standard testing methods of materials. The course covers non-destructive destructive testing. It gives an idea about selection of the testing criteria.

Method of delivery

Online lectures

Study time

3 Hour Lecture per week

CO-PO Mapping (PO: Program Outcomes)

Mapping CO's with PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				3								
CO2				3								
CO3				3								
CO4				3				1				

1-Lightly Mapped 2- Moderately Mapped 3- Highly Mapped

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

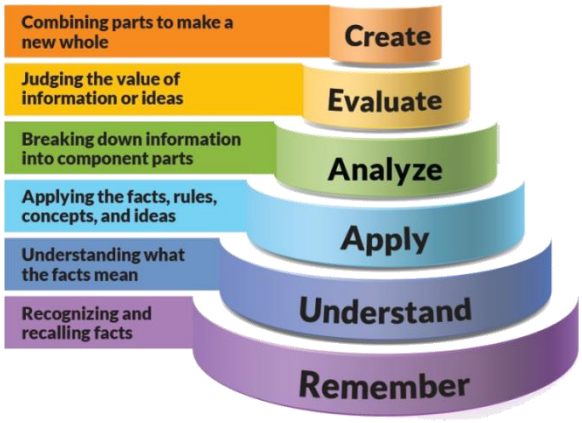

Figure 1: Blooms Taxonomy

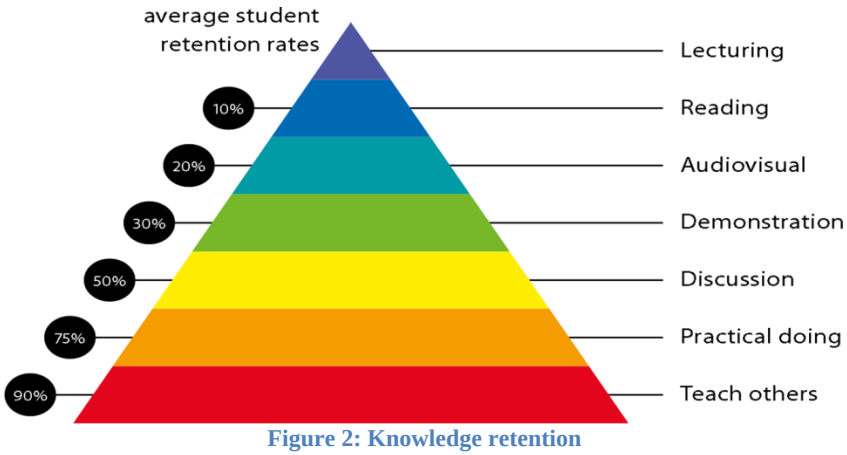

Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness**
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	**2 Information literacy, gathering & processing**
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills**
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Practical work:

(Mention what practical work this Course involves)

NA

Lecture/tutorial times

Example:

Monday	10.00 – 11.00 AM	Online
Tuesday	12.20 – 01.20 PM	Online
Thursday	10.00 – 11.00 AM	Online

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

Text books

1. G. E. Dieter, “Mechanical Metallurgy”, McGraw Hill, 3rd Edition, 2013, ISBN: 9781259064791.
2. A. V. K. Suryanarayana, “Testing of Metallic Materials”, B. S. Publications, 2nd Edition, 2007, ISBN: 9788178001340.

Additional Materials

Reference Books

1. R. Abbaschian, L. Abbaschian and R. E. Reed-Hill, “Physical Metallurgy Principles”, Wadsworth Publishing Co Inc, 4th Edition, 2008, ISBN: 9780495082545.
2. R. W. Hertzberg, R. P. Vinci and J. L. Hertzberg, “Deformation and Fracture Mechanics of Engineering Materials”, John Wiley & Sons, 5th Edition, 2012, ISBN: 9780470527801.
3. T. H. Courtney, “Mechanical Behavior of Materials”, McGraw-Hill Education, 2nd Edition, 2017, ISBN: 9781259027512.
4. ASM International, “ASM Handbook: Nondestructive Evaluation and Quality Control”, ASM International, 9th Edition, 1989, ISBN: 9780871700230.
5. H. E. Davis, G. E. Troxell and C. T. Wiscosil, “Testing and Inspection of Engineering Materials”, Mcgraw-Hill Book Company, 2nd Edition, 1954, ASIN: B000I1C8DI.
6. R. A. Beaumont, “Mechanical Testing of Metallic Materials”, Sir Isaac Pitman & Sons, 1st Edition, 1945, ASIN: B0010XYLO2.
7. C. W. Richards and E. A. Trabant, “Engineering Materials Science”, Literary Licensing, 1st Edition, 2012, ISBN: 9781258243067.
8. W. J. McGonnagle, “Non Destructive Testing”, Routledge, 1st Edition, 1971, ISBN: 9780677005003.

Web Resources

1. NPTEL MOOC Course on “Theory and Practice of Non Destructive Testing” (https://onlinecourses.nptel.ac.in/noc16_mm07/preview)

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

CIE	60 Mark		
		Presentation	5%
		Attendance	5%
		Assignment	10%
		Mid semester examination	40%
End semester exam	40 Mark	As per IU format	

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e., mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day.

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment).

Course schedule

Weeks	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
Week01	**Introduction**: Importance of Material Testing. Classification of various types of testing methods.	CO1	PPT
Week02	Selection of testing methods. Importance of calibration of testing instruments. Calibration methods and standards for various tests. Problem Solving	CO1	PPT
Week 03	**Non-destructive testing**: Importance, scope, advantages and limitations – Dye penetrant, radiographic magnetic, ultrasonic and eddy current testing and their application.	CO1, CO2	PPT
Week 04	**Tensile test**: Engineering stress –strain curve, true stress –strain curve, Instability in tension, Stress distribution at neck, principle of stress and strain measurement, bend test measurement of ductility and formability	CO1, CO2	PPT
Week 05	Compression test, yield stress and proof stress, universal tensile testing machine. Fatigue and Ductile Brittle Transition Temperature	CO1, CO2	PPT
Week 06	**Hardness test**: Introduction, Brinell, Vickers and Rockwell hardness tests, Meyer hardness test, Analysis of indentation by an indenter,	CO1, CO2	PPT
Week 07	Relationship between hardness and the flow curve, Micro-hardness tests, Hardness conversion, Hardness at elevated temperature.	CO1, CO2	PPT
Week 08	**Impact testing:** Types of impact tests and their relative merits and demerits. Ductile-brittle transitions behavior and its significance.	CO1, CO2	PPT

Week 09	**Torsion test:** Introduction, Mechanical properties in torsion, Torsional stresses for large plastic strains,	CO1, CO2	PPT
Week 10	Types of torsion failures, Torsion test vs. tension test, Hot torsion test.	CO1, CO2	PPT
Week 11	**Fatigue and Creep Testing:** Elementary treatment of fatigue phenomenon, S – N curve and corrosion fatigue,	CO1, CO2	PPT
Week 12	Fatigue testing principle, Signification of Creep testing procedure, creep curve and its interpretation, stress-rupture test.	CO1, CO2	PPT
Week 13	Metallurgical and mechanical factors affecting, creep and fatigue failures. Problem Solving	CO1, CO2, CO4	PPT
Week 14	Introduction to various standards for mechanical testing: Standard Test Methods for Metallic Material	CO1, CO2, CO4	PPT
Week 15	Standard Test Methods for Metallic Material	CO1, CO2, CO3	PPT

PROGRAM MAP FOR BACHELOR OF ENGINEERING (MME)