



**DEPARTMENT OF MECHANICAL ENGINEERING,  
UNIVERSITY OF ENGINEERING & TECHNOLOGY LAHORE (KSK CAMPUS).**

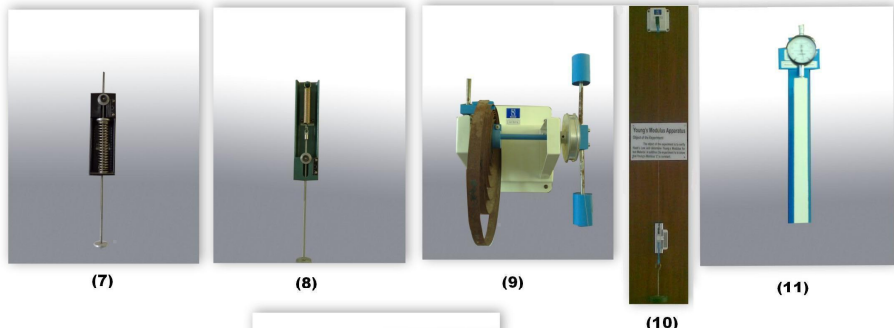
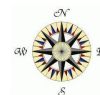
# **MECHANICS OF MATERIALS LABORATORY**



Lab Director:  
Coordinating Staff:

***Mr. Muhammad Farooq (Lecturer)***  
Mr. Liaquat Qureshi (Lab Supervisor)  
Mr. Muhammad Irfan (Lab Assistant)

# MECHANICS OF MATERIALS LAB LAYOUT



(7) (8) (9) (10) (11)



(6)



(5)



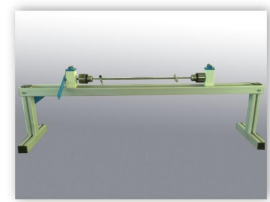
(4)



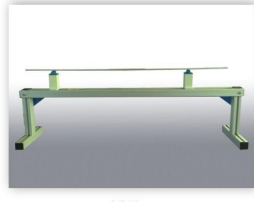
(3)



(14)



(12)

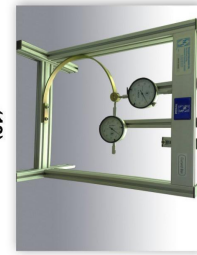


(13)

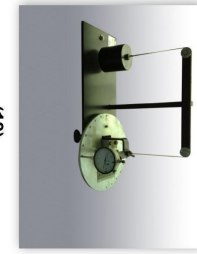
- (1) Whirling of Shafts
- (2) Polariscope
- (3) Thin Cylinder Apparatus
- (4) Thick Cylinder Apparatus
- (5) Strain Gauge Apparatus
- (6) Calibration of Electrical Resistance Strain Gauges
- (7) Compression of Spring Apparatus
- (8) Extension of Spring Apparatus
- (9) Coil Spring Apparatus
- (10) Young's Modulus Apparatus
- (11) Modulus of Rigidity of Rubber Apparatus
- (12) Deflection and Torsion Apparatus
- (13) Deflection of Beam Apparatus
- (14) Bending Moment Apparatus
- (15) Twisting and Bending Testing Machine
- (16) Shearing Force Apparatus
- (17) Torsion of Bars Apparatus
- (18) Curved Bar Apparatus
- (19) Combined Bending and Torsion Apparatus
- (20) Reaction of Beam Apparatus
- (21) Simply Supported Beam Apparatus
- (22) Continuous Beam Apparatus
- (23) Beam Bending and torsion Apparatus



(17)



(18)



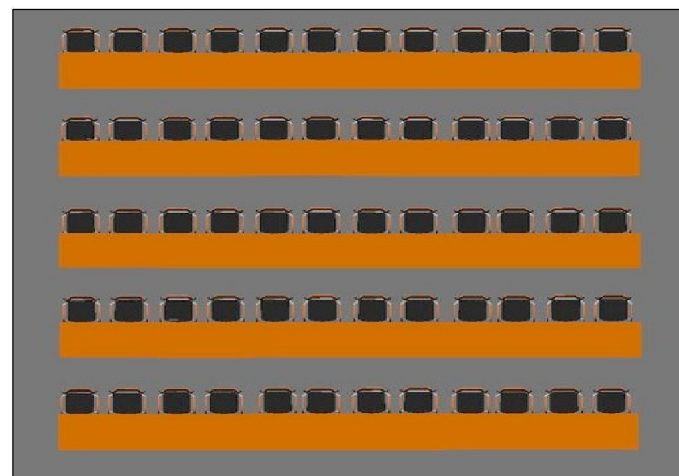
(19)



(15)



(16)



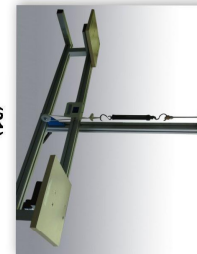
Students Seating Area



(20)



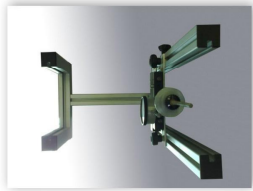
(22)



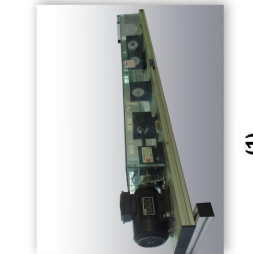
(21)



(23)



(2)



(1)

Designed by;  
 Mishal Gul 09-ME-356  
 Muhammad Asad Hafeez 09-ME-357  
 Hafiz Abdul Rehman 09-ME-358  
 Hafiz Muzamil Bilal 09-ME-359  
 Muhammad Fahad Fiaz 09-ME-360



## **Objective:**

Enable the students to understand application of forces & their effects on different mechanical & structural members in Mechanics.

The laboratory is operational with the latest equipments for the experimentation of different applications of Mechanics of Materials.

## **Courses:**

The Laboratory is covering the following courses offered in the different departments.

### 1. Mechanical Engineering Department

- i. Mechanics of Materials – I
- ii. Mechanics of Materials – II
- iii. Mechanics of Materials – III

### 2. Electrical Engineering Department

- i. Applied Mechanical Technology
- ii. Strength of Materials

### 3. Chemical Engineering Department

- i. Mechanics of Materials



# DESCRIPTION OF LAB EQUIPMENT & EXPERIMENTS

## 1. Simply supported beams apparatus:

**Objective:** The object of the experiments is to measure the support reactions for a variety of configurations of simply supported beams.

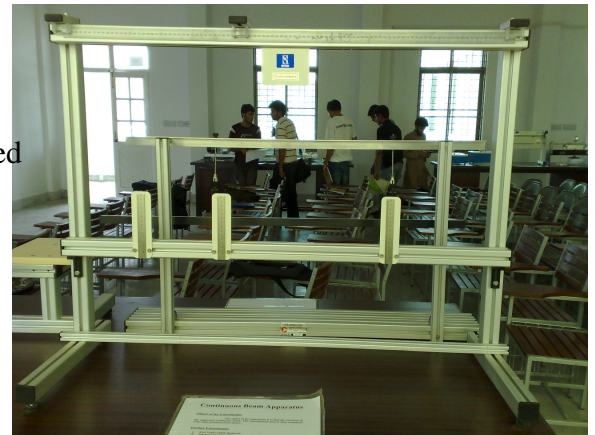
1. single load
2. multiple loads
3. cantilever reaction



## 2. Continuous beams apparatus:

**Objective:** The object of the experiments is to find the support reactions and central moment for a simply supported continuous beam.

1. Two loads within the supports
2. Three loads within the support
3. Two loads with one outside the supports
4. Three loads with one outside the support
5. Uniformly distributed loads instead of point loads



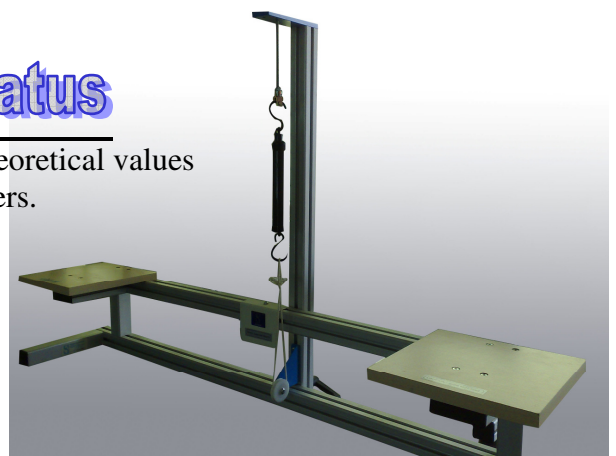
## 3. Beams bending and torsion apparatus

**Objective:** The object of the experiments is to empirically test various specimens in both bending and torsion arrangements and to compare the experimental results with those obtained from theory.

## 4. Reaction of beams apparatus

**Objective:** The object is to compare experimental and theoretical values of the reactions due to point loads on beams and cantilevers.

1. simply supported beams
2. simply supported beam with overhangs
3. cantilever beam

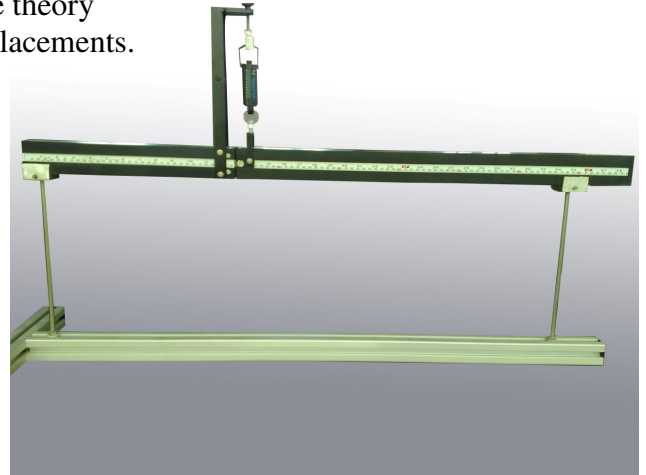


## 5. Twist and Bending Testing Machine

---

### Objective:

1. The relationship between torque and twist of a circular cross section specimen is to be investigated in terms of the formula  $\Phi = TL/GJ$
2. To verify the deflection of beams calculated from the theory of bending and using super position and reciprocal displacements.



## 6. Shear force apparatus

---

### Objective:

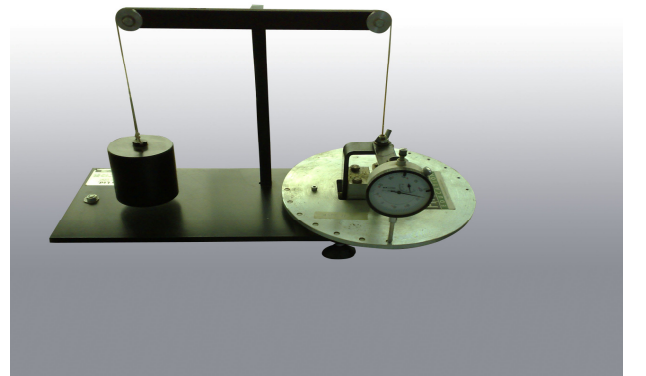
1. To comprehend the action of shear in a beam.
2. To measure the shearing force at a normal section of a loaded beam and to check its agreement with theory

## 7. Combined bending and torsion.

---

### Objective:

The object of this experiment is to determine what levels of combine what levels of combined bending and torsion cause elastic failure in different materials, and to compare them with various theories of failure.

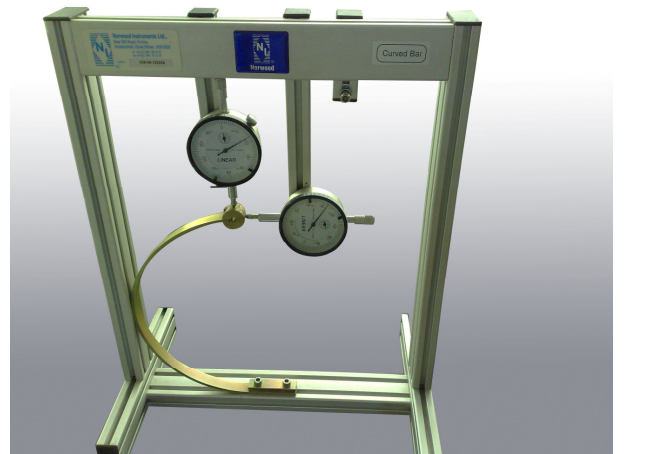


## 8. Curved bar apparatus

---

### Objective:

The object of the experiments is to measure the deflection of a set of curved bars, of known geometry. Then to compare the empirical data with values calculated from theory.

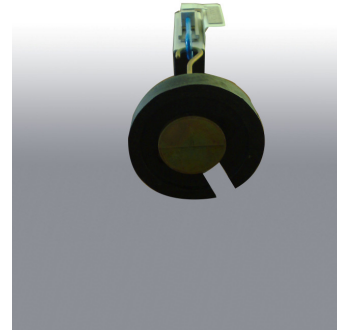


## 9. Young's modulus apparatus

---

**Objective:**

The object of the experiments is to verify hooks law and determine young's modulus for the test material.



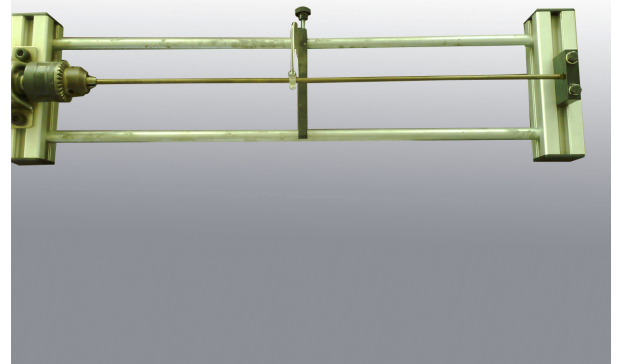
## 10. Torsion of bars apparatus

---

**Objective:**

The relationship between torque and twist of a circular cross section specimen is to be investigated in terms of the formula

$$\theta = TL/GJ$$



## 11. Extension of spring apparatus

---

**Objective:**

To measure the stiffness of a extension spring and compare it with the theoretical values.



## 12. Compression of spring apparatus

---

**Objective:**

To measure the stiffness of a Compression spring and compare it with the theoretical values.

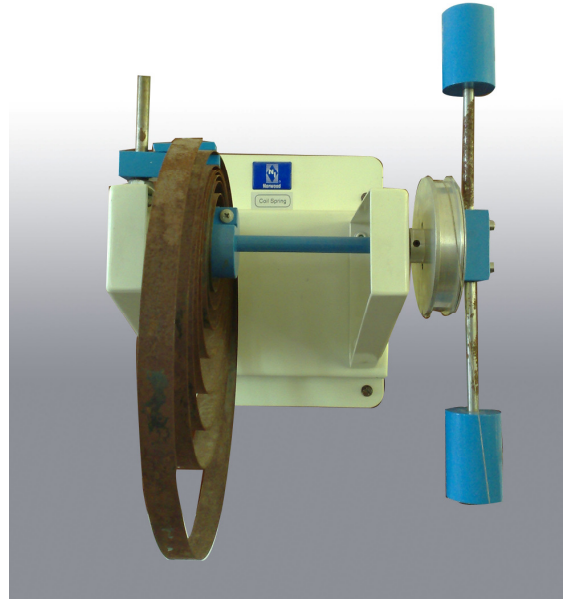


## 13. Coil spring apparatus

---

### Objective:

The object of the experiments is to investigate the characteristics of a spiral spring. We will determine the spring stiffness for the various lengths of spring and show that the time of one oscillation is proportional to the radius of the vibrating mass.



## 14. Calibration of electrical strain gauges

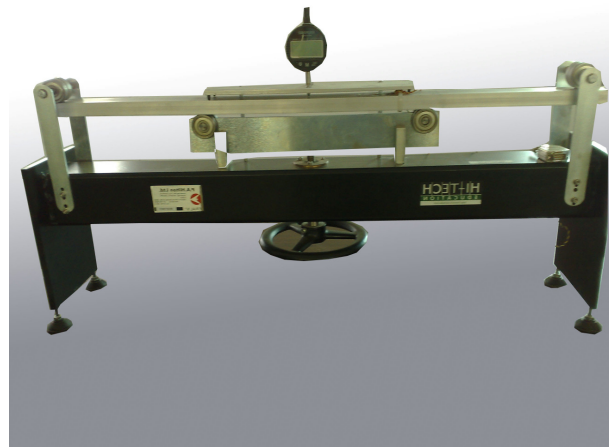
---

### Objective:

The primary function of this apparatus is to provide a calibration standard for strain. This enables manufacturers and users of bonded electrical resistance strain gauges to measure the gauge factor.

As a teaching aid there are three objects, namely:

1. To study the application of structural theory to the calibration of strain gauges.
2. To study standards of accuracy and sources of error in the calibration.
3. To introduce students to production quality Control and compliance checking of a material.

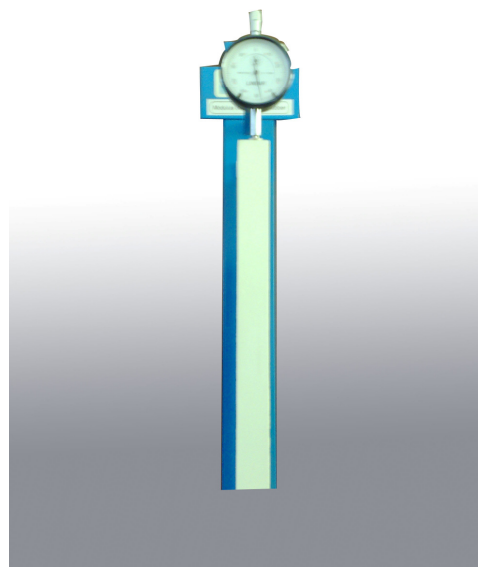


## 15. Modulus of rigidity of rubber apparatus

---

### Objective:

The object of the experiment is to investigate the relationship between shear stress and shear strain for rubber. Then using this data determines the modulus of rigidity for material.



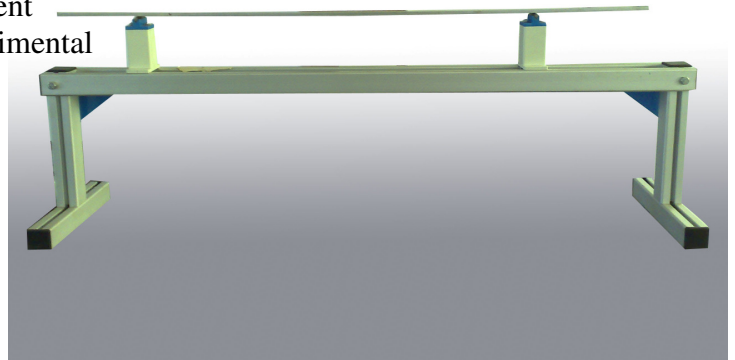


## 16. Deflection of beams

### **Objective:**

The object is to empirically test various different beam arrangements and to compare the experimental results with those obtained from theory.

1. four point bending test
2. influence lines for beam deflection
3. deflection, span and load variation
4. Maxwell's reciprocal theorem
5. deflection of a cantilever
6. fixing moments for a built in beam



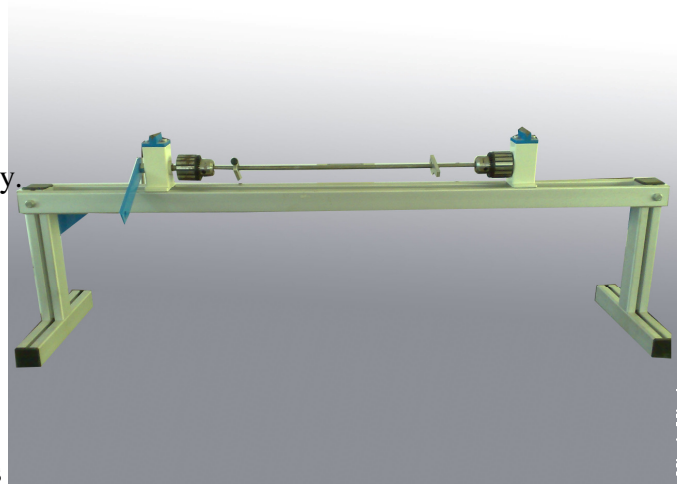
## 17. Deflection and torsion of beams

### **Objective:**

The object is to empirically test various different beam arrangements and to compare the experimental results with those obtained from theory.

- 1 four point bending test
- 2 influence lines for beam deflection
- 3 deflection, span and load variation
- 4 Maxwell's reciprocal theorem
- 5 deflection of a cantilever.
- 6 fixing moments for a built in beam

The object is to investigate the relationship between torque and angle of twist for shafts of various materials subjected to a torque.



## 18. Digital strain meter

### **Objective:**

Digital strain meter enables strain measurements to be displayed from Hi - tech experiments.



## 19. Experimental strain gauge apparatus

---

**Objective:**

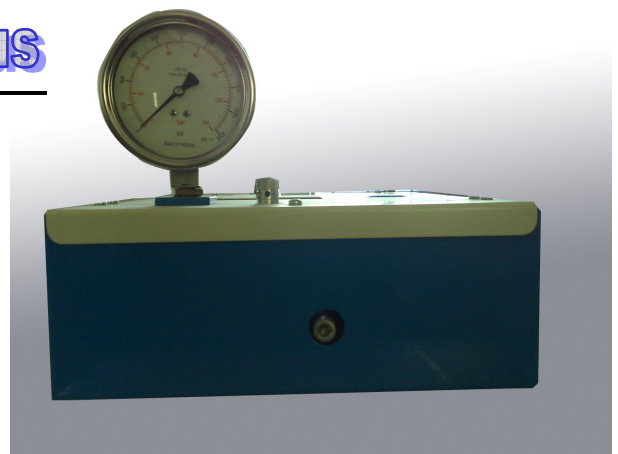
The object of the experiment is to investigate the relationship between load and surface stress for three common engineering situations, namely tension, torsion and bending.

## 20. Thin cylinder apparatus

---

**Objective:**

The object is to determine the stresses in an internally pressurized thin wall cylinder. The experimental data will be compared to theory and also used to determine Poisson's ratio for the cylinder material.

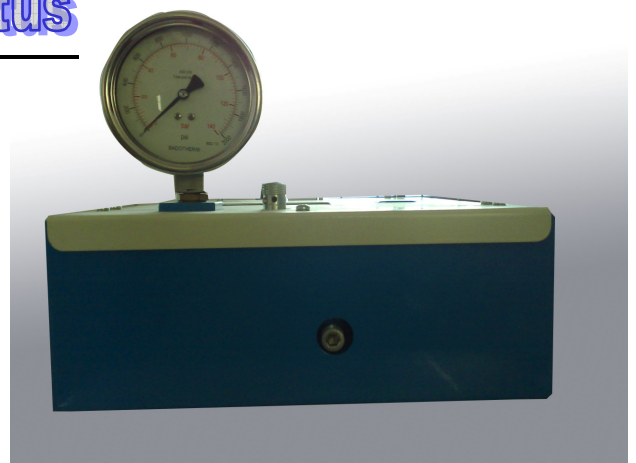


## 21. Thick cylinder apparatus

---

**Objective:**

The object is to determine the stresses in an internally pressurized thick wall cylinder. The experimental data will be compared to theory and also used to determine Poisson's ratio for the cylinder material.



## 22. Whirling of shafts apparatus

---

### Objective:

1. to investigate the whirling speed of an unloaded shaft with fixed-free ends
2. to investigate the whirling speed of an unloaded shaft with fixed-fixed ends
3. to investigate the whirling speed of an unloaded shaft with rotors fitted
4. to observe the shape of the test specimens during whirling for different end conditions.
5. to compare actual results with theoretical results.



## 23. Polariscope

---

### Objective:

To observe the stress concentrations and colourings of model test specimens.



## 24. Bending Moments Apparatus

---

### Objective:

The object of this experiment is to verify the use of a bending moment influence line for a simply supported beam.

