| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *E* | *0* | *4* | *4* | *0* | *3* | *1* | *1* | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | To understand the Measurement of force ,torque and Power |
| **LO Description** | To Explain various methods of force measurement**( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 01 | Definition of Force , Definition of weight. Pendulum Scale, load Cell. probing ring, Hydraulic and Pneumatic load cells | Interactive classroom lecture , PPT, demonstration, quiz, assignments | 4 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures NPTEL& others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximm Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 01 | **Mid semester Theory exam** | **Student will be asked to (**and/or)<br>1. Explain the working principle of load cell<br>2. Describe the working principle of Pendulum Scale | 10 | | Question paper, Rating scale | Internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 1 | 2 | |

| COURSE NAME | Instrumentation and Measurement |
|---|---|
| CO Description | To understand the Measurement of force ,torque and Power. |
| LO Description | To classify various methods of Torque And power measurement **( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 02 | Definition of Torque, Definition of power measurement of torque of rotating shafts, Absorption type dynamometer, Mechanical & Hydraulic dynamometer, Pneumatic dynamometer, Eddy current Dynamometer ,Dc Dynamometers. | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 2 | Text Books, PPT, Handouts, chalk board, charts.Videos lectures- NPTEL& others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 02 | **End Semester Theory Exam** | **Student will be asked to (**and/or) 1.Explain the various methods of Torque measurement. 2. Explain the various methods of Power measurement. | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 1 | 3 | |

| COURSE NAME | Instrumentation and Measurement |
|---|---|
| CO Description | To understand the Measurement of force ,torque and Power. |
| LO Description | To measurement Force, Torque and power using different instrument **. ( Psychomotor)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teah Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 03 | • To measure the lode using load cell<br>• To measure the Torque using stroboscopic Method.<br>• To measure the force, Torque and power using different method | Lab demonstration, hands on practice, lab assignments, Virtual Lab. | | 6 | Lab manual, charts, experimental trainer instruments/kit with measuring instruments.. | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 03 | **End semester practical Exam** | **Student will be asked to**<br>To study The various methods of Force, Torque measurement. | 10 | | Rubrics/Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *E* | *0* | *4* | *4* | *0* | *3* | *2* | *4* | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | To understand the measurement of speed & Acceleration |
| **LO Description** | To Explain the construction and working of Tachometer For Velocity measurement.**( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teah Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 04 | Definition of velocity ,mechanical Tachometer ,Electrical Tachometer, Electromagnetic Tachometer generator | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 4 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures NPTEL& others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 04 | **End Semester Theory Exam** | **Student will be asked to**<br>1.Explain the working principal of Electrical Tachometer for velocity measurement | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 2 | 5 | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | To understand the measurement of speed & Acceleration |
| **LO Description** | To understand various Digital methods for Velocity measurement**( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 05 | Photoelectric Tachometer, Toothed rotor variable reluctance tachometer, Stroboscopic methods | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 4 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures NPTEL& others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 05 | **Assignment &**quiz | **Student will be asked to (**and/or)<br>1. Explain the stroboscopic method for velocity measurement.<br>2. Explain thePhotoelectric Tachometer for velocity measurement | 10 | | Question paper, Rating scale | internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 2 | 6 | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | To understand the measurement of speed & Acceleration |
| **LO Description** | To classify various methods of Vibrations and Shock measurement**( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 06 | Accelerometers, Seismic Transducers , Potentiometric Type Accelerometer, ,LVDT Accelerometer, Strain Gauge Accelerometer, piezo – electric Accelerometer. | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 4 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures NPTEL& others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 06 | **End Semester Theory Exam** | **Student will be asked to**<br>1. Explain the seismic Transducer<br>2. Explain the working principal of piezo - electric accelerometer | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *E* | *0* | *4* | *4* | *0* | *3* | *3* | *7* | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods of pressure measurement |
| **LO Description** | To Define the various Term for pressure. (**cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 07 | To introduction of Pressure ,Static Pressure, velocity Pressure, Absolute pressure Gauge pressure, Gauge Pressure, Vacuum Pressure, Unit of pressure, Relation between different unit of pressure. | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 07 | **mid semester theory Exam** | **Student will be asked to** (and/or)<br>1. what is pressure? Describe<br>2. Draw a Chart for Relation between different unit of pressure. | 10 | | Question paper, Rating scale | Internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 3 | 8 | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods of pressure measurement |
| **LO Description** | Explain Measurement of Pressure using Elastic sensing Elements & Manometers (**cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 08 | Elastic sensing Elements:-Bourdon Tube ,Bellows ,Diaphragm ,Capsules Monometers:- Manometric Fluid, U-Tube Manometer, Well Type Manometer, inclined Tube Manometer, micro Manometer | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 08 | **End Semester Theory Exam** | **Student will be asked to (**and/or) 1. Explain the elastic pressure measurement instrument 2. Explain the working of monometers | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 3 | 9 | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods of pressure measurement |
| **LO Description** | Explain Various Instrument For Vacuum Pressure measurement. **( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 09 | Barometer, Mc-leod Gauge ,Thermal conductivity Gauge -Thermocouple Gauge ,Pirani Gauge, ionization Gauge | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 4 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 09 | **End Semester Theory Exam** | **Student will be asked to**<br>1. Explain Working principal of Thermal conductivity Gauge. | 10 | | Rubrics/Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *E* | *0* | *4* | *4* | *0* | *3* | *4* | *10* | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods Fluid Flow measurements |
| **LO Description** | Explain variable Head And variable Area Type Flow meter .**( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 10 | Introduction Flow ,laminar and turbulent flow , Venturimeter ,Orifice Plate, Flow Nozzles, Dall tube Pitot Tube, Weirs And Flumes , Rotameter | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 7 | 3 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 10 | **Assingment &** quiz | **Student will be asked to (**and/or)<br>1. Define various type Flow<br>2. Explain the venturimeter for flow measurement | 10 | | Question paper, Rating scale | Internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *E* | *0* | *4* | *4* | *0* | *3* | *4* | *11* | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods Fluid Flow measurements |
| **LO Description** | Explain Various Type Electronic Flow meter.**( cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 11 | Electromagnetic Flow meter, Turbine Flow meter, Vortex meter, ultrasonic Flow meter , Laser Doppler Anemometer(LDA) | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 11 | **End Semester Theory Exam** | **Student will be asked to (**and/or)<br>1. Explain the Electromagnetic Flow meter<br>2. Explain the Laser Doppler Anemometer | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 4 | 12 | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods Fluid Flow measurements |
| **LO Description** | To Understand And measure fluid flow using Various device **( Psychomotor)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 12 | Measure the flow use Venturimeter ,Measure the flow use Orifice Plat , Measure the flow use Rota meter, Measure the Flow use Electromagnetic flow meter (Lab) | Lab demonstration, hands on practice, lab assignments, Virtual Lab. | | 6 | Lab manual, charts, experimental trainer instruments/kit with measuring instruments. | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 12 | **End Semester Practical Exam** | **Student will be asked to**<br>1. Demonstration of venturrimeter, orifice plate and rotameter for flow measurement. | 10 | | Rubrics/Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *E* | *0* | *4* | *4* | *0* | *3* | *5* | *13* | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods of temperature measurements |
| **LO Description** | To Understand the Some definitions and Heat transfer methods**.( Cognitive)** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 13 | Temperature, Different types of method Used in Heat Transfer, Conduction, convection and radiation , Various units of Temperature conversion , Thermal conductivity ,Temperature range of various temperature measuring element, Liquid in glass Thermometers, Liquid in metal Thermometer ,Bi-metallic Thermometer | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 4 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 13 | **End Semester theory Exam** | **Student will be asked to**<br>1. Explain the various method for temperature measurement | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal ) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *E* | *0* | *4* | *4* | *0* | *3* | *5* | *14* | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods of temperature measurements |
| **LO Description** | To understand Electrical methods of Measurement of Temperature.**(Psychomotor )** |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 14 | RTD, Materials used For RTDs, Constructional Details of RTDs, Measurement of Resistance of Thermometers Three And four lead Arrangement ,Salient Features Of RTDs<br>Thermocouples, Materials used For Thermocouples, Constructional Details of Thermocouples, Installation of Thermocouples<br>Thermistor, Materials used For Thermistor, Constructional Details of Thermistor | Lab demonstration, hands on practice, lab assignments, Virtual Lab. | | 10 | Lab manual, charts, experimental trainer instruments/kit with measuring instruments | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 14 | **End Semester Practical Exam** | **Student will be asked to**<br>1. Demonstration of RTD ,Thermocouples Thermistor for Temperature measurement in lab | 10 | | Rubrics/Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing Bhopal) | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 3 | 5 | 15 | |

| | |
|---|---|
| **COURSE NAME** | **Instrumentation and Measurement** |
| **CO Description** | Explain the various methods of temperature measurements |
| **LO Description** | To understands various methods of High Temperature measurement by using Pyrometer |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO 15 | Explain the Radiation Pyrometer, Principal used for Radiation Temperature measuring Device Explain the Optical Pyrometer ,Disappearing Filament Optical Pyrometer | Interactive classroom lecture, PPT, demonstration, quiz, assignments. | | 6 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO 15 | Assignment & quiz | **Student will be asked to** 1. Explain Working principle Of Pyrometer For high temperature measurement. | 10 | | Rubrics/Rating scale | internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**