

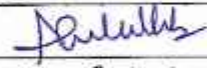



LESSON PLAN

| Course Code | Course Title | Semester | Branches | Contact Periods /Week | Academic Year | Date of commencement of Semester |
|------------------------|---|---|--|---------------------------------------|---------------|---|
| 20ME5E03 | INSTRUMENTATION AND CONTROL SYSTEMS | V | MECHANICAL ENGINEERING | 6 | 2024-25 | 06-06-2024 |
| COURSE OUTCOMES | | | | | | |
| 1 | Discuss the concepts of measurements and displacement measurement.[K3] | | | | | |
| 2 | Illustrate the working principles of pressure, temperature and humidity measuring instruments. [K3] | | | | | |
| 3 | Describe the working principles of level, speed and flow measuring instruments.[K2] | | | | | |
| 4 | Discuss stress strain measurement, acceleration measurement and seismic instruments. [K2] | | | | | |
| 5 | Interpret the elements of control system used in instrumentation. [K3] | | | | | |
| UNIT | Outcomes / Bloom's Level | Topics No. | Topics/Activity | Text Book / Reference | Contact Hour | Delivery Method |
| I | CO1 : Discuss the concepts of measurements and displacement measurement.[K3] | UNIT-I FUNDAMENTALS OF INSTRUMENTS | | | | |
| | | 1.1 | Basic principles of measurement, measurement systems | T1,T2, R1,R2 | 2 | Chalk and talk /ppt/Videos & LMS MATERIAL |
| | | 1.2 | Generalized configuration of measuring instruments functional | T2,T3, R1,R2 | 2 | |
| | | 1.3 | Descriptions of measuring instruments Sources of error, Classification and elimination | T1,T2, R1,R2 | 2 | |
| | | 1.4 | Measurement of Displacement Theory and construction of various transducers | T1,T3, R2,R1 | 2 | |
| | | 1.5 | Measurent of displacement piezo electric transducers | T1,T3, R2,R1 | 2 | |
| | | 1.6 | inductive, capacitance, resistance | T2,T3, R1,R2 | 1 | |
| | | 1.7 | ionization and photo electric transducers, Calibration procedures | T2,T3, R1,R2 | 2 | |
| | | Content beyond Syllabus | | Measurmets of displacement by sensors | | |
| Total | | | | | 14 | |

| | | UNIT-II MEASUREMENT OF TEMPERATURE AND PRESSURE | | | | |
|-----|--|---|--|--------------------------------------|-----------|---|
| II | CO2: Illustrate the working principles of pressure, temperature and humidity measuring instruments. [K3] | 2.1 | Measurement of temperature:- Classification, Ranges, | T1,T2, R1,R2 | 2 | Chalk and talk /ppt/Videos & NPTEL |
| | | 2.2 | Various principles of measurement – expansion, | T1,T2, R1,R2 | 1 | |
| | | 2.3 | electrical resistance, thermistor, thermocouple, Pyrometers | T1,T2, R1,R2 | 2 | |
| | | 2.4 | Measurement of humidity: Moisture content of gases, sling psychrometer, absorption | T1,T2, R1,R2 | 2 | |
| | | 2.5 | psychrometer, dew point meter Measurement of Pressure: Introduction | T1,T2, R1,R2 | 2 | |
| | | 2.6 | Units – classification, different principles used, Manometers, Bourdon pressure gauges, bellows – diaphragm gauges, | T1,T2, R1,R2 | 2 | |
| | | 2.7 | Low pressure measurement thermal conductivity gauges – ionization pressure gauges, McLeod pressure gauge. | T1,T2, R1,R2 | 2 | |
| | | Content beyond Syllabus | | Advanced material for measurement | | |
| | | Total | | | 14 | |
| | | UNIT-III FLOW, SPEED AND LEVEL MEASUREMENT | | | | |
| III | CO3: Describe the working principles of level, speed and flow measuring instruments. [K2] | 3.1 | Measurement of level: Direct method – indirect methods – capacitive, ultrasonic, | T1,T2, R1,R2 | 2 | Chalk and talk /ppt/Videos |
| | | 3.2 | magnetic, cryogenic fuel level indicators – bubbler level indicators. | T1,T2, R1,R2 | 2 | |
| | | 3.3 | Flow measurement: Rotameter, | T2,T3, R1,R2 | 1 | |
| | | 3.4 | magnetic, ultrasonic, turbine flow meter | T2,T3, R1,R2 | 2 | |
| | | 3.5 | Hot – wire anemometer, laser Doppler anemometer (LDA) | T1,T2, R1,R2 | 2 | |
| | | 3.6 | Measurement of speed: Mechanical tachometers – | T1,T3, R1,R2 | 1 | |

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|-------------------------|---|---|--|-----------------|-----------|--|
| | | 3.7 | electrical tachometers – stroboscope, non-contact type of tachometer | T2,T3, R1,R2 | 2 | |
| Content beyond Syllabus | | | Advanced fluids for level measurements | | 1 | |
| Total | | | | | 13 | |
| IV | CO4 : Discuss stress strain measurement, acceleration measurement and seismic instruments. [K2] | UNIT-IV MEASUREMENT OF FORCE, ACCELERATION AND VIBRATION | | | | |
| | | 4.1 | Measurement of force: Proving ring, Load cells - strain gauge, | T1,T2, R2,R1 | 2 | Chalk and talk /ppt/Videos & SIMULATIONS |
| | | 4.2 | hydraulic and pneumatic load cell, | T1,T2, R1,R2 | 1 | |
| | | 4.3 | Various types of stress and strain measurements – electrical strain gauge , gauge factor | T1,T3, R1,R2 | 2 | |
| | | 4.4 | method of usage of resistance strain gauge for bending | T1,T3 R1,R2 | 1 | |
| | | 4.5 | compressive and tensile strains , usage for measuring torque, strain gauge rosettes | T1,T2, T3 R1,R2 | 2 | |
| | | 4.6 | Measurement of Acceleration and Vibration: Different simple instruments, | T1,T2, R2,R1 | 2 | |
| | | 4.7 | principles of seismic instruments Vibrometer and accelerometer using this principle | T1,T2, R1,R2 | 2 | |
| Content beyond Syllabus | | | Integrated Electronic Piezoelectric (IEPE) accelerometers | | 1 | |
| Total | | | | | 13 | |
| V | CO5: Interpret the elements of control system used in instrumentation . [K3] | UNIT-V ELEMENTS OF CONTROL SYSTEMS | | | | |
| | | 5.1 | Introduction, Importance of control system , Classification – open and closed systems | T1,T3, R1,R2 | 2 | Chalk and talk /ppt/Videos & LMS/ QUIZ / |
| | | 5.2 | CLOSED SYSTEMS - servo mechanisms–examples with block diagrams, temperatur | T1,T2, R1,R2 | 2 | |
| | | 5.3 | examples with block diagrams of speed & position control systems. | T1,T2, R2,R1 | 2 | |
| Content beyond Syllabus | | | Hierarchical suitability. Strategic control points | | 1 | |

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|-------------------------|---|-----------|
| Total | | 7 |
| GRAND TOTAL | | 61 |
| Text Books: | | |
| S.No. | AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION | |
| T1 | . R. K. Jain, Mechanical and industrial measurements, 12th Edition, Khanna Publishers, 2016 | |
| T2 | Jain R.K. "Engineering Metrology", 21st Edition, Khanna Publishers, 2018. | |
| T3 | M Gopal, I J Nagrath , "Control System Engineering" 6th Edition, Generic, 2017. | |
| Reference Books: | | |
| S.No. | AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION | |
| R1 | R.K. Rajput, "Mechanical Measurements and Instrumentation", 5th Edition, S.K. Kataria & Sons, 2013 | |
| R2 | Katsuhiko Ogata, "Modern Control Engineering Prentice" 7th Edition, Hall of India, New Delhi, 2016. | |
| Web Details | | |
| | 1. https://nptel.ac.in/courses/103105130 | |
| | 2. https://nptel.ac.in/courses/107106081 | |

| | Name | Signature with Date |
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Principal