**GOVERNMENT POLYTECHNIC, VAISHALI**

(Department of Mechanical Engineering)

**Lecture Plan**

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| **Name of the Faculty** | MR. RAHUL KUMAR |
| **Email id and Mobile no.** | rahul.mzp44@gmail.com, 8092352711 |
| **Semester /Branch** | 5th / Mechanical |
| **Subject Name/Subject (Code)** | Metrology & Quality Control / 1625504 |
| **Lectures/week** | 3 periods/week |
| **THEORY** | |

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| **Units** | **Week** | **Lecture Day** | **Topics** | **Methods of Teaching** | **Remarks** |
| **Unit -1**  **Introduction to metrology** | 1 | 1 | Introduction to metrology:   * 1. Metrology Basics, Measurement   Definition of metrology, Categories of metrology | PPT, PDF/Video |  |
| 2 | Scientific metrology,  Industrial metrology, Legal metrology, objective, scope. | PPT, PDF/Video |
| 3 | Inspection, Need of inspection, Revision of Definitions of Precision, Accuracy Sensitivity, Readability, Calibration, Traceability, Reproducibility | PPT, PDF/Video |
| 2 | 1 | Revision of Definitions of error, Sources of errors, Factors affecting accuracy, Selection of instrument, Precautions while using an instrument for getting higher precision and accuracy. | PPT, PDF/Video |  |
| 2 | * 1. Standards and Comparators   Definition and introduction to line standard, end standard, Wavelength standard, Slip gauge and its accessories, Length bars. | PPT, PDF/Video |
| 3 | Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators | PPT, PDF/Video |
| 3 | 1 | Dial indicator, Sigma comparator, | PPT, PDF/Video |
| 2 | Pneumatic comparator, Electrical, Electronic, Relative advantages and disadvantages. | PPT, PDF/Video |
| 3 | 1.3 Limits, Fits, Tolerances and Gauges  Concept of Limits, Fits, And Tolerances, Selective Assembly | PPT, PDF/Video |
| **Units** | **Week** | **Lecture Day** | **Topics** | **Methods of Teaching** | **Remarks** |
| **Unit -1**  **Introduction to metrology** | 4 | 1 | Interchangeability, Hole and Shaft Basis System, Taylor’s Principle, | PPT, PDF/Video |  |
| 2 | Design of Plug, Ring Gauges, IS919-1993 (Limits, Fits & Tolerances, Gauges IS 3477-1973, concept of multi gauging and inspection | PPT, PDF/Video |
| 3 | * 1. Angular Measurement   Concept, Instruments for Angular, Measurements, Working and Use of Universal Bevel Protractor, Sine Bar | PPT, PDF/Video |
| 5 | 1 | Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges). | PPT, PDF/Video |
| 2 | **MCQ TEST BASED ON UNIT 1 Introduction to metrology (TEST-1)** | Google Form |
| **Unit-02 Threads and Gear Metrology:** | 5 | 3 | **Threads and Gear Metrology:**   * 1. Screw thread Measurements   ISO grade and fits of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter | PPT, PDF/Video |  |
| 6 | 1 | minor diameter, effective diameter, pitch, two wire method, Thread gauge micrometer, Working principle of floating carriage dial micrometer | PPT, PDF/Video |
| 2 | * 1. Gear Measurement and Testing   Analytical and functional inspection, Rolling test | PPT, PDF/Video |
| 3 | Threads and Gear Metrology:  Measurement of tooth thickness (constant chord method), gear tooth Vernier, | PPT, PDF/Video |
| 7 | 1 | Errors in gears such as backlash, run out, composite. | PPT, PDF/Video |
|  | 2 | **MCQ TEST BASED ON UNIT 2** Threads **and Gear Metrology (TEST-2)** | Google Form |
| **Unit-03**  **Testing Techniques**: | 7 | 3 | **Testing Techniques:**   * 1. Measurement of surface finish   Primary and secondary texture, Sampling length, Lay | PPT, PDF/Video |  |
| 8 | 1 | terminology as per IS 3073- 1967, direction of lay, Sources of lay and its significance | PPT, PDF/Video |
| 2 | CLA, Ra, RMS, Rz values and their interpretation | PPT, PDF/Video |
| 3 | .  Symbol for designating surface finish on drawing | PPT, PDF/Video |

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| **Unit-03**  **Testing Techniques:** | 9 | 1 | Various techniques of qualitative analysis, Working principle of stylus probe type instruments | PPT, PDF/Video |  |
| 2 | * 1. Machine tool testing   Parallelism, Straightness | PPT, PDF/Video |
| 3 | Squareness, Coaxiallity, roundness, run out | PPT, PDF/Video |
| 10 | 1 | alignment testing of machine tools as per IS standard procedure. | PPT, PDF/Video |
| **2** | **MCQ TEST BASED ON UNIT 2** Threads **and Gear Metrology (TEST-3)** | Google Form |
| **Unit-04**  **Quality Control** | **10** | **3** | **Quality Control:**  A) Quality : Definitions, meaning of quality of product & services | PPT, PDF/Video |  |
| **11** | **1** | Quality characteristics, Quality of design, Quality of conformance | PPT, PDF/Video |
| **2** | Quality of performance, Concept of reliability, Cost, Quantity assurance, | PPT, PDF/Video |
| **3** | Cost of rework & repair, Quality & Inspection, Inspection stages | PPT, PDF/Video |
| **12** | **1** | 1. Total Quality Management:    1. Principles of total quantity management. | PPT, PDF/Video |
| **2** | 1. Customer focus. 2. Commitment by top management. | PPT, PDF/Video |
| **3** | 1. Continuous improvement–PDCA, Quality Circles | PPT, PDF/Video |
| **13** | **1** | Employee empowerment (JIDOKA). Quality Audit | PPT, PDF/Video |
| **2** | 1. Quality Audit: Concept of audit practices, lead assessor certification. | PPT, PDF/Video |
| **3** | 1. Six sigma: Statistical meaning, methodology of system Improvement, DMAIC cycle, Yellow belt, Green belt, Black belt certification. | PPT, PDF/Video |

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| **Unit-04**  **Quality Control** | 14 | 1 | C) ISO 9000 Series & other standards:  Concept, ISO 9000 series quality standards | PPT, PDF/Video |  |
| 2 | Standards in general, Its evaluation & Implications | PPT, PDF/Video |
| 3 | necessity of ISo certification, other Quality systems | PPT, PDF/Video |
| 15 | 1 | **MCQ TEST BASED ON UNIT 4 Quality Control (TEST-4)** | Google Form |
| **Unit-05**  **Elementary Statistics & it’s application in quality control:** | 15 | 2 | **Elementary Statistics & it’s application in quality control:**  5.1 Statistical Quality Control – Meaning and importance of SQC | PPT, PDF/Video |  |
| 3 | Variable and attribute Measurement. Control charts | PPT, PDF/Video |
| 16 | 1 | control charts – inherent and assignable sources of variation, | PPT, PDF/Video |
| 2 | control charts for variables | PPT, PDF/Video |
| 3 | – X & R charts, control charts for attributes p | PPT, PDF/Video |
| 17 | 1 | np, C charts | PPT, PDF/Video |
| 2 | process capability of machine, determination of statistical limits, | PPT, PDF/Video |
| 3 | different possibilities, Rejection area, | PPT, PDF/Video |
| 18 | 1 | Statistically capable and incapable processes | PPT, PDF/Video |
| 2 | incapable processes Cp, Cpk. | PPT, PDF/Video |
| 3 | 5.2 Acceptance Sampling, Concept | PPT, PDF/Video |
| 19 | 1 | Comparison with 100% inspection | PPT, PDF/Video |
| 2 | Different types of sampling plans, with merits and demerits | PPT, PDF/Video |
| 3 | OC curve, It’s importance and significance | PPT, PDF/Video |
| 20 | 1 | Producers risk, Consumer’s risk | PPT, PDF/Video |
| 2 | AQL, AOQL | PPT, PDF/Video |
| 3 | IQL, LTPD | PPT, PDF/Video |
| 21 | 1 | **MCQ TEST BASED ON UNIT-5 Elementary Statistics & it’s application in quality control:**  **(TEST-5)** | Google Form |
| **TOTAL** | | **64 PERIODS , - (61 +3 EXTRA PERIODS = 64 PERIODS)** | | | |
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