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| PROFESSOR'S NAME | Dr. Kanakuppi Sadashivappa |
| DEPARTMENT | Department of Industrial & Production Engineering |
| INSTITUTE | Indian Institute of Technology Madras |
| COURSE OUTLINE | In today's world of high-technology products, the most important requirements of dimensional and other accuracy controls are becoming very stringent as a very important aspect in achieving quality and reliability in the service of any product in dimensional control. Unless the manufactured parts are accurately measured, assurance of quality cannot be given. In this context, the course deals with the basic principles of dimensional measuring instruments and precision measurement techniques. The first 2 modules deal with the basic concepts of metrology and measurement standards. Then, linear, angular, geometrical shape metrology along with interferometry techniques and various types of comparators are explained in the subsequent modules. Concepts of limits, fits and tolerances and surface finish measurement, screw thread and gear measurements are also presented in detail. Module 12 deals with metrology of machine tools and advanced metrology respectively. |
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COURSE DETAILS

| S. No | Module ID/ Lecture ID | Lecture Title/Topic |
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| 1. | Module1_L1 | Introduction to Metrology |
| 2. | Module1_L2 | Metrology Terminologies |
| 3. | Module1_L3 | Measurement Errors |
| 4. | Module2_L4 | Linear Measuring Instruments – I (Angle Plate, Steel Rule, Spring Calipers) |
| 5. | Module2_L5 | Linear Measuring Instruments - II(Combination Set, Vernier Calipers) |
| 6. | Module2_L6 | Linear Measuring Instruments - III (Height |

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| | | Gauge, Micrometers – 1) |
| 7. | Module2_L7 | Linear Measuring Instruments – IV (Micrometers – 2, Bore Gauge) |
| 8. | Module2_L8 | Linear Measuring Instruments – V (Dial Indicators, Thickness Gauges, Depth Gauges) |
| 9. | Module3_L9 | Manufacturing Tolerances and Fits |
| 10. | Module3_L10 | Terminologies of Limits Fits and Tolerances |
| 11. | Module3_L11 | Numerical Problems on Fit and Tolerances |
| 12. | Module3_L12 | Selection of Fits, Geometrical Tolerances |
| 13. | Module3_L13 | Positional Tolerances |
| 14. | Module3_L14 | Limit Gauging - I |
| 15. | Module3_L15 | Limit Gauging - II |
| 16. | Module3_L16 | Design of Limit Gauges |
| 17. | Module4_L17 | Measurement of Straightness, Flatness and Squareness |
| 18. | Module4_L18 | Perpendicularity Measurement |
| 19. | Module5_L19 | Basics of Surface Roughness |
| 20. | Module5_L20 | Surface Finish Parameters |
| 21. | Module5_L21 | Stylus Type Surface Finish Measuring Instruments |
| 22. | Module5_L22 | Non-Contact Type Surface Finish Measuring Instruments |
| 23. | Module6_L23 | Screw Thread Production and Terminology |
| 24. | Module6_L24 | Measurement of Screw Thread Elements |
| 25. | Module7_L25 | Introduction to Gears |
| 26. | Module7_L26 | Measurement of Gear Elements |
| 27. | Module8_L27 | Angle Measurement - I |
| 28. | Module8_L28 | Angle Measurement - II |
| 29. | Module8_L29 | Radius Measurement, Contact Angle Measurement |
| 30. | Module9_L30 | Basics of Interferometry |

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| 31. | Module9_L31 | Interferometers |
| 32. | Module10_L32 | Introduction to Comparators, Mechanical Comparators |
| 33. | Module10_L33 | Electrical And Electronic Comparators, Optical Comparators |
| 34. | Module10_L34 | Pneumatic Comparators |
| 35. | Module11_L35 | Geometrical Tests on Lathe |
| 36. | Module11_L36 | Geometrical Tests on Pillar Type Drilling Machine |
| 37. | Module12_L37 | Universal Measuring Machine (UMM) and Coordinate Measuring Machine (CMM) |
| 38. | Module12_L38 | CMM Probes and CMM Software |
| 39. | Module12_L39 | Feature Measurement Using CMM, Laser Vision |
| 40. | Module12_L40 | In-Process Gauging And Control |
| 41. | Module12_L41 | Stage Position Metrology |
| 42. | Module12_L42 | Micro and Nano Stages, Nano Technology Instrumentation |
| 43. | Module12_L43 | Optical System Design |
| 44. | Module12_L44 | Complex Opto- Mechanical Assemblies, Metrology Testing and Certification Services |

List of reference material/ books:

Engineering Metrology – K.J. Hume, Macdonald and Co.(publisher) London.

The Springer handbook of metrology and Testing, Czichos (Ed), 2011.

The Metrology Hand book- Jay. L.Bucher (ed), American Society for Quality, 2004.

Industrial Metrology – Smith GT, 2002,Spinger.

Hand book of industrial metrology – John W. Greve, Frank W. Wilson,PHI – New Delhi .

Engineering Metrology – D.M.Anthony,Pergamon Press .

Dimensional Metrology – Khare MK, OXFORD-IBH Publishers.

Name and contact details of two referees for the course:

