

For Syllabus, Question Papers, Notes & many More

RO6701 PRECISION EQUIPMENT DESIGN

DETAILED SYLLABUS

UNIT I INTRODUCTION TO PRECISION ENGINEERING

Precision manufacturing, Intelligent manufacturing – objectives, Reconfigurable systems.

UNIT II MOTION ERRORS

Errors and error measurements, Model of measurement, Statistical measurements, Propagation of errors, Motion errors principle –translational body, rotational body, geometric and kinematic errors, Other types of errors in machines – thermal, cutting force induced, environmental, common geometric errors – cosine, abbe, dead path errors, Methodologies of error elimination

UNIT III DESIGN STRATEGIES FOR MACHINE TOOLS

Standard sizes, Precision engineering principles –design, modeling and simulation, Design roadmap– conceptual analysis, materials selection, kinematic design of bearing and guide ways, Structural analysis – static and dynamic analysis, Micro machines – design approach, design challenges – kinematics, interactive forces, actuators,

UNIT IV PARALLEL KINEMATIC MACHINES (PKM)

Serial and parallel systems, Precision design of PKM – need of PKM, low cost, degrees of freedom, workspace volume, high stiffness and agility, repeatability in movement, low inertia, Configurations and characteristic issues – degrees of calculation, Design principles – Kinematic modeling.

UNIT V PRECISION CONTROL

Fundamentals of motion control, system modeling and performance assessment, linear dynamics, nonlinear dynamics – force ripple, friction, hysteresis, incorporating nonlinear dynamics, Control design strategies – PID feedback, feed forward control, ripple, RBF compensation, internal model control, Case study: Design of piezoelectric actuator – piezoelectric actuator, LVDT, adaptive controller.

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REFERENCES

1. Samir Mekid, "Introduction to Precision Machine Design and Error Assessment", CRC-Press, Taylor and Francis Group, New York, 2009.
2. Alexander H Slocum, "Precision Machine Design", Prentice Hall Publishers, 1992.
3. Moore W R, "Foundations of Mechanical Accuracy", The Moore Special Tool Company, Bridgeport, Connecticut, 1970.
4. Nakazawa H, "Principles of Precision Engineering", Oxford University Press, Oxford, 1994.
5. Smith S.T, Chetwynd D.G, "Foundations of Ultra – Precision Mechanism Design", Gordon and Breach Publishers, Switzerland, 1992.

OBJECTIVES

To impart knowledge in the increasing quality concepts of parts, accuracy requirement of machine tools and also to introduce latest topics in Manufacturing like micro machining and smart materials so as to equip them to join core electronic manufacturing industries.