Precision Engineering “principles and state of the art concepts”

CONVENOR: P Shore CREDIT POINTS: 10
OTHER LECTURERS: J. Hopkins, P. Morantz, R. May Miller, L.Blunt, D.Walker, R.Jourdain
PRE-REQUISITES: MODULE CODE :A1125

RATIONALE:
This module will instil determinism as a precision engineering philosophy and will provide awareness and understanding of the principles and state of the art concepts employed in “high end” ultra precision manufacturing industries.

OBJECTIVES/LEARNING OUTCOMES/COMPETENCES: (Numbered list)
On successful completion of this study the student should be able to:

1. Critically evaluate ultra precision engineering issues in a deterministic and logical manner.
2. Demonstrate fundamental understanding and critical awareness that random results are a consequence of random procedures.
3. Critically review, assess and evaluate the design of precision machines and motion systems based on their adherence to established principles of precision engineering.
4. Demonstrate critical awareness that the main enemy of precision and ultra precision motion is uncontrolled or “stray” energy.
5. Demonstrate conceptual thinking to critically evaluate how stray energy influences the response of precision engineering systems.

SYLLABUS/RANGE:
- Introduction of determinism as a manufacturing philosophy
- introduce principles applied to precision engineering systems, including:Kinematics, Structures, Slideways, Spindles, fluid film bearings, measuring systems, actuators, advanced CNC systems, thermal effects and stabilisation approaches, dynamic performance analysis, machine calibration, geometric error budgeting.
- 2 detail case studies - to provide practical exposure to necessary design trade-offs made through adopting each of the precision engineering principles. The case studies become the central theme of module 2: Computer Aided Engineering where the role of computers in ultra precision engineering and the tools they offer are covered. Example, the design, manufacture and measurement of a complex multi-mirror array for the James Webb Space Telescope.

INDICATIVE READING:

STUDENT WORKLOAD: Hours

Staff/Student Contact Time:	Lectures	30
	Seminars/Example classes	0
	Visits	0
Directed Learning Time:	Essays & Reports	0
Independent Learning Time:	Private Study & Revision	70
Tests & Exam Time:		
Total Notional Work Time		100

ASSESSMENT:

Title	Type*	Learning Outcome	Weighting %
Essay (summative)	E	1-4	100
Review & analysis (formative)	O	1-4	0

* W = Written Assignment E = Exam T = Test P = Practicals O = Oral