



Department of Production Engineering

The department of Production Engineering offers the following programs:

1. Graduate Diplomas

1.1 Specialized Graduate Diploma in Manufacturing Engineering

The student must complete 30 credit hours.

Compulsory courses: The student must pass six courses with a total of 18 credit hours with course numbers (07 09 611, 07 09 612, 07 09 613, 07 09 621, 07 09 642, 07 09 643).

Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Diploma courses”

2. Master Degrees

2.1 Master of Engineering in Manufacturing Engineering

The student must complete 30 credit hours in the form of courses and an additional 3 credit hours in the form of a scientific report.

Compulsory courses: The student must pass six courses with a sum of 18 credit hours with course numbers (07 09 711, 07 09 713, 07 09 721, 07 09 722, 07 09 741).

Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Master courses”. The student is allowed to choose 2 courses from another major.

2.2 Master of Science in Industrial Engineering

The student must pass 24 credit hours in the form of courses and an additional 8 credit hours in the form of a thesis.

Compulsory courses: The student must pass three courses equivalent to 9 credit hours with course numbers (07 10 711, 07 10 721, 07 19 714).

Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Master courses”. The student is allowed to choose 2 courses from another major.

2.3 Master of Science in Manufacturing Engineering

The student must complete 24 credit hours in the form of courses and an additional 8 credit hours in the form of a thesis.



Compulsory courses: The student must pass three courses equivalent to 9 credit hours with course numbers (07 09 713, 07 09 715, 07 09 741).

Elective courses: The student can choose the remaining credit hours from any other courses that are specified as “Master courses”. The student is allowed to choose 2 courses from another major.

3. Doctor of Philosophy- Ph.D. Degree

3.1 Doctor of Philosophy in Industrial Engineering

The student must complete 18 credit hours in the form of courses and an additional 24 credit hours in the form of a dissertation.

The student must choose from courses specified as “Doctorate courses”. The student has the right to choose another three courses from another major.

3.1 Doctor of Philosophy in Manufacturing Engineering

The student must complete 18 credit hours in the form of courses and an additional 24 credit hours in the form of a dissertation.

The student must choose from courses specified as “Doctorate courses”. The student has the right to choose another three courses from another major.



List of Diploma, Master and Ph.D. courses

No.	Course Code	Course Name	Credit Hours	Exam Duration	Pre-requisites
1	07 10 631	Ergonomics and Biomechanics	3	3	
2	07 10 632	Industrial Safety and Occupational Health	3	3	
3	07 10 651	Engineering Cost Analysis	3	3	
4	07 10 711	Operations Research A	3	3	
5	07 10 712	Operations Research B	3	3	07 10 711
6	07 10 713	Simulation and Queuing Models	3	3	07 19 714
7	07 10 721	Plant Design And Material Handling	3	3	
8	07 10 722	Industrial Operations Management	3	3	07 10 711
9	07 10 723	Supply Chain Management	3	3	
10	07 10 724	Industrial Project Management	3	3	
11	07 10 731	Macroergonomics	3	3	
12	07 10 741	Industrial Information Systems	3	3	
13	07 10 751	Industrial Feasibility Study	3	3	
14	07 09 611	Forming Theories and Techniques	3	3	
15	07 09 612	Heat Treatment	3	3	
16	07 09 613	Material Selection	3	3	
17	07 09 621	Fundamentals of Cutting Processes	3	3	
18	07 09 631	Vibration Measurements and Analysis	3	3	
19	07 09 641	Error Analysis and Modeling	3	3	
20	07 09 642	Metrology Systems	3	3	
21	07 09 643	Industrial Quality Control	3	3	
22	07 09 710	Welding Methods and Welding Defects	3	3	
23	07 09 711	Solid Mechanics	3	3	
24	07 09 712	Forming Machines	3	3	
25	07 09 713	Manufacturing Properties of Engineering Materials	3	3	
26	07 09 714	Destructive and Non-destructive Testing of Welds	3	3	07 09 713
27	07 09 715	Advanced Metallic Alloys	3	3	
28	07 09 716	Plastics	3	3	
29	07 09 717	Finite Element Plasticity	3	3	
30	07 09 718	Failure Analysis and Prevention	3	3	
31	07 09 719	Special Topics in Material Forming	3	3	
32	07 09 721	Non-Conventional Cutting Methods	3	3	



33	07 09 722	Numerical Controlled Machines	3	3	
34	07 09 723	Design and Manufacturing of Cutting Tools	3	3	
35	07 09 724	Cutting with Abrasive Particles	3	3	07 09 721
36	07 09 725	Selected Topics in Machining Techniques	3	3	
37	07 09 731	Reverse Engineering	3	3	
38	07 09 732	Reliability Engineering and Machine Performance	3	3	
39	07 09 733	Maintenance Systems and Strategies	3	3	
40	07 09 734	Wavelet Analysis and Condition Based Maintenance	3	3	
41	07 09 735	Automatic Control and Robotics	3	3	
42	07 09 736	Selected Topics in Maintenance and Fault Diagnosis	3	3	
43	07 09 741	Statistical Design and Analysis of Experiments	3	3	
44	07 09 742	Laser and Optical Metrology	3	3	
45	07 09 743	Metrology of Pattern and Image Recognition	3	3	
46	07 09 744	Quality Assurance and Improvement	3	3	
47	07 09 745	Error Analysis in Measurement	3	3	
48	07 09 746	Quality Control Systems and Techniques	3	3	
49	07 09 747	Selected Topics in Dimensional Metrology	3	3	
50	07 10 821	Selected Topics in Planning and Management	3	3	
51	07 10 822	Selected Topics in Industrial Engineering	3	3	
52	07 10 823	Selected Topics in Operations Research Applications	3	3	
53	07 10 824	Selected Topics in Supply Chain Management	3	3	
54	07 10 831	Selected Topics in Industrial Safety	3	3	
55	07 10 832	Selected Topics in Human Factors Engineering	3	3	
56	07 10 841	Selected Topics in Information Systems	3	3	
57	07 09 811	Selected Topics in Forming Operations	3	3	



58	07 09 812	Sheet Metal Forming for Specific Industries	3	3	
59	07 09 813	Molten Metal Flow and Cooling Simulation	3	3	
60	07 09 814	Nanomaterials and Nanotechnology	3	3	
61	07 09 815	Selected Topics in Engineering Materials Technology	3	3	
62	07 09 821	Selected Topics in Machining Operations	3	3	
63	07 09 822	Machinability of Exotic € and Difficult-to-machine (DTM) Materials	3	3	
64	07 09 823	Design for Machining	3	3	
65	07 09 824	Machine Tools for High Speed Machining	3	3	
66	07 09 831	Selected Topics in Equipment Fault Diagnosis	3	3	
67	07 09 832	Failure Analysis of Mechanical Systems			
68	07 09 841	Selected Topics in Metrology and Measurement	3	3	
69	07 09 842	Selected Topics in Quality and Reliability	3	3	
70	07 09 843	Selected Topics in Micro- and Nano-Metrology	3	3	
71	07 09 844	Uncertainty Evaluation in Dimensional Measurements	3	3	
72	07 09 845	Selected Topics in Quality Systems and Applications	3	3	
73	07 09 851	Selected Topics in Material Inspection	3	3	
74	07 09 601	Diploma Project in Manufacturing Engineering	3	Presentation	
75	07 09 701	Master of Engineering Scientific Report in Manufacturing Engineering	3	Defense	
76	07 10 702	M.Sc. Thesis in Industrial Engineering	8	Defense	
77	07 09 702	M.Sc. Thesis in Manufacturing Engineering	8	Defense	
78	07 10 801	Ph.D. Dissertation in Industrial Engineering	24	Defense	
79	07 09 801	Ph.D. Dissertation in Manufacturing Engineering	24	Defense	



Description of Courses for Graduate Programs (Diploma- Master- Doctor of Philosophy)

07 10 631 Ergonomics and Biomechanics

The effect of human factors on systems performance. Human abilities and limitations. Anatomy, physiology of the human body. Bio mechanical aspects of hand tool and equipment design. Manufacturing systems design for better performance and human welfare.

07 10 632 Industrial Safety and Occupational Health

The relationship between man and environment. Factors, anatomical, social, and psychological affecting and affected by the work environment. Received external influences. The reaction. The impact of pollutants, the work environment to the worker. Workplace design to improve human performance. Hazardous chemicals and toxic. Noise control. Personnel protection equipment. Fire protection and prevention. Engineering product safety. Fault tree analysis. Risk analysis. The laws governing industrial safety and occupational health.

07 10 651 Engineering Cost Analysis

Review engineering costs and the relationship of the effect of time on value. The importance of cost analysis. Depreciation expense. Replacement and replacement policies. Risk analysis. Cost-benefit analysis. The impact of inflation on the cost analysis. Production costs. Budgets and balance sheet. Budget control.

07 10 711 Operations Research A

Formulations of LP. Linear Algebra. Simplex method. Sensitivity analysis. Assignment model. Transportation model. Multi-objectives and goal programming.

07 10 712 Operations Research B

Integer programming. Nonlinear programming. Quadratic programming. Dynamic programming. Network flow problems. Certainty and uncertainty in decision processes. Queuing theory: single service channel, multiple service channel.

07 10 713 Simulation and Queuing Models

Basics of simulation. Simulation models of queuing simple and complex. Simulation software packages. Process analysis and data collection. Choose a probability distribution of the input. Building a simulation model. Random numbers generation. Result analysis. Probabilistic and random processes



07 10 721 Plant Design and Material Handling

Basis of production planning systems and industrial projects. The foundations of product design and processes. The flow and material handling. Material handling systems. Warehouse. Mathematical models for facilities planning. Packaging and its role in the materials handling.

07 10 722 Industrial Operations Management

Basic concepts of production and operations management. Designing of products and services. Demand forecasting models. E-commerce and operations management. The basics of inventory management and the economic lot size. Determining the material requirements. Aggregate production planning. Scheduling.

07 10 723 Supply Chain Management

Supplier selection. Transportations systems. Vehicle routing and supply models. Site selection of storage and distribution systems. Inventory models. Geographic information system. Electronic commerce. The exchange of electronic data. Aggregate supply chain.

07 10 724 Industrial Project Management

Activity networks. CPM method. Probabilistic activity networks; structures. terminology, and PERT model. Models of time. Cost trade off. Resource planning in project networks.

07 10 731 Macroergonomics

Human performance of tasks. The structure of human-system communication. Human capabilities to use system components, and the design, specification, and evaluation of interfaces. The objectives of efficiency, safety, and comfort of users performing their tasks. Mini project.

07 10 741 Industrial Information Systems

Review of different IS. Elements of IS. A framework for Information Systems Architecture. The IS development methodology. The role of people in IS.

07 10 751 Industrial Feasibility Study

Element of feasibility studies. Financial and economical analysis. Equity and debt analysis. Economics, Financial project and economical measures. Cost analysis. Costing and break-even analysis. Technology selection. Plant design consideration. Capital Investment. Opportunity analysis. Technical feasibility. Basic engineering. Detailed engineering. Economical feasibility. Marketing feasibility. Financial feasibility. Basic principles of financing. Sources of financing. Business plans. Balance sheet. Income projection. Cash flow. Financial policies.



07 09 611 Forming Theories and Techniques

Classification. Fundamentals of plastic forming. Effect of temperature. Metallurgical changes. Formability. Rolling techniques. Forging techniques. Extrusion techniques. Technology of rod , wire and tube drawing. Sheet metal forming. Flow curves. Effect of strain rates. Stresses. Effect of temperature. Effect of hydrostatic pressure. Strain hardening. Plasticity theories. Calculations of forces in forming processes. Slip line fields. Upper bound techniques. Viscoplasticity. Finite element analysis. Upsetting loads and stresses. Friction hills. Plain strain and axial symmetry. Loads and stresses in rolling. Effect of front and back tension. Torque and power in rolling. Extrusion pressures. Drawing. Theories of wire drawing. Limit stresses in bending.

07 09 612 Heat Treatment

Annealing. Recrystallization. Normalizing. Hardening. Martensite transformation. Surface hardening. Case hardening. TTT diagram. Martensite and bainite formation. Hardenability and weldability. Annealing. Normalizing. Hardening and tempering. Stress relief treatment. Solution treatment. Precipitation treatment.

07 09 613 Material Selection

Material selection for: high strength, high wear resistance, high temperature, use for corrosion resistance and other properties.

07 09 621 Fundamentals of Cutting Processes

The concept of material machinability. Evaluation of machinability. Recent trends of cutting tool materials. Tool wear and tool failure. Durability of cutting tools. Economic considerations in cutting processes. Surface integrity in cutting processes.

07 09 631 Vibration Measurements and Analysis

Types of vibrations in machinery and structures. Forced vibrations. Random vibrations. Vibration analysis techniques. Modal analysis. Use of temperature measurement as a supplement for vibration measurement for machinery. Diagnostic pressure monitoring and its use as a machinery inspection tool.

07 09 641 Error Analysis and Modeling in Metrology

Types and sources of errors in the measurements. The concept of tolerance and uncertainty in measurement. The concept and basics of the accumulation of errors. Modeling errors in measurement. Methods for calculating the uncertainty in measurement.



07 09 642 Metrology Systems

Basic elements of metrology systems. Automatic, on-line and in-process measurement and inspection systems. Data analysis and feedback systems. Intelligent metrology systems. Basics and applications of coordinate measurements. Coordinate measuring machines. Measurement strategies and error reduction

07 09 643 Industrial Quality Control

Concepts and the foundations of quality. Principles of statistical quality control. Collection and representation of data. Probability distributions of quality characteristics. Models and interactions between processes quality and product quality. Quality tools and techniques during and after processes. Applications of quality control systems. Principles and applications quality control charts for variables and attributes. Samples data distribution. Acceptance sampling. Types of samples. Sampling plans and techniques for attributes and variables. Applications of computers for online and offline quality control.

07 09 710 Welding Methods and Welding Defects

Gas welding. Gases. Filters. Safety. Shielded Metal Arc Welding (SMAW). Arc characteristics. Welding machines. Types of welding electrodes. Electric resistance welding (spot welding, seam welding, butt welds, stud welds). Sources of defects and how to eliminate them. Cracks. Porosity. Shrinkage cavities. Slag inclusions. Form defects. Distortions. **Special welding methods:** Submerged Arc Welding (SAW). Electro slag welding. MIG welding. TIG welding. Plasma welding. Electron beam welding. Laser welding. Ultrasonic welding.

07 09 711 Solid Mechanics

Tension test. Compression test. Bending test. Shear and torsion test. Notch impact tests. Hardness testing. Fatigue tests. Creep tests. Stress tensors. Two dimensional stresses. Mohr's circle. Three dimensional stresses. Stress deviators and mean stress. Analysis of strains. Strain energy. Yield criteria. Theories of plasticity.

07 09 712 Forming Machines

Types of presses and hammers. Types and specifications rolling equipment. Roll pass design. Extrusion presses. Drawing benches for bars and tubes. Wire drawing machines.

07 09 713 Manufacturing Properties of Engineering Materials

Classification of engineering materials. Properties of engineering materials (Mechanical, Electrical, Thermal, Environmental). Manufacturing processes and manufacturability. Casting and castability. Bulk forming and workability. Sheet forming and formability. Machining and machinability. Welding and weldability. Heat treatment and heat treatability. Selection of manufacturing processes.



07 09 714 Destructive and Non-destructive Testing of Welds

Tension test. Bending test. Neck break test. Notch impact tests. Determination of brittle transient temperature. Other special mechanical tests. Weld procedure. Qualification tests. Microscopic examination. Hardness distribution tests.

Visual inspection. Radiography: radiation, Alpha ray, isotopes, X-ray equipment. Radiation hazards and protection. Film development. Film characteristics. Interpretation.

07 09 715 Advanced Metallic Alloys

Crystal structure. Single crystal and polycrystalline materials. Defects of crystal structure. Effect on mechanical properties. Phase equilibrium diagrams. Ferrous materials and alloys. Non-ferrous materials and alloys. Clay products. Refractors. Aluminum Oxides. Silicon. Nitrides. Other Ceramics. Fiber reinforced materials. Strengthened metals. Ceramics and hard metals. Timber: classification, properties and testing.

07 09 716 Plastics

Polymers. Chain reactions. Step-reactions. Linear polymers. Crystalline and amorphous polymers. Cross linked polymers. Additives and fillers. Thermoplastics. Processing of polymers: casting, compression molding, transfer molding, injection molding, extrusion blow molding.

07 09 717 Finite Element Plasticity

General introduction to the Finite Element Method. Basic formulation for elastic deformation (types of elements, linear elements, plane-stress and plane-strain elements, three dimensional elements, displacement matrix, matrix of elastic constants, stiffness matrices, boundary conditions). Analysis of small plastic strain (yield stress, transfer from elastic to plastic behavior, effect of strain hardening, examples). Finite element plasticity on microcomputers. Analysis of large plastic strain. Applications on forming processes.

07 09 718 Failure Analysis and Prevention

Engineering aspects of failure and prevention. Manufacturing aspects of failure and prevention. Structural life assessment methods. Principles and practice of failure analysis. Tools and techniques in failure analysis. Types and mechanisms of fracture. Corrosion related failures. Wear failures. Distortion. Failures of mechanical components (shafts and axles, bearings, fasteners, dies, cutting tools, gears, pressure vessels, pipelines, etc.).

07 09 719 Selected Topics in Material Forming

07 09 721 Non-Conventional Machining Methods



Theories , fundamentals and applications. Advantages and disadvantages. Accuracy and machinability. Tool wear and factors affecting the following processes: electro-discharge machining, laser beam machining, electron beam machining, electrochemical machining, ultrasonic machining, water jet machining, abrasives jet machining.

07 09 722 Numerical Controlled Machines

Fundamentals and advantages of NC machines. System components. Programming CNC machines. Economical considerations. Performance tests of NC machines.

07 09 723 Design and Manufacturing of Cutting Tools

Cutting tool materials. Metallic and non-metallic cutting tool materials. Design of cutting tool: single point cutting tools, form cutting tools, reamers, broaches, gear cutting tools. Tool fixation. Turrets and magazines. Cutting tools manufacturing.

07 09 724 Cutting with Abrasive Particles

Principles of abrasive machining. Types of abrasive materials and properties. Mechanism of chip removal. Theoretical consideration. Applications. Specialized methods of abrasive machining.

07 09 725 Selected Topics in Machining Techniques

07 09 731 Reverse Engineering

Principles, concepts and procedures of reverse engineering. Identification, measurement and restoration of dimensions and geometry. Selection and application of dimensional and geometrical tolerances. Selection and testing of raw materials. Development and modification in reverse engineering. Basic criteria for evaluation and analysis of product performance.

07 09 732 Reliability Engineering and Machine Performance

Failure types and analysis. Reliability. Modes. Reliability testing. Reliability parameters. System reliability. Reliability optimization. Maintenance types and objectives. Maintenance effectiveness. Total Productive Maintenance

07 09 733 Maintenance Systems and Strategies

Basics of successful industrial maintenance. Problems and limits of application. Sample maintenance organizations. Structure and operation of maintenance organizations. Objectives of planned maintenance. Types of maintenance. Maintenance programs. Methods of planning maintenance. Maintenance records. Maintenance databases. Management of spare parts and crews in maintenance. Economics of maintenance. Computerized Maintenance Management Systems.



07 09 734 Wavelet Analysis and Condition Based Maintenance

The nature of wavelet analysis. The difference between the wavelet analysis and Fast Fourier Transformations. The use of wavelet analysis in condition based maintenance.

07 09 735 Automatic Control and Robotics

Automatic control. Open loop and closed loop control systems. Adaptive control. On-line control. Sensors. Robotic technology. Robot physical configuration. Work cell control. Robotics applications.

07 09 736 Selected Topics in Maintenance and Fault Diagnosis

07 09 741 Statistical Design and Analysis of Experiments

Introduction to experimental design and analysis of results. Statistical analysis. Statistical evaluation of experiments and analysis of variance. Single factor experiments with unrestricted randomness. Multiple factors experiments. Covariance and correlation analysis.

07 09 742 Laser and Optical Metrology

Types and properties of lasers. Applications of lasers in metrology. Holography and holographic interferometry and its applications in metrology. Optical sensors and their applications. Optical profiling. Principle, types and applications of optical fiber. Applications of optical fibers in metrology.

07 09 743 Metrology of Pattern and Image Recognition

Components of pattern recognition systems. Applications of image analysis and pattern recognition in metrology. Pattern recognition, preprocessing, feature extraction, and classification methods and algorithms.

07 09 744 Quality Assurance and Improvement

The concept and bases of quality improvement. Tools and methods of quality improvement. The foundations and methods of quality assurance. Specifications and international systems of quality assurance. Basics of Total Quality Management. Principles and applications of Six Sigma (6σ).

07 09 745 Error Analysis in Measurements

Errors in measurement (sources and types). Accumulation of errors in measurement. Estimation and evaluation of errors in measurement. Uncertainty evaluation in measurements.

07 09 746 Quality Control Systems and Techniques



Basics of quality control. Online quality control. Offline quality control. Statistical principles of quality control. Quality control tools and techniques. Loss function and Tagushi theory. Role of computers in quality control.

07 09 747 Selected Topics in Dimensional Metrology

07 10 821 Selected Topics in Planning and Management

07 10 822 Selected Topics in Industrial Engineering

07 10 823 Selected Topics in Operations Research Applications

07 10 824 Selected Topics in Supply Chain Management

07 10 831 Selected Topics in Industrial Safety

07 10 832 Selected Topics in Human Factors Engineering

07 10 841 Selected Topics in Information Systems

07 09 811 Selected Topics in Forming Operations

07 09 812 Sheet Metal Forming for Specific Industries

Characterization methods of sheet materials. Sheet metal formability. Anisotropy of sheet metal. Stress analysis of anisotropic materials. Bending. Cupping, redrawing and ironing. Stamping. Spinning. Roll forming and incremental forming. Forming limit diagram. Mechanical and physical properties of automotive materials. Materials selection for automotive components. Lightweight construction materials and techniques.

07 09 813 Molten Metal Flow and Cooling Simulation

Fundamentals of casting design. Finite elements for casting simulation. Models used in metal casting simulation. Design optimization (size, feeding system, metal fluidity, pour temperature, chilling). Estimation and remedy of casting defects using simulation tools. Simulation and analysis of investment casting.- Simulation and analysis of die casting. Fundamentals of weld design and welding problems. Models and assumptions used in welding simulation. Simulation and analysis of a simple SMAW operation. Simulation and analysis of TIG operation.

07 09 814 Nanomaterials and Nanotechnology

Introduction (definitions, properties and types). Sectors influenced by nanomaterials



(health, communication, energy, environment, transport, safety, security and defense).
Special applications. Advanced nanomaterials (silicon substitutes, au, ag and pt, composite, catalysis). Nanotechnology. Selected manufacturing techniques.

07 09 815 Selected Topics in Engineering Materials Technology

07 09 821 Selected Topics in Machining Operations

07 09 822 Machinability of Exotic (E) and Difficult-to-machine (DTU) Materials

Definition and classification of E and DTM materials. Material properties and applications of E and DTM materials. Mechanics of hard machining. Selection of appropriate working conditions. Advanced cutting tool and cutting fluids. Surface integrity when machining E and DTM materials. Economics of cutting E and DTM materials. Special considerations when cutting E and DTM. Non-conventional technologies for cutting E and DTM materials.

07 09 823 Design for Machining

General design principles for manufacturability. History of DFM. General guidelines for design for machining. Design for turning. Screw cutting. Gear cutting. Drilling. Milling. Planing, shaping, and slotting. Broaching. Grinding. Honing, lapping, and superfinishing. Design for nontraditional machining. Electrical-discharge machining. Chemical and electrochemical machining. Laser and electron beam machining.

07 09 824 Machine Tools for High Speed Machining

Introduction to machine tools for removal processes. New concepts for structural components. New developments in drives and guide ways. Advanced controls for new machining processes. High speed machining. New developments in machining centers. Performance and precision of machining centers. Parallel kinematics for machine tools. New trends in conventional and non-conventional machine tools.

07 09 831 Selected Topics in Equipment Fault Diagnosis

07 09 832 Failure Analysis of Mechanical Systems

Modes of mechanical failure. General practice in failure analysis. Combined stress theories of failure. Fracture mechanisms in engineering materials. Linear elastic fracture mechanics. Stress intensity and fracture toughness. Fatigue failure and fatigue life prediction. Creep and stress rupture. Shock and impact failure. Buckling and instability. Wear mechanisms and wear analysis. Corrosion and stress corrosion cracking.

07 09 841 Selected Topics in Metrology and Measurement



07 09 842 Selected Topics in Quality and Reliability

07 09 843 Selected Topics in Micro- and Nano- Metrology

07 09 844 Uncertainty Evaluation in Dimensional Measurements

Concept of uncertainty in measurement. Measurement errors and distributions. Selection of the appropriate distribution. Error versus uncertainty. Developing the error model. Uncertainty estimation and variance distribution. Combinations of uncertainties. Variance addition rule. Error correlations and cross-correlation between error components. Confidence limits and expanded uncertainty. Type A uncertainty estimates and statistics for sampled values. Type B uncertainty estimates for different distributions (normal, lognormal, student's t and other distributions). Determining uncertainty according to ISO GUM procedure. Sensitivity coefficients - Expanded uncertainty .

07 09 845 Selected Topics in Quality Systems and Applications

07 09 851 Selected Topics in Material Inspection

07 09 601 Diploma Project in Manufacturing Engineering

07 09 701 Master of Engineering Scientific Report in Manufacturing Engineering

07 10 702 M.Sc. Thesis in Industrial Engineering

07 09 702 M.Sc. Thesis in Manufacturing Engineering

07 10 801 Ph.D. Dissertation in Industrial Engineering

07 09 801 Ph.D. Dissertation in Manufacturing Engineering