Department of Industrial and Management Systems Engineering

Degrees Offered

• Masters of Science, Industrial Engineering (M.S.I.E.)
• Masters of Science, Safety Management (M.S.)
• Doctor of Philosophy, Industrial Engineering (Ph.D.)
• Doctor of Philosophy, Occupational Safety and Health (Ph.D.)

One of the defining attributes in the success of the department is the dedication and talent of its fifteen faculty and three staff members. The aggregate careers of our faculty and staff represent over 200 years of service to students at WVU. In these 200 years of service is embodied the wisdom and experience to successfully prepare industrial engineers and occupational health and safety professionals to address ever-changing societal needs. The faculty and staff typically educate nearly 300 undergraduate, 100 to 120 M.S., and fifteen to twenty-five Ph.D. students. The department is unique in the United States for having a closely related graduate program in safety management (M.S.) that is accredited by the Applied and Natural Sciences Accreditation Commission of ABET, http://www.abet.org. The combined resources and faculty talents of these programs create synergies that provide our students with outstanding academic and research experiences in the field of occupational safety and health. Excellent academic and research opportunities are also available for students in the areas of healthcare systems, supply chain optimization, energy systems, smart manufacturing, occupational safety/health, and ergonomics.

Faculty Research

The department has quality research laboratories in smart manufacturing, operations research, production planning and control, data analytics and visualization, ergonomics, industrial hygiene, and safety. Graduate students are encouraged to utilize these resources to explore and develop their capabilities.

FACULTY

CHAIR
• Kenneth R. Currie - Ph.D. P.E., (West Virginia University)
  Manufacturing systems design, Optimization, Automation & Controls, Healthcare Systems Engineering

PROFESSORS
• B. Gopalakrishnan - Ph.D., P.E., CEM. (Virginia Polytechnic Institute and State University)
• Majid Jaridi - Ph.D. (University of Michigan)
  Statistics, Quality Control, Forecasting and Transportation Research
• David A. Wyrick - Ph.D., P.E., P.E.M. (University of Missouri-Rolla)
  Engineering Management, Engineering Education, Effective Management of Technology in SMEs

ASSOCIATE PROFESSORS
• Alan McKendall, Jr. - Ph.D. (University of Missouri, Columbia)
  Operations Research, Meta-heuristics, Facilities Layout and Materials Handling, Project Scheduling, Integrated Production Systems
• Ashish Nimbarte - Ph.D. (Louisiana State University)
  Work Related Musculoskeletal Disorders, Occupational Biomechanics and Biomechanical Modeling
• Feng Yang - Ph.D. (Northwestern University)
  Simulation, Applied Statistics, Stochastic Processes

ASSISTANT PROFESSORS
• Zhichao Liu - Ph.D. (Texas Tech University)
  Manufacturing processes, Metal additive manufacturing, Sustainable manufacturing
• Thorsten Wuest - Ph.D. (University of Bremen)
  Smart Manufacturing, Machine Learning/Artificial Intelligence, Conceptual Design, Process and Information/Data Management
VISITING AND ADJUNCT PROFESSORS

- **Lorenzo G. Cena - Ph.D.** (University of Iowa)
  Occupational health and safety, Aerosol generation and characterization, Exposure assessment
- **Christopher Coffey - Ph.D.** (West Virginia University)
  Occupational Safety and Health, Assessment, Evaluation of Respiratory Protective Equipment
- **Ren Dong - Ph.D.** (Concordia University)
  Human Factors Engineering, Ergonomics, Safety engineering
- **John R. Etherton - Ph.D.** (West Virginia University)
  Safety Engineering, Human Factors
- **Martin Harper - Ph.D.** (London School of Hygiene and Tropical Medicine)
  Industrial Hygiene, Exposure Assessment
- **James R. Harris - Ph.D., P.E.** (West Virginia University)
  Safety Research, Human Factors
- **Hongwei Hsiao - Ph.D.** (University of Michigan)
  Safety Engineering, Human Factors
- **Kevin Michael - Ph.D.** (Pennsylvania State University)
  Acoustics, Hearing Protection, Industrial Hygiene
- **Christopher Pan - Ph.D.** (University of Cincinnati)
  Industrial Hygiene, Exposure Assessment
- **Ju-Hyeong Park - Sc.D., M.P.H., C.I.H.** (Harvard University)
  Industrial Hygiene, Exposure Assessment
- **M. Abbas Virgi - Sc.D., C.I.H.** (University of Massachusetts)
  Exposure assessment, Epidemiology, Biostatistics
- **Ziqing Zhuang - Ph.D.** (West Virginia University)
  Exposure Assessment, Assessment and Evaluation of Respiratory Protective Equipment

LECTURERS

- **Alvin Guthrie - BSIE** (West Virginia University)
  Operations management, Manufacturing systems, Production planning and control
- **Daniel Kniska - MSIE** (West Virginia University)
  Engineering economy, Statistics, Production planning and control

PROFESSORS EMERITI

- **Rashpal S. Ahluwalia - Ph.D., P.E.** (Western Ontario University)
  Manufacturing systems, Quality and reliability engineering, Robotics and automation
- **Jack Byrd Jr. - P.E.** (West Virginia University)
  Operations research, Workforce development, Work design, Integrated product development
- **Robert C. Creese - Ph.D., P.E.** (Pennsylvania State University)
  Manufacturing processes/systems, Foundry engineering, Cost engineering, Engineering economics
- **Daniel E. Della-Giustina - Ph.D.** (Michigan State University)
  Playground and recreation safety, Sport safety, Highway and traffic management, Safety, fire, and emergency response
- **Steven Guffey - Ph.D., C.I.H.** (North Carolina State University)
  Ventilation systems theory and design, Noise measurement and control, Exposure assessment
- **Wafik Iskander - Ph.D., P.E.** (Texas Tech University)
  Operations research and optimization, Simulation modeling and analysis, Production planning and control, Applied statistics, Energy efficiency, Transportation planning
- **Warren Myers - Ph.D., C.I.H.** (West Virginia University)
  Industrial hygiene and safety, Worker exposure assessment and modeling, Aerosol filtration, Occupational respiratory protection design and testing
- **Ralph W. Plummer - Ph.D.** (West Virginia University)
  Systems safety engineering, Energy conservation, Human factors, Ergonomics
- **Gary Winn - Ph.D.** (University of Michigan)
  Construction safety, Transportation safety and program evaluation, Total quality management, Theory of paradigm shifts

ASSOCIATE PROFESSOR EMERITUS

- **Andrew J. Sorine - Ed.D.** (West Virginia University)
  Benchmarking, Safety and Health Programs, Safety Management Information Systems
TEACHING ASSISTANT PROFESSOR

- Jeremy Gouzd - Ph.D., (West Virginia University)
  Occupational safety and health, Risk assessment, Engineering safety
- Oscar A. Saenz - Ph.D. (Florida International University)
  Engineering education, Project management, Capstone project design

ADJUNCT INSTRUCTOR

- Nelson F. Rekos - BSME (University of Maryland), MBA (West Virginia University)
  Project management, Materials science, Advanced energy systems, Government Contracting

TEACHING INSTRUCTOR

- Omar Al-Shebeeb - Ph.D., (West Virginia University)
  Manufacturing systems, Design for manufacturing, CAD/CAM applications
- Jenny Fuller - MS, CSP (West Virginia University)
  Occupational safety and health, Risk assessment, Legislation and compliance, Training

COURSES

IENG 502. Advanced Manufacturing Processes. 3 Hours.
PR: IENG 302 and IENG 303. Metal cutting economic models, solidification processes, bulk deformation, sheet metal and drawing, joining design, and economics. Overall view of manufacturing systems. Introduction to numerical control programming and projects on numerical control equipment.

IENG 505. Computer Integrated Manufacturing. 3 Hours.
PR: Graduate standing. Several aspects of computerized manufacturing systems will be covered. Emphasis will be placed on computer fundamentals, computer-aided design and manufacturing, numerically-controlled (NC) machine tools, part programming, system devices, and direct digital control. (2 hr. lec., 1 hr. lab.).

IENG 506. Computer Aided Process Planning. 3 Hours.
PR: Consent. Computer aided process planning for manufacturing applications; selection of processes and parameters; machining, casting, and forming; development of process plans from design data; and analysis of effect of changes in design on manufacturability in concurrent engineering.

IENG 507. Robotics and Flexible Automation. 3 Hours.
PR: Graduate standing. This course will provide an understanding of the principles, capabilities, and limitations of industrial robots and other flexible automation tools. Emphasis will be placed on kinematic analysis, trajectory planning, machine vision, and manufacturing automation. (2 hr. lec., 1 hr. lab.).

IENG 508. Advanced Problems in Manufacturing Engineering. 1-3 Hours.
PR: IENG 593 or IENG 502; Graduate standing. Special problems relating to one of the areas of manufacturing engineering, such as manufacturing processes, robotics, CAD/CAM, group technology, and manufacturing systems engineering.

IENG 514. Design of Industrial Experiments. 3 Hours.
PR: IENG 314 or Consent. Continuation of IENG 314. More complex experimental design especially useful to engineering and industrial researchers, including factorials and optimum-seeking design. Emphasis on use of existing digital computer routines and interpretation of results.

IENG 518. Technology Forecasting. 3 Hours.
PR: IENG 213 or Consent. Various procedures used in forecasting technical developments.

IENG 542. Advanced Production Control. 3 Hours.
PR: IENG 350. Different mathematical models useful in the design of effective production control systems. The various models include: static production control models under risk and uncertainty, dynamic models under certainty, and under risk.

IENG 551. Quality and Reliability Engineering. 3 Hours.
PR: Graduate standing. Introduction to quality and reliability engineering. Special emphasis on Taguchi Design and Markov Models for determining system reliability and availability.

IENG 553. Applied Linear Programming. 3 Hours.
PR: IENG 350 or Consent. Application of the assignment, transportation, and simplex algorithms to typical industrial problems. The methods and computational efficiencies of the revised simplex and other algorithms are also studied.

IENG 554. Applied Integer/Heuristic Programs. 3 Hours.
PR: IENG 350 or IENG 553 and knowledge of a computer programming language. Applications of integer and heuristic programming techniques for solving combinatorial optimization problems. Topics include computational complexity, relaxations, branch and bound, cutting planes, simulated annealing, tabu search, and genetic algorithms.

IENG 555. Scheduling and Sequencing Methods. 3 Hours.
PR: IENG 350. Theory and applications of analytical models used in the scheduling models; flow shop models; job shop models; and assembly line balancing methods.
IENG 556. Supply Chain Management. 3 Hours.
PR: IENG 350 or IENG 553. Principles and methods for designing and managing supply chain systems. Topics include: forecasting demand, strategies, aggregate planning, inventory control, outsourcing, transportation networks, and locating facilities within the supply chain network.

IENG 557. Geometric Programming. 3 Hours.
PR: IENG 350 or Consent. Introduction to the primal and dual solution techniques for geometric programming problems. Focus on the development of design relationships for cost optimization or profit maximization problems.

IENG 561. Industrial Hygiene Engineering. 3 Hours.
Introductory course in industrial hygiene with laboratory. Topics include: recognition, evaluation, and control of occupational and environmental contaminants and physical agents; basic IH quantitative analysis; PPE selection and evaluation.

IENG 564. Industrial Ergonomics. 3 Hours.
PR: IENG 360 or Consent. Practical experience in the application of ergonomic principles to industrial problems. Safety and production implications of work physiology, industrial biomechanics, and circadian rhythms, as well as current interest topics.

IENG 577. Advanced Engineering Economy. 3 Hours.
PR: IENG 377 or Consent. Special emphasis on depreciation, engineering and economic aspects of selection and replacement of equipment; relationship of technical economy to income taxation; and effect of borrowed capital and project cost control.

IENG 578. Costing and Estimating. 3 Hours.
PR: IENG 377 or Consent. Analysis of overhead, cost indexes, cost capacity factors; improvement curves; costing for materials with design considerations, conceptual cost estimating; costing for machining, joining, casting and forming; and facility cost estimation.

IENG 593. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

IENG 660. Human Factors System Design. 3 Hours.
PR: IENG 360 or Consent. Theoretical aspects and practical applications of man/machine relationships as they influence future system design. The student will examine human limitations with respect to acceptance of information, decision making, and ability to transmit the result of such decisions to controlled equipment systems to obtain design optimization. (2 hr. lec., 3 hr. lab.).

IENG 662. Systems Safety Engineering. 3 Hours.
PR: IENG 461 or Consent. Analysis of manufacturing methods, processes, and properties of materials from a system safety engineering viewpoint. Emphasis will be on hazard analysis techniques (fault tree, MORT, failure modes, and effects) and machine guarding methods.

IENG 691. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

IENG 693. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

IENG 695. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

IENG 697. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.).

IENG 698. Thesis or Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798): Grading is normal.

IENG 754. Inventory Theory. 3 Hours.
PR: IENG 213 and IENG 350 or Consent. Techniques used in optimization of inventory systems. Elements of static, deterministic inventory models, and static, stochastic inventory models. Selected inventory models. Selected topics related to inventory analysis.

IENG 756. Applied Stochastic Processes. 3 Hours.
PR: Consent. Stochastic systems with emphasis on application to inventory and queueing theory. Conditional probability, Poisson processes, renewal processes, Markov chains with discrete and continuous parameters.

IENG 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of industrial and management systems engineering. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be S/U.).

IENG 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

IENG 792. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.
IENG 793. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

IENG 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

IENG 796. Graduate Seminar. 1-3 Hours.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

IENG 797. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.).