LEHIGH UNIVERSITY
DISTANCE EDUCATION

ONLINE CREDIT COURSES
FALL 2009
08/24/09 – 12/04/09

Cost per credit hour - $645 per credit hour plus $100 access fee for each course
Business credit hour - $840 per credit hour plus $100 access fee for each course

ADMISSION AND REGISTRATION

[**NOTE:** Only officially admitted students are eligible to register for Lehigh University courses for academic credit] Admitted students must register using LESN GRADUATE REGISTRATION FORM under **http://www.lesn.lehigh.edu/** or contact the Lehigh Office of Distance Education at 610-758-6210/e-mail rjm0@lehigh.edu. ***Alternate instructions for registration will be sent to the MBA students and MSE students*.** Follow payment instructions included with registration form

- LESN-Online Fall course registration deadline – 8/20/09
- Students seeking admission should contact the Lehigh Office of Distance Education at 610-758-6210, e-mail rjm0@lehigh.edu. Fall 2008 admission application deadline – See listings for individual program for deadline dates.
- Fall semester runs from 8/24/09 thru 12/04/09. **Unless otherwise noted, all courses will be available week of 8/24/09**
- Textbooks may be ordered directly through the Lehigh University online link to the bookstore from www.lesn.lehigh.edu under "forms" or going directly to the website: **http://lehigh1.bkstore.com/bkstore/content**

Please check on www.distance.lehigh.edu for schedule revisions and updates

BUSINESS/MBA

ECO 401-D10 (CRN#41509). Basic Statistics for Business and Economics (3)

Descriptive statistics, probability and probability distributions, estimation, hypothesis testing, correlation and regression, chi-square analysis and analysis of variance. Computer applications**.**

Instructor: **Prof. Robert Thornton** **e-mail: rjt1@lehigh.edu** Phone: 610-758-3460

- Course includes approximately 36 hours of content, plus assignments.,
- **Textbook Required** – "***Basic Statistics for Business and Economics,"*** Anderson, Sweeney, and Williams, South-Western, 9th edition, ISBN#0324 20082 X.

GBUS 401-D10 (CRN#40258). Financial Reporting for Managers and Investors (3)

Corporate financial reporting under Generally Accepted Accounting Principles. Analysis and interpretation of financial statements: accrual accounting, balance sheet valuation, income determination and cash flow analysis. Profit manipulation, window dressing and "creative accounting" through accounting policy choices. Fraudulent financial reporting, uses and limitations of accounting information. Accounting information as a tool for strategic decision making.

***Instructor*: Professor Gary Smith** **e-mail: gas205@lehigh.edu** Phone: (610) 758-5963

- Course includes approximately 36 hours of content, plus assignments
- **Textbooks Required** – "***Financial Accounting in An Economic Context"***, Jamie Pratt, 6th Ed., by John Wiley & Sons, Inc., ISBN#0-471-65528-7
- **Optional Textbook**: Study Guide to Accompany the above text by Joseph H. Anthony and Robin P. Clement; #0-471-73111-0.

GBUS 453-D10 (CRN#43472). Transportation and Logistics Management (3)

This course provides a variety of tools and frameworks that will help students understand the basis behind effective transportation and logistics planning and how it relates to broader issues in managing the entire supply chain and supporting the strategic objectives of a firm. The course will cover global supply chain issues as well as focus on the various modes of transportation, warehousing and distribution, material handling, inventory management, customer service, and logistics outsourcing. The methods used to convey and develop these ideas include a mix of lecture, interactive discussion, case study analysis, and independent research. The course material is drawn from a number of sources, including a published textbook, articles from the popular business press, published research, and real-world business experiences. Course may be used in SCM Certificate Program.

Includes 6 Elluminate sessions scheduled by the instructor.

Instructor: Professor **Joel Sutherland** **e-mail: jos206@lehigh.edu** Phone: (610) 758-6428

- Course includes approximately 36 hours of content, plus assignments
- **Text Package Required** – "*Transportation,"* **6th** Edition, Coyle, Cardi and Novack, South-Western Publishing, ISBN#0-538-88180-1

MBA 406-D10 CRN#45782). Integrative Experience (3)

The MBA Integrative Experience is a very important course in Lehigh's MBA program. This course places an emphasis on strategic management as a key tool for creating and sustaining organizational competitive advantage. By taking the point of view of the general manager, we will view the organization from an overall perspective in the context of the firm's internal and external environment. We will examine historical perspectives, contemporary theories, and practical applications all in the spirit of helping you develop a broad understanding of strategic management issues and solutions. This course will expose you to rigorous theoretical analysis while providing you with hands-on, simulated real world business experience.

As the capstone experience in the College of Business & Economics' MBA program, this course requires that you integrate the concepts, knowledge, and skills acquired in previous functional courses and creatively apply them toward understanding and analyzing strategic management issues. The major objectives of this course include a focus on seven key areas. 1) Embrace a general management perspective – think strategically. 2) Develop a working knowledge of crucial strategic management concepts. 3) Hone basic skills for analyzing strategic issues. 4) Formulate and solve complex unstructured organizational problems. 5) Advance competence in a variety of primary and supporting organizational functions (the firm's value chain), especially organizational processes outside your present experience, education, and interests. 6) Refine self-directed work team skills such as setting and implementing agendas, understanding other people's perspectives, and dealing with people over whom you have no formal authority. 7) Sharpen written and verbal communication skills in order to more effectively inform and influence target audiences.

My goal is to engage you in the process of thinking and acting strategically through exposure to good theory, practice, and application. Thus, the course objectives will be achieved through an array of methods that include lecture, in-class discussions/assignments, case analyses, and a business simulation competition. The business simulation competition requires thoughtful and timely decisions in order for you to successfully start and operate a business firm in the computer hardware industry.

Prerequisites: MBA 401, MBA 402, MBA 403, MBA 404, MBA 405

Instructor: **Prof. Michael Santoro** **e-mail:** **mds8@lehigh.edu** Phone: 610-758-6414

- **Course includes approximately 36 hours of content, plus assignments**
- **Textbook and Software Required: (1)** Hitt, Ireland, and Hoskisson (2009)**. *"Strategic Management:Competitiveness and Globalization"*, 8**th Edition, Southwestern Publishing, ISBN#0324655592; **(2)** Business Simulation Software Certificate**: *"International Corporate Management with outsourcing"*** version of Marketplace Business Simulation, ISBN#:0-74413-6-8, Innovative Learning, Inc.

CHEMISTRY

CHM 332-D10 (CRN#43446). Analytical Chemistry (3)

Theory and practice of chemical analysis. Principles of quantitative separations and determinations; theory and application of selected optical and electrical instruments in analytical chemistry; interpretation of numerical data design of experiments, solute distribution in separation methods.

***Instructor*: Prof. James Roberts** **e-mail:** **jer1@lehigh.edu** Phone: 610-758-4841

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required** – "***Quantitative Chemical Analysis***.," W. H. Freeman, 7th Ed. D. C. Harris, ISBN#0-7167-7041-5

CHM 393-D11 (CRN#45272)/CHE 393-D11 (CRN#45339)/MAT 393-D11 (CRN#45340). Physical Polymer Sci (3)

Structural and physical aspects of polymers (organic, inorganic, natural). Molecular and atomic basis for polymer properties and behavior. Characteristics of glassy, crystalline, and paracrystalline states (including visoelastic and relaxation behavior) for single-and muilti-component systems. Thermodynamics and kinetics of transition phenomena. Structure, morphology, and behavior. Prerequisite: 1 year of physical chemistry

***Instructor*: Prof. Ray Pearson** **e-mail:** **rp02@lehigh.edu** Phone: 610-758-3857

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required**: ***"Introduction to Physical Polymer Science,"*** by Les Sperling, 4th Ed., ISBN#978-0471706069

CHM 424-D10 (CRN#41659). Medicinal and Pharmaceutical Chemistry (3)

Principles of drug design, structure-activity relationships in antibacterial, antimalarial, anti-inflammatory and psychoactive drugs; synthesis and modes of action of pharmacologically active agents radioactive pharmaceuticals. **Prerequisite**:1 year of organic chem. and CHM 358 or equivalent.

Instructor of Record: **Prof. Ned Heindel** ***Moderator*: Dr. Peter Kennewell** **e-mail: pete@kennewell5855.fsnet.co.uk**

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required**: "***Medicinal Chemistry: An Introduction***", Gareth Thomas; **2nd** Edition; John Wiley& Sons, 2007 ISBN #978-0-470-02597-0 for **hard copy** and #978-0-470-02598-7 in **paperback**.

CHM 425-D10 (CRN#42937). Pharmaceutical Regulatory Affairs I: Drug Discovery to Approval (3)
This course is one of four courses required to fulfill the requirements for a Certificate in Regulatory Affairs. It may be applied as one of the 400-level credits in any of the Chemistry or Pharmaceutical Chemistry degree tracks. Coverage includes the stages of the drug approval process and how these relate to the laboratory activities that provide the scientific basis for the New Drug Application (NDA). Lectures treat drug discovery, chemical process development of the active pharmaceutical ingredient (API), and pharmaceutical process development of the drug product. Regulatory issues in screening and testing, the management of the preclinical trials, and the management of clinical trials will be covered. The regulatory requirements for the production of the drug substance (API) from bench to pilot plant to full-scale manufacturing will also be covered. Included in the discussions will be Good Laboratory Practices (GLPs) and Good Manufacturing Practices (GMPs). The regulatory issues concerning the use of Contract Research Organizations (CROs) and Contract Manufacturing Organizations (CMOs) will also be treated. The processes for approvals of diagnostics and devices will also be covered. All topics are presented by practicing professionals in the regulatory affairs area.
This course is one of four courses required to fulfill the requirements for a Certificate in Regulatory Affairs. It may be applied as one of the 400-level credits in any of the Chemistry or Pharmaceutical Chemistry degree tracks.
***Instructor*: Prof. Sam Niedbala** **e-mail: san204@lehigh.edu**

- Course includes approximately 36 hours of content, plus assignments
- **Textbooks Required:** (1) ***"Development of FDA-Regulated Medical Products Prescription Drugs, Biologics, and Medical Devices***," Elaine Whitmore, 2nd Ed., ASQC Publ., ISBN#0873896130 and (2) ***"FDA Regulatory Affairs. A Guide for Prescription Drugs, Medical Devices and Biologics,"*** by Douglas J. Pisano, David Mantus, '03 Edition, CRC Press, ISBN#1587160072

CHM 428-D10 (CRN#42938). Pharmaceutical Regulatory Affairs II: Biomarkers (3)
This course is one of four courses required to fulfill the requirements for a Certificate in Regulatory Affairs. It may be applied as 400-level credit in any of the Chemistry or Pharm Chemistry degree tracks. Technological advancement in the medical and veterinary fields has fueled research and development of medical devices and products resulting from combination technologies. Each year, over 4,000 devices are reviewed by the U. S. Food & Drug Administration for efficacy and safety before being allowed to enter the marketplace. This course will review the history of medical device law and regulations in the U.S. It will also define current requirements of science needed to allow technologies to be developed according to regulations. Case studies will be used to educate participants on Design Controls, Quality System Regulations, Manufacturing Requirements and International Harmonization. Specific content may include Nucleic Acid Diagnostics, Cardiovascular Stents, Drug Delivery, Cancer Diagnostics, and Consumer Self-Testing. Students will also use knowledge gained to prepare class presentations to address current issues within the field.
This course is one of four courses required to fulfill the requirements for a Certificate in Regulatory Affairs. It may be applied as one of the 400-level credits in any of the Chemistry or Pharm Chemistry degree tracks.
***Instructor*: Prof. Sam Niedbala** **e-mail: san204@lehigh.edu**

- Course includes approximately 36 hours of content, plus assignments
- **Textbooks Required**: (1) ***"Development of FDA-Regulated Medical Products, Prescription Drugs, Biologics, and Medical Devices"*** by Whitmore, Elaine; (2) "***Mastering and Managing the FDA Maze"*** by Gordon Harnack, '99 Edition, ASQC Publ., ISBN#0873894553.

CHM 436-D10 (CRN#45279). Mass Spectrometry for the Pharmaceutical Industry (3)
Drug structural characterization, drug analysis, metabolite identification, PK/PD, bioavailability, biodistribution, dosage form optimization, pharmaceutical stability studies…these and many other problem areas within the pharmaceutical industry yield to mass spectrometry. Mass spec-along with HPLC – has become the platform instrument for nearly all analytical aspects of drug development. This course will be divided into three topic areas: (1) hardware, (2) data treatment, and (3) cutting edge applications. In the hardware section, Dr. Cecilia Basic will treat the types of MS spectrometers, the principles upon which each operates, and the problem situations for which is the optimum choice. In the data treatment section, Dr. Basic discusses the extraction of qualitative and quantitative information from the mass spectral methods, cracking pattern analysis, and data reliability. In the cutting edge applications section, a series of presenters from the pharmaceutical industry will present unique applications of mass spec to contemporary problem-solving. Three hour –exams, no final, occasional homework.
***Instructor:* Prof. Ned Heindel** ***Moderator*: Prof. Ron Evilia** **email: ronevilia@bellsouth.net**

- Course includes approximately 36 hours of content, plus assignment
- **Textbook Required:** ***"Mass Spectroscopy:Principles and Applications***," **3rd** Edition by E. de Hoffmann and V. Stroobant, John Wiley and Sons, 2002, ISBN#978040033111

CHM 463-D10 (CRN#45282). Regulatory Affairs IV. Commercial Production (3)
The University's Certificate Program in Pharmaceutical Affairs prepares students to understand applicable regulations for the discovery, development and analysis of pharmaceuticals and medical devices. This course will address the last portion of successful commercialization. The focus of the course will be the review and application of regulations and strategies related to the manufacture of pharmaceutical and combination medical device products. The underlying regulations and principles will be followed by examples

and problem solving. Additionally, knowledge gained from lectures will be used to trouble shoot problems from hypothetical situations that may arise during manufacture and scale up of products.

This course is one of four courses required to fulfill the requirements for a Certificate in Regulatory Affairs. It may be applied as one of the 400-level credits in any of the Chemistry degree tracks.

Instructor: **Prof. Sam Niedbala** **Moderator: Prof. R. O'Donnell** **e-mail:** **ray@elsinorepharma.com**

- Course includes approximately 36 hours of content
- **Textbook Required: *"Good Pharmaceutical Manufacturing Practices,"*** John Sharp, CRC Press, ISBN#9780849319945

CHM 475-D10 (CRN#45719). Professional Seminar in Pharm Chemistry Management (1)

A lecture by practitioners on modern pharmaceutical business practices. This Professional Seminar will consist of senior managers from the industry addressing topics such as: "Commercializing a Discovery," "Outcome Assessments and Other Business Challenges for the Global Pharmaceutical Industry," "Transitioning from Big Pharma to Little Pharma:How does Corporate Culture and Resource Availability Control the Process of Drug Development," "Investing in Image-Building: Public Affairs/Public Relations Programs in Pharma and their Relationship to Core Business Strategy," Investing in Biotechnology Companies:A Venture Capital Perspective," "From Concept to Company:Creating,Growing,& Maturing a Pharmaceutical Start-Up Company," "Outsourcing:Legal and Financial Issues in Getting a Contract Project Performed in a Quality Fashion," "Licensing, Acquisition, and Deal Making," "Patent Protection:The Attack on Secondary Patents and other Threats to Pharma from Proposed Revisions of the Hatch-Waxman Act," and "The Unique Challenges Facing the Diagnostic Products Industry." This course will have a final exam.

Instructor: **Prof. Ned Heindel** ***Moderator:*** **Dr. Jeff Mcguire** **e-mail**: **mcguirejm@rcn.com**

- Course includes approximately 9 hours of content, plus assignments
- **Textbook**: **No textbook required**

CHM 477-D10 (CRN#40945). Pharmacology for Chemists (3)

This is a specially designed course in Pharmacology for Chemists. The content conveys "the big picture" of how therapeutics respond in biological test systems. The structural drug types known to be efficacious in the primary organ systems (central nervous system, endocrine, pulmonary, gastrointestinal, etc.) as well as in primary disease types (cancer, inflammation, infectious disease, etc.) will be treated as well as discussions of their modes of action. The course also focuses on contemporary techniques for drug evaluation including *in silico*, high throughput, and high content screening. The course is intended to complement medicinal chemistry in that chemists working in the pharmaceutical industry need to know how their drug candidates are evaluated both in early stage ADME and in down-stream, pre-clinical testing. Prerequisite: Two semesters of organic chemistry, Chm 371 or its equivalent.

***Instructor*:** **Prof. Ned Heindel** **Moderator: Joshua Gray,** Rutgers University, **e-mail: Joshua.p.gray@uscga.edu**

Co-Moderator: **Dr. Carol Gardner** **e-mail: cgardner@eohsi.rutgers.edu**

- Course includes approximately 36 hours of content
- **Textbook Required**: Joseph Cannon, ***"Pharm for Chemists",*** American Chem Soc, 2nd ed, ISBN#978-0-8412-3927-2

CHM 477-D11 (CRN#43452). Toxicological Principles for the Pharmaceutical Industry (3)

The key to the successful process of drug development is the measurement, mechanistic understanding, and pharmacological interpretation of the biological effects of the promising new drug substance. How a candidate substance impacts a mammal-and ultimately man-in all major organ systems must be understood before the pharmaceutical goes forward to registry. This course has been especially organized for the students of Lehigh University's Distance Education program by Rutgers University toxicologist, Dr. Diane E. Heck. The course is team-taught by toxicologists and pharmacologists from pharmaceutical industry and from academia. Any BS/BA graduate in the biological, chemical, and pharmaceutical sciences should have appropriate academic preparation for this course. Undergraduate organic chemistry and a minimum of one-semester of biochemistry would be essential.

Instructor*:** **Prof. Ned Heindel** ***Moderator: **Dr. Carol Gardner** **e-mail: cgardner@eohsi.rutgers.edu**

***Co-Moderator*:** **Dr. Joshua Gray** **e-mail: Joshua.p.gray@uscga.edu**

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required: "Molecular Toxicology," 2nd ed., Josephy and Mannervik, 2006 .**

CHM 477-D12 (CRN#45283). Pharmaceuticals & the Immune System (3)

Biological immune response modifying agents (pharmaceutical drugs) have both general and specific targets that encompass a wide range of clinical conditions from cancer to obesity. Clinical trials have shown the impact these pharmaceutical agents have had in the areas of infectious disease prevention (vaccines), immune suppression (transplantation, auto-immune disease), therapies (cancer treatment, infectious diseases) and symptom relief/prevention (allergies). The course is divided into two parts. Part I will provide the basic immunology background required to understand the fundamental principles of immunology used in the design of applied pharmaceuticals. Part II will be given by representative lecturers from the pharmaceutical industry as well as major medical research centers that will discuss the design, formulation, delivery and clinical outcome of immune-based therapies. The topics will cover vaccination strategies in the area of infectious diseases and cancer, the application of monoclonal antibodies as therapeutics and

as delivery motifs in radio-immunotherapeutics and immunoconjugates of chemo-therapeutics and toxins, immune suppression and activation, and other related topics. This course should provide to the student with the necessary background and examples of applied immunology required to understand current immune modulating pharmaceuticals and to aide in the future design of more effective immune-based agents.

***Instructor*: Prof. Ned D. Heindel Moderator: Dr. Kathy Alpaugh e-mail: RK_Alpaugh@fccc.edu**

- Course includes approximately 36 hours of contact
- **Textbook Required**: "***Immunobiology***" by Janeway et al. Garland Publishing (Taylor & Francis Group), 7th Ed 2005, ISBN#9780815341239

CHM 482-D10 (CRN#45663)/CHE 482-D10 (CRN#45662)/Mat 482-D10 (CRN#45661). Eng Behavior of Polymers (3)

Mechanical behavior or polymers. Characterization of experimentally observed viscoelastic response of polymeric solids with the aid of mechanical model analogs. Topics include time-temperature superposition, experimental characterization of large deformation and fracture processes, polymer adhesions, and the effects of fillers, plasticizer, moisture, and aging on mechanical behavior.

***Instructor*: Prof. Ray Pearson e-mail: rp02@lehigh.edu Phone: 610-758-3857**

- Course includes approximately 36 hours of contact
- **Textbook Required**: ***"An Introduction to The Mechanical Properties of solid Polymers"***, 2nd Ed. by Ward and Sweeney published by Wiley**.**

CHM (CRN 45613)/CHE (CRN# 45612)/MAT 492-D11 (CRN#45614). Transport Processes in Polymers (3)

Transport processes in polymers cover a wide variety of subjects relevant to the utility of polymers in a myriad of applications. One of the major areas to be covered in these lectures involves the transport of gases and liquids through polymeric membranes. This area involves the diffusion, solubility and permeability in polymeric films and covers barrier properties for packaging applications, membrane separation, water purification processes. Membrane separation processes will be emphasized as the potential as a unit operation is increasingly important for key separation processes due to the low energy requirements relative to more conventional processes. Other transport processes of importance include thermal conductivity and electrical conductivity which will also be discussed. In the emerging technologies also involving polymers, proton transport (for fuel cell applications), lithium ion transport (for lithium battery applications) and hole and electron transport for advanced optoelectronic applications (light emitting diodes and photovoltaic devices) are increasing important and will be covered. The major emphasis will be placed on gas permeability and water purification processes involving polymeric membranes including the various membrane fabrication processes. The lectures will emphasize the technology with the basic fundamentals of each process also covered.

***Instructor*: Prof. Lloyd Robeson, Adj e-mail: lesrob2@verizon.net**

Course includes approximately 36 hours of content, plus assignments

- **Textbook Required: None Required – Lecture Notes will be provided**

ENGINEERING

CHE 283-D10 (CRN#46230). Chemical Engineering Fundamentals III (4)

Fundamentals of thermodynamics, reaction kinetics and reactor analysis, and applied mathematics. Prerequisites: Undergraduate degree in a scientific or engineering discipline or one semester undergraduate level general chemistry, one semester undergraduate level physics (statistics and dynamics), and two semesters undergraduate calculus **and** department permission required.

***Instructor*: Prof. Cesar Silebi Dr. Rajagopalan Srinivasan, Adjunct e-mail: professorsree@gmail.com Phone: 610-437-0846**

- Course includes approximately 48 hours of content, plus assignments
- **Textbooks Required**:

  "***Mathematical Methods in ChE***," Academic Press, VG Jenson, GV Jeffreys, ISBN#0-12-384456-8

  "Introduction to Chemical Thermodynamics," McGaw Hill, Smith, Vaness and Abbott; ISBN#9780073104454

  "Chemical Reaction Engineering," J. Wiley, O. Levenspiel, ISBN#0-471-25424-X

CHE 341-D11 (CRN#45602)/CHE 441-D11 (CRN#45603). Biotechnology I (3)

Applications of material and energy balances; heat, mass, and momentum transfer; enzyme and microbial kinetics; and mathematical modeling to the engineering design and scale-up of bio-reactor systems. Additional work will be required if taken as CHE 441-D10. Please specify which level you want to take this course.

***Instructor:* Prof. James Hsu e-mail: jth0@lehigh.edu Phone: 610-758-4257**

- Course includes approximately 36 hours of content
- **Textbook Required: *"Biotechnology,"*** by Barnum, ISBN#534492967, 2nd Ed., Thomson, Publ.

CHE 393-D11 (CRN#45339)/MAT 393-D11 (CRN#45340)/CHM 393-D11 (CRN#45272). Physical Polymer Sci (3)

Structural and physical aspects of polymers (organic, inorganic, natural). Molecular and atomic basis for polymer properties and behavior. Characteristics of glassy, crystalline, and paracrystalline states (including visoelastic and relaxation behavior) for single-and

muilti-component systems. Thermodynamics and kinetics of transition phenomena. Structure, morphology, and behavior. Prerequisite: 1 year of physical chemistry

***Instructor*: Prof. Ray Pearson** **e-mail: rp02@lehigh.edu** Phone: 610-758-3857

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required**: ***"Introduction to Physical Polymer Science,"*** by Les Sperling, 4th ed, ISBN#978-0471706069

CHE 452-D11 (CRN#45609)/ME 452-D11 (CRN#45610)/ENGR 452-D11 (CRN46124). Mathematical Methods in Eng (3)
Analytical techniques relevant to the engineering sciences are described. Vector spaces; eigenvalues, eigenvectors. Linear ordinary differential equations; diagonalizable and non-diagonalizable systems. Inhomogeneous linear systems; variation of parameters. Non-linear systems; stability; phase plane. Series solutions of ordinary differential equations; special functions. Laplace and Fourier transforms; application to partial differential equations and integral equations. Sturm-Liouville theory. Finite Fourier transforms; planar, cylindrical and spherical geometries.

***Instructor*: Prof. Philip Blythe** **e-mail: pab0@lehigh.edu** Phone: 610-758-3782

- Course requires approximately 36 hours of content and assignment
- **Textbook Required:** M. D. Greenberg *"**Advanced Engineering Mathematics"*** (2nd ed.) Prentice Hall

CHE 482-D10 (CRN#45662)/MAT 482-D10 (CRN#45661)/CHM 482-D10 (CRN#45663). Engineering Behavior of Polymers (3)
Mechanical behavior or polymers. Characterization of experimentally observed viscoelastic response of polymeric solids with the aid of mechanical model analogs. Topics include time-temperature superposition, experimental characterization of large deformation and fracture processes, polymer adhesions, and the effects of fillers, plasticizer, moisture, and aging on mechanical behavior.

***Instructor*: Prof. Ray Pearson** **e-mail: rp02@lehigh.edu** Phone: 610-758-3857

- Course includes approximately 36 hours of contact
- **Textbook Required**: ***"An Introduction to the Mechanical Properties of solid Polymers"***, 2nd Ed. by Ward and Sweeney published by Wiley.

CHE (CRN#45612)/MAT (CRN#45614)/CHM 492-D11 (CRN#45613). Transport Processes in Polymers (3)
Transport processes in polymers cover a wide variety of subjects relevant to the utility of polymers in a myriad of applications. One of the major areas to be covered in these lectures involves the transport of gases and liquids through polymeric membranes. This area involves the diffusion, solubility and permeability in polymeric films and covers barrier properties for packaging applications, membrane separation, water purification processes. Membrane separation processes will be emphasized as the potential as a unit operation is increasingly important for key separation processes due to the low energy requirements relative to more conventional processes. Other transport processes of importance include thermal conductivity and electrical conductivity which will also be discussed. In the emerging technologies also involving polymers, proton transport (for fuel cell applications), lithium ion transport (for lithium battery applications) and hole and electron transport for advanced optoelectronic applications (light emitting diodes and photovoltaic devices) are increasing important and will be covered. The major emphasis will be placed on gas permeability and water purification processes involving polymeric membranes including the various membrane fabrication processes. The lectures will emphasize the technology with the basic fundamentals of each process also covered.

***Instructor*: Prof. Lloyd Robeson, Adj** **e-mail: lesrob2@verizon.net**

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required: None Required – Lecture Notes will be provided**

IE 443-D11 (CRN#45624)/MSE 443-D11 (CRN#45625)/ME 450-D11 (CRN#45053)). Automation & Production Systems (3)
Principles and analysis of manual and automated production systems for discrete parts and products. Cellular manufacturing, flexible manufacturing systems, transfer lines, manual and automated assembly systems, and quality control systems.

***Instructor*: Prof. Mikell P. Groover** **e-mail: mpg0@lehigh.edu** Phone: 610-758-4030

- Course requires approximately 36 hours of content and assignments
- **Textbook Required: *"Automation, Prod. Sys. And Computer Integrated Manufacturing,"***Groover, M., Publ., Pearson, 3rd Ed; 2008

MAT 393-D11 (CRN# 45340)/CHM 393-D11 (CRN#45272)/ChE 393-D11 (CRN#45339). Physical Polymer Sci (3)
Structural and physical aspects of polymers (organic, inorganic, natural). Molecular and atomic basis for polymer properties and behavior. Characteristics of glassy, crystalline, and paracrystalline states (including visoelastic and relaxation behavior) for single-and muilti-component systems. Thermodynamics and kinetics of transition phenomena. Structure, morphology, and behavior. Prerequisite: 1 year of physical chemistry

***Instructor*: Prof. Ray Pearson** **e-mail: rp02@lehigh.edu** Phone: 610-758-3857

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required**: ***"Introduction to Physical Polymer Science,"*** by Les Sperling, 4th Ed., ISBN#978-0471706069

MAT 482-D10 (CRN#45661)/CHM 482-D10 (CRN#45663)/CHE 482-D10 (CRN#45662). Engineering Behavior of Polymers (3)

Mechanical behavior or polymers. Characterization of experimentally observed viscoelastic response of polymeric solids with the aid of mechanical model analogs. Topics include time-temperature superposition, experimental characterization of large deformation and fracture processes, polymer adhesions, and the effects of fillers, plasticizer, moisture, and aging on mechanical behavior.

***Instructor*: Prof. Ray Pearson** **e-mail: rp02@lehigh.edu** Phone: 610-758-3857

- Course includes approximately 36 hours of contact
- **Textbook Required**: ***"An Introduction to The Mechanical Properties of solid Polymers"***, 2nd Ed. by Ward and Sweeney published by Wiley**.**

MAT (CRN#45614)/CHM (CRN#45613)/CHE/492-D11 (CRN#45612). Transport Processes in Polymers (3)

Transport processes in polymers cover a wide variety of subjects relevant to the utility of polymers in a myriad of applications. One of the major areas to be covered in these lectures involves the transport of gases and liquids through polymeric membranes. This area involves the diffusion, solubility and permeability in polymeric films and covers barrier properties for packaging applications, membrane separation, water purification processes. Membrane separation processes will be emphasized as the potential as a unit operation is increasingly important for key separation processes due to the low energy requirements relative to more conventional processes. Other transport processes of importance include thermal conductivity and electrical conductivity which will also be discussed. In the emerging technologies also involving polymers, proton transport (for fuel cell applications), lithium ion transport (for lithium battery applications) and hole and electron transport for advanced optoelectronic applications (light emitting diodes and photovoltaic devices) are increasing important and will be covered. The major emphasis will be placed on gas permeability and water purification processes involving polymeric membranes including the various membrane fabrication processes. The lectures will emphasize the technology with the basic fundamentals of each process also covered.

***Instructor*: Prof. Lloyd Robeson, Adj** **e-mail: lesrob2@verizon.net**

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required: None Required – Lecture Notes will be provided**

MSE 438-D11 (CRN#45639). Agile Organizations & Manufacturing Systems (3)

Analysis of the factors contributing to the success of manufacturing enterprises in an environment characterized by continuous and unpredictable change. Fundamentals of lean production; aspects of systems design, value stream analysis, flow, set-up and cycle time reduction, kaizen, elimination of waste. Fundamentals of agility:global enterprises, virtual organizations, adapting to change, mass customization, manufacturing flexibility, activity-based management.

Instructor: **Profs. Gardiner/Groover** **e-mails: kg03@lehigh.edu (X85070)** **mpg0@lehigh.edu (X84030)**

- This course consists of approximately 36 hours of content and assignments
- **Textbooks Recommended:**
  - Liker, Jeffrey and Meier, David. The Toyota Way Fieldbook, McGraw Hill, 2005. ISBN 10-0071448934 / 13-978-0071448932.
  - Osono, Emi, Shimizu, Norihiko, Takeuchi, Hirotaka. Extreme Toyota: Radical Contradictions That Drive Success at the World's Best Manufacturer, Wiley, 2008. ISBN 978-0-470-26762-2.
  - Goldman, S., Nagel, R., and Preiss, K. Agile Competitors and Virtual Organizations, Wiley, 1995. ISBN 978-0-471-28650-9 /978-0-471-28650-8. (The original 'Agile' book)
  - Dove, R. Response Ability-The Language, Structure, and Culture of the Agile Enterprise, John Wiley & Sons, Inc., 2001.ISBN 978-0-471-35018-7 / 978-0-471-35018-4.
  - Turney, P. Common Cents, Cost Tech Inc., McGraw, 2nd Ed., 2006. ISBN 978-0-7144037-0 / 0-0-7144037-2.
  - MacInnes, Richard L. The Lean Enterprise Memory Jogger, Create Value and Eliminate Waste throughout Your Company, GOAL/QPC, 2nd Ed. ISBN 978-1-5-7681045-3.
  - Brassare, Michael, Finn, Lynda, Ginn, Dana, Ritter Dian. The Six Sigma Memory Jogger II, A Pocket Guide of Tools for Six Sigma Improvement Teams, GOAL/QPC, 2nd Ed., 2002. ISBN 978-1-57681-044-6 /-1-57681-044-5

These texts are recommended, not required! Students in the course usually have a very wide range of backgrounds and industry experiences. It is not presumed to mandate a text for the course, there are many available, but it is left to each student to decide which they may find interesting and worthwhile. There are many newer and equally relevant texts on display at your local bookstore or through Amazon etc. What students may have covered in regular work situations, special programs such as 'Six Sigma,' or in prior courses varies widely. Students are expected to be familiar with the business and industry news found in the business pages of the more serious newspapers or on NPR and TV, and to be accustomed to occasional glances at Business Week, The Economist, Fortune or web sites such as www.ceoexpress.com This latter is an excellent portal for international business news etc. The amount and often the quality of information freely available on the web is a continual inspiration and surprise; this site, for example, has links to material from the text by Rick Dove: http://www.parshift.com/ResponseAbility/Preface.htm and there are other similar sites.

Additional links will be suggested once classes commence. Students are encouraged to search for themselves and exchange ideas through the Discussion Board on the course web site.

There is a special deal for students to subscribe to FORTUNE for only $10 for one year (26 issues) or $9 for six months (13 issues). Here is a link to the FORTUNE Education Program online student order form (http://www.fortuneeducation.com/fortune/individual.php) . For proper credit, please remind your students list you as their professor and mention this course.

MSE 443-D11 (CRN#45625)/IE 443-D11 (CRN#45624)/ME 450-D11 (45053). Automation & Production Systems (3)
Principles and analysis of manual and automated production systems for discrete parts and products. Cellular manufacturing, flexible manufacturing systems, transfer lines, manual and automated assembly systems, and quality control systems.
***Instructor*: Prof. Mikell P. Groover** **e-mail: mpg0@lehigh.edu** Phone: 610-758-4030

- Course requires approximately 36 hours of content and assignments
- **Textbook Required: *"Automation, Prod. Sys. And Computer Integrated Manufacturing,"*** Groover, M., Publ., Pearson, 3rd Ed; 2008

MSE 481-D11 (CRN#45644). Technology, Mfg. & Competitive Advantage (3)
Develops an understanding and appreciation of the interrelationships among technology, operations and the competitive strategy of the firm. Industry analysis and competitiveness; competitive strategy formulation and implementation; value chain analysis; operations strategy and technology strategy; operation's contributions to competitive advantages in cost, quality and variety and new product introduction.
***Instructor*: Prof. Ted Schlie** **e-mail: tes3@lehigh.edu** Phone: 610-758-5341

- Course includes approximately 36 hours of content, plus assignments
- **Textbook Required*: "Strategic Management & Competitive Advantage", Barney, Ed 2nd, 08; Publ. Pearson***

EMA 350-D10 (CRN#43885). Elements of Engineering Analysis (3)
Engineering Mathematics (EMA) 350 is designed to be a refresher of mathematics and computation skills for graduate students who have been away from formal college level studies for some time. After completing this course students should be able to successfully participate in those graduate courses of the department which heavily utilize mathematics and computations. Examples of these courses are ME 442 (Math Methods), ME 443 (Advanced Math Methods) , ME 413 (Numerical Methods) , ME 423 (Heat & Mass Transfer), etc. This course may be appropriate to students in other departments of RCEAS needing some refresher course in Math and Computations. **Please Note:** EMA 350-D10 will count towards any graduate degree within the constraints of the program.
By the end of EMA 350 students will know how to perform the following tasks:

a) Solving analytically basic differential equations
b) Utilizing mathematical modeling to study basic engineering problems
c) Working with vectors, arrays, matrices, determinants and performing mathematical operations with them.
d) Solving systems of linear algebraic equations using analytical methods as well as numerical methods via MATLAB.
e) Using MATLAB and Excel to solve and plot the results of certain simple engineering problems.
f) Writing a computer program using either C++ or MATLAB in the context of an engineering problem.
g) Using numerical methods in the following tasks:
   - solving transcendental equations
   - differentiating and integrating functions
   - curve fitting data
   - solving simple differential equations

***Instructor*: Prof. Jacob Kazakia** **e-mail: jyk0@lehigh.edu** Phone: 610-758-3785

- Course includes approximately 36 hours of content and assignments
- **Textbooks Required**: **(1) *"Mathematical Methods in Chemical Engineering,"*** 2nd edition, Jenson & Jeffreys (this book will be provided through Distance Education with the cost of a handling fee to you). Upon completion the book may be returned to Distance Education or you may have the option of purchasing the book from Distance Education at cost; **(2) *"The Mathematics Companion:Essential and Advanced Mathematics for Scientists and Engineers,"*** by A. C. Fischer-Cripps; **(3) *"Essential C++ for Engineers and Scientists,"*** 2nd edition by Jeri Hanly can be purchased on Lehigh's Bookstore website; (C++ compiler will be sent to you on CD); **(4) *"Getting Started with MATLAB 7",*** by Rudra Pratap (most of you may already use Matlab or instructions to access this program will be sent to you).

ME 385-D11 (CRN#45063)/485-D11(CRN#45064). Polymer Processing (3)
An exploration of the science underlying polymer processes such as injection molding through a combination of theory development, practical analysis, and utilization of commercial software. Polymer chemistry and structure, material rheological behavior, processing kinetics, molecular orientation development, process simulation software development, manufacturing defects, manufacturing window establishment, manufacturing process design, manufacturing process optimization. **Prerequisites:** (**ME 385:** Senior level standing in engineering or science). (**ME 485**: This course is a version

of ME 385 for graduate students, with research projects and advanced assignments. Closed to students who have taken ME 385. Graduate level standing in engineering or science).

***Instructor*: Prof. John Coulter** **e-mail: jc0i@lehigh.edu** Phone: 758-6310

- **Course includes approximately 36 hours of content and assignments**
- **Textbook Required:** None required

ME 413-D10 (CRN#44017). Numerical Methods in Mechanical Engineering (3)

Zeros of functions, difference tables, interpolation, integration, differentiation. Divided differences, numerical solution of ordinary differential equations of the boundary and initial value type. Eigen problems. Curve fitting, matrix manipulation and solution of linear algebraic equations. Partial differential equations of the hyperbolic, elliptic and parabolic type. Application to problems in mechanical engineering.

Instructor: Prof. Jacob Kazakia **e-mail: jyk0@lehigh.edu** Phone: 610-758-3785

- Course includes approximately 36 hours of content and assignments
- **Textbook Required**: ***"Numerical Mathematics and Computing,"*** 5th Ed., by Ward Cheney and David Kincaid; Publ. Brooks/Cole Publishing Company, 2004, ISBN#0-534-38993-7

ME 430-D10 (CRN#45649). Advanced Fluid Mechanics (3)

This course is a first graduate course in compressible fluid mechanics, providing a broad coverage of key areas of viscous and inviscid fluid mechanics. Topics covered include: Flow kinematics, differential equations of motion, viscous and inviscid solutions, vorticity dynamics and circulation, vorticity equation, circulation theorems, potential flow behavior, irrotational and rotational flows, simple boundary layer flows and solutions, and real fluid flows and consequences.

***Instructor*: Prof. Chuck Smith** **e-mail: crs1@lehigh.edu** Phone: 610-758-5532

- Course includes approximately 36 hours of content and assignments
- **Textbook Required**: An online text, authored by Prof. Smith will be provided
- **Optional Text*: "Intro to Fluid Mechanics,"*** Owczarek, Lehigh Print, ISBN# Unknown

ME 450-D11 (CRN#45053)/IE 443-D11 (CRN#45624)/MSE 443-D11 (CRN#45625). Automation and Production Sys (3)

Principles and analysis of manual and automated production systems for discrete parts and products. Cellular manufacturing, flexible manufacturing systems, transfer lines, manual and automated assembly systems, and quality control systems

***.Instructor*: Prof. Mikell P. Groover** **e-mail: mpg0@lehigh.edu** Phone: 610-758-4030

- Course requires approximately 36 hours of content and assignments
- **Textbook Required: *"Automation, Prod. Sys. & Computer Integrated Manufacturing,"***Groover, M., Publ., Pearson, 3rd Ed; 2008

ME 452-D11 (CRN#45610)/CHE 452-D11 (CRN#45609)/ENGR 452-D11 (CRN#46124). Mathematical Methods in Eng (3)

Analytical techniques relevant to the engineering sciences are described. Vector spaces; eigenvalues, eigenvectors. Linear ordinary differential equations; diagonalizable and non-diagonalizable systems. Inhomogeneous linear systems; variation of parameters. Non-linear systems; stability; phase plane. Series solutions of ordinary differential equations; special functions. Laplace and Fourier transforms; application to partial differential equations and integral equations. Sturm-Liouville theory. Finite Fourier transforms; planar, cylindrical and spherical geometries.

***Instructor*: Prof. Philip Blythe** **e-mail: pab0@lehigh.edu** Phone: 610-758-3782

- Course requires approximately 36 hours of content and assignment
- **Textbook Required:** M. D. Greenberg ***"Advanced Engineering Mathematics"*** (2nd ed.) Prentice Hall

ME 485-D11 (CRN#45064)/ME 385-D11 (CRN#45063). Polymer Processing (3)

An exploration of the science underlying polymer processes such as injection molding through a combination of theory development, practical analysis, and utilization of commercial software. Polymer chemistry and structure, material rheological behavior, processing kinetics, molecular orientation development, process simulation software development, manufacturing defects, manufacturing window establishment, manufacturing process design, manufacturing process optimization. **Prerequisites:** (**ME 385:** Senior level standing in engineering or science). (**ME 485**: This course is a version of ME 385 for graduate students, with research projects and advanced assignments. Closed to students who have taken ME 385. Graduate level standing in engineering or science).

***Instructor*: Prof. John Coulter** **e-mail: jc0i@lehigh.edu** Phone: 758-6310

- **Course includes approximately 36 hours of content and assignments**
- **Textbook Required:** None required

MECH 312-D11 (CRN#45654). Finite Element Analysis (3)

Basic concepts of analyzing general media (solids, fluids, heat transfer, etc.) with complicated boundaries. Emphasis on mechanical elements and structures. Element stiffness matrices by minimum potential energy. Isoparametric elements. Commercial software packages (ABAQUS, NISA) are used. In addition students develop and use their own finite elements codes. Applications to design. Prerequisite: MECH 12.

Instructor: Prof. Terry Delph **e-mail: tjd1@lehigh.edu** Phone: 610-758-4119

- Course includes approximately 36 hours of content and assignments
- **Textbook Recommended: *"The Finite Element Method for Engineers,"*** 4th Ed., by Huebner et al., Wiley-Interscience.

10/1/2009