COMMONWEALTH GRADUATE ENGINEERING PROGRAM
TELEVISED COURSE PLANNING SHEET
UNIVERSITY OF VIRGINIA

Course **MAE662 - MECHANICAL DESIGN ANALYSIS** Semester **SPRING 2005**

Instructor **P. N. SHETH** Phone No. **434-924-7366**

Office Address **208-B MECH BUILDING**
122 Engineer's Way
University of Virginia
School of Engineering and Applied Science
Charlottesville, VA 22904

E-Mail Address **pns7q@virginia.edu**

Textbook(s): (Student to purchase)

(1) Mechanical Analysis and Design, by Arthur H. Burr and John B. Cheatham, Prentice-Hall, Second Edition, 1995; ISBN 0-02-317265-7. This Textbook from Prentice-Hall is designated as "available on demand" and there is a 4 week lead time. We have ordered the book now and should become available in January. You may also purchase the Textbook from the University of Virginia Newcomb Hall Bookstore after that date.

(2) Additional material will be posted on the toolkit website, particularly material related to optimization.

Reference(s): (To be put on library reserve) - Limit 4

No specific References on Library Reserve are required for this course. Some material, supplemental to the Textbook, will be distributed in the class. Students may also find it useful to refer to any standard undergraduate Textbook of their choice on Mechanical Design.

Computer Needs: Students will utilize MATLAB for some problems. ***It is assumed that either the receive sites will provide access to MATLAB on PC's, or students themselves may have student version of MATLAB on their own PC's. All receive sites must coordinate with students the availability of MATLAB.***

MAE 662
MECHANICAL DESIGN ANALYSIS

This course is directed towards advanced topics in mechanical design which are not normally covered in the standard undergraduate courses devoted to machine design. A more rigorous analytical treatment of mechanical design and analysis methods is presented and the ability to utilize these analytical design methods for practical mechanical design situations will be developed through problem solutions. A mechanics approach to design analysis from first principles is presented in this course, such that a basic understanding of the various design criteria is developed. In this regard, computer based engineering analysis (e.g., finite elements software, machine dynamics software, etc.) will not be utilized, but instead the ability to visualize design problem solutions based on a "paper-pencil", or equivalently, problem specific computer code approach to various design problem solutions or optimization will be emphasized. Both the component level and the system level design issues will be considered. Students will carry out a design project during this course, which will involve a system level design.

A standard undergraduate Mechanical Engineering (or equivalent) preparation involving static, dynamics, and strength of materials, fluid mechanics, and design of machine elements is necessary for this course. The following syllabus details the topics planned for this course.

NUMBER OF LECTURES	TOPIC
3	Film lubrication and bearings with applications to sliding element Bearings, hydrostatic bearings, squeeze film bearings, thrust bearings, and journal bearings.
2	Friction theory and applications to brakes, clutches, and belt drives.
2	Hydrodynamic drives and applications to fluid couplings, adjustable speed fluid drives, and torque converters
2	Matching of prime movers with machinery—the process for selecting motors as drivers, and geared drive systems/transmissions. Considerations of electromechanical dynamics in system design. Use of MATLAB/Simulink for system design.
3	Optimization of machine elements
2	Design for strength and endurance.
2	Fatigue design and applications.
2	Thermal properties and stresses.
1	Residual stresses and design applications.
3	Axially symmetric loading with applications to the design of vessels, Rotors, and fits.
3	Flexure of machine parts, beams and plates, thin and thick curved beams, continuous elastic supports, and design applications

INSTRUCTOR

Dr. Pradip N. Sheth is an Associate Professor of Mechanical Engineering at the University of Virginia. At the University of Virginia, Dr. Sheth has taught graduate courses on Manufacturing Systems, Manufacturing Automation Technologies, Manufacturing Processes and Materials, Mechanical Design, and Dynamics/Control of Multibody Systems. At the undergraduate level, Dr. Sheth has taught courses on Engineering Design, Mechanisms, Control Systems Engineering, and Mechatronics. Dr. Sheth's research at the University of Virginia focuses on control of motions as applied to flexible automation of products and manufacturing tools, and multibody mechanical systems for machinery, vehicles, and biomovements. Dr. Sheth's research has a strong industrial collaboration or an application orientation.

Prior to joining the University of Virginia in December 1985, Dr. Sheth worked in industry for about 14 years. Dr. Sheth's industrial experience includes work at Allis-Chalmers Corporation and Ford Motor Company in design and manufacturing with emphasis on CAD/CAM/CAE techniques and automation.

Dr. Sheth received his M.S. and Ph.D. in Mechanical Engineering from the University of Wisconsin-Madison. Dr. Sheth is a co-developer of a widely used CAE system for mechanisms and linkages called IMP. He holds a patent on a vibration absorber device for vertical pumps and presently has three provisional patents, one on a device for the inspection of high mast highway poles, the second on a method for inferring walking gait parameters from a walker utilized as a walking aid, and the third on a pole climbing robotic system.