COURSE NUMBER	**ME 408**
COURSE TITLE	**Mechanical Systems Design II**
COURSE STRUCTURE	1-2-2 (lecture hr/wk – lab hr/wk – course credits)
COURSE COORDINATOR	Raj S Sodhi
COURSE DESCRIPTION	A continuation of ME 403 from a more integrated viewpoint with lectures on special topics. Students work on group projects more comprehensive in nature using concepts of optimization, computer simulations, decision making in the design and synthesis or mechanical engineering systems. Students develop designs incorporating a variety of realistic constraints such as, economic, safety, reliability, professional ethics, social and environmental issues, codes and standards and intellectual property.
PREREQUISITE(S)	ME 403 – Mechanical Systems Design I ME 407 – Heat Transfer
COREQUISITE(S)	None
REQUIRED MATERIALS	A Ertas and J.C. Jones, The Engineering Design Process, 2nd Edition, Wiley, 1996
REQUIRED, ELECTIVE OR SELECTED ELECTIVE	Required
Other supplemental materials (not req.)	D.Planchard and M.Planchard, Engineering Design with SolidWorks, SDC , 2012.
COMPUTER USAGE	Projects will include optimization and computer aided engineering. FEA programs (e.g. PRO ENGINEER, ANSYS), mathematics modeling (MATLAB) spreadsheets (e.g.MS Excel), and user-written programs may be used.

COURSE LEARNING OUTCOMES/ EXPECTED PERFORMANCE CRITERIA:

Course Learning Outcomes Upon completing this course, students will be able to:	SOs*	Expected Performance Criteria
1. Write a design proposal incorporating evaluation of need, technical and economic feasibility and environmental impact.	1, 5, 6	**Report** (80% of students will earn a grade of 70% or better on this submission)
2. Develop a design notebook, accompanied by a list of critical design tasks and a scheduling time chart to be reviewed during weekly consultations.	1, 2, 4, 6	**Report** (80% of students will earn a grade of 70% or better on this submission)
3. Write monthly interim reports documenting cumulative progress towards the final report.	6	**Report** (80% of students will earn a grade of 70% or better on this submission)
4. Create innovative designs using engineering analysis and	2, 5	**Final Group Report** (80% of students will earn a grade of 70% or better on this submission)

	synthesis to satisfy the goals developed earlier.		
	5. Make mid-term and final oral presentations documenting design objectives, conceptual designs and progress made towards achieving the final goal.	3	**Presentation** (80% of students will earn a grade of 70% or better on this presentation)
	6. Write a comprehensive final project report that incorporates appropriate engineering standards and multiple constraints.	6	**Report** (80% of students will earn a grade of 70% or better on this submission)
	7. Confirm FEA simulation results using fundamental principles and structural theories.	1, 6, 7	**Demonstrate** (80% of students will earn a grade of 7% or better on this submission)
	8. Build prototypes, demonstration models and/or 3D copies associated with their projects with the assistance of the MIE department technical staff and the NJIT factory floor and Makers Space.	2, 6	**Report** (80% of students will earn a grade of 70% or better on this submission)
	9. Conduct experiments and trials, when appropriate, to validate design choices simulations and analysis.	7	**Report** (80% of students will earn a grade of 70% or better on this submission)

CLASS TOPICS	1. Project proposal. Bar-chart tasks. Indicate how computers will be used. Obtain instructor's approval of written proposal. Submit design proposal. If necessary, resubmit with revisions. Establish design task definitions and time chart. Lecture: Formulation of Design Objectives and Design tasks. 2. Begin feasibility study. Limit scope of project to that which can be accomplished in a professional manner. Lecture, Introduction to Engineering Design Process. 3. Background work, Library and other searches for information. Demonstrate how to find, evaluate and use information. 4. Progress Report 1, Lecture –Group Effectiveness, Communications and Leadership. 5. Submit weekly progress reports and design logs during weekly team-instructor meetings. Incorporate design changes and make use of appropriate technical consultants throughout the NJIT campus. Lecture – Design Using standard parts and design for assembly. 6. Continue design, incorporate changes suggested by comments at progress report. Update task bar-chart as required throughout term. Lecture on Safety health and environment Issues in design.

	7. Submit Second Progress Report. Incorporate changes and continue design. Confirmation of FEA results using simplified models from elementary theories. Lecture: Design Using 3 D printing. 8. Mid-term Oral presentations using software, media tools by the groups to the class. Lecture – Ethics in Engineering. 9. Lecture – Research and Development Issues in Design, patents and Inventions. 10. Where appropriate, make arrangements with the MIE department staff or the NJIT makers Space for prototype building, and/or the use of the 3D printing apparatus. 11. Submit Third Interim Report. Incorporate changes as suggested and prepare for submission of the Final Report. Begin preparation for oral report presentation. Lecture: Oral communication methods and skills. 12. Final weekly progress report and review of design notebook. Further preparation for oral report and visual presentation. Lecture – Typical Work day for a Mechanical Engineer. 13. Submit Final Report and design notebook. Make team oral presentation of the design project before a general NJIT audience composed of students, faculty, staff and guests.
STUDENT OUTCOMES (SCALE: 1-3)	

1	**2**	**3**	**4**	**5**	**6**	**7**
3	3	3	3	3	2	3

3 – Strongly supported 2 – Supported 1 – Minimally supported

* Student Outcomes.