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MET 450-104: Mechanical Design Project

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**New Jersey Institute of Technology
Department of Engineering Technology
MET 450 Mechanical Design Project**

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| COURSE NUMBER | MET 450 |
| COURSE NAME | Mechanical Design Project |
| COURSE STRUCTURE | 2-2-3 (lecture hr/wk - lab hr/wk – course credits) |
| COURSE COORDINATOR/ INSTRUCTOR | Dr. A. Sengupta/ Prof. Romanov |
| COURSE DESCRIPTION | The course applies the principles learned in all technical courses to more advanced design situations. Project of a typical mechanical engineering system is developed and presented by an individual or by small groups. The project must meet the approval of course instructor. A formal report is required. Oral presentation and formal written report are required. |
| PREREQUISITE(S) | MET 302, MET 303, MET 304, MET 314, ECET 329, Eng 352. |
| COREQUISITE(S) | None |
| REQUIRED, ELECTIVE OR SELECTED ELECTIVE | Required |
| REQUIRED MATERIALS | None. |
| COMPUTER USAGE | Microsoft Office, Visio, MSPProject, CAD |
| COURSE LEARNING OUTCOMES (CLO) | By the end of the course students should be able to: <ol style="list-style-type: none"> 1. Prepare detailed schedules using Visio or MS Project. 2. Organize a design review meetings and submit the minutes. |

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| | <ol style="list-style-type: none"> 3. Provide references for research material that increased their technical knowledge as required for their project. 4. Develop a detailed design project in technical report format. 5. Perform a mechanical analysis of their design. 6. Give an oral presentation of their proposed design project. 7. Develop an awareness of professional ethics and regulatory bodies. |
| <p>CLASS TOPICS</p> | <p>Project Report, Meeting Minutes, Project Log Book, , Design Project Report Organization, Project Design and Analysis, Three Individual Design Review Meetings with Instructor, Three Group Design Review Meetings, Presentation of Project Reports, Project Time Scheduling, Project Planning Overview Presentation, Project Cost Estimating, Professional Ethics, Design Project Presentations</p> |
| <p>STUDENT OUTCOMES</p> | <p>The Course Learning Outcomes support the achievement of the following MET Student Outcomes and TAC of ABET Criterion 9 requirements:</p> <p>Student Outcome c - an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;</p> <p>Related CLO 4</p> <p>Student Outcome d - an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.</p> <p>Related CLO – 4, 5</p> <p>Student Outcome e - an ability to function effectively as a member or leader on a technical team.</p> <p>Related CLO - 2</p> <p>Student Outcome g - an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature. Related CLO – 3, 4, 6</p> <p>Student Outcome h - an understanding of the need for and an ability to engage in self-directed continuing professional</p> |

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| | <p>development. Related CLO – 7</p> <p>Student Outcome i - an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity team. Related CLO - 7</p> <p>Student Outcome j - a knowledge of the impact of engineering technology solutions in a societal and global context. Related CLO - 7</p> <p>Student Outcome k - a commitment to quality, timeliness, and continuous improvement. Related CLO - 1</p> |
| PROGRAM SPECIFIC OUTCOMES | <p>Student Outcome m - technical expertise having added technical depth in mechanical design, solid mechanics, and electro-mechanical devices and controls. Related CLO - 5</p> |
| ACADEMIC INTEGRITY | <p>NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted. For more information on the honor code, go to http://www.njit.edu/academics/honorcode.php</p> |
| STUDENT BEHAVIOR | <p>See Individual Instructor Policies, which can include:</p> <ul style="list-style-type: none"> • No eating or drinking is allowed at the lectures, recitations, workshops, and laboratories. • Cellular phones must be turned off during the class hours – if you are expecting an emergency call, leave it on vibrate. • No headphones can be worn in class. • Unless the professor allows the use during lecture, laptops should be closed during lecture. |

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| MODIFICATION TO COURSE | The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline. |
| CLASS HOURS & LOCATION | Thursday 5:45 PM- 7:40 PM: CKB 220 Thursday 7:50 PM - 9:45 PM: CKB 220 |
| PREPARED BY | Vasily Romanov |
| COURSE COORDINATED BY | Dr. A. Sengupta |

OFFICE HOURS:

By appointment romanov@njit.edu

GRADING:

| Deliverable | Percentage of Grade |
|---|----------------------------|
| Project Log Book | 5% |
| Project Progress Reports | 15% |
| Meeting Minutes | 10% |
| Design Project Proposal Oral Presentation | 5% |
| Design Project Proposal | 10% |
| Design Project Oral Presentation | 10% |
| Design Project Report | 35% |
| Career Development Project | 10% |

COURSE RULES AND REGULATIONS:

1. Attendance in class is mandatory. If you must miss a class, notify the instructor by email before the class meeting. If that is not possible, due to extenuating circumstances, then notify the instructor by email immediately when possible. 2 or more unexcused absences will result in failure of the course.
2. All presentations must be done using Power Point.
3. All drawings must be done using CAD. Analysis software should be used whenever possible.
4. Assignments are not accepted late for any reason. If you must miss a class, please make arrangements to have someone hand in your assignment when due. The exception of course is if there is a family emergency. In such a situation, effort must be made to submit the work at the first possible time. Please note, email may be used to submit assignments in these instances

RECORD REQUIREMENTS

1. Project Log Book:

This is a daily project log. Entries should be recorded in ink, dated and signed. The logbook should include a record of anything having to do with your project, e.g., sketches, calculations, summaries of articles, conversations and/or meetings. The Project Log Book will be checked at Individual Meeting with instructor. It must be submitted with the final project report.

2. Team Project Progress Report (1-2 pages):

Progress Reports are due as indicated on syllabus. Follow provided template or specific request from instructor. General Progress reports should include the following:

1. Group Number and Project Title
2. Names of Group Members
3. Progress Period Start and End Date
4. Itemized summary of progress (i.e., productive activities) during the progress period.
5. Identify any problems encountered and fixes implemented.
6. List change orders processed during the progress period.
7. List activities planned for the next progress period.
8. Report status of project relative to your planned schedule. (Show schedule and any changes).

3. Design Review Meeting Minutes (1 page):

Please follow provided template. Minutes to a Design Review meeting should include the following:

1. Title of Topic of the Meeting
2. Location, Date and Time of the Meeting
3. Principle Presenter if appropriate
4. Names of Attendees
5. Summary of the Discussion during the meeting by person or group
6. Name and Signature of Person Recording the Minutes

4. Project Proposal (3 to 5 pages):

Please follow the provided template. The proposal will include the following:

1. Project Title
2. Name of Project Designers
3. Executive Summary
4. Concept – Clear explanation of concept and description including preliminary sketches.
5. Background Information on Project Selection
6. Design Criteria
7. Concept Design
8. Project Phases & Planned Schedule
9. Planned Project Logistics & Budget

The Proposal will contain a draft of the above items for presentation.

5. Project Report (5 to 10 pages, excluding drawings):

Please follow the provided template. The report will include the following:

1. Project Title
2. Name of Project Designers
3. Executive Summary
4. Concept – Clear explanation of concept and description including preliminary sketches.
5. Background Information on Project Selection
6. Design Criteria
7. Concept Design
8. Project Phases & Planned Schedule
9. Planned Project Logistics & Budget
10. Engineering Design & Analysis
11. Prototyping
12. Testing & Analysis
13. Actual Project Schedule
14. Actual Project Logistics & Budget
15. Discussion & Conclusion

The Proposal will contain a draft of the above items for presentation.

DESIGN PROJECT REQUIREMENTS

1. Teams will be provided fixed project categories to choose.
2. The team should select a category they are personally interested in.
3. The project costs should be reasonably within your personal limits.
4. The necessary manufacturing resources should be obtainable by you.
5. The project will have an engineering design/analysis element to it.
6. The project may not have been already been started by you or someone else.
7. You must be the principle designer for this project. You may have assistance, but it must be under your personal direction.
8. Once a project is selected, it may not be changed.

GRADING LEGEND

| GRADE | NUMERIC RANGE |
|--------------|----------------------|
| A | 90 to 100 |
| B+ | 85 to 89 |
| B | 80 to 84 |
| C+ | 75 to 79 |
| C | 70 to 74 |
| D | 60 to 69 |
| F | 0 to 59 |

COURSE OUTLINE:

| WEEK | DATE | TOPIC/ACTIVITY |
|------|-------|---|
| 1 | 01/23 | <p><u>Lecture:</u></p> <p>Introduction: Design Project Report/Presentation, Progress Reports, Meeting Minutes, Project Log Book.</p> <p>Formation of Teams, Selecting Project, Background on Project</p> |
| | | <p><u>Lab:</u></p> <p>Resources for Making. Individual Discussion with Professor</p> |
| 2 | 01/30 | <p><u>Lecture:</u></p> <p>Design Criteria & Concept Design</p> <p><i>Deliverable Due</i> : Progress Reports (Concept)</p> |
| | | <p><u>Lab:</u></p> <p>Team Meetings & Discussion with Professor</p> |
| 3 | 02/06 | <p><u>Lecture:</u></p> <p>Project Design: Design for Prototyping.</p> <p><i>Deliverable Due:</i> Progress Reports (Background & Design Criteria)</p> |
| | | <p><u>Lab:</u></p> <p>Team Meetings & Discussion with Professor</p> |
| 4 | 02/13 | <p><u>Lecture:</u></p> <p>Project Planning, Time Scheduling, and Cost Estimating</p> <p><i>Deliverable Due:</i> Progress Reports (Concept Design)</p> |
| | | <p><u>Lab:</u></p> <p>Converting Design Criteria to Design Features</p> <p>Individual Design Review Meeting with Instructor, Minutes due 1 week after meeting</p> |

| WEEK | DATE | TOPIC/ACTIVITY |
|------|-------|--|
| 5 | 02/20 | <p><u>Lecture:</u></p> <p>Engineering Design & Analysis Part 1</p> <p><i>Deliverable Due:</i> Progress Reports (Plan & Budget) and Minutes (Week 4)</p> |
| | | <p><u>Lab:</u></p> <p>Concept Development & Prototyping</p> |
| 6 | 02/27 | <p><u>Lecture:</u></p> <p>Engineering Design & Analysis Part 2</p> |
| | | <p><u>Lab:</u></p> <p>Concept Development & Prototyping</p> |
| 7 | 03/05 | <p><u>Lecture:</u></p> <p><i>Deliverable Due</i> Design Project Proposal Design Project Proposal Presentation</p> |
| | | <p><u>Lab:</u></p> <p>Concept Development & Prototyping</p> |
| 8 | 03/12 | <p><u>Lecture:</u></p> <p>Special Lecture 1</p> <p><i>Deliverable Due:</i> General Progress Reports</p> |
| | | <p><u>Lab:</u></p> <p>Concept Development & Prototyping</p> <p>Individual Design Review Meeting with Instructor, Minutes due 1 week after meeting</p> |

| WEEK | DATE | TOPIC/ACTIVITY |
|------|-------|--|
| 9 | 03/26 | <p><u>Lecture:</u></p> <p>Special Lecture 2</p> <p><i>Deliverable Due</i> : General Progress Reports (focus on Engineering Design & Analysis) and Minutes (Week 8)</p> |
| | | <p><u>Lab:</u></p> <p>Concept Development & Prototyping</p> |
| 10 | 04/02 | <p><u>Lecture:</u></p> <p>Career Development & Engineering Ethics</p> <p><i>Deliverable Due</i> : General Progress Reports due</p> |
| | | <p><u>Lab:</u></p> <p>Concept Development & Prototyping</p> <p>Individual Design Review Meeting with Instructor, Minutes due 1 week after meeting</p> |
| 11 | 04/09 | <p><u>Lecture:</u></p> <p>Special Lecture 3</p> <p><i>Deliverable Due</i> : Progress Reports (focus on Prototyping) and Minutes (Week 10)</p> |
| | | <p><u>Lab:</u></p> <p>Concept Development & Prototyping</p> |
| 12 | 04/16 | <p><u>Lecture:</u></p> <p>Special Lecture 4</p> <p><i>Deliverable Due:</i> Progress Reports (Testing & Analysis)</p> |
| | | <p><u>Lab:</u></p> <p>Prototyping & Testing</p> |
| 13 | 04/23 | <p><u>Lecture:</u></p> <p>Individual Meeting with Instructor</p> |

| WEEK | DATE | TOPIC/ACTIVITY |
|------|-------|--|
| | | <p data-bbox="459 285 529 317"><u>Lab:</u></p> <p data-bbox="459 359 727 390">Design Project Time</p> |
| 14 | 04/30 | <p data-bbox="459 436 578 468"><u>Lecture:</u></p> <p data-bbox="459 510 675 541"><i>Deliverable Due</i></p> <p data-bbox="459 543 745 575">Design Project Report</p> <p data-bbox="459 577 829 609">Design Project Presentations</p> <p data-bbox="459 611 646 642">Career Project</p> |