# Appendix I – Additional Information

# ABET Self -Study

# Department of Mechanical Engineering

# California State University, Los Angeles

# TABLE OF CONTENTS

# APPENDIX IA – TABULAR DATA FOR PROGRAM

## Table I-1. Basic-Level Curriculum

## Mechanical Engineering

| Year; Semester or Quarter | Course (Department, Number, Title) | Category (Credit Hours) | | | |
|---|---|---|---|---|---|
| | | Math & Basic Sciences | Engineering Topics Check if Contains Significant Design (✓) | General Education | Other |
| 1/1 | ENGL. 101 Composition I | | ( ) | 4 | |
| | ENGR 100 Introduction to Engineering | | ( ) | | 1 |
| | MATH 206 Calculus I | 4 | ( ) | | |
| | PHYS 201 General Physics | 4 | ( ) | | |
| | SPCH 150 Oral Communication | | ( ) | 4 | |
| 1/2 | *CS 290 Introduction to FORTRAN Programming | | ( ) | | 2 |
| | ENGL 102 Composition II | | ( ) | 4 | |
| | MATH 207 Calculus II | 4 | ( ) | | |
| | ME 103 Intro to Mechanical Design | | ( √) | | 3 |
| | PHYS 202 General Physics | 4 | ( ) | | |
| 1/3 | CE/ME 201 Statics | | 4 ( ) | | |
| | CHEM 101 General Chemistry I | 5 | ( ) | | |
| | HISTORY 202A or B U.S. Civilization | | ( ) | 4 | |
| | MATH 208 Calculus III | 4 | ( ) | | |
| | | | ( ) | | |
| | | | ( ) | | |
| | * May substitute Any high-level programming course | | ( ) | | |
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## Table 1-1. Basic-Level Curriculum (continued)

## Mechanical Engineering

| Year; Semester or Quarter | Course (Department, Number, Title) | Category (Credit Hours) | | | |
|---|---|---|---|---|---|
| | | Math & Basic Sciences | Engineering Topics Check if Contains Significant Design (✓) | General Education | Other |
| 2/1 | CE/ME 210 Matrix Algebra | 2 | ( ) | | |
| | CE/ME 211 Statistics & Probability | 2 | ( ) | | |
| | ENGR 207 Materials Science | 4 | ( ) | | |
| | MATH 209 Calculus IV | 4 | ( ) | | |
| | PHYS 203 General Physics | 4 | ( ) | | |
| 2/2 | ENGR 300 Economics for Eng. | | ( ) | | 4 |
| | MATH 215 Differential Equations | 4 | ( ) | | |
| | ME 326A Thermodynamics I | | 4 ( ) | | |
| | PHYSICS 204 General Physics | 4 | ( ) | | |
| 2/3 | CE/ME 205 Strength of Mat. | | 4 ( ) | | |
| | CE/ME 320 Dynamics | | 4 ( ) | | |
| | EE 210 Electrical Meas. Lab. | | 1 ( ) | | |
| | ME 204 Mech. Meas. & Inst. | | 4 ( ) | | |
| | ME 326B Thermodynamics II | | 4 (✓) | | |
| | | | ( ) | | |
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## Table 1-1. Basic-Level Curriculum (continued)

## Mechanical Engineering

| Year; Semester or Quarter | Course (Department, Number, Title) | Category (Credit Hours) | | | |
|---|---|---|---|---|---|
| | | Math & Basic Sciences | Engineering Topics Check if Contains Significant Design (✓) | General Education | Other |
| 3/1 | CE/ME 303 Fluid Mechanics I | | 4 ( ) | | |
| | ME 310 Mechanical Engineering Writing Laboratory | | ( ) | | 1 |
| | LD Humanities Elective | | ( ) | 4 | |
| | Life Long Understanding | | ( ) | 4 | |
| | POLS 150 Gov. & Amer. Soc. | | ( ) | 4 | |
| 3/2 | ME 306 Heat Transfer I | | 4 (✓) | | |
| | ME 312 Strength of Materials Laboratory | | 1 ( ) | | |
| | ME 323 Machine Design I | | 4 (✓) | | |
| | ME Lecture Elective | | 4 ( ) | | |
| | ME 313 Fluid Mechanics Laboratory I | | 1 ( ) | | |
| | LD Humanities Elective | | ( ) | 4 | |
| 3/3 | ENGR301 Ethics & Professional. | | ( ) | | 1 |
| | ME 315 Thermal Systems Laboratory I | | 1 ( ) | | |
| | LD Humanities Elective | | ( ) | 4 | |
| | *ME 321 or ME 421 | | 4 (✓) | | |
| | ME 327 Manufacturing Processes | | 4 (✓) | | |
| | ME Lecture Elective | | 4 (✓) | | |
| | | | ( ) | | |
| | *One will count as elective | | ( ) | | |
| | | | ( ) | | |
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| | | | ( ) | | |
| | | | ( ) | | |
| | | | ( ) | | |

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## Table 1-1. Basic-Level Curriculum (continued)

## Mechanical Engineering

| Year; Semester or Quarter | Course (Department, Number, Title) | Category (Credit Hours) | | | |
|---|---|---|---|---|---|
| | | Math & Basic Science | Engineering Topics Check if Contains Significant Design (✓) | General Education | Other |
| 4/1 | UD Theme (Biology) | 4 | ( ) | | |
| | ME 497A Mechanical Engineering Senior Project | | 4 ( √) | | |
| | ME Lecture Elective | | 4 ( ) | | |
| | ME Lecture Elective | | 4 ( √) | | |
| 4/2 | UD Theme | | ( ) | 4 | |
| | ME 497B Mechanical Engineering Senior Project | | 4 ( √) | | |
| | ME Lecture Elective | | 4 ( √) | | |
| | ME Laboratory Elective | | 1 ( ) | | |
| 4/3 | UD Theme | | ( ) | 4 | |
| | ME 497C Mechanical Engineering Senior Project | | 4 ( √) | | |
| | ME Lecture Elective | | 4 ( √) | | |
| | | | ( ) | | |
| | | | ( ) | | |
| | | | ( ) | | |
| | Most, ***but not all,*** ME Lecture Electives contain significant design content | | ( ) | | |
| | | | ( ) | | |
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| | | | ( ) | | |
| | | | ( ) | | |
| TOTALS-ABET BASIC-LEVEL REQUIREMENTS | | 53 | 85 | 44 | 12 |
| OVERALL TOTAL FOR DEGREE | | 194 | 194 | 194 | 194 |
| PERCENT OF TOTAL | | 27.3% | 43.8% | 22.7% | 6.2% |
| Totals must satisfy one set | Minimum quarter credit hours | 48 hrs | 72 hrs | | |
| | Minimum percentage | 25% | 37.5 % | | |

## Table I-2. Course and Section Size Summary

## Mechanical Engineering

| Course No. | Title | No. of Sections offered in Current Year | Avg. Section Enrollment | Type of Class (1) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Lecture | Laboratory | Recitation | Other |
| ENGR 100 | Introduction to Engineering | 6 | 22 | 100 | | | |
| ME 103 | Introduction to Mechanical Design | 2 | 12 | 30 | 70 | | |
| CE/ME 201 | Statics | 4 | 16 | 100 | | | |
| EE/ME 204 | Circuit Analysis I / Mechanical Engr. Measurements and Instrumen. | 5 | 24 | 100 | | | |
| CE/ME 205 | Strength of Materials I | 4 | 12 | 100 | | | |
| ENGR 207 | Materials Science & Engineering | 2 | 13 | 100 | | | |
| CE/ME 210 | Matrix Algebra for Engineers | 3 | 12 | 100 | | | |
| EE 210 | Electrical Measurements Laboratory | 5 | 14 | | 100 | | |
| CE/ME 211 | Statistics and Probability for Engrs. | 3 | 13 | 100 | | | |
| CHEM 101 | General Chemistry I | 3 | 66 | 40 | 60 | | |
| CS 290 | Introduction to FORTRAN Prog. | 3 | 18 | 50 | 50 | | |
| MATH 206 | Calculus I: Differentiation | 17 | 25 | 100 | | | |
| MATH 207 | Calculus II: Integration | 15 | 27 | 100 | | | |

## Table I-2. Course and Section Size Summary (continued)

## Mechanical Engineering

| Course No. | Title | No. of Sections offered in Current Year | Avg. Section Enrollment | Type of Class (1) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Lecture | Laboratory | Recitation | Other |
| MATH 208 | Calculus III:Sequences, Series, & Coordinate Systems | 11 | 22 | 100 | | | |
| MATH 209 | Calculus IV: Several Variables | 9 | 20 | 100 | | | |
| MATH 215 | Differential Equations | 5 | 29 | 100 | | | |
| PHYS 201 | General Physics | 5 | 50 | 50 | 50 | | |
| PHYS 202 | General Physics | 5 | 44 | 50 | 50 | | |
| PHYS 203 | General Physics | 5 | 32 | 50 | 50 | | |
| PHYS 204 | General Physics | 4 | 27 | 50 | 50 | | |
| ENGR 300 | Economics for Engineers | 7 | 22 | 100 | | | |
| ENGR 301 | Ethics and Professionalism in Engr. | 6 | 14 | 100 | | | |
| CE/ME 303 | Fluid Mechanics I | 4 | 12 | 100 | | | |
| ME 306 | Heat Transfer I | 1 | 13 | 100 | | | |
| ME 310 | Mechanical Measurements Lab. | 2 | 7 | | 100 | | |
| CE/ME 312 | Strength of Materials Lab. | 2 | 6 | | 100 | | |

## Table I-2. Course and Section Size Summary (continued)

## Mechanical Engineering

| Course No. | Title | No. of Sections offered in Current Year | Avg. Section Enrollment | Type of Class (1) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Lecture | Laboratory | Recitation | Other |
| CE/ME 320 | Dynamics I | 4 | 14 | 100 | | | |
| ME 323 | Machine Design I | 1 | 10 | 100 | | | |
| ME 326A | Thermodynamics I | 2 | 16 | 100 | | | |
| ME 326B | Thermodynamics II | 1 | 12 | 100 | | | |
| ME 327 | Manufacturing Processes | 1 | 12 | 100 | | | |
| ME 497A | Mechanical Engineering Senior Proj. | 1 | 11 | 25 | | | 75 |
| ME 497B | Mechanical Engineering Senior Proj. | 1 | 8 | 25 | | | 75 |
| ME 497C | Mechanical Engineering Senior Proj. | 1 | 10 | 25 | | | 75 |
| ME 321 | Kinematics of Mechanisms | 0 | 0 | 100 | | | |
| ME 328 | Introduction to Metallurgy | 0 | 0 | 100 | | | |
| ME 402 | Advanced Mechanics of Materials | 1 | 9 | 100 | | | |
| ME 403 | Aerodynamics | 1 | 24 | 100 | | | |
| ME 404 | Turbomachinery | 1 | 27 | 100 | | | |

## Table I-2. Course and Section Size Summary (continued)

## Mechanical Engineering

| Course No. | Title | No. of Sections offered in Current Year | Avg. Section Enrollment | Type of Class (1) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Lecture | Laboratory | Recitation | Other |
| ME 406 | Heat Transfer II | 1 | 15 | 100 | | | |
| ME 407 | Design of Thermal Systems | 1 | 18 | 100 | | | |
| ME 408 | Fluid Mechanics II | 0 | 0 | 100 | | | |
| ME 409 | Mechanical Engineering Analysis | 0 | 0 | 100 | | | |
| ME 410 | Control of Mechanical Systems | 1 | 15 | 100 | | | |
| ME 411 | Vibrational Analysis I | 0 | 0 | 100 | | | |
| ME 414 | Machine Design II | 1 | 9 | 100 | | | |
| ME 415 | Air Conditioning | 1 | 6 | 100 | | | |
| ME 416 | Energy Systems | 0 | 0 | 100 | | | |
| ME 420 | Power Plants | 0 | 0 | 100 | | | |
| ME 421 | Dynamics of Mechanisms | 0 | 0 | 100 | | | |
| ME 422 | Optimization of Mechanical Engineering Systems | 1 | 11 | 100 | | | |
| ME 425 | Process Heat Transfer | 0 | 0 | 100 | | | |

## Table I-2. Course and Section Size Summary (continued)

## Mechanical Engineering

| Course No. | Title | No. of Sections offered in Current Year | Avg. Section Enrollment | Type of Class (1) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Lecture | Laboratory | Recitation | Other |
| ME 426 | Thermodynamics III | 0 | 0 | 100 | | | |
| ME 428 | Automation and Computer-Aided Manufacturing | 1 | 14 | 100 | | | |
| ME 454 | Special Topics in Mechanical Engr. | 2 | 12 | | | | 100 |
| EE/ME 481 | Introduction to Robotics | 1 | 9 | 100 | | | |
| CE/ME 313 | Fluid Mechanics Laboratory I | 3 | 10 | | 100 | | |
| ME 315 | Thermal Systems Laboratory I | 2 | 7 | | 100 | | |
| ME 329 | Metallography Laboratory | 0 | 0 | | 100 | | |
| ME 412 | Strength of Materials Laboratory II | 0 | 0 | | 100 | | |
| CE/ME 413 | Fluid Mechanics Laboratory II | 0 | 0 | | 100 | | |
| ME 417 | Machine Analysis Laboratory | 1 | 5 | | 100 | | |
| ME 427 | Thermal Systems Laboratory II | 0 | 0 | | 100 | | |
| EE/ME 491 | Robotics Laboratory | 0 | 0 | | 100 | | |
| ME 499 | Undergraduate Directed Study | 2 | 3 | | | | 100 |

## Table I-3. Faculty Workload Summary

## Mechanical Engineering

| Faculty Member (Name) | FT or PT (%) | Classes Taught (Course No./Credit Hrs.) Term and Year[1] | Total Activity Distribution[2] | | |
|---|---|---|---|---|---|
| | | | Teaching | Research | Other[3] |
| Fabris, N. | FT | Su'05 | QTR. Off | | |
| | | Fa'05 ME327(4), ME430(4), ME528(4) | 12 | | 3 |
| | | Wi'06 ME201(4), ME428(4), ME529(4) | 12 | | 3 |
| | | Sp'06 ME323(4), ME327(4), ME530(4) | 12 | | 3 |
| Felszeghy, S. | FT | Su'05 | QTR. Off | | |
| | | Fa'05 ME208(4), ME320(4), ME423(4) | 12 | | 3 |
| | | Wi'06 | QTR. Off | | |
| | | Sp'06 ME412(2), ENGR300(4) | 6 | | 1.5 |
| Guillaume, D. | FT | Su'05 | QTR. Off | | |
| | | Fa'05 ME306(4) | 4 | 4 | 7 |
| | | Wi'06 ME407(4) | 4 | 4 | 7 |
| | | Sp'06 SABBATICAL | - | - | - |
| Hsia, L.M. | FT | Su'05 | QTR. Off | | |
| | | Fa'05 ME210(2), ME211(2), ME497A(6), ME398,499,597,598,599 (4.31) | 14.31 | | 3 |
| | | Wi'06 ME205(4), ME321(4), ME497B(6) | 14 | | 3 |
| | | Sp'06 ME497C(8) | 8 | | 3 |

## Table I-3. Faculty Workload Summary (continued)

## Mechanical Engineering

| Faculty Member (Name) | FT or PT (%) | Classes Taught (Course No./Credit Hrs.) Term and Year[1] | Total Activity Distribution[2] | | |
|---|---|---|---|---|---|
| | | | Teaching | Research | Other[3] |
| Landsberger, S. | FT | Su'05 | QTR. Off | | |
| | | Fa'05 ME310(2), ENGR100(2) | 4 | | 1.5 |
| | | Wi'06 ME204(4), ME208(4) | 8 | | 1.5 |
| | | Sp'06 ME303(4), ME208(4) | 8 | | 1.5 |
| Manvi, R | FT | Su'05 CE313(3), ME406(4), ME422(4), ME499(.66), ME497,598(.99) | 11.65 | | 3 |
| | | Fa'05 | QTR. Off | | |
| | | Wi'06 ME210(2), ME416(4), ME591(1) | QTR. Off | | |
| | | Sp'06 | 7 | | 1.5 |
| Mirmirani, M. | FT | Su'05 ME521 (4) | 4 | 4 | 11 |
| | | Fa'05 | | 4 | 11 |
| | | Wi'06 | | 4 | 11 |
| | | Sp'06 | | 4 | 11 |
| Sharif, A. | | Su'05 | QTR. Off | | |
| | | Fa'05 ME114(2), ENGR207(4), ME323(4), ME409(4) | 14 | | 3 |
| | | Wi'06 ME414(4) | 4 | | 9 |
| | | Sp'06 CREATIVE LEAVE | | | |

## Table I-3. Faculty Workload Summary (continued)

## Mechanical Engineering

| Faculty Member (Name) | FT or PT (%) | Classes Taught (Course No./Credit Hrs.) Term and Year[1] | Total Activity Distribution[2] | | |
|---|---|---|---|---|---|
| | | | Teaching | Research | Other[3] |
| Wu, C | FT | Su'05 ME326B(4), ME413(2), ME508(4), ME499(.33) | 10.33 | | 3 |
| | | Fa'05 ME403(4), ME525(4), ME313 (2) | 10 | 4 | 3 |
| | | Wi'06 | | 4 | |
| | | Sp'06 ME508(4) | 4 | 4 | 2 |
| Agrawal, S. | PT | Su'05 ME415(4) | 4 | | |
| | | Fa'05 | | | |
| | | Wi'06 | | | |
| | | Sp'06 | | | |
| Amar, R. | PT | Su'05 | | | |
| | | Fa'05 ME303 (4), ME326A (4) | 8 | | |
| | | Wi'06 ME408 (4), ME506 (4) | 8 | | |
| | | Sp'06 | | | |
| Azarbayjani, M. | PT | Su'05 | | | |
| | | Fa'05 | | | |
| | | Wi'06 ENGR 301 (2) | 2 | | |
| | | Sp'06 ME310 (2) | 2 | | |

## Table I-3. Faculty Workload Summary (continued)

## Mechanical Engineering

| Faculty Member (Name) | FT or PT (%) | Classes Taught (Course No./Credit Hrs.) Term and Year[1] | Total Activity Distribution[2] | | |
|---|---|---|---|---|---|
| | | | Teaching | Research | Other[3] |
| Choi, S. | PT | Su'05 | | | |
| | | Fa'05 ME103 (5) | 5 | | |
| | | Wi'06 ME419 (4) | 4 | | |
| | | Sp'06 ME103 (5) | 5 | | |
| Gratton, L. | | Su'05 | | | |
| | | Fa'05 | | | |
| | | Wi'06 | | | |
| | | Sp'06 ME326A(4), ME406 (4) | 8 | | |
| Herwerth, C. | | Su'05 ME315 (2) | 2 | | |
| | | Fa'05 | | | |
| | | Wi'06 ME315 (2) | 2 | | |
| | | Sp'06 ME315 (2) | 2 | | |
| Kerdanyan, G. | PT | Su'05 | | | |
| | | Fa'05 | | | |
| | | Wi'06 | | | |
| | | Sp'06 ME312(2), ME421(4) | 6 | | |

## Table I-3. Faculty Workload Summary (continued)

## Mechanical Engineering

| Faculty Member (Name) | FT or PT (%) | Classes Taught (Course No./Credit Hrs.) Term and Year[1] | Total Activity Distribution[2] | | |
|---|---|---|---|---|---|
| | | | Teaching | Research | Other[3] |
| Khashayar, K. | PT | Su'05 | | | |
| | | Fa'05 ENGR300 (4) | 4 | | |
| | | Wi'06 ENGR300 (4) | 4 | | |
| | | Sp'06 ME211 (2) | 2 | | |
| Parvin, M. | PT | Su'05 ENGR207 (4), ME205(4) | 8 | | |
| | | Fa'05 | | | |
| | | Wi'06 | | | |
| | | Sp'06 | | | |
| Ploen, S. | PT | Su'05 | | | |
| | | Fa'05 ME522 (4) | 4 | | |
| | | Wi'06 ME501A (4) | 4 | | |
| | | Sp'06 ME501B (4) | 4 | | |
| Yousefiani, A. | PT | Su'05 | | | |
| | | Fa'05 | | | |
| | | Wi'06 | | | |
| | | Sp'06 ENGR207 (4) | 4 | | |

## Table I-4. Faculty Analysis

## Mechanical Engineering

| Name | Rank | FT or PT | Highest Degree | Institution from which Highest Degree Earned & Year | Years of Experience | | | Professional Registration (State) | Level of Activity (high, med, low, none) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Govt./ Industry Practice | Total Faculty | This Institution | | Professional Society (Indicate Society) | Research | Consulting/Summer Work in Industry |
| Fabris, N. | Full | FT | Ph.D. | Illinois Inst. of Tech. 1976 | 3 | 31 | 27 | | Medium ASEE/SME/SWE/AAUW | Medium | Low |
| Felszeghy, S. | Full | FT | Ph.D. | U.C. Berkeley 1974 | 20 | 29 | 28 | EIT/CA | Medium AIAA/ASEE/ASME | Low | Low |
| Guillaume, D. | Full | FT | Ph.D. | U.C. Irvine 1997 | 7 | 8.5 | 7.5 | PE/CA | Medium ASME/ASEE/AIAA | High | Low |
| Hsia, L.M. | Full | FT | Ph.D. | U.C. Davis 1979 | 4 | 26 | 23 | PE/CA | Low ASME/SAE/AIAA | High | Medium |
| Landsberger, S. | Full | FT | Ph.D. | MIT 1988 | 10 | 12 | 6 | | Medium ISPO/ISG/ASEE | High | Low |
| Manvi, R. | Full | FT | Ph.D. | Wash. State Univ. 1968 | 42 | 38 | 35 | PE/CA | Low ASME/ASEE | Medium | High |
| Mirmirani, M. | Full | FT | Ph.D. | U.C. Berkeley 1977 | 3 | 27 | 25 | | Medium AIAA/ASME/ASEE | High | None |
| Sharif, A. | Associ. | FT | Ph.D. | U.C. Irvine 1998 | 3 | 6 | 4 | EIT/CA | Medium ASME | Medium | Medium |
| Wu, C. | Full | FT | Ph.D. | Univ. of Illinois 1983 | 0 | 23 | 23 | | Medium ASME/AIAA/UVS | High | Low |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

## Table I-4. Faculty Analysis (continued)

### Mechanical Engineering

| Name | Rank | FT or PT | Highest Degree | Institution from which Highest Degree Earned & Year | Years of Experience | | | Professional Registration (State) | Level of Activity (high, med, low, none) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Govt./ Industry Practice | Total Faculty | This Institution | | Professional Society (Indicate Society) | Research | Consulting/ Summer Work in Industry |
| Agrawal, S. | Lect | PT | MS | Southern Methodist Univ., 1976 | 32 | 6 | 5 | PE/CA | Medium ASHRAE/ASME/SAE/AIPE | Medium | Medium |
| Amar, R | Lect | PT | Ph.D. | UCLA 1974 | 31 | 24 | 22 | PE/CA | Medium ASME | High | Low |
| Azarbayjani, M. | Lect | PT | MS | Loyola Marymount Univ., 2000 | 8 | 11 | 11 | EIT/CA | Medium | Low | High |
| Choi, S. | Lect | PT | MS | CSULA 2003 | 5 | 4 | 3 | | Medium AIAA/ASME/UVS | High | Medium |
| Gratton, L. | Lect | PT | Ph.D. | U.C. Berkeley 2000 | 6 | 2 | 1 | | Medium | Medium | High |
| Herwerth, C. | Lect | PT | BS | CSULA 2005 | | 2 | 2 | EIT/CA | Medium AIAA/SME | High | Low |
| Kerdanyan, G. | Lect | PT | MS | CSULA 2000 | 5 | 1 | 1 | | Medium ASME/IEEE | High | Medium |
| Khashayar, K. | Lect | PT | MS | CSULA 2000 | 22 | 3.5 | 3.5 | | Medium SME/AIAA | Low | High |
| Parvin, M. | Lect | PT | Ph. D. | Univ. of London, England 1975 | 20 | 15 | 15 | | Medium | Medium | High |
| Ploen, S. | Lect | PT | Ph.D. | Univ. of Calif., Irvine 1997 | 9 | 4 | 3 | | High ASME/AIAA/IEEE/SIAM | High | Low |
| Yousefiani, A. | Lect | PT | Ph.D. | Univ. of Calif., Irvine 1999 | 6 | 2 | 1 | | Medium AIAA/ASME/ASM/TMS | High | Low |

## Table I-5. Support Expenditures

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Fiscal Year / Expenditure Category | 2003-04 | 2004-05 | 2005-06 | 2006-07 |
| Operations (1) (not including staff) | $20,023 | $35,594 | $20,987 | $20,500 |
| Travel (2) | $6,132 | $9,873 | $13,672 | $13,000 |
| Hardware/Software | $38,414 | $13,050 | $35,415 | $35,000 |
| Equipment (3) | $6,168 | $39,486 | $65,000 | $58,000 |
| (a) Institutional Funds | $6,168 | $20,486 | $20,000 | $3,000 |
| (b) Grants and Gifts (4) | 0 | $19,000 | $45,000 | $55,000 |
| Teaching Assistants | 0 | 0 | 0 | 0 |
| Part-time Assistance (5) (other than teaching) | 0 | 0 | 0 | 0 |

# APPENDIX IB – COURSE SYLLABI

**1. Department, Course Number, and Course Title:**

**CHEMISTRY AND BIOCHEMISTRY**

# CHEM 101 GENERAL CHEMISTRY I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Physical concepts, stoichiometry, structure of atom, periodic table, chemical bonding.

**4. Prerequisites:** High school chemistry and physics; two years of high school algebra; satisfactory performance on mathematics placement examination given during registration period.

**5. Text and Materials:** Chemistry: Molecular Science, 3rd Ed. Moore, Thomson, 2006
Experiments for General Chemistry, 5th Ed. Goldwhite, McGraw-Hill, 2002

**6. Course Objectives:** The topics to be learned are: units of measurement and the scientific method, the structure of the atom, describing and measuring chemical change, energetics of chemical change, elementary aspects of quantum mechanics in order to better understand the nature of chemical bonding, and finally the prediction of three-dimensional structures of small molecules. The lecture discussion of these topics is complemented by laboratory experiments.

Course Outcomes

A. Knowledge of atomic structure and systems of measurement
B. Ability to balance equations of reactions.
C. Use of A and B to predict amounts of product(s) formed or reactants(s) required of a given chemical reaction.
D. Use of A, B and C to predict energy released or consumed by a chemical process.
E. To have an understanding of the microscopic nature of matter and the quantization of electromagnetic radiation and atomic and molecular energy levels.
F. To be able to predict the three-dimensional structures of simple molecules from their chemical formula.
G. To be able to safely perform qualitative and quantitative experiments in a chemistry laboratory and understand how uncertainty in measurements results in uncertainty in calculated results.

**7. Topics Covered:** (in Order of Presentation)

- Introduction (Ch. 1)
- Molecular nature of matter (Ch. 2)
- Stoichiometry (Ch. 3)
- Aqueous Reactions (Ch. 4)
- Thermochemistry (Ch. 5)
- Atomic structure (Ch.6)
- Periodic Properties (Ch. 7)
- Basic bonding (Ch. 8)
- Bonding theories (Ch. 9)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 3 lectures; 1 recitation; 1 laboratory | |
| Duration of each session: | Lectures and recitation: | 50 minutes; |
| | Laboratory: | 2 hours and 50 minute |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Science: | 5 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Wayne Tikkanen, Professor, Department of Chemistry and Biochemistry, 12/1999
Updated by Maj Dean Mirmirani 01/2006

**1. Department, Course Number, and Course Title:**

**MATHEMATICS AND COMPUTER SCIENCE**

# CS 290 INTRODUCTION TO FORTRAN PROGRAMMING

| | | | | |
|---|---|---|---|---|
| **2. Designation:** | Required | ☑ | Elective | ☐ |
| | Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Elementary computer programming using FORTRAN language. Lecture 1 hour, laboratory 3 hours. No credit toward Computer Science major

**4. Prerequisites:** MATH 206, Calculus I, Differentiation

**5. Text and Materials:** FORTRAN 77 for Engineers and Scientists, 4th Ed., Nyhoff & Leestma, Prentice Hall, 1992.
Reference: FORTRAN 77 With Applications for Scientists and Engineers, 2nd Edition, Reddy & Ziegler, West., West Publishing Company, 1994

**6. Course Objectives:** Students should be able to: Have a good understanding of the basic programming concepts. Divide a problem into its logical set of components. Have a good understanding of how a good program design reduces coding and debugging time. Design and code mid-level problems. This course is offered as a service course for non CS majors. In this course, students will learn the basic concepts of Fortran programming language. They will learn algorithm development for structured programming, designing, coding, debugging, and documenting programs. Solutions design in this course mostly involves generating pseudo-code for program development.

Course Outcomes

- Understand basic programming concepts
- Divide a problem into its logical set of components
- Understand how good program design reduces coding and debugging time
- Design and code mid-level problems

**7. Topics Covered:** (in Order of Presentation)

- Introduction to Computer Systems, Programming, and Problem Solving
- Fortran Syntax
- Algorithm
- Control Structures
- Functions
- Arrays
- Files
- Program development using flowcharts. (Lab.
- Modular program development. (Lab.)
- Programming using control statements. (Lab.)
- Repetitions; loops. (Lab.)
- Arrays, creating & using arrays. (Lab.)
- Sequential files, using data files. (Lab.)

| | | | |
|---|---|---|---|
| **8. Class Schedule:** | Number of Sessions per week: | 1 lectures; 1 laboratory | |
| | Duration of each session: | Lectures | 1 hour |
| | | Laboratory | 3 hours |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Science | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)

Skill outcomes:

- an ability to analyze and interpret data (abet b)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a recognitition of the need for an ability to engage in life long learning (abet i)
- a desire to be a flexible and adaptable team player

| | | |
|---|---|---|
| **11. Prepared by:** | Vladimir Akis | 12/1999 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**MATHEMATICS AND COMPUTER SCIENCE**

# MATH 206 CALCULUS I: DIFFERENTIATION (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Functions, graphs, conics, limits, continuity and derivatives, anti-differentiation, and applications.

**4. Prerequisites:** Satisfactory score on (or exemption from) ELM; MATH 102 AND 103, each with a minimum C grade or satisfactory score on placement examination.

**5. Text and Materials:** Calculus, Early Transcendentals, 5th ed., Stewart, Thomson, 2002
Single Variations Calculus, Early Transcendentals, 5th ed., Stewart, ITP

**6. Course Objectives:** This course is designed to teach the student the principles and techniques of differential calculus of functions of one real variable with a selection of typical applications

Course Outcomes

- The student should attain an intuitive understanding of limits and continuity and computation facility with commonly encountered limit problems. The students should have an intuitive understanding of the intermediate value theory and be able to apply it to locate solutions within an interval.
- The student should have an understanding of the derivative as a slope, as a rate of change, and as a limit and should have computational facility with standard methods for derivatives including the chain rule.
- The student should have an understanding of the second derivative as an indicator of concavity and as acceleration.
- The student should be able to apply derivative methods to the graphing of functions and to optimization (max-min) problems as well as other selected applications.
- The student should be familiar with the idea of an antiderivative, basic facts about them, and the solution to a first order initial value problem.

**7. Topics Covered:** (in Order of Presentation)

- Idea of limit and continuity (Ch. 1)
- Computation of limits (Ch. 1)
- Derivative as a slope (Ch. 2)
- Derivative as a rate of change (Ch. 2)
- Derivative as a limit (Ch. 2)
- Computation of derivatives (Ch.2)
- Implicit differentiation (Ch. 2)
- Application to graphing (Ch. 3)
- Application to optimization (Ch. 3)
- Newton's Method (optional) (Ch. 3)
- Antiderivatives (Ch. 4)
- Initial Value Problems (Ch. 4)
- Substitution (Ch. 4)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 2 lectures | |
| Duration of each session: | Lectures | 1 hour and 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Mathematics | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

| | | |
|---|---|---|
| **11. Prepared by:** | Michael Hoffman | 03/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**MATHEMATICS AND COMPUTER SCIENCE**

# MATH 207 CALCULUS II: INTEGRATION (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** The definite integral, Fundamental Theorem of the Calculus, transcendental functions, methods of integration, applications to physics and biology.

**4. Prerequisites:** MATH 206 with minimum C grade.

**5. Text and Materials:** Calculus, Early Transcendentals, 5th ed., Stewart, Thomson, 2002
Single Variations Calculus, Early Transcendentals, 5th ed., Stewart, ITP

**6. Course Objectives:** This course is designed to teach the student the principles and techniques of integral calculus of functions of one real variable with a selection of typical applications

Course Outcomes

- The student should attain an intuitive understanding of the integral as a limit of sums and as an antiderivative. The student should have an appreciation for the fundamental theorem of calculus especially as the method of solution of integration problems.
- The students should have an understanding of and computational facility with integration by substitution, parts, and partial fractions as well as other selected techniques.
- The student should be familiar with and have computational facility in common geometric applications such as area between curves, volumes and areas of solids of revolution, and length of curves as well as other selected applications.
- The students should have familiarity and computational facility with the calculus of the common transcendental functions especially exponential, logarithm, and the trigonometric functions and their inverses. The exponential function should be familiar as the solution to a growth problem.
- Improper integrals, L'Hopital's Rule and related computations should be familiar.

**7. Topics Covered:** (in Order of Presentation)

- Antiderivatives and substitution (Ch. 4)
- Integral as limit of sums (Ch. 4)
- Fundamental Theorem (Ch. 4)
- Areas (Ch. 5)
- Solids of Revolution (Ch. 5)
- Length of plane curves (Ch.5)
- Other applications (optional) (Ch. 5)
- Log and Exponential (Ch. 6)
- Growth and decay (Ch. 6)
- L'Hopital's Rule (Ch. 6)
- Inverse trig functions (Ch. 6)
- Integration by parts (Ch. 7)
- Partial fractions (Ch. 7)
- Other techniques (Ch. 7)
- Improper integrals (Ch. 7)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 2 lectures | |
| Duration of each session: | Lectures | 1 hour and 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Mathematics | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

| | | |
|---|---|---|
| **11. Prepared by:** | Michael Hoffma | 03/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**MATHEMATICS AND COMPUTER SCIENCE**

# MATH 208 CALCULUS III: SEQUENCES, SERIES, AND COORDINATE SYSTEMS (4)

| | | | | |
|---|---|---|---|---|
| **2. Designation:** | Required | ☑ | Elective | ☐ |
| | Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Limits of sequences and series, indeterminate forms, Taylor Series, plane coordinate systems, and change of coordinates.

**4. Prerequisites:** MATH 207 with minimum C grade.

**5. Text and Materials:** Calculus, Early Transcendentals, 5th ed., Stewart, Thomson, 2002
Single Variations Calculus, Early Transcendentals, 5th ed., Stewart, ITP

**6. Course Objectives:** This course is designed to broaden the students skills and knowledge of differential and integral calculus of functions of one real variable. Major topics are infinite sequences and series with emphasis on Taylor series and polar coordinates in the plane. Vector geometry and parameterized curves begin the study of higher dimensions

Course Outcomes

- The student should gain an intuitive understanding and computational facility with the limits of sequences of real numbers and the algebra of limits.
- The student should gain an intuitive understanding of the convergence of infinite series and computational facility with important cases, especially geometric series. The student should be familiar with and be able to apply standard tests for the convergence of series. The student should be familiar with the basic facts about power series and the radius of convergence.
- The student should be familiar with application of the ideas of part (B) to Taylor series and should be familiar with the Taylor series expansions of important functions, especially the exponential and trigonometric functions.
- The student should be familiar with the use of polar coordinates in the plane and cylindrical and spherical coordinates in space.. The student should be familiar with the idea of parameterized curves in two and three dimensions and with the basic use of calculus along such curves (velocity and acceleration)
- The student should be familiar with and have computational facility in the tools of vector geometry in two and three dimensions. (projection, dot product, cross product), the equations of lines and planes, and standard quadric surfaces.

**7. Topics Covered:** (in Order of Presentation)

- Limits of sequences (Ch. 8)
- Convergence of infinite series (Ch. 8)
- Standard tests for convergence (Ch. 8)
- Absolute and conditional conv. (Ch. 8)
- Power series, radius of conv. (Ch. 8)
- Taylor series expansions (Ch. 8)
- Parameterized plane curves (Ch. 9)
- Polar coordinates (Ch. 9)
- Vectors (Ch. 10)
- Dot and cross products (Ch. 10)
- Lines and planes (Ch. 10)
- Quadric surfaces (Ch. 10)
- Cylindrical &Spherical coord. (Ch. 10)
- Curves in space (Ch. 11)

| | | | |
|---|---|---|---|
| **8. Class Schedule:** | Number of Sessions per week: | 2 lectures | |
| | Duration of each session: | Lectures | 1 hour and 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Mathematics | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

| | | |
|---|---|---|
| **11. Prepared by:** | Michael Hoffma | 03/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**MATHEMATICS AND COMPUTER SCIENCE**

# MATH 209 CALCULUS IV: SEVERAL VARIABLES (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Calculus and Analytic Geometry, 9th ed., George B. Thomas, Jr. and Ross L. Finney, Addison-Wesley Publishing Co., Reading, Massachusetts

**4. Prerequisites:** MATH 207 with minimum C grade.

**5. Text and Materials:** Calculus, Early Transcendentals, 5th ed., Stewart, Thomson, 2002
Single Variations Calculus, Early Transcendentals, 5th ed., Stewart, ITP

**6. Course Objectives:** This course is designed to teach the principles and techniques of differential and integral calculus of functions of several variables with a selection of typical applications. The ideas and tools developed in MATH 206-208 are applied to these ends.

Course Outcomes

- The student should be familiar with the idea of and the description of functions of several variables through graphs and level curves or surfaces.
- The student should have an understanding of and computational facility with partial derivatives.
- The student should be familiar with and have computational facility in the application of partial derivatives to linear approximation, tangent planes, and optimization problems. This should include first derivative tests, second derivative test in two variables, and methods for constrained extrema such as Lagrange multipliers.
- The students should be familiar with multiple integrals, especially double and triple integrals including their computation as iterated integrals and change of order of integration. The student should be familiar with the expression of double integrals in polar coordinates and of triple integrals in cylindrical or spherical coordinates.
- The student should be familiar with tools of vector analysis including directional derivatives, gradients, divergence and curl. The student should be familiar with line integrals, vector fields, path independence, and Green's theorem.
- Further work if time permits continues (E) to include parametrized surfaces, surface integrals, surface area, divergence theorem and Stoke's theorem.

**7. Topics Covered:** (in Order of Presentation)

- Functions of several variables (Ch. 12)
- Graphs and level sets (Ch. 12)
- Partial derivatives (Ch. 12)
- Linear approximation (Ch. 12)
- Directional derivatives, gradient (Ch. 12)
- Tangent planes (Ch. 12)
- Extremes and saddle points (Ch. 12)
- Constrained extrema (Ch. 12)
- Double integrals and appl. (Ch. 13)
- Integrals in polar coordinates (Ch. 13)
- Triple integrals and appl. (Ch. 13)
- Cylindrical and Spherical (Ch. 13)
- Line integrals (Ch. 14)
- Vector fields (Ch. 14)
- Path independence (Ch. 14)
- Green's theorem (Ch. 14)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 2 lectures | |
| Duration of each session: | Lectures | 1 hour and 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Mathematics | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

| | | |
|---|---|---|
| **11. Prepared by:** | Michael Hoffma | 03/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**MATHEMATICS AND COMPUTER SCIENCE**

# MATH 215 DIFFERENTIAL EQUATIONS (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Ordinary differential equations with concentration on methods of finding solutions; applications in science and engineering

**4. Prerequisites:** MATH 209

**5. Text and Materials:** Fundamentals of Differential Equations, 6th ed., Nagle

**6. Course Objectives:** This course is designed to teach students techniques for analyzing problems in terms of ordinary differential equation and techniques of solution for important classes of such equations.

Course Outcomes

- The student should have a qualitative understanding of the nature of a differential equation and of modeling various situations involving smoothly changing quantities sing them
- The student should have a familiarity with first order ordinary differential equations and various interpretations of them as well as computational facility in the solution of important classes of them.
- The student should be familiar with the modeling of important classes of problems by second order equations, especially harmonic oscillator equations. The student should have familiarity with some of the basic theory, especially a complete set of independent solutions as well as computational facility with methods of solution
- Variable topics may be selected from first order systems, series solutions, Laplace transforms, or basic approximation techniques.

**7. Topics Covered:** (in Order of Presentation)

- Types of differential equations (Ch. 1)
- What are solutions? (Ch. 1)
- Initial value problems (Ch. 1)
- Existence of solutions (Ch. 1)
- Exact First order equations (Ch. 2)
- Integrating factors (Ch. 2)
- Separable equations (Ch. 2)
- First order applications (Ch. 3)
- Basic theory for higher order (Ch. 4)
- Constant coeff. homogeneous (Ch. 4)
- Undetermined coefficients (Ch. 4)
- Variation of parameters (Ch. 4)
- 2nd order constant coeff. (Ch. 5)
- Harmonic oscillators (Ch. 5)
- Resonance (Ch. 5)
- Variable topics as time allows
- Series solutions (Ch. 6)
- First order systems (Ch. 7)
- Laplace transforms (Ch. 9)
- Approximation techniques (Ch. 8)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 2 lectures | |
| Duration of each session: | Lectures | 1 hour and 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Mathematics | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Maj Mirmirani, 12/2005

**1. Department, Course Number, and Course Title:**

**DEPARTMENT OF PHYSICS AND ASTRONOMY**

# PHYSICS 201 GENERAL PHYSICS (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Vectors, mechanics of particles and rigid bodies, basic conservation laws of mechanic

**4. Prerequisites:** High school physics or permission of department; MATH 206 (may be taken concurrently).

**5. Text and Materials:** Physics for Scientist and Engineers, 6th Ed. Serway R., Thomson, 2004
Phys 100/200 Supplement & Notes, Carr
Phys 201 Lab Manual

**6. Course Objectives:** Students will be exposed to a first course in Newtonian Mechanics using differential calculus. They will see how the application of Newton's Laws of Motion and the Conservation of Momentum and Mechanical Momentum can yield solutions to complex 1, 2, and 3 dimensional motion, including rotations and problems in elementary Static Equilibrium and Elasticity.

Course Outcomes

- Students will come to appreciate the scalar and vector nature of physical quantities.
- Students will learn to identify and quantify forces which govern dynamics of particle motion.
- Students will learn how to use the concepts of work, kinetic energy, and potential energy in quantitative descriptions of dynamics.
- Students will learn how to employ conservation laws to simplify and to understand motion.
- Students will learn how to use rotational kinematics and dynamics for complex rigid body motion.

**7. Topics Covered:** (in Order of Presentation)

- Units, dimensional analysis (Ch. 1)
- Kinematics in one dimension (Ch. 2)
- Vector and scalar quantities (Ch. 3)
- Motion in two dimensions (Ch. 4)
- Newton's Laws of Motion (Ch. 5)
- Rotational kinematics (Ch. 6)
- Kinetic energy and work (Ch. 7)
- Potential energy and conservation of energy (Ch. 8)
- Linear momentum, conservation of linear momentum, center of mass motion (Ch. 9)
- Rotational dynamics, rotational energy, torque (Ch. 10)
- Angular momentum, conservation of angular momentum, rolling motion (Ch. 11)
- Equilibrium of rigid bodies, center of gravity, elastic properties of solids (Ch. 12)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 2 lectures; 1 recitation; 1 laboratory | |
| Duration of each session: | Lecture | 1 hr, 15 min |
| | Recitation | 50 minutes |
| | Laboratory | 2 hours, 30 min |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a desire to be a flexible and adaptable team player (collaborative attitude)

| | | |
|---|---|---|
| **11. Prepared by:** | Konrad A. Aniol | 01/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**DEPARTMENT OF PHYSICS AND ASTRONOMY**

# PHYSICS 202 GENERAL PHYSICS (4)

| | | | | |
|---|---|---|---|---|
| **2. Designation:** | Required | ☑ | Elective | ☐ |
| | Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Mechanical vibrations and sound, elementary thermodynamics.

**4. Prerequisites:** PHYS 201: MATH 207 (prerequisite or corequisite)

**5. Text and Materials:** Physics for Scientist and Engineers, 6th Ed. Serway R., Thomson, 2004
Phys 100/200 Supplement & Notes, Carr
Phys 202 Lab Manual

**6. Course Objectives:** Students will be introduced to the mechanics of continuous media via wave motion. Gravity is also discussed as a force responsible for the large scale motion of planets and galaxies. Thermodynamics expands the concept of the conservation of energy from the limited form discussed in Physics 201 ( for conservative forces) to its broadest application to all forms of energy. The kinetic theory of gases shows how Newton's Laws of motion can be fruitfully applied on a microscopic scale. Entropy is a common concept in thermodynamics and statistical mechanics. Students will see that the many varied types of motion and transformations seen in the physical world can often be understood in terms of Newton's Laws of Motion.

Course Outcomes

- Students will learn about universal gravitation.
- Students will learn about fluid mechanics.
- Students will learn about oscillatory motion, such as waves on a string and sound waves, and wave phenomena , such as superposition of waves, energy transported by waves, and resonances.
- Students will be introduced to thermodynamics and its applications, such as thermometry, heat conduction, First Law of Thermodynamics, heat capacity, heat engines, and entropy.
- Students will be introduced to the microscopic Kinetic Theory of Gases. They will see the connection between topics discussed in thermodynamics and a microscopic theory that explains these topics based on Newtonian mechanics.

**7. Topics Covered:** (in Order of Presentation)

- Oscillatory motion (Ch. 13)
- Universal gravitation (Ch. 14)
- Fluid mechanics (Ch. 15)
- Wave motion (Ch. 16)
- Sound waves (Ch. 17)
- Superposition and standing waves (Ch. 18)
- Temperature, thermal expansion and Ideal Gases (Ch. 19)
- Heat and the First law of Thermodynamics (Ch. 20)
- The Kinetic Theory of Gases (Ch. 21)
- Heat engines, Entropy, and the Second law of Thermodynamics (Ch. 22)

| | | | |
|---|---|---|---|
| **8. Class Schedule:** | Number of Sessions per week: | 2 lectures; 1 recitation; 1 laborator | |
| | Duration of each session: | Lecture | 1 hr, 15 min |
| | | Recitation | 50 minutes |
| | | Laboratory | 2 hours, 30 min |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a desire to be a flexible and adaptable team player (collaborative attitude)

| | | |
|---|---|---|
| **11. Prepared by:** | Konrad A. Aniol | 01/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**DEPARTMENT OF PHYSICS AND ASTRONOMY**

# PHYSICS 203 GENERAL PHYSICS (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Elementary field theory, basic electricity and magnetism, DC and AC circuits.

**4. Prerequisites:** PHYS 202; MATH 208 (prerequisite or corequisite)

**5. Text and Materials:** Physics for Scientist and Engineers, 6th Ed. Serway R., Thomson, 2004
Phys 100/200 Supplement & Notes, Carr
Phys 203 Lab Manual

**6. Course Objectives:** Students will learn the fundamentals of electrostatics and magnetostatics. Basic direct current circuit analysis with resistive and capacitive elements will be studied

Course Outcomes

- Students will learn about Coulomb's law, Electric fields, electric flux and applications of Gauss' law.
- Students will learn about the concept of the electric potential, capacitance, and dielectrics.
- Students will learn about Ohm's law, electric currents, microscopic semi-classical models of electrical conduction, and the use of Kirchoff's rules to solve direct current circuits.
- Students will be introduced to the effect of magnetic fields on charged particles in motion, the Lorentz force. They will learn that the cumulative effect of the Lorentz force on individual charge carriers results in macroscopic forces and torques on current carrying wires.
- Students will learn how to apply the Biot-Savart law to calculate the magnetic fields generated by current distributions. Ampere's law will be used to demonstrate how symmetries in the current distribution can be used to simplify magnetic field calculations. They will learn how to include the presence of materials in the computation of magnetic fields.

**7. Topics Covered:** (in Order of Presentation)

- Electric fields (Ch. 23)
- Gauss' law (Ch. 24)
- Electric potential (Ch. 25)
- Capacitance and dielectrics (Ch. 26)
- Current and resistance (Ch. 27)
- Direct current circuits, Kirchoff's rules (Ch. 28)
- Magnetic fields, Lorentz force (Ch. 29)
- Biot-Savart law, Ampere's law, magnetism in matter (Ch. 30)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 2 lectures; 1 recitation; 1 laborator | |
| Duration of each session: | Lecture | 1 hr, 15 min |
| | Recitation | 50 minutes |
| | Laboratory | 2 hours, 30 min |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a desire to be a flexible and adaptable team player (collaborative attitude)

| | | |
|---|---|---|
| **11. Prepared by:** | Konrad A. Aniol | 01/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**DEPARTMENT OF PHYSICS AND ASTRONOMY**

# PHYSICS 204 GENERAL PHYSICS (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Continuation of electricity and magnetism including oscillations and waves; geometrical and physical optics.

**4. Prerequisites:** PHYS 203; MATH 209 (prerequisite or corequisite)

**5. Text and Materials:** Physics for Scientist and Engineers, 6th Ed. Serway R., Thomson, 2004
Phys 100/200 Supplement & Notes, Carr
Phys 204 Lab Manual

**6. Course Objectives:** Students are introduced to electrodynamics and Maxwell's equations. They will learn about time dependent electromagnetic phenomena, including the concept of inductance. Circuit analysis will be expanded to include inductive elements. They will learn about the properties of electromagnetic waves and study light and optics, both from the point of view of geometrical optics and physical optics.

Course Outcomes

- Students will learn about motional emf, Faraday's law of induction, and the connections between dynamic electric and magnetic fields.
- Students will be introduced to the concept of inductance and how this can be used along with capacitance and resistance to solve problems in alternating current circuit analysis. Oscillations in LC circuits and power in an AC circuit will be developed.
- Students will learn that Maxwell's equations predict the existence of electromagnetic waves that carry energy and momentum, and are responsible for the phenomenon of light, among other things.
- Students will learn how to use geometrical optics to develop a first order understanding lenses and optical devices.
- Students will learn how physical optics affects the operation of optical devices through the phenomena of interference, diffraction and polarization

**7. Topics Covered:** (in Order of Presentation)

- Faraday's law of induction (Ch. 31)
- Inductance, energy in a magnetic field, RL and LC circuits (Ch. 32)
- Alternating current circuits, power in an AC circuit (Ch. 33)
- Electromagnetic waves, properties of E.M. waves (Ch. 34)
- Nature of light and laws of geometrical optics (Ch. 35)
- Geometrical optics and its applications (Ch. 36)
- Interference of light waves, double slit interference experiments, interference in thin films (Ch. 37)
- Diffraction and polarization, resolution of single slit circular apertures, diffraction grating, x-ray diffraction (Ch. 38)

**8. Class Schedule:**

| | | |
|---|---|---|
| Number of Sessions per week: | 2 lectures; 1 recitation; 1 laborator | |
| Duration of each session: | Lecture | 1 hr, 15 min |
| | Recitation | 50 minutes |
| | Laboratory | 2 hours, 30 min |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a desire to be a flexible and adaptable team player (collaborative attitude)

| | | |
|---|---|---|
| **11. Prepared by:** | Konrad A. Aniol | 01/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**CIVIL AND MECHANICAL ENGINEERING**

# CE/ME 201 STATICS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Fundamental principles of statics, resolution and composition of forces, algebraic and graphic solutions, friction, center of gravity, moment of inertia.

**4. Prerequisites:** MATH 207 (Calculus II: Integration), PHYS 201 (General Physics: Mechanics)
Topics: Fundamental theorem of calculus; definite integral; transcendental functions; methods of integration; general physics—mechanics

**5. Text and Materials:** Vector Mechanics for Engineers: Statics, Seventh Edition, F. P. Beer, E. R. Johnston, Jr., and E. R. Eisenberg, McGraw-Hill, 2004.

**6. Course Objectives:** Students will become familiar with the basic principles of statics, and will be able to solve problems involving forces and moments applied to a body in static equilibrium, determine the centroids of lines, areas, and volumes, moments of inertia of areas and masses

Course Outcomes

- an ability to use vector methods to study forces in two and three dimensions
- an ability to replace a given system of forces and couples by a simpler equivalent system
- an ability to solve static equilibrium problems of rigid bodies in two and three dimensions
- an ability to find centroids and centers of gravity for bodies of various shapes
- an ability to find internal forces for simple structures: trusses, frames and machines
- an ability to solve problems for systems with dry friction
- an ability to find moments of inertia of areas and moments of inertia of masses
- an ability to work independently

**7. Topics Covered:** (in Order of Presentation)

- Statics of particles (3 sessions)
- Equivalent systems of forces (2 sessions)
- Equilibrium of rigid bodies (3 sessions)
- Centroids and center of gravity (2 sessions)
- Analysis of Structures: Trusses, Frames and Machines (2 sessions)
- Friction (3 sessions)
- Moments of inertia of areas (2 sessions)
- Moments of inertia of masses (1 session)
- Examinations (2 sessions), plus final examination (2.5 hours)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (53 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Engineering Science: | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Anjan K. Bhaumik and Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**CIVIL & MECHANICAL ENGINEERING**

# CE/ME 205 STRENGTH OF MATERIALS I (4)

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Stresses and strains under axial, shearing, and torsional forces; flexural stresses and deflections of simple beams; columns; and combined stresses.

**4. Prerequisites:** CE/ME 201 (Statics)
Topics: Equilibrium of forces; reactions of simple structures and machines; analysis of simple trusses, frames, and machines; moments of inertia of areas; Mohr's circle

**5. Text and Materials:** F. P. Beer, E. R. Johnston, Jr., and J. T. DeWolf, Mechanics of Materials, Third Edition, McGraw-Hill, 2002.

**6. Course Objectives:** Students will become familiar with the basic principles of and techniques in the analysis and design of simple structural and mechanical members, subjected to static loads.

Course Outcomes

- ability to analyze and/or design simple systems subjected to normal stress, shearing stress, and bearing stress
- ability to analyze and/or design simple systems, including statically indeterminate systems, subjected to axial loading
- ability to analyze and/or design simple cylindrical shafts, including statically indeterminate systems, subjected to torsion
- ability to analyze and/or design simple systems subjected to bending—bending and shear stress
- ability to find the slope and deflection of simple beams
- ability to find principal stress and strain—plane stress/strain transformations
- ability to find buckling loads for columns with various end conditions
- ability to work independently

**7. Topics Covered:** (in Order of Presentation)

- Concept of stress; normal, shearing, and bearing (1 session)
- Stress and strain in axial loading (2 sessions)
- Torsion of cylindrical shafts (2 sessions)
- Bending moment and shear forces (2 sessions)
- Bending and shear stress (2 sessions)
- Transformation of plane stress and strain, Mohr's circle (3 sessions)
- Deflection of beams; double integration and moment-area methods (4 sessions)
- Introduction to energy methods, buckling of columns (2 sessions)
- Examinations (2 sessions), plus final examination (2.5 hours)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Engineering Science: | 3 units |
| Engineering Design | 1 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Anjan K. Bhaumik and Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# CE/ME210 MATRIX ALGEBRA FOR ENGINEERS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Introduction to calculations using vectors; matrix operations; solutions of linear simultaneous equations; coordinate transformations; application to engineering problems

**4. Prerequisites:** MATH 208, Calculus III; PHYS 201, General Physics I

**5. Text and Materials:** Elementary Linear Algebra, Fourth Edition, Stewart Venit and Wayne Bishop, Brooks/Cole Publishing Co., 1996

**6. Course Objectives:** This course teaches and prepares engineering student the techniques for analyzing and solving engineering problems involving vectors and matrices.

Course Outcomes

- an ability to apply linear algebra to the solution of engineering problems.
- the introductory knowledge of the theory of vector and matrix algebra and the ability to perform operations and calculations using these quantities.
- the analytical and computational skills to solve systems of linear equations.
- the ability to use suitable computer software to perform matrix operations and solve system of linear equations.

**7. Topics Covered:** (in Order of Presentation)

- Two and Three-dimensional Vectors and Vector operations (Ch. 1)
- Linear Equations, Application to Engineering Systems (Ch. 2)
- Matrices, Operations and Application to Engineering (Ch. 3)
- Determinants, Cramer's Rule (Ch. 4)
- Linear Dependence and Independence (Ch. 5)
- Eigenvalues and Eigenvectors (Ch. 8)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the lower division major requirement for the civil and mechanical engineering programs.

| | |
|---|---|
| Mathematics | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Maj Mirmirani 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# CE/ME211 STATISTICS AND PROBABILITY FOR ENGINEERS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Introduction to calculations using probabilities and densities; concepts in statistics; application to engineering problems

**4. Prerequisites:** MATH 208, Calculus III; PHYS 201, General Physics I

**5. Text and Materials:** Miller and Freund's Probability and Statistics for Engineers, Fifth Edition Richard A. Johnson, Prentice-Hall, 1994

**6. Course Objectives:** This course teaches and prepares engineering students the statistical methods of data analysis and basic probability theory for engineering application.

Course Outcomes

- an ability to apply knowledge of statistics to the solution of engineering problems.
- the introductory knowledge of the theory of probability and the ability to apply statistical methods to design of experiments and analysis of data.
- the ability to apply statistical methods and probability to design and implement quality improvement programs
- the ability to apply statistics and probability to reliability and life testing.

**7. Topics Covered:** (in Order of Presentation)

- Introduction to Modern statistics and Application to Engineering (ch. 1)
- Treatment of Data, Frequency Distribution (ch. 2)
- Probability (ch. 3)
- Probability Distributions (ch. 4)
- Probability densities (ch. 5)
- Curve Fitting (ch. 11)
- Statistical Content of Quality Improvement Programs(ch. 14)
- Applications to Reliability and Life testing (ch. 15)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the lower division major requirement for the civil and mechanical engineering programs.

| | |
|---|---|
| Mathematics | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)

**11. Prepared by:** Maj Mirmirani 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# CE/ME303 FLUID MECHANICS I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Fundamental principles and methods of fluid mechanics; thermodynamics of fluid flow; Newtonian fluids; equations of fluid flow; laminar and turbulent flow; applications.

**4. Prerequisites:** CE/ME 205 (Statics), PHYS 202 (General Physics II)

**5. Text and Materials:** Fluid Mechanis, Third Edition, Munson, Young & Okiishi, John Wiley & Sons, 2004.

**6. Course Objectives:** To introduce the fundamental principles of fluid mechanics, the basic equations governing of fluid statics and fluid flow, and the methods of solving engineering problems involving fluid mechanics.

Course Outcomes

- an ability to predict physical properties of Newtonian fluids and the standard atmosphere
- an ability to predict the pressures and forces exerted by a fluid at rest
- an ability to predict the flow rate and variations of pressure and velocity for ideal incompressible flows
- an ability to define a control volume and predict the forces and moments exerted by a moving fluid
- an ability to predict flow rate, head loss, pressure variation and power for viscous flows in pipes
- a knowledge of the methods of measuring fluid properties, pressure, velocity, flow rate and force

**7. Topics Covered:** (in Order of Presentation)

- Properties of Fluids – Ch. 1
- Static Pressure in Fluids – Ch. 2
- Pressure Measurement – Ch. 2
- Standard Atmosphere – Ch. 2
- Hydrostatic Forces on Plane Surface – Ch. 2
- Hydrostatic Forces on Curve Surface – Ch. 2
- Bouyancy & Stability – Ch. 2
- Bernoulli Equation – Ch. 3
- Applications of Bernoulli Equation – Ch. 3
- Control Volume Concept – Ch. 5
- Conservation of Mass – Ch. 5
- Conservation of Momentum – Ch. 5
- Conservation of Angular Mom – Ch. 5
- Applications to Turbomachines – Ch. 5
- Conservation of Energy – Ch. 5
- Laminar Flow in Pipes – Ch. 8
- Turbulent Flow in Pipes – Ch. 8
- Moody Chart & Curve-Fit Formulas – Ch. 8
- Minor Losses and Flow Meters – Ch. 8

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 51 units of upper division major requirements in the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Chivey Wu 05/2005

**1. Department, Course Number, and Course Title:**

**CIVIL & MECHANICAL ENGINEERING**

# CE/ME312 STRENGTH OF MATERIALS LABORATORY I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Tests of engineering materials in tension, compression, bending, and torsion; verification by experiment; basic theories learned in strength of materials. Laboratory 3 hours

**4. Prerequisites:** Course: CE/ME 205 (Strength of Materials I), (may be taken concurrently)
Topics: Hooke's Law; Euler's column buckling; shear, torsional and flexural formulas; stress, strain and theories of failure

**5. Text and Materials:** Strength of Materials Laboratory Manual, CSULA.

**6. Course Objectives:** This course provides students opportunities to become familiar with standard mechanical testing methods and fundamental properties of engineering materials, and to develop report writing proficiency.

Course Outcomes

- ability to conduct standard tension tests of steel and other metals
- ability to conduct compression tests of concrete, cast iron and steel
- ability to conduct tests with materials subjected to torsion
- ability to conduct simple tests of column buckling
- ability to use strain gages for strain measurement
- ability to document results in written reports
- ability to work in groups
- ability to work independently

**7. Topics Covered:** (in Order of Presentation)

- Introduction (1 session)
- Tensile test of mild steel (1 session)
- Tensile test of aluminum and brass (1 session)
- Tensile test of steel-- hysteresis effect (1 session)
- A study on the effects of finishing and varying carbon content on the properties of carbon steel (1 session)
- Direct shear test of steel, brass and aluminum; torsion test of steel and cast iron (1 session)
- Flexure test of an aluminum alloy I-beam (1 session)
- Transverse test of timber, cast iron and plain concrete (1 session)
- Compression test of steel, cast iron and concrete (1 session)
- Column buckling test of timber (1 session)
- Final Examination (2.5 hours)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hours 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is a required laboratory for the civil and mechanical engineering programs.

| | |
|---|---|
| Engineering Science: | 1 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Anjan K. Bhaumik and Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# CE/ME313 FLUID MECHANICS LABORATORY I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Experiments on fluid properties, fluid statics, conservation of mass, energy, and momentum, and fluid resistance.

**4. Prerequisites:** CE/ME 303 (Fluid Mechanics I)

**5. Text and Materials:** Fluid Mechanics, D.F. Young, B.R. Munson and T.H. Okiishi
Published by John Wiley & Sons, Inc. 2004

**6. Course Objectives:** The students will learn to conduct experiments to verify fundamental principles of fluid mechanics, calibrate measuring devices, analyze experimental data and develop empirical relations when appropriate.

Course Outcomes

- The ability to conduct experiments for a given purpose.
- The ability to analyze experimental data and develop empirical equations.
- Verification of basic principles and equations of fluid mechanics.
- The ability to use computers for data analysis, empirical equations and presentation.
- The ability to work individually and as a team
- The ability to communicate in written reports and oral presentation.

**7. Topics Covered:** (in Order of Presentation)

- Orientation. Review of Least Square Method
- Calibration of Pressure Gages &Transducers
- Hydrostatic Force on a Plane Surface
- Buoyancy and Stability
- Verification of Bernoulli Equation
- Calibration of Flow Meters
- Hydrodynamic Force of a Free Jet
- Friction Head Loss in Pipe
- Performance of Impulse Turbine
- Final Examination/Oral presentation

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hour 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is a required laboratory course in the Mechanical Engineering program.

| | |
|---|---|
| Engineering Laboratory | 1 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Chivey Wu 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# CE/ME320 DYNAMICS I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Kinematics and kinetics of rigid bodies; work, kinetic energy, impulse, momentum in two and three dimensions; applications to space mechanics.

**4. Prerequisites:** CE/ME 201 (Statics)

**5. Text and Materials:** Vector Mechanics for Engineers, Dynamics, Seventh Edition, F. P. Beer and E. R. Johnston, McGraw-Hill, 2004.

**6. Course Objectives:** The student will learn and understand the governing principles and methods of analysis of particle and rigid body dynamics. The student will apply these principles and methods of analysis to solving realistic engineering problems.

Course Outcomes

- Understanding of Newton's laws of motion for a particle and their generalization to systems of particles and rigid bodies.
- Understanding of the significance of an inertial frame.
- Ability to solve problems in particle motion in rectangular and polar coordinates.
- Ability to solve problems in particle motion in moving frames.
- Ability to apply relative velocity and relative acceleration equations in vector form.
- Understand and apply work-energy and impulse-momentum principles for systems of particles and rigid bodies.
- Ability to draw equivalent free-body and kinetic (mass-acceleration) diagrams for plane motion of rigid bodies.
- Ability to draw equivalent impulse and momentum diagrams for plane motion of rigid bodies.
- Ability to use calculus, vector algebra and vector notation to solve problems in dynamics.
- Ability to solve problems in a systematic rational manner, both in SI and USCU.

**7. Topics Covered:** (in Order of Presentation)

- Basic concepts and definitions, Newton's laws of motion, law of gravitation
- Kinematics of particles, rectilinear motion, dependent motions, angular motion of a line
- Vector algebra, curvilinear motion of a particle, rectangular components, motion relative to translating reference axes, normal and tangential components, radial and transverse components
- Kinetics of particles, force and acceleration, work and energy, potential energy, conservation of energy, impulse and momentum, conservation of momentum, impact
- Kinetics of systems of particles, equations of motion, work and energy, potential energy, linear and angular momentum, conservation of energy and momentum
- Kinematics of rigid bodies, angular velocity vector, absolute and relative velocity and acceleration in plane motion, derivative of a vector referenced to a rotating frame, plane motion of a particle relative to a rotating frame
- Plane kinetics of rigid bodies, translation, fixed-axis rotation, general plane motion, work and energy methods, impulse and momentum methods
- Kinematics of rigid bodies in three dimensions, kinetics, angular momentum, inertial properties.

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 51 units of upper division major requirements in the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Neda S. Fabris 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# CE/ME413 FLUID MECHANICS LABORATORY II

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Experiments on subsonic and supersonic flow, pumps, turbines, fans and unsteady flow

**4. Prerequisites:** CE/ME 313 (Fluid Mechanics Laboratory I), Prerequisite or corequisite: CE 387 (Hydraulics) or ME 408 (Fluid Mechanics II)

**5. Text and Materials:** Laboratory manual provided by instructor

**6. Course Objectives:** The students will learn to operate wind tunnels and modern data- acquisition system, and conduct tests to verify airfoil theory, and to obtain aerodynamic characteristics of basic shapes, wings, aircraft, and land vehicles. Visualization of flow past these objects in a smoke tunnel is also introduced.

Course Outcomes

- The ability to use wind tunnels to observe air flow and to measure aerodynamic forces.
- The ability to collect and analyze test data with a data-acquisition system.
- Verification of typical characteristics of airfoils and wings.
- The ability to use computers for data analysis, empirical equations and presentation.
- The ability to work individually and as a team
- The ability to communicate with written reports and oral presentation.

**7. Topics Covered:** (in Order of Presentation)

- Introduction to wind tunnel testing
- Aerodynamic Drag on 2-D Objects
- Aerodynamic Drag on 3-D Objects
- Aerodynamic Characteristics of an Airfoil
- Aerodynamic Characteristics of a Wing
- Effect of Winglets
- Aerodynamic Characteristics of an Aircraft
- Aerodynamic Characteristics of Solar Car Designs
- Aerodynamic Thrust of a Propeller
- Final Exam/Oral Presentation

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hours 50 minute |

**9. Contribution of course to meeting the professional component:**

This course is part of the 1 unit of laboratory elective in Mechanical Engineering program.

| | |
|---|---|
| Engineering Laboratory | 1 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes: • • •

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)

- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Chivey Wu 05/2005

**1. Department, Course Number, and Course Title:**

**ELECTRICAL ENGINEERING**

# EE 210 ELECTRIC MEASUREMENTS LABORATORY

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Characteristics and limitations of analog and digital electrical and electronic instrumentation, signal sources, and d-c power supplies. Analysis, tabulations, and graphical presentation of measurement data and technical report writing

**4. Prerequisites:** PHYS 203, General Physics I

**5. Text and Materials:** Electric Measurements Laboratory Manual, Sidney Soclof, CSULA

**6. Course Objectives:** Comprehend, understand, and have fluency in the topics and basic concepts of this course as stipulated in the University Catalog description, the expanded course outline, and the topics as listed here, so as to be able to apply this understanding and knowledge in a variety of open-ended design situations.

Course Outcomes

- ability to analyze rigid bodies subjected to planer and spatial forces and moments
- ability to determine centroids and moments of inertia of rigid bodies
- ability to analyze and/or design simple systems subjected to normal stress, shearing stress, and bearing stress, including statically indeterminate systems subjected to axial loading (tension and compression)
- ability to analyze and/or design simple cylindrical shafts, including statically indeterminate systems, subjected to torsion
- ability to analyze and/or design simple systems subjected to bending and shear
- ability to find the slope and deflection of simple beams
- ability to find principal stress and strain—plane stress/strain transformations
- ability to work independently

**7. Topics Covered:** (in Order of Presentation)

- Introduction to Electronic Measuring Instruments
- Precision and Accuracy
- Frequency Range
- Input Impedance - Loading Effects
- Signal Sources - Output Impedance
- Digital Multimeters (DMMs)
- DMM Functions
- DMM Resolution (number of digits)
- D-C Power Supplies - Regulation
- Function Generators - Output Waveforms
- Function Generators - Output Impedance
- Function Generators - Sweep Function
- Function Generators - Arbitrary Waveforms
- Oscilloscopes - Basic Operation
- Oscilloscopes - Cursor Measurements
- Frequency Counters

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hours 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 63 units of major requirement for the electrical engineering program.

| | |
|---|---|
| Engineering Science | 1 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

| | | |
|---|---|---|
| **11. Prepared by:** | Sidney Soclof | 01/2000 |
| | Updated by Maj Dean Mirmirani | 01/2006 |

**1. Department, Course Number, and Course Title:**

**ENGINEERING**

# ENGR 100 INTRODUCTION TO ENGINEERING

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Introduction to profession of engineering; academic success strategies; models for viewing education; collaborative learning and team building; time management; communication skills; introduction to campus facilities and resources.

**4. Prerequisites:** None.

**5. Text and Materials:** Studying Engineering: A Road Map to a Rewarding Career, R. B. Landis, Discovery Press, 2000.

**6. Course Objectives:** Provide students with an understanding of the academic and professional behaviors and skills necessary to enhance their chances of success as an engineering major, and ultimately as a professional. The skills include working effectively in teams, goal setting, time management, and developing oral communication skills. Students are also introduced to the campus resources available to engineering majors.

Course Outcomes

- knowledge of the engineering profession and academic success strategies.
- knowledge of the computing, library, and career center resources available.
- knowledge of the University policies and procedures.
- ability to manage time and work effectively in team settings
- ability to prepare and deliver an oral presentation.

**7. Topics Covered:** (in Order of Presentation)

- Keys to Success in Engineering Study (1 session)
- Rewards and opportunities of an Engineering Career (1 session)
- Models for Viewing Education (1 session)
- Academic Success Strategies (2 sessions)
- Behavior Modification (1 session)
- University Policies and Procedures (1session)
- Team Building and Collaborative Learning (2 sessions)
- Time Management (1 session)
- Engineering Disciplines and Professional Registration (1 session)
- Communication Skills (1 session)
- Campus Resources (3 sessions)
- Broadening the Engineering Education (1 session)
- Quizzes (2 sessions)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 1 hour 15 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the lower-division required courses.

| | |
|---|---|
| Other | 1 unit or 100% |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an understanding of professional and ethical responsibility (abet f)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ablity to think in a logical, sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Mark Tufenkjian and Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**ENGINEERING**

# ENGR 207 MATERIAL SCIENCE AND ENGINEERING

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Understanding structure and fundamental atomic and molecular mechanisms of behavior of engineering materials, atomic and electronic movement, physical, mechanical, and electrical properties; overview of engineering materials, semiconductors, metals, ceramics, polymers, and composites.

**4. Prerequisites:** CHEM 101 (General Chemistry), MATH 206 (Calculus I)

**5. Text and Materials:** Materials Science and Engineering: An Introduction, 6th ed., William D. Callister, Jr., John Wiley and Sons, Inc. 2003.

**6. Course Objectives:** This course gives engineering students fundamental understanding of materials' structures and their effects on physical and engineering properties. The methods of controlling microstructure to obtain desired mechanical properties in materials and influence of material processing on material behavior are discussed. Broad categories of engineering materials are reviewed.

Course Outcomes

- the ability to distinguish between different types of materials, their use, effect of environment on behavior
- an appreciation of influence of material on human development, and its sustainability
- the understanding of the atomic structure, bonding and arrangement of atoms and their influence on properties
- the understanding of influence of imperfection on material properties and deformation of materials
- the understanding of diffusion of atoms and application on the strengthening of the material and sintering
- the knowledge of mechanical properties and testing of materials , interpretation and analysis of experiments
- the understanding of influence of processing and methods of obtaining desired properties of materials
- the knowledge of interpretation of phase diagrams and their use in achieving the desirable properties
- the understanding of equilibrium and non-equilibrium iron-carbon phase diagram
- an introductory knowledge of other engineering materials
- the ability to read and understand materials literature and to continue studying on their own
- the ability to write answers, and critically think
- the ability to critically analyze, and interpret experimental data.

**7. Topics Covered:** (in Order of Presentation)

- Atomic Structure and Interatomic Bonding Chapter 2
- Crystal Structures, Crystal systems, Crystallographic Points, Directions, and Planes, Crystalline and Non-crystalline Materials Chapter 3
- Point Defects, Miscellaneous Imperfections, Microscopic Examination Chapter 4
- Diffusion Chapter 5
- Mechanical Properties of Materials Chapter 6
- Dislocations and Strengthening Mechanisms Chapter 7
- Failure Chapter 8
- Phase Diagrams Chapter 9
- Phase Transformations Chapter 10
- Structure and Properties of Ceramics Chapter 12
- Corrosion and Degradation of Materials Chapter 17
- Electrical properties of Materials Chapter 18
- Optical Properties of Materials Chapter 21

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the lower division required classes for Mechanical and Civil Engineering programs and Electrical Engineering students on old catalog.

Engineering Design 4 units

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Adel A. Sharif 05/2005

**1. Department, Course Number, and Course Title:**

**ENGINEERING**

# ENGR 300 ECONOMICS FOR ENGINEERS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Basic economic concepts, relationships between economic and engineering problems, role of interest and capital in cost minimization, analysis of financial statements, original and alternative investments, capital depreciation and replacement problems.

**4. Prerequisites:** None

**5. Text and Materials:** Donald G. Newnan, Ted G. Eschenbach, and Jerome P. Lavelle, Engineering Economic Analysis, 9th Ed., Oxford Univ. Press, 2004.

**6. Course Objectives:**

Course Outcomes

- the ability to calculate time value of money.
- an appreciation for rational decision making process.
- develop capabilities for identification of feasible alternatives.
- the ability to perform present worth, annual cash flow, and rate of return analyses.
- the ability to use computer tools for capital allocation evaluations, incremental analysis, & study of alternatives
- the ability to perform before and after tax comparisons of investments taking into account depreciation, investment credits & income taxes.
- the broad education necessary to understand the impact of engineering economics in a global/societal context.
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player.

**7. Topics Covered:** (in Order of Presentation)

- Introduction to Engineering Economics Ch. 1
- The Decision-Making Process Ch. 1
- Engineering Costs and Cost Estimating Ch. 2
- Interest and Equivalence Ch. 3 & 4
- Present Worth Analysis Ch. 5
- Annual Cash Flow Analysis Ch. 6
- Rate of Return Analysis Ch. 7
- Incremental Analysis Ch. 8
- Other Analysis Techniques Ch. 9
- Depreciation Ch. 11
- Income Taxes Ch. 12

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 53 units of upper division required courses of the mechanical engineering program.

| | |
|---|---|
| Other | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level

indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- a knowledge of simulation software
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Ram Manvi and Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**ENGINEERING**

# ENGR 301 ETHICS AND PROFESSIONALISM IN ENGINEERING

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Ethical and professional standards in engineering profession; impact of engineering profession on society; professional registration and liability; government regulations and legal responsibilities.

**4. Prerequisites:** Junior or Senior standing in engineering.

**5. Text and Materials:** Introduction to Engineering Ethics by R. Schinzinger & M. Martin, McGraw-Hill. ISBN: 0-07-233959-4.
Ethics in Engineering by M. Martin & R. Schinzinger, 4th Ed., McGraw-Hill. ISBN: 0-07-283115-4.
FE Review Manual by M. R. Lindeburg, Professional Publications, Inc. ISBN: 1-888577-53-3.

**6. Course Objectives:**

Course Outcomes

- Acquisition of the knowledge of professional responsibilities in engineering
- Acquisition of the knowledge of ethical issues in engineering professions
- Case studies of ethics in engineering and its impact on society
- Improvement in organization skills by identifying a team project and its building blocks
- Teamwork by working as a team to complete the term project
- Improvement in writing skills by means of term papers
- Improvement in presentation skills by means of team presentation.

**7. Topics Covered:** (in Order of Presentation)

- The Profession of Engineering (Ch. 1)
- Moral Reasoning and Ethical Theories (Ch. 2)
- Engineering as Social Experimentation (Ch. 3)
- Commitment to Safety (Ch. 4)
- Workplace Responsibilities and Rights (Ch. 5)
- Global Issues (Ch. 6)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 49 units of upper

| | |
|---|---|
| Engineering Science | 1 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an understanding of professional and ethical responsibility (abet f)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)

Skill outcomes:

- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Jeffrey Y. Beyon 05/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 103 INTRODUCTION TO MECHANICAL DESIGN

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Introduction to mechanical design; engineering drawing; engineering experiment; computer aided design; introduction to finite element analysis software.

**4. Prerequisites:** None

**5. Text and Materials:** Engineering Graphics Principles w/ GD&T, E. Max Raisor FIAE, SDC Publications
Engineering Design with SolidWorks, Planchard, SDC Publications Engineering Analysis with COSMOSWorks Software, Kurowski, SDC Publications

**6. Course Objectives:** Understand engineering graphics as a form of communication; Understand the principals of orthographic, pictorial, and auxiliary projection; Exposure to standard dimensioning; Build basic aptitude in 2D and 3D solid CAD modeling (SolidWorks); Exposure to the Finite Element Analysis (FEA, SolidWorks/COSMOS)

Course Outcomes

- knowledge of the product design process.
- ability to draw and read engineering drawings.
- ability to use of finite element analysis software for solving engineering problems.
- ability to prepare and deliver an oral presentation.

**7. Topics Covered:** (in Order of Presentation)

- Introduction to SolidWorks (1 session)
- SolidWorks, Basic Functions (2 sessions)
- Orthographic Projection (2 sessions)
- Auxiliary Views (1 session)
- Isometric Views / Section Views (1 session)
- Dimension & Tolerance (2 sessions)
- GD&T / Assembly (1 session)
- Introduction to Structural Analysis (1 session)
- Material Strength Experiment (1 session)
- Finite Element Analysis (2 sessions)
- Introduction to Fluid Dynamics (1 session)
- Wind Tunnel Experiment (1 session)
- Computational Fluid Dynamics (2 sessions)
- Presentation (1 session)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 3 hours |

**9. Contribution of course to meeting the professional component:**

This course is part of the lower-division required courses.

| | |
|---|---|
| Other | 3 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- 7. a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Sangbum Choi and Maj Mirmirani 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 204 MECHANICAL MEASUREMENTS AND INSTRUMENTATION

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☑ | Upper Division | ☐ |

**3. Course Description:** Introduction to electrical circuits, engineering measurements and instrumentation, introduction to automatic control systems and components.

**4. Prerequisites:** PHYS 203

**5. Text and Materials:** Control Sensors and Actuators, Clarence W. deSilva, Prentice-Hall, 1989
Electric Circuits, Nilson, 3rd Edition, Addison Wesley, 1993 (Supplemental text)

**6. Course Objectives:** To provide essential elements of electrical circuit analysis with a definite focus on Mechanical Engineering application. To provide an introduction to instrumentation and devices used for measurements in electromechanical systems and introduction to automatic control systems.

Course Outcomes

- an understanding of, and an ability to analyze and select electric circuit components including current and voltage sources, resistance, inductance, capacitance, and operational amplifier.
- an understanding of and an ability to apply analytical and computer-aided methods for solution of electrical circuits.
- an understanding of basic measuring devices including transformers, transducers, and pressure, flow rate, and temperature measurement devices.
- Methods for rating instrument devices including dynamic range, resolution, accuracy and precision, bandwidth.
- an understanding of the elementary concepts and elements of automatic and feedback control system
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player.

**7. Topics Covered:** (in Order of Presentation)

- Introduction to Electric Circuit elements (supplemental text) (Ch. 1)
- Resistive circuits and electric sources (supplemental text) (Ch. 2,3)
- Analysis methods (supplemental text) (Ch. 4)
- Circuits with energy storing elements(supplemental text) (Ch. 5,6,7)
- Introduction to instrumentation, measuring devices, and control (Ch. 1)
- Performance specification and component matching (Ch. 2)
- Motion measurement sensors (Ch. 3)
- Torque, force, and tactile measurement sensors (Ch. 4)
- DC-motors and actuators (Ch. 6,7)
- Introduction to automatic control systems

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 68 units of lower division required courses for the mechanical engineering program.

| | |
|---|---|
| Engineering Science: | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Maj Mirmirani 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 306 HEAT TRANSFER I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Fundamental principles of heat transfer; conduction, convection, and radiation; applications.

**4. Prerequisites:** CE/ME 303 (Fluid Mechanics) or ME 326A (Thermodynamics I), MATH 215 (Differential Equations)

**5. Text and Materials:** Heat Transfer, Eight Edition, J. P. Holman, McGraw-Hill, 1997

**6. Course Objectives:** The student will develop a fundamental understanding of the basic principles and equations of heat transfer, through studies of conduction and forced convection, design methodologies of fins and heat exchangers, and computational methods for solving hear transfer problems

Course Outcomes

- an understanding of the differences between conduction, convection, and radiation heat transfer modes.
- the ability set-up, analyze and solve one-dimensional heat transfer problems.
- an understanding of the numerical processes for solving heat transfer problems.
- the ability to design and analyze heat transfer augmented by fins.
- the ability to set-up, analyze and solve multi-dimensional steady state conduction problems
- the ability to set-up, analyze and solve unsteady heat transfer problems
- an understanding of the principles used to design heat exchangers
- the ability to set-up, analyze and solve radiation heat transfer problems

**7. Topics Covered:** (in Order of Presentation)

- Heat Transfer Modes: Conduction, Convection, and Radiation
- One-Dimensional, Steady state Conduction
- Numerical Methods for Thermal System Design
- Fin Design
- Multi-Dimensional Steady State Conduction
- Analysis of Unsteady Heat Transfer
- Design Relations for Forced-Convection
- Heat Exchanger Design
- Radiation Heat Transfer

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 51 upper division units required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)

Attitudes Outcome:

- an ability to think in a logical sequential process

**11. Prepared by:** Darrell Guillaume 01/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 310 MECHANICAL ENGINEERING WRITING LABORATORY

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** The purpose of this course is to provide students with methods, strategies and context for developing clear and effective writing suitable for the mechanical engineering profession.

**4. Prerequisites:** Successful completion of all General Education writing requirements, including the Writing Proficiency Exam.

**5. Text and Materials:** Technical Writing Basics: A Guide to Style and Form, 3rd Edition, Holloway, Prentice Hall, 2005

**6. Course Objectives:** The purpose of this course is to draw the attention of students to the importance of written and oral communication skills in their engineering career success. The instructor provides students with methods, strategies, and context for developing clear and effective writing suitable for the mechanical engineering profession. Special attention is paid to issues of formatting, audience, purpose, organization, clarity, and style.

Course Outcomes

- Students will be able to prepare a concise and organized plan and outline for engineering research paper.
- Follow scientific and citation guidelines in the field of engineering.
- Students will be able to analyze how the scientific genre differs from composition writing.
- Students will be able to write and communicate effectively through writing memos, transmittal letters

**7. Topics Covered:** (in Order of Presentation)

- Course introduction; diagnostic quiz and grammar review
- Discussion of communication evaluation; workshop on editing and peer review
- Proposal workshop; discussion of letters of transmittal
- Technical presentations and PowerPoint workshop; discussion of Internet research methods;
- ECST librarian presentation on ME research databases; workshop on CBE citation
- Workshop on abstracts and executive summaries
- Job interview workshop; discussion of resumes and cover letters
- Review and wrap-up; peer and course evaluations; grammar/punctuation post-diagnostic

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hour 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the one year (48 quarter units) of Basic Mathematics and Science.

| | |
|---|---|
| Other | 1 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)

- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Maryam Azarbayjani 06/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 315 THERMAL SYSTEMS LABORATORY

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Experiments in heat transfer and thermodynamics; Thermophysical properties of fluids; analysis, operation, and performance testing of thermal energy conversion systems.

**4. Prerequisites:** ME 306 (Heat Transfer I), ME 326a (Thermodynamics I)

**5. Text and Materials:** Introduction to Heat Transfer, Fourth Edition, Frank P. Incropera and David P. DeWitt, John Wiley and Sons, 2002

**6. Course Objectives:** The student will become familiar with instrumentation commonly used in heat transfer and energy conversion systems.

Course Outcomes

- an understanding and the ability to apply the fundamental principles of heat transfer, heat transfer and fluid mechanics
- the ability to measure fluid velocity, pressure and temperature
- the ability to measure the flow and heat transfer characteristics around a tube bundle
- the ability to measure heat transfer in a lumped capacity system
- the ability to measure and analyze the performance characteristics of a mechanical heat pump
- the ability to measure steady state temperature profiles in conduction
- the skills necessary to measure and analyze HVAC systems
- the ability to determine the convective heat transfer coefficients in circular pipes
- an understanding of thermal storage systems
- the ability to analyze internal combustion systems
- the ability to measure the properties of fluids

**7. Topics Covered:** (in Order of Presentation)

- Data Collection and Analysis
- Measurement of Fluid Properties
- Lumped Capacity Systems
- Analysis of Heat Transfer from Fins
- Temperature Measurements during Conduction Heat Transfer
- Measurements of C onvection Heat Transfer Coefficients
- Analysis of Combined Conduction, Convection and Radiation Systems
- Analysis of a Vortex Tube
- Analysis of Heated Flow in a Wind Tunnel

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hours 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is a required laboratory course for the mechanical engineering program.

| | |
|---|---|
| Engineering Laboratory | 1 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Darrell Guillaume 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 321 KINEMATICS OF MECHANISMS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Transmission of motion; theory of mechanisms; linkages; gears; cams; belts and chains

**4. Prerequisites:** CE/ME 320 (Dynamics I)

**5. Text and Materials:** Kinematics and Dynamics of Machines, Second Edition, George H. Martin, Waveland Press, 1982

**6. Course Objectives:** This course is intended to present to students the concepts and methods as applied to the complete kinematic analysis of mechanisms. Graphical as well as analytical methods are discussed. During the course of carrying out the assignments, students are required to develop and apply computer models of the physical systems.

Course Outcomes

- the ability to analyze motions of linkages, gears, and compound mechanisms.
- the ability to perform a complete kinematic analysis of a four-bar linkage.
- the ability to analyze a planetary gear train.
- the ability to obtain computer solution by using commercial software.
- an ability to write a brief engineering report.

**7. Topics Covered:** (in Order of Presentation)

- Fundamental Concepts Ch. 1
- Properties of Motion Ch. 2
- Linkages Ch. 3
- Synthesis of Mechanisms Ch. 14
- The Concept of Instant Centers Ch. 4
- Velocities by Instant Centers and by Components Ch. 5
- Velocities by Method of Relative Velocities Ch. 6
- Application of Complex Numbers for Plane Kinematics Ch. 9
- Acceleration Analysis Ch. 7
- Gear Trains Ch. 13

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science: | 3 units |
| Engineering Design | 1 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Lih-Min Hsia 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 323 MACHINE DESIGN I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Application of principles of mechanics, properties of materials, and fabrication processes to design simple machines and structural elements.

**4. Prerequisites:** ME 103 Introduction to Mechanical Design, CE/ME 205 Strength of Materials, ENGR 207 Materials Science and Engineering, and Math 208 Calculus III: Sequence Series and Coordinate Systems

**5. Text and Materials:** "Machine Design, An Integrated Approach" (2nd ed.) Robert L. Norton, Prentice Hall, 2000.

**6. Course Objectives:** The student will learn current engineering methods used to determine stress and deformation of machine elements and to design simple machine components under static and dynamic loading.

Course Outcomes

- the ability to determine the principal stresses and maximum shear stress in machine elements such as cylinders, curved members, beams, and columns.
- the ability to determine the deflection of machine members using various techniques and to design machine elements to satisfy the desired stiffness.
- the ability to predict failure of machine elements under steady lading using various theories of failure.
- the ability to predict failure of machine elements and their factor of safety under variable loading conditions using various theories of failure and to design machine elements to have a required factor of safety under variable loading conditions given.

**7. Topics Covered:** (in Order of Presentation)

- Introduction, Vibration Loading, Impact Loading Chapter 3
- Deflection of beams: Equations of deflection, Singularity Functions Chapter 3
- Mohr's Circle Chapter 4
- Normal, Shear, Bearing, Tearing, Bending, and Torsional Stresses; Combined Stresses Loading Chapter 4
- Stress Concentration Chapter 4
- Curved Beams Chapter 4
- Deflection of beams: Castigliano's method Chapter 4
- Axial Compression, Buckling of columns Chapter 4
- Stresses in Cylinders Chapter 4
- Static Failure Theories for ductile materials Chapter 5
- Static Failure Theories for brittle materials Chapter 5
- S_N Diagrams and fatigue life estimation Chapter 6
- Fatigue Failure theories, mechanisms, and models, Fatigue life & endurance limit Chapter 6
- Fatigue Stress Concentration Factors, Fracture mechanics Chapter 6
- Fully reversed stresses, Mean and alternating stresses Chapter 6
- Fluctuating stresses, multiaxial stresses Chapter 6

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minuts |

**9. Contribution of course to meeting the professional component:**

This course is one of the required courses in upper division required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 unit. |

Engineering Design 2 unit.

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Adel A. Sharif 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 326A THERMODYNAMICS I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Concepts of Equilibrium and temperature; first and second laws of thermodynamics. Properties of pure substances; ideal gases; application of thermodynamic principles to closed and open systems.

**4. Prerequisites:** MATH 208, Calculus III: Sequences, Series and Coordinate Systems); PHYS 202, General Physics

**5. Text and Materials:** Fundamentals of Thermodynamics, Fifth Edition, Sonntag, Borgnakke Van Wylen, John Wiley and Sons, 1998

**6. Course Objectives:**

Course Outcomes

- the understanding of the terms used in thermodynamics
- the ability to determine the properties of a pure substance
- the ability to identify the state of a pure substance
- an understanding of the difference between a path dependent and a path independent process
- an understanding of the zeroth law of thermodynamics
- an understanding of work
- an understanding of heat
- an understanding of the first law of thermodynamics
- the ability to apply the fist law of thermodynamics to a closed system
- an understanding and the ability to apply the concept of control volumes and control surfaces
- the ability to apply the first law of thermodynamics within a control volume
- an understand of the difference between a reversible and irreversible system
- an understanding of the second law of thermodynamics
- an understanding of the concept of entropy

**7. Topics Covered:** (in Order of Presentation)

- Concepts and Definitions
- Properties of Pure Substances
- Work and Heat
- First Law of Thermodynamics – Systems
- First Law of Thermodynamics – Control Volumes
- Second Law of Thermodynamics
- Entropy

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minuts |

**9. Contribution of course to meeting the professional component:**

This course is part of the 51 upper division units required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Darrell Guillaume 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 326B THERMODYNAMICS II

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Application of thermodynamic principles; steam generators, engines and turbines; combustion, vapor cycles; refrigeration; internal combustion engines.

**4. Prerequisites:** ME 326A (Thermodynamics I)

**5. Text and Materials:** Fundamentals of Thermodynamics, Sixth Edition, Sonntag, Borgnakke Van Wylen, John Wiley and Sons, 2003

**6. Course Objectives:** The student will gain experience in the application of the principles of thermodynamics and in the design and analysis of complex thermal energy conversion systems

Course Outcomes

- the ability to apply the first law and second law of thermodynamics
- the ability to find thermodynamics properties of fluids at given states
- the ability to predict the performance of a thermodynamic cycle
- the ability to predict the thermodynamic performance of engines and heat pumps
- the ability to design and analyze power or refrigeration cycles
- an understanding of ideal gas mixtures
- the ability to predict air-vapor mixture properties and performance of a psychometric system
- the ability to balance chemical reactions between fuels and oxidizers
- the ability to predict the thermodynamic performance of a combustor

**7. Topics Covered:** (in Order of Presentation)

- Review of First Law and Second Law
- Otto & Diesel Cycles – Ch. 11
- Internal & External Combustion Engines – Ch. 11
- Stirling Cycle – Ch. 11
- Brayton Cycle & Ericsson Cycle – Ch. 11
- Jet Engine Cycle – Ch. 11
- Rankine Cycle & Power Plants – Ch. 11
- Reheat & Regeneration Cycles – Ch. 11
- Air Refrigeration Cycle – Ch. 11
- Vapor-Compression Refrigeration – Ch. 11
- Mid-Term Exam
- Ideal Gas Mixtures – Ch. 12
- Gas-Vapor Mixtures – Ch. 12
- Psychometrics – Ch. 12
- Combustion Process – Ch. 14
- First Law of Reacting System – Ch. 14
- Enthalpy of Formation– Ch. 14
- Adiabatic Flame Temperature – Ch. 14
- Second Law of Reacting System – Ch. 14
- Combustion Efficiency – Ch. 14

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minuts |

**9. Contribution of course to meeting the professional component:**

This course is part of the 51 upper division units required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Chivey Wu 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 327 MANUFACTURING PROCESSES

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Manufacturing properties of metals, alloys, and non-metallic materials; solidification processes; material forming; material removal; joining processes; numerical control and automated processes.

**4. Prerequisites:** ENGR 207 Material Science and Engineering

**5. Text and Materials:** Manufacturing Processes for Engineering Materials, 4th., S. Kalpakjian, Addison-Wesley, 2003

**6. Course Objectives:** This course teaches students qualitative and quantitative approach to the solution of manufacturing problems without losing sight of the applied aspects of processing and equipment

Course Outcomes

- The ability to understand the complex nature of manufacturing and relation ship between design and manufacturing
- The ability to understand the basis for the selection of materials and manufacturing processes
- The appreciation for the global competition , world class manufacturing; lean production, agile manufacturing,
- The familiarization with the methods of testing materials: tension test compression, torsion, bending, hardness, fatigue, creep and impact, interpretation of obtained data, the limitation of tests.
- The ability to understand behavior of material in plastic region, true stress and true strain analysis and instability .
- The ability to understand origin and manifestation of residual stress
- The understand of physical meaning and use yield criteria, effective stress and strain, plane -stress and plane-strain
- The ability to understand effective stress, strain and work of deformation
- The ability to appreciate the influence of cold, warm and hot work on material properties
- Familiarization with commercially obtained metals and alloys
- The understanding of the structure and characteristic of surfaces of objects
- The understanding of basic concept of tribology: the origin and types of friction, wear and lubrication
- The familiarization of surface treatments and coatings
- The understanding of fluid flow and heat transfer in casting and different casting processes and practices
- The understanding of bulk deformation processes: forging, rolling, extrusion, drawing and swaging
- Ability to compute stresses, forces, and power consumed in forming using slab method analysis.
- Familiarization with basic cutting processes, tools life, tool wear and miscellaneous other manufacturing processes
- An ability to appreciate realistic constrain and in real life challenges in manufacturing

**7. Topics Covered:** (in Order of Presentation)

- Importance and Interdisciplinary Nature of Manufacturing. – Ch. 1
- Global Competitiveness and Worldwide Manufacturing, Short Quiz – Ch. 1
- Solidification and Casting Processes – Ch. 2
- Fluid Flow and Heat Transfer in Casting – Ch. 2
- Casting Processes, Project I assigned – Ch. 2
- Mechanical Properties of Engineering Materials, tensile test – Ch. 2
- Creep, Impact and Fatigue. Manufacturing Properties – Ch. 3
- EXAM I
- Three-axial Stresses and Yield criteria – Ch. 4
- Residual Stresses, Plane Stress-Plain Strain, Three-axial Stresses – Ch. 4
- Overview of Joining Processes Project II due – Ch. 5

- Structure and Manufacturing Properties, Cold and Hot Work – Ch. 5
- Surface Structure and Properties, Friction and Wear – Ch. 6
- Lubrication and Surface Treatments – Ch. 6
- Stresses in Forging and Forging Practices – Ch. 6
- EXAM II
- Rolling, Extrusion and Drawing Analytical and practical Approach – Ch. 8
- Sheet Metal Forming – Ch. 11
- Cutting of Materials – Ch. 12
- Tool Materials, Tool Wear and Machinabilty – Ch. 12

**8. Class Schedule:** Number of Sessions per week: 1
Duration of each session: 1 hour 40 minutes

**9. Contribution of course to meeting the professional component:**

This course is junior level required course for all mechanical engineering students.

| | |
|---|---|
| Engineering Science | 2 unit |
| Engineering Design | 2 unit |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Neda Fabris 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 402 ADVANCED MECHANICS OF MATERIALS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Basic concepts; unsymmetrical beam bending, shear flow; energy methods; the finite element method; theories of failure; introduction to theory of elasticity, plane elastostatic problems; torsion of prismatic cylinders

**4. Prerequisites:** ME 323 (Machine Design I), MATH 215 (Differential Equations).

**5. Text and Materials:** Advanced Strength and Applied Stress Analysis, Second Edition, Richard G. Budynas, McGraw-Hill, 1999.

**6. Course Objectives:** Seniors in M.E. will learn and understand concepts and principles, and methods of analysis, drawn from advanced strength of materials, and from elementary theory of elasticity. They will apply these concepts, principles, and methods to design.

Course Outcomes

- Ability to determine bending stresses for beams with unsymmetrical cross sections.
- Ability to determine bending and shear stresses for beams with thin-walled open sections.
- Ability to analyze the stresses in thick-walled pressurized cylinders.
- Ability to analyze deflections for linearly and nonlinearly elastic structures.
- Elementary understanding of the finite element method, and ability to use commercial FEM software.
- Ability to apply failure theories to brittle and ductile materials.
- Ability to perform deformation, stress and strength analyses for linearly elastic, machine and structural elements, under combined loading.
- Ability to calculate principal stresses and principal directions.
- Understanding of plane-stress and plane-strain problems, and torsion problems, within theory of elasticity.
- Awareness of the complexities and limitations of advanced strength of materials and the theory of elasticity.
- Ability to apply concepts and methods of analysis from advanced strength of materials and theory of elasticity to design situations.

**7. Topics Covered:** (in Order of Presentation)

- Review of some basic concepts: stress, strain, strain-stress relations. Strain-displacement relations.
- Review of axial loading, bending of beams with symmetrical cross sections.
- Introduction to the Finite Element Method: one-dimensional and two-dimensional spring element. Application to trusse
- Area moments of inertia; pure bending of unsymmetrical beams; more on beam transverse shear stresses; shear flow in open, thin-walled beams, shear center; thick-walled pressurized cylinders, press fits.
- Energy methods: work, strain energy, complementary energy, Castigliano's first theorem, complementary-energy theorem, Castigliano's second theorem.
- The Finite Element Method continued, one-dimensional truss element, triangular plane-stress element.
- Stress-strain diagram; theories of failure; factor of safety.
- Introduction to the Theory of Elasticity
- Plane elastostatic problems, the Airy stress function; torsion of prismatical cylinders, St. Venant's torsion function

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of upper division technical electives required for the mechanical engineering

program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 403 AERODYNAMICS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Airfoil characteristics; transonic, supersonic, and viscous effects on lift and drag; power considerations, plane performances, introduction to airplane and missile stability and control.

**4. Prerequisites:** CE/ME 303 (Fluid Mechanics I), MATH 208 (Calculus III)

**5. Text and Materials:** Brandt, Introduction to Aeronautics–A Design Perspective, 2nd Edition, AIAA Education Series, 2004.

**6. Course Objectives:** The student will develop a fundamental understanding of aerodynamics, propulsion systems and their relationship to the design of aircraft and aircraft performance.

Course Outcomes

- the ability to calculate properties of air in standard and non-standard atmospheric conditions.
- an appreciation for the history of aviation and aerodynamics
- the ability to estimate aerodynamic forces on a flying vehicle.
- the ability to select an airfoil and design a wing.
- the ability to select an adequate propulsion system and predict its performance.
- an introductory understanding of flight mechanics and flight stability.
- the broad education necessary to understand the impact of engineering solutions in a global/societal context.
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player.

**7. Topics Covered:** (in Order of Presentation)

- History and Trends in Aircraft Design – Ch. 1
- Properties of Air and the Atmosphere – Ch. 2
- Review of Airfoil Theory – Ch. 3
- Boundary Layer and Flow Separation – Ch. 3
- Wind tunnels and Airfoil Characteristics – Ch. 3
- Wing Theory – Ch. 4
- Empirical Wing Characteristics – Ch. 4
- Airfoil Selection and Wing Design – Ch. 4
- High Lift Devices – Ch. 4
- Aircraft Aerodynamics – Ch. 4
- Propeller Theory – Ch. 5
- Compressible Flow Theory – Ch. 5
- Jet Propulsion Systems – Ch. 5
- Flight Performance – Ch. 5
- Longitudinal Stability & Control – Ch. 6
- Lateral Stability & Control – Ch. 6
- Aircraft Structure – Ch. 7
- Introduction to Aircraft Design – Ch. 8
- Sizing and Weight Estimation – Ch. 8
- Case Studies – Ch. 9

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Chivey Wu 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 406 HEAT TRANSFER II

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Numerical methods in conduction; theory and application of convection; thermal radiation; condensing and boiling hear transfer; mass transfer special topics.

**4. Prerequisites:** ME 306 (Heat Transfer I) and CS 290 (Introduction to FORTRAN programming)

**5. Text and Materials:** Heat Transfer, Eight Edition, J. P. Holman, McGraw-Hill, 1997

**6. Course Objectives:** The student will gain an in-depth understanding of the principle modes of heat transfer. Additionally, the student will demonstrate the use of methods for performing heat transfer analysis.

Course Outcomes

- an understanding of the finite difference methods of steady-state numerical conduction and convection analysis
- an understanding of the finite difference methods of transient numerical conduction and convection analysis
- an understanding of boundary layer analysis
- the ability to determine the convection heat transfer coefficient in laminar flow
- the ability to determine the convection heat transfer coefficient in turbulent flow
- an understanding of the principles of free convection
- the ability to determine the convection heat transfer coefficient of free convection heat transfer
- an understanding of the effects of turbulent flow on heat transfer
- an understanding of radiation heat transfer
- the ability to determine the radiation heat transfer to and from black and gray bodies
- an understanding of the principles of boiling and condensing
- an understanding of the principles of mass transfer

**7. Topics Covered:** (in Order of Presentation)

- Numerical methods in conduction
- Design analysis of conduction in simple components
- Basic boundary layer theory convection
- Introduction to turbulence and eddy diffusivity models
- Design and analysis of convect ion heat transfer equipment
- Theory of black and diffuse gray thermal radiation
- Introduction to boiling and condensing
- Introduction to mass transfer

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process that lends itself to identifying, formulating, and solving engineering problems (abet e)

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Darrell Guillaume 01/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 407 DESIGN OF THERMAL SYSTEMS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Design in engineering practice; system simulation and optimization; economic, environmental, other constraints; practical aspects of equipment selection; thermal design literature.

**4. Prerequisites:** ME 306 (Heat Transfer I) and ME 326A (Thermodynamics I)

**5. Text and Materials:** Analysis and Design of Energy Systems, Third Edition, B.K. Hodge and Robert P. Taylor. Published by Prentice Hall, 1999

**6. Course Objectives:** The student will learn the fundamental operating principles of the components of thermal systems. Further, the student will gain an understanding of the design methodology which unites the diverse elements of engineering design and engineering science and the ability to utilize this methodology.

Course Outcomes

- the ability to apply the fundamental fluid mechanics necessary to design and analyze thermal systems
- the ability to apply the fundamental heat transfer necessary to design and analyze thermal systems
- the ability to design a piping system with the purpose of transmission of thermal-fluid energy
- the ability to design and analyze shell and tube heat exchangers
- the ability to design and analyze cross flow heat exchangers
- an understanding of pump characteristics
- the ability to select a pump for a thermal-systems based on the manufacture's specifications
- an understanding of the considerations necessary to design flow systems with pumps in series and parallel configurations
- the ability to perform an uncertainty analysis on piping and heat exchanger systems
- the ability to design a thermal system to meet a realistic need

**7. Topics Covered:** (in Order of Presentation)

- The design of piping systems
- The design of simple heat exchangers
- The design of complex heat exchangers
- The principles and selection process of prime movers
- Estimating uncertainty in thermal/fluid systems analysis
- The design of thermal system

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Darrell Guillaume 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 408 FLUID MECHANICS II

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Compressible and incompressible fluid dynamics; continuity, momentum and energy equations for viscous fluids; circulation and vorticity, Navier-Stokes equation, boundary layer theory, turbulence, two-dimensional flow, three-dimensional flow.

**4. Prerequisites:** CE/ME 303 (Fluid Mechanics I), MATH 215 (Differential Equations)

**5. Text and Materials:** A Brief Introduction to Fluid Mechanics, Second Edition, Munson, Young & Okiishi, John Wiley & Sons, 2001.

**6. Course Objectives:** To introduce the governing equations of viscous, inviscid and compressible fluid flow, some basic solutions to these equations, and methods of solving engineering problems involving fluid dynamics.

Course Outcomes

- a knowledge of the governing equations for potential flow and basic flow solutions
- a knowledge of the Navier-Stokes equations for viscous flow and basic flow solutions
- a knowledge of the compressible flow theory for perfect gas
- a knowledge of Computational Fluid Dynamics (CFD) software and on-line fluid mechanics software
- an ability to predict the boundary layer thickness and skin friction drag on a surface
- an ability to predict the lift and drag on a body moving in a fluid
- an ability to solve problems involving 1-D isentropic flow, normal shock and oblique shock
- an ability to utilize various computer software for problems and design projects involving fluid flow

**7. Topics Covered:** (in Order of Presentation)

- Review of Control Volume Analysis
- Potential Flow Theory
- Basic Potential Flow Solutions
- Superposed Solutions
- Navier-Stokes Equ. for Viscous Flow
- Simple Solutions of Viscous Flow
- Laminar Boundary Layer Theory
- Integral Momentum Method
- Turbulent Boundary Layers
- Drag Prediction
- Lift Prediction
- Ideal Gas Properties
- 1-D Isentropic Flow
- Normal Shock

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)

**11. Prepared by:** Darrell Guillaume 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 409 MECHANICAL ENGINEERING ANALYSIS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Setup of vibration, heat transfer, fluid flow, and other mechanical engineering systems as ordinary and partial differential equations; analogies between various physical systems. Classical, transform, numerical, and computer-aided methods for solutions.

**4. Prerequisites:** Math 215 and Senior Standing

**5. Text and Materials:** Advanced Engineering Mathematics, 8th Edition, E. Kreyszig, John Wiley and Sons, 1999.

**6. Course Objectives:** To teach students some basic concepts needed for analysis and design of mechanical engineering systems

Course Outcomes

- the ability to apply advanced mathematical methods to the analysis and design of engineering systems
- the ability and skill to develop idealized mathematical model of physical systems that capture the salient aspects of the system.
- the ability to apply ordinary and partial differential equations to model engineering systems.
- the ability apply numerical methods and computer-aided engineering software and perform simulation studies.
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player.

**7. Topics Covered:** (in Order of Presentation)

- First Order Differential Equations
- Linear Differential Equations of Second and Higher Order
- Development of Mat hematical Models
- Application of Laplace Transformation Solution of Differential Equations to Mechanical Engineering Systems
- Fourier Analysis
- Partial Differential Equations

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of upper division technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability

**11. Prepared by:** Adel Sharif 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 410 CONTROL OF MECHANICAL SYSTEMS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Mathematical models of dynamic systems, fundamentals of feedback control, basic control action and devices, application to mechanical systems.

**4. Prerequisites:** CE/ME 303, Fluid Mechanics; ME 306, Heat Transfer I; CS 290, Introduction to Fortran programming; MATH 215, Differential Equations.

**5. Text and Materials:** Modern Control Engineering, Third Edition, Katsushiko Ogata, Prentice-Hall, 1997

**6. Course Objectives:** To provide basic understanding of dynamic system behavior of engineering systems. To introduce elements and concepts involved in design of single-input, single-output feedback control systems. To teach application of analytical, graphical, and computer-aided methods used in design and analysis of feedback control systems.

Course Outcomes

- an understanding of the basic concepts and elements of automatic and feedback control system.
- an understanding of dynamic behavior of physical and engineering systems.
- an ability to develop mathematical models for simple linear lumped parameter dynamic systems.
- an ability to apply Laplace transform and other mathematical methods to predict the response of simple linear systems to various inputs.
- an appreciation of transient versus steady state response.
- a basic understanding of control actions and devices that realize such actions.
- an understanding of concept of stability
- an ability to apply analytical, graphical and computer-aided methods used in design of control systems.
- an ability to analyze and design simple single-input single-output control systems.
- an understanding of the contribution of controls as a highly developed and an interdisciplinary engineering science in the recent technological advances and its overall impact in a societal/global context.
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player.

**7. Topics Covered:** (in Order of Presentation)

- Dynamic Behavior of Physical Systems (Ch. 1)
- Elements of a Single-input Single-output Control System (Ch. 1)
- Linear Differential Equations and the Laplace Transform Method (Ch. 1)
- Mathematical Models of Physical Systems (Ch. 2)
- Linearization, Analogous Systems , dc Motors Sensors (Ch. 2)
- Proportional, Integral, Derivative, and PID Control Actions (Ch. 3)
- Time-domain and Frequency-domain Characterization of Transient Response (Ch. 4)
- Error Analysis, Parameter Optimization (Ch. 4)
- Steady State error and Stability of Feedback Control Systems, Routh's Stability Criterion (Ch. 4)
- The Root Locus Method (Ch. 5)
- Application of Computer-aided analysis and design Methods including MATLAB and SIMULINK. Use On-line Manual and Tutorial
- Case Studies and Discussions of Term Project

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement

**11. Prepared by:** Maj Mirmirani 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 411 VIBRATIONAL ANALYSIS I

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Analysis of free and forced vibrations with and without damping, systems with several degrees of freedom, vibration isolation, mechanical transients, torsional vibrations, natural frequency computation techniques, finite element analysis software.

**4. Prerequisites:** CE/ME 320 (Dynamics I), MATH 215 (Differential Equations).

**5. Text and Materials:** Theory of Vibration with Applications, William T.Thomson, and Marie Dillon Dahleh, 5th Ed., Prentice-Hall, 1998.

**6. Course Objectives:** Seniors in M.E. will learn and understand concepts and principles, and methods of analysis, in mechanical vibrations. They will apply these concepts, principles, and methods to design.

Course Outcomes

- Ability to set up the governing equations of motion for single and two degree of freedom systems.
- Ability to calculate the natural frequencies for single and two degree of freedom systems, and the normal modes for two degree of freedom systems.
- Ability to apply the energy method to calculate the natural frequency of a single degree of freedom system.
- Ability to apply Rayleigh's method to account for the effect on natural frequency of distributed mass.
- Ability to determine the steady-state harmonic response for single and two degree of freedom systems
- Ability to determine the transient and shock response for single and two degree of freedom systems using the convolution integral and the Laplace transform.
- Understanding of the workings of vibration measuring equipment.
- Elementary understanding of the finite element method, and ability to use commercial FEM software.
- Ability to perform modal analysis for two degree of freedom systems.
- Awareness of the complexities and limitations of linear vibration analysis.
- Ability to apply concepts and methods of analysis form mechanical vibrations to design situations.

**7. Topics Covered:** (in Order of Presentation)

- Free vibration of a single degree of freedom (SDOF), undamped, linear system; conservation of energy; free vibration of a SDOF, viscously damped, linear system; Coulomb damping; instructions for using finite element software such as MSC/PATRAN and NASTRAN.
- Response of a SDOF, linear system, to harmonic excitation; design applications: rotating unbalance, transmitted forces and vibration isolation, support motion; vibration measuring instruments; energy dissipated in a SDOF, viscously damped system during sinusoidal steady-state vibration; structural damping; Coulo mb damping; superposition principle; response to periodic forces
- Response to aperiodic forces, transient vibrations; impulse response; convolution integral; step response; system response by the Laplace transform method; design by shock response spectrum.
- Two degrees of freedom (TDOF) systems; free vibration of an undamped TDOF system; coupled coordinates; steady-state response of a TDOF, undamped system, to sinusoidal forces; design of vibration absorber; general response of an undamped system; response of a viscously damped system

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of upper division technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability

**11. Prepared by:** Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 412 STRENGTH OF MATERIALS LABORATORY II

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Fatigue tests of materials and connections, stress concentration, photo-elasticity, creep tests, shock and vibration tests, combined stresses, and individual projects.

**4. Prerequisites:** CE/ME 312 (Strength of Materials Laboratory I), CE 360 (Structural Mechanics I) or CE 323 (Machine Design I).

**5. Text and Materials:** Strength of Materials Lab II Notes, by Profs. George E. Mann and Alfred H. Fritz, CSULA.

**6. Course Objectives:** Seniors in M.E. will learn and understand concepts and principles associated with advanced experimental methods used to determine stress, strain and strength for mechanical components.

Course Outcomes

- Understand the principles and concepts of photoelasticity.
- Ability to operate circular polariscope, and acquire and interpret photoealstic data to determine stress concentrations and contact stresses.
- Understand the principles and concepts of resistance strain gages.
- Ability to operate universal testing machine to acquire and then interpret strain-gage data for determining the stresses in a compressed split-ring.
- Ability to acquire and interpret strain-gage data to determine the shear center for a channel beam section.
- Ability to operate universal testing machine to acquire load and strain-gage data to determine the compressive stress-strain diagram for an aluminum specimen.
- Ability to operate universal testing machine to determine and interpret the elastic and inelastic buckling loads of aluminum columns.
- Ability to operate universal testing machine to acquire and then interpret strain-gage data for determining the mechanical behavior of adhesive-bonded joints.
- Ability to operate a rotating-beam fatigue testing machine to acquire and then interpret fatigue data for specimens with and without stress concentrations.

**7. Topics Covered:** (in Order of Presentation)

- Photoelasticity: Determination of fringe constant from beam in pure bending. Report required
- Photoelasticity: Determination of fringe constant from disk in compression; determination of stresses in compressed split-ring. Report required.
- Photoelasticity: Determination of stress concentrations and contact stresses. Report required.
- Strain Gages: Determi nation of stresses in compressed split-ring. Report required.
- Strain Gages: Determination of the shear center for a channel beam section. Report required
- Elastic and inelastic buckling of columns. Report required.
- Strain Gages: Behavior of adhesive-bonded single-lap and scarf joints. Report required
- Fatigue testing. Report required

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 3 hours |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of upper division technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 1 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 414 MACHINE DESIGN II

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Design of unit assembles and machines: materials, safety, lubrication, and construction.

**4. Prerequisites:** ME 323, Machine Design I

**5. Text and Materials:** "Machine Design, An Integrated Approach" (2nd ed.) Robert L. Norton, Prentice Hall, 2000.

**6. Course Objectives:** Students will learn current engineering methods used in the design and selection of machine components.

Course Outcomes

- The ability to calculate surface stresses, to predict surface failure under various loading conditions, and to design machine components against surface failure.
- the ability to size and select fasteners for systems with both static and dynamic forces both static.
- the ability to design and select material for mechanical springs.
- an appreciation for the variety of ways rotating machine components can be mounted in machines with rolling contact bearings.
- the ability to select and size ball and roller bearings given the loading and life requirements.
- the ability to design and select materials for spur, helical and worm gear systems.
- an appreciation of how various machine components and engineering methods have evolved.

**7. Topics Covered:** (in Order of Presentation)

- Surface stresses, surface failure prediction and design Chapter 7
- Design of shafts, keys and couplings Chapter 9
- Bearings and lubrications Chapter 10
- Gear stress and strength analysis, gear design Chapter 11
- Spring design Chapter 13
- Screws and fasteners Chapter 14

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 1 units |
| Engineering Design | 3 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

(abet k)

- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability

**11. Prepared by:** Adel A. Sharif 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 415 AIR CONDITIONING

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Psychrometric properties of air, heat loads, air conditioning and heating equipment, and air distribution

**4. Prerequisites:** ME 306 and ME 326 B

**5. Text and Materials:** Heating, Ventilating, and Air Conditioning, Analysis and Design, 5th ed., McQuiston, F.C., and Parker, J.D.,and Spitler,J.D, John Wiley and Sons, 2000

References:

Heating and Cooling Buildings, Design for Efficiency. Jan . Kreider, and Ari Rabl, McGraw-Hill, 1994.

Jennings, The Thermal Environment conditioning and Control, Harper & Row, 1978.

ASHRAE Handbook, 1992

**6. Course Objectives:**

Course Outcomes

- the ability to calculate the properties of moist air, psychrometrics for human comfort, and health.
- an appreciation for the history of air conditioning.
- the ability to estimate building heating, and cooling loads.
- the ability to evaluate physiological reactions to the environment.
- the ability to design hydronic and air distribution systems.
- an introductory understanding of duct design, and fan selection.
- the broad education necessary to understand the impact of engineering solutions in a global/societal context.
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player.

**7. Topics Covered:** (in Order of Presentation)

- Introduction (Ch. 1)
- Air-conditioning Systems (Ch. 2)
- Moist Air Properties and Conditioning Processes (Ch. 3)
- Comfort and Health-Indoor Environmental Quality (Ch. 4)
- Heat Transmission in Building Structures (Ch. 5)
- Space Heating Load (Ch. 7)
- The Cooling Load (Ch. 8)
- Energy Calculations (Ch. 9)
- Fans and Building Air Distribution (Ch. 12)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- a recognition of the need for an ability to engage in lifelong learning (abet i)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Ram Manvi 06/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 416 ENERGY SYSTEMS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Unconventional energy conversion systems, energy storage, thermoelectric power and refrigeration, absorption refrigeration, and cryogenics.

**4. Prerequisites:** ME 326 B

**5. Text and Materials:** Advanced Energy Systems, Nikolai V. Khartchenko, Taylor & Francis,1998
References:
Threkeld, J., Thermal Environmental Engineering, Prentice-Hall.
Culp, A., Principles of Energy conversion, McGraw-Hill Book Co.
Wood, B.D., Applications of Thermodynamics, 3rd ed., Addison-Wesley Publishing Co., 1993.
Sorensen, H.A, Energy Conversion Systems , John Wiley & Sons, 1983

**6. Course Objectives:**

Course Outcomes

- the ability to calculate energy conversion efficiencies for a variety of practical power systems.
- an appreciation for the history and technology advancements of energy conversion systems.
- the ability to perform preliminary design analyses to explore alternative means of energy conversion, storage, and utilization.
- the ability to evaluate candidate refrigeration and cryogenic systems, and estimate their costs.
- the ability to size energy storage systems.
- an introductory understanding of direct energy conversion techniques and their applications.
- the broad education necessary to understand the impact of engineering solutions in a global/societal context.
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player in engineering design projects.

**7. Topics Covered:** (in Order of Presentation)

- Introduction : Fundamentals of Energy (Ch. 1)
- Fuel Combustion and Gasification (Ch. 2)
- Steam Power Plant Technology (Ch 4)
- Gas Turbine Based Combined Cycle Power Plants (Ch 6)
- Cogeneration
- Refrigeration and Cryogenics (References )
- Fuel Cell (Ch 8)
- Direct Energy Conversion (References )
- Advanced Energy Storage Systems (Ch.10)
- Design and Analysis of Various Alternative Energy Systems (References)
- Cryogenics (References)

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of upper division technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- a knowledge of computer aided design and simulation software
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- a recognition of the need for an ability to engage in lifelong learning (abet i)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:**

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 417 MACHINE ANALYSIS LAB

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Experimental analysis of steady state and transient characteristics of machine components and of complete machines.

**4. Prerequisites:** ME 321, ME 323

**5. Text and Materials:** No text. In class handouts from Instructor.

**6. Course Objectives:** Students will learn about the various devices and methods for making mechanical measurements, develop a fundamental understanding of current data acquisition techniques, and make mechanical measurements using actual machines.

Course Outcomes

- the ability to understand and to use the various means for making mechanical measurements.
- the ability to use and understand typical sensing devices used for the measurement of displacement, velocity, acceleration, force torque, and speed.
- the ability to employ electronic instrumentation and state-of-the-art data acquisition software in mechanical measurements.
- the ability to acquire and analyze data involving mechanical measurements of displacement, velocity, acceleration, force, torque, and speed, and to evaluate the accuracy of the data.

**7. Topics Covered:** (in Order of Presentation)

- Strain gages, sensor design and application.
- Experimental determination of moment of inertia.
- Experiment involving the motion and dynamics in a four-bar linkage.
- Theoretical analysis aspects of cams, kinematics and dynamics.
- Experiment involving the motion and dynamics of cams; eccentric, parabolic, SHM, and cycloidal.
- Experiment involving the balancing of a un-balanced rotor in its own bearing

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hour 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 4 units of technical lab electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 1 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)

- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Adel Sharif 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 419 COMPUTER-AIDED PROBLEM SOLVING IN MECHANICAL ENGINEERING

| | | | | |
|---|---|---|---|---|
| **2. Designation:** | Required | ☐ | Elective | ☑ |
| | Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Application of computer-aided numerical and graphical methods to the solution of problems drawn from various areas of mechanical engineering. The computer-aided methods will be implemented using a combination of one or more computer programming languages and/or existing software packages.

**4. Prerequisites:** CS 290 (Intro. to FORTRAN Programming, or equivalent), ME 303 (Fluid Mechanics I), ME 306 (Heat Transfer I), ME 323 (Machine Design I), ME 326A (Thermodynamics I)

**5. Text and Materials:** Numerical Methods for Engineers, 2nd Ed., Steven C. Chapra and Raymond P. Canale, McGraw-Hill, 1988

**6. Course Objectives:** The student will learn and understand the characteristics and relative advantages of a number of practical numerical methods. The student will apply these methods to solve engineering problems.

Course Outcomes

- Understand the need for computer-aided numerical methods in problem solving.
- Understand the role of approximations and errors in numerical methods.
- Ability to choose and apply the best computer-aided bracketing methods and open methods for finding roots of equations.
- Ability to choose and apply the best computer-aided methods available for solving systems of linear algebraic equations.
- Ability to choose and apply the best computer-aided least-squares regression, interpolation and Fourier approximation methods for curve fitting.
- Ability to choose and apply the best computer-aided methods for numerical integration and differentiation.
- Ability to choose and apply the best computer-aided methods available for solving numerically ordinary differential equations including boundary-value problems and eigenvalue problems.
- Ability to choose and apply the best computer-aided finite difference and finite element methods for solving elliptic and parabolic partial differential equations.

**7. Topics Covered:** (in Order of Presentation)

- Introduction: Mathematical Modeling in Mechanical Engineering Problem Solving; Overview of Programming Languages; Overview of Numerical and Graphical Software Packages; Approximations and Errors (Ch. 1,2,3)
- Roots of Equations: Bracketing Methods: Bisection and False Position; Open Methods: One-Point Iteration, Newton-Raphson, Secant Methods; Case Studies (Ch. 4,5,6)
- Systems of Linear Algebraic Equations: Gauss Elimination; Matrix Inversion and Gauss-Seidel Method; Lower and Upper Triangular Matrix Product Decomposition Methods; Case Studies (Ch. 7,8,9,10)
- Curve Fitting: Least-Squares Regression: Linear, Polynomial, Multiple Linear, Nonlinear; Interpolation: Newton's and Lagrange Polynomials, Splines; Fourier Approximation: Fast Fourier Transform; Case Studies (Ch. 11,12,13,14)
- Numerical Integration and Differentiation: Newton-Cotes Integration Formulas: Trapezoidal and Simpson's Rules, Open Formulas; Integration of Analytical Equations: Romberg Integration, and Gauss Quadrature; Numerical Differentiation; Case Studies (Ch.15,16,17,18)
- Ordinary Differential Equations: One-Step Methods: Euler, Heun, Improved Polygon and Runge-Kutta Methods; Adaptive Step Size Control: Adaptive Runge-Kutta and Multistep Methods; Boundary-Value Problems: Shooting and Finite Difference Methods; Eigenvalue Problems: Polynomial and Power Methods; Case Studies (Ch. 19,20,21,22)
- Partial Differential Equations: Finite Differences Applied to Elliptic Equations: Laplace Equation; Finite

Differences Applied to Parabolic Equations: Heat-Conduction Equation; Finite Element Method: One Dimensional and Two Dimensional Applications; Case Studies (Ch. 23,24,25,26)

**8. Class Schedule:** Number of Sessions per week: 2
Duration of each session: 1 hour 40 minutes

**9. Contribution of course to meeting the professional component:**

This course is part of the 51 units of upper division major requirements in the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- a knowledge of computer aided design and simulation software
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement

**11. Prepared by:** Stephen F. Felszeghy 12/1999
Updated by Maj Dean Mirmirani 01/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 421 DYNAMICS OF MACHINES

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Application of principles of statics, kinematics, and dynamics to analyze and design of mechanisms with rotating or reciprocating masses

**4. Prerequisites:** ME 321, Kinematics of Mechanisms

**5. Text and Materials:** Design of Machinary, 3rd edition, R.L. Norton, Mc Graw Hill, 2005.

**6. Course Objectives:** Students will learn current engineering methods used in the analysis and design of dynamic mechanical systems.

Course Outcomes

- the ability to determine static and dynamic forces in mechanisms.
- the ability to formulate and solve differential equations of motion for multimass, single degree of freedom mechanical systems.
- the ability to analyze and design compound and epicyclic gear trains.
- an ability to determine the required inertial effect of flywheels and determine the gyroscopic effects of rotors.
- the ability to analyze the dynamics of cam operated systems.
- the ability to determine critical speeds in machines and to select isolation mounts to reduce motion and transmitted forces in vibrating systems.

**7. Topics Covered:** (in Order of Presentation)

- Virtual work methods in mechanisms
- Energy methods in formulating equation of motion in mechanisms
- Gear Trains
- Flywheels
- Cam Systems
- Undamped vibrations, rotating unbalance, critical speeds and transmissibility of motion and force in vibrating systems
- Transformation of moments of inertia in rigid bodies
- Gyroscopic effects of flywheels

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 1 units |
| Engineering Design | 3 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such

as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)

- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability

**11. Prepared by:** Adel Sharif 12/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 422 OPTIMIZATION OF MECHANICAL SYSTEMS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Design consideration of mechanical engineering systems; optimization techniques; application analytical methods and computer-aided analysis and design software to optimization of engineering systems

**4. Prerequisites:** ME 319, Computer-aided Problem Solving in Mechanical Engineering; ME323, Machine Design I

**5. Text and Materials:** Design of thermal Systems, 3rd Ed., W. F. Stoecker, McGraw-Hill, 1989
References
Arora, J.S., Introduction to Optimal Design, McGraw-Hill, New York, 1989
Venkataraman, P., Applied Optimization with MATLAB Programming, John Wiley & Sons, Inc., New York, 2002

**6. Course Objectives:** To introduce the concept of engineering design, optimization criteria and objective function in the decision making process. The student will learn how to formulate and include feasibility considerations and engineering, economical, and environmental constraints. Student will learn how to apply optimization techniques to design better performing engineering systems, decision making process, and engineering project management.

Course Outcomes

- an understanding of engineering design and interactive decision making process and selection of optimization criteria.
- the ability to develop mathematical models and perform simulation studies for simple systems.
- an understanding of, and the ability to develop, meaningful optimization criteria.
- an understanding of, and the ability to develop engineering, economical, and environmental constraints.
- an understanding of, and the ability to apply analytical and computer-aided methods to search for, the extrema of functions of several variables subject to constraints
- the ability to apply linear, nonlinear, and dynamic programming techniques to the solution of optimization problems.
- an ability to apply optimization techniques to engineering project management problems.
- An appreciation of how optimization can be employed to improve economic life and lessen the adverse impact of technology on environment.
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player in systems engineering.

**7. Topics Covered:** (in Order of Presentation)

- Engineering Design (Ch. 1)
- Designing a Workable System Optimization, Economic Aspects (Ch.2)
- Economics
- Equation Fitting (Ch. 4)
- Modeling Thermal systems (Ch. 5)
- Systems Simulation (Ch. 6)
- Optimization (Ch. 7)
- Lagrange Multipliers (Ch 8)
- Calculus-based Optimization Techniques and Search Methods (Ch.9 & Ch 16)
- Dynamic Programming (Ch. 10)
- Linear Programming (Ch. 12)
- Comercial Software (MATLAB & GMAS)

**8. Class Schedule:** Number of Sessions per week: 2

Duration of each session: 1 hour 40 minutes

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Maj Mirmirani 01/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 423 INTRODUCTION TO THE FINITE ELEMENT METHOD

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Derivation of element stiffness matrices for spring, bar, beam, and constant-strain triangle elements, from energy principles. Application to trusses and frames. Steady-state heat transfer. Use of finite element method software.

**4. Prerequisites:** CE/ME 210 (Matrix Algebra for Engineers), CS 290 (Introduction to FORTRAN Programming), MATH 215 (Differential Equations), Corequisites: ME 306 (Heat Transfer I), ME 323 (Machine Design I).

**5. Text and Materials:** A First Course in the Finite Element Method, 3rd Ed., D. L. Logan, Brooks/Cole, 2002

**6. Course Objectives:** Seniors in Mechanical Engineering will learn and understand the concepts and principles, and methods of analysis, followed in the displacement, or stiffness, approach within the finite element method, to model and simulate deformable bodies under loading, and heat transfer processes.

Course Outcomes

- Ability to carry out the conceptual and computational steps followed in the displacement, or stiffness, approach, within the finite element method, to model bodies and simulate deformation processes, the steps being: body discretization, element shape function selection, element stiffness matrix development, specification of loads and boundary conditions, and assembly and solution of governing force-displacement matrix equations.
- Ability to carry out analogous steps for steady-state heat transfer.
- Ability to derive element stiffness matrices for linearly elastic spring, bar, beam, and constant-strain triangle elements, from the principle of stationary potential energy.
- Ability to assemble element stiffness matrices to represent three-dimensional trusses, two-dimensional frames, and plates.
- Ability to formulate loads and boundary conditions for truss and frame structures, and plane-strain and plane-stress problems, and incorporate them into the governing force-displacement matrix equations.
- Ability to solve the governing force-displacement matrix equations, by hand calculations, or with mathematical software, or commercial FEM software.
- Ability to extract element stress information.
- Awareness of the complexities and limitations of the finite element method.
- Ability to apply concepts and methods of analysis from the finite element method to homework problems.
- Ability to solve steady-state heat transfer problems with commercial FEM software.

**7. Topics Covered:** (in Order of Presentation)

- Introduction. History, applications, advantages, and limitations of FEM. Steps of FEM. Computer programs for FEM.
- Introduction to the Stiffness (Displacement) Method
- Development of Truss Equations
- Development of Beam Equations
- Development of Frame Equations
- Two-Dimensional Elements
- Modeling Guidelines Using the CST Element as an Example
- Steady-State Heat Transfer

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 25 units of upper division technical electives required for the mechanical engineering program.

Engineering Science 4 units

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- a knowledge of computer aided design and simulation software
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement

**11. Prepared by:** Stephen F. Felszeghy 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 428 AUTOMATION AND COMPUTER-AIDED MANUFACTURING

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Automation of manufacturing processes, numerical control, computer-aided manufacturing, group technology, flexible manufacturing, applications of robots in industry.

**4. Prerequisites:** ME 327 (Manufacturing Processes)

**5. Text and Materials:** Automation, Production Systems, and Computer-Integrated Manufacturing, 2nd ed., M.P. Groover, Prentice-Hall, Inc.2001

**6. Course Objectives:** This course provide students with knowledge of manufacturing systems automation, computer aided manufacturing and management techniques utilized in modern manufacturing environment. In this The course also provides "hands-on" experience in computer aided manufacturing and rapid prototyping.

Course Outcomes

- the understanding of history of automation, impact of automation on society and global economy
- the knowledge of types of production, plant layout, production concepts and mathematical models,
- the ability to compute cost of manufacturing, break-even analysis, unit cost of production
- the basic understanding of fixed automation and methods of workpart transport and transfer
- the familiarization with assembly processes, manual and automatic. The knowledge of methods used in analysis of automated flow lines a) without storage, b) with storage buffers.
- the knowledge of balancing of assembly lines..
- the knowledge of principles used in the design for assembly and manufacturing
- the familiarization with Process Design methods: Pareto Analysis, Ishikawa diagrams
- the understanding of principles of Total Quality Management, Deming principals, Taguchi Loss Function, Quality Function Deployment, Just-in Time practices, Lean manufacturing
- the knowledge of statistical process analysis and control, process capability analysis
- the understanding of group technology, part families and production flow analysis
- the ability to analyze and design machine cells
- the familiarization with the numerical control production systems, NC machining and adaptive control
- the "hands-on" experience in programming using MASTER CAM and NC machining and rapid prototyping
- an ability to work in teams and to perform concurrent engineering
- an ability to communicate effectively in written, visual (CAD) and oral form
- the appreciation of ergonomics, environmental and socioeconomic constrains

**7. Topics Covered:** (in Order of Presentation)

- Automation Defined, Reason for Automating
- Production Systems Facilities, Plant Layout
- Manual labor in Production Systems Ten Strategies for Automation
- Manufacturing Operation, Manufacturing
- Production Rate, Cost of Manufacturing, Overhead rates
- Introduction to NC and CNC
- Material Handling.
- Material Transport Systems
- Intro to Manufacturing Systems
- Analysis of automated Flow Lines
- Single Station Manufacturing Cells
- Group Technology and Part Families
- Design of Manufacturing and Assembly cells

- Flexible manufacturing Systems
- Manual Assembly Lines and Line Balancing
- Automated Production Lines without and with storage buffers
- Quality Assurance
- Ergonomic Design
- Process Planning, Concurrent Eng.
- Lean and Agile Man. ISO 900

**8. Class Schedule:** Number of Sessions per week: 2
Duration of each session: 1 hour 40 minutes

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 2 units |
| Engineering Design | 2 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to visualize designs from engineering drawings

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Neda Fabris 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 430 PROPERTIES AND SELECTION OF ENGINEERING MATERIALS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Production, strengthening, alloying and thermal treatment of metals. Types and properties of polymers, ceramics and composites. Semiconductor materials and devices. Material selection and protection against deterioration.

**4. Prerequisites:** ME 207 (Material Science), or equivalent

**5. Text and Materials:** Material Science and Engineering, Sixth Edition, W.D. Callister, Wiley, 2003

**6. Course Objectives:** The student will develop knowledge of types and properties of common engineering materials, their modification by thermal and mechanical treatment, their manufacturing characteristics and time and environment dependent behavior with the end result of selecting proper material for specific application.

Course Outcomes

- the understanding of mechanical properties of engineering materials
- the familiarization with standardized tests used to determine properties
- the understanding of heat treatment methods that alter the properties of materials
- the understanding of material solidification and familiarization with common casting practices
- the ability to read phase diagrams and estimate the composition, quantities and properties of each phase
- familiarization with different methods of strengthen materials including grain size, cold work, dispersion and solid solution.
- the understanding of equilibrium and non-equilibrium phase diagrams of steel and cast iron and influence of alloying elements.
- the basic knowledge of properties of non-ferrous metals and alloys
- the familiarization with properties and structures of ceramics materials
- the basic understanding of formation, behavior, properties and forming of thermosetting, thermoplastic and elastomeric polymers
- introductory knowledge of composite materials
- the understanding of the electrical behavior of materials including conductivity of metals, semiconductors and superconductors.
- familiarization with the semiconductor devices including their fabrication
- the ability to select proper material for the given engineering application based upon behavior, properties and cost.
- the broad education necessary to understand the impact of engineering solutions in a global/societal context.
- an ability to communicate effectively in written form.

**7. Topics Covered:** (in Order of Presentation)

- Review of atomic bonding, imperfection in the atomic arrangement and diffusion
- Mechanical properties of engineering materials, tensile test
- Hardness test, impact test, fatigue test, creep test.
- Dislocations and Slip Systems Mechanism.
- Cold work and residual stresses, annealing and hot working
- Failure of engineering materials: fracture, fatigue and creep
- Equilibrium phase diagrams and solid solution strengthening. Dispersion strengthening by solidification
- Iron-Carbon System, isothermal transformation
- Phase Transformations in Metals: Development of Microstructures
- Fabrication and thermal processing of metals
- Structure and properties of ceramics
- Types and application of ceramics

- Fabrication and processing of ceramics
- Polymer structures
- Characteristics, Applications and Processing of Polymers
- Composites
- Electrical behavior of materials, conductors and semiconductors
- Electronic devices and manufacturing of semiconductors, Selection of materials

**8. Class Schedule:** Number of Sessions per week: 2
Duration of each session: 1 hour 40 minutes

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.
Engineering Science 4 units

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:
- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- a knowledge of measurement and manufacturing techniques

Skill outcomes:
- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to design a process to meet desired needs. (abet c)
- an ability to communicate effectively (abet g)
- an ability to select materials and manufacturing processes.

Attitudes Outcome:

**11. Prepared by:** Neda Fabris 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 454 SPECIAL TOPICS IN MECHANICAL ENGINEERING

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Production, strengthening, alloying and thermal treatment of metals. Types and properties of polymers, ceramics and composites. Semiconductor materials and devices. Material selection and protection against deterioration.

**4. Prerequisites:** ME 207, Material Science and Engineering, or equivalent

**5. Text and Materials:** The Science and Engineering of Materials, 3rd Ed., Published by PWS Publishing Company, 1997

**6. Course Objectives:** The student will develop knowledge of types and properties of common engineering materials, their modification by thermal and mechanical treatment, their manufacturing characteristics and time and environment dependent behavior with the end result of selecting proper material for specific application.

Course Outcomes

- the understanding of mechanical properties of engineering materials
- the familiarization with standardized tests used to determine properties
- the understanding of heat treatment methods that alter the properties of materials
- the understanding of material solidification and familiarization with common casting practices
- the ability to read phase diagrams and estimate the composition, quantities and properties of each phase
- familiarization with different methods of strengthen materials including grain size, cold work, dispersion and solid solution.
- the understanding of equilibrium and non-equilibrium phase diagrams of steel and cast iron and influence of alloying elements.
- the basic knowledge of properties of non-ferrous metals and alloys
- the familiarization with properties and structures of ceramics materials
- the basic understanding of formation, behavior, properties and forming of thermosetting, thermoplastic and elastomeric polymers
- introductory knowledge of composite materials
- the understanding of the electrical behavior of materials including conductivity of metals, semiconductors and superconductors.
- Familiarization with the semiconductor devices including their fabrication
- The ability to select proper material for the given engineering application based upon behavior, properties and cost.
- the broad education necessary to understand the impact of engineering solutions in a global/societal context.
- an ability to communicate effectively in written form.

**7. Topics Covered:** (in Order of Presentation)

- Review of atomic bonding, imperfection in the atomic arrangement and diffusion (Ch. 1 - 5)
- Mechanical properties of engineering materials, tensile test (Ch.6)
- Hardness test, impact test, fatigue test, creep test (Ch. 6)
- Introduction into fracture mechanics (Ch. 6)
- Cold work and strain hardening (Ch. 7)
- Microstructures and residual stresses, annealing and hot working (Ch. 7)
- Solidification process , solidification strengthening, defects casting processes and metal joining (Ch. 8)
- Unary phase diagrams and solid solution strengthening. Dispersion strengthening by solidification (Ch. 9,10)
- Dispersion strengthening by phase transformation and heat treatment (Ch. 11)
- Steels and heat treatment of steel, hardenability (Ch. 12)
- Types of steel, stainless steels cast irons (Ch. 12)

- Nonferrous metals and alloys (Ch. 13)
- Introduction to ceramics materials (Ch. 14)
- The structure of crystalline ceramics, silicates and glasses (Ch. 14)
- Processing and applications of ceramics, glasses & refractories (Ch. 14)
- Polymers, classification chain formation, polymerization (Ch. 15)
- Thermoplastics, thermosetting polymers, elastomers and adhesives (Ch. 15)
- Review of composite materials (Ch. 16)
- Electrical behavior of materials, conductors and semiconductors (Ch. 18)
- Electronic devices and manufacturing of semiconductors, Selection of materials (Ch. 18)

**8. Class Schedule:** Number of Sessions per week: 2
Duration of each session: 1 hour 40 minutes

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.
Engineering Science 4 units

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:
- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- a knowledge of measurement and manufacturing techniques

Skill outcomes:
- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to select materials and manufacturing processes

Attitudes Outcome:
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Neda Fabris 04/2000
Updated by Maj Dean Mirmirani 01/2006

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 481 INTRODUCTION TO ROBOTICS

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** General considerations of robotic manipulator; spatial description, homogeneous transformations; manipulator kinematics; inverse manipulator kinematics; motion trajectories; static forces.

**4. Prerequisites:** CE/ME320 (Dynamics I) or EE360 (Control Systems Theory I)

**5. Text and Materials:** Introduction to Robotics: Mechanics and Control, Third Edition, John J. Craig, Pearson Prentice Hall, 2005

**6. Course Objectives:** This course is intended to introduce to students the science and engineering of mechanical manipulation. Application of the theory for the analysis and design of industrial robots is emphasized. Students are required to develop computer models of the physical systems and use the models to solve open-ended design problems.

Course Outcomes

- the ability to analyze motions of mechanical manipulators.
- the ability to perform a complete dynamic force analysis of a robot.
- the ability to tackle problems involved in the design of manipulators.
- the ability to obtain computer solution by using commercial software.
- an ability to write a brief engineering report for a term project.

**7. Topics Covered:** (in Order of Presentation)

- Coordinate transformation
- Manipulator kinematics
- Manipulator inverse kinematics
- Static forces and Jacobians
- Manipulator dynamics
- Trajectory generation
- Manipulator design

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 1 hour 40 minutes |

**9. Contribution of course to meeting the professional component:**

This course is part of the 24 units of technical electives required for the mechanical engineering program.

| | |
|---|---|
| Engineering Science | 3 units |
| Engineering Design | 1 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)

- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Lih-Min Hsia 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 497A MECHANICAL ENGINEERING SENIOR PROJECT

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Study of engineering design processes. ME 497A includes case studies to discuss the impact of design constraints. 497B and 497C include the selection and completion of a faculty-supervised project focusing on typical problems encountered in engineering practice and resulting in a formal report and oral presentation. Must be taken in sequence starting with ME 497A

**4. Prerequisites:** Satisfactory completion of the graduation writing assessment requirement (GWAR), Senior standing and/or consent of the instructo

**5. Text and Materials:** Product Design and Development, Third Edition, Karl T. Ulrich, McGraw-Hill

**6. Course Objectives:** The three-quarter long Senior Project sequence is intended to provide students with a major design experience in Mechanical Engineering. In ME 497B, and C, the students are required to conduct a project of significant scope from its inception to its final completion. They need to write the specifications, evaluate parameters and constraints, and apply the engineering science and methods learned in previous classes to evaluate alternative solutions to the problem, select an optimum solution, and complete a design based on their assumptions and evaluations. The experience culminates with a presentation of results in a formal written and oral report and prototype building and testing in some cases.

Course Outcomes

- the ability to design a system, component, or process to meet desired needs.
- the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- the ability to select materials and manufacturing processes.
- the ability to think in a logical sequential process.
- an understanding of professional and ethical responsibility.
- a knowledge of computer aided design and simulation software.
- an ability to communicate effectively.
- an understanding of responsibility and accountability.
- a desire to be a professional that exhibits values, dedication and a need for continual improvement.

**7. Topics Covered:** (in Order of Presentation)

- The Engineering Design Process
- Project Planning and Scheduling
- Static force and stress analysis
- Fatigue analysis
- Manufacturing processes
- Cost estimate
- Contemporary issues
- Report writing
- Oral presentation preparation

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 3 hours |

**9. Contribution of course to meeting the professional component:**

This course is required for all mechanical engineering majors.

| | |
|---|---|
| Engineering Design | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Lih-Min Hsia 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 497B MECHANICAL ENGINEERING SENIOR PROJECT

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Study of engineering design processes. ME 497A includes case studies to discuss the impact of design constraints. 497B and 497C include the selection and completion of a faculty-supervised project focusing on typical problems encountered in engineering practice and resulting in a formal report and oral presentation. Must be taken in sequence starting with ME 497A

**4. Prerequisites:** Satisfactory completion of the graduation writing assessment requirement (GWAR), Senior standing and/or consent of the instructo

**5. Text and Materials:** Product Design and Development, Third Edition, Karl T. Ulrich, McGraw-Hill

**6. Course Objectives:** The three-quarter long Senior Project sequence is intended to provide students with a major design experience in Mechanical Engineering. In ME 497B, and C, the students are required to conduct a project of significant scope from its inception to its final completion. They need to write the specifications, evaluate parameters and constraints, and apply the engineering science and methods learned in previous classes to evaluate alternative solutions to the problem, select an optimum solution, and complete a design based on their assumptions and evaluations. The experience culminates with a presentation of results in a formal written and oral report and prototype building and testing in some cases.

Course Outcomes

- the ability to design a system, component, or process to meet desired needs.
- the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- the ability to select materials and manufacturing processes.
- the ability to think in a logical sequential process.
- an understanding of professional and ethical responsibility.
- the broad education necessary to understand the impact of engineering solutions in a global/societal context.
- a knowledge of computer aided design and simulation software.
- an ability to design and conduct experiments as well as to analyze and interpret data.
- an ability to communicate effectively.
- an understanding of responsibility and accountability.
- a desire to be a professional that exhibits values, dedication and a need for continual improvement.

**7. Topics Covered:** (in Order of Presentation)

- The Engineering Design Process
- Project Planning and Scheduling
- Static force and stress analysis
- Fatigue analysis
- Manufacturing processes
- Cost estimate
- Contemporary issues
- Report writing
- Oral presentation preparation

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 3 hours |

**9. Contribution of course to meeting the professional component:**

This course is required for all mechanical engineering majors.

Engineering Design 4 units

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Lih-Min Hsia 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 497C MECHANICAL ENGINEERING SENIOR PROJECT

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☑ | Elective | ☐ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Study of engineering design processes. ME 497A includes case studies to discuss the impact of design constraints. 497B and 497C include the selection and completion of a faculty-supervised project focusing on typical problems encountered in engineering practice and resulting in a formal report and oral presentation. Must be taken in sequence starting with ME 497A

**4. Prerequisites:** Satisfactory completion of the graduation writing assessment requirement (GWAR), Senior standing and/or consent of the instructo

**5. Text and Materials:** Product Design and Development, Third Edition, Karl T. Ulrich, McGraw-Hill

**6. Course Objectives:** The three-quarter long Senior Project sequence is intended to provide students with a major design experience in Mechanical Engineering. In ME 497B, and C, the students are required to conduct a project of significant scope from its inception to its final completion. They need to write the specifications, evaluate parameters and constraints, and apply the engineering science and methods learned in previous classes to evaluate alternative solutions to the problem, select an optimum solution, and complete a design based on their assumptions and evaluations. The experience culminates with a presentation of results in a formal written and oral report and prototype building and testing in some cases.

Course Outcomes

- the ability to design a system, component, or process to meet desired needs.
- the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- the ability to select materials and manufacturing processes.
- the ability to think in a logical sequential process.
- an understanding of professional and ethical responsibility.
- a knowledge of computer aided design and simulation software.
- an ability to communicate effectively.
- an understanding of responsibility and accountability.
- a desire to be a professional that exhibits values, dedication and a need for continual improvement.

**7. Topics Covered:** (in Order of Presentation)

- The Engineering Design Process
- Project Planning and Scheduling
- Force and stress analysis
- Fatigue analysis
- Manufacturing processes
- Cost estimate
- Contemporary issues
- Report writing
- Oral presentation preparation
- Case studies

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 2 |
| Duration of each session: | 3 hours |

**9. Contribution of course to meeting the professional component:**

This course is required for all mechanical engineering majors.

| | |
|---|---|
| Engineering Design | 4 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- an understanding of professional and ethical responsibility (abet f)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to visualize designs from engineering drawings
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Lih-Min Hsia 05/2005

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

# ME 499 UNDERGRADUATE DIRECTED STUDY

**2. Designation:**

| | | | |
|---|---|---|---|
| Required | ☐ | Elective | ☑ |
| Lower Division | ☐ | Upper Division | ☑ |

**3. Course Description:** Project selected in conference with the sponsor before registration; progress meetings held regularly, and a final report submitted. May be repeated for credit.

**4. Prerequisites:** Consent of an instructor to act as sponsor.

**5. Text and Materials:** Text varies. Resources include the Library, the Internet, all of the test equipment available in the college.

**6. Course Objectives:** To allow a student to independently research a topic and perform an experimental investigation related to the topic.

Course Outcomes

- Varies with Project

**7. Topics Covered:** (in Order of Presentation)

- Varies with Project and Advisor

**8. Class Schedule:**

| | |
|---|---|
| Number of Sessions per week: | 1 |
| Duration of each session: | 2 hour 50 minutes |

**9. Contribution of course to meeting the professional component:**

This course is a required laboratory course for the mechanical engineering program.

| | |
|---|---|
| Engineering Laboratory | 1 units |

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of measurement and manufacturing

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Darrell Guillaume 05/2005

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# APPENDIX 1C – FACULTY RESUMES

## FULL-TIME FACULTY



## PART-TIME FACULTY



## INDUSTRY ADVISORY BOARD MEMBERS

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**1. Name and Academic Rank**

**Fabris, Neda S., Professor**

**2. Degrees with fields, institution, and date**

1976 Doctor of Philosophy
Aerospace, Mechanics and Mechanical Engineering
Specialization: Manufacturing and Solid Mechanics
Illinois Institute of Technology

1972 Master of Science in Mechanical Engineering
Specialization: Manufacturing and Solid Mechanics
Illinois Institute of Technology

1965 Diploma Mechanical Engineer (Master in Mechanical Engineering)
University of Sarajevo, Bosnia and Herzegovina

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of Years on this Faculty: 27
Date of original Appointment, Assistant Professor, 9/79
Associate Professor: 9/83
Professor 9/86-present

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

1965 to 1970 Assistant Professor, Mechanical Engineering
University of Sarajevo, Bosnia and Herzegovina

1966 to 1967 Researcher, Institute for Machine Tools and Production Technology,
Technical University, Aachen, Germany

1967 to 1970 Director of Metal Cutting Laboratory,
University of Sarajevo, Bosnia and Herzegovina

1970 to 1974 Teaching Assistant and Lecturer
Illinois Institute of Technology, Chicago IL.

1974 to 1975 Lecturer, Department of Material Engineering
University of Illinois at Chicago Circle Campus, Chicago IL

Industrial Experience:

1976 to 1979 Member of Technical Staff, Bell Telephone Laboratory, Naperville IL

**5. Consulting, patents, etc.**

Consulting: Quantum Leap, Beverly Hills, Ca

Recent External Grants:

Fabris N.: “Engineering for Teachers”, K-12 teachers supplement, 2004 ($19,000)
Fabris N.: (PI), Ukpolo F. (Co-PI): “Engineering for Teachers Program”, NSF, 2002- 2004 ($94,000)
Fabris N.: (PI), Milton R. (Co-PI): "Mother-Daughter Academy" NSF 1999, ($ 97,988)
Fabris N.: “Determining Best Parameters for Machining Honeycomb Materials" ($45,900)
Lockheed Martin-CSU Partnership Program:

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

Fabris, N., Spuzic, S., Stevens C., Abhary K., Rice J., Nouwens F.: “Contribution to Cross-disciplinary Lexicon” paper accepted for the presentation at 4th ASEE/AaeE Global Colloquium in Engineering Education, Sept 2005, Sidney Australia.

Fabris N., Shamol M.: “A Simple Experiment to Determine the Coefficient of Friction”, Proceedings, 19th Annual National Educator’s Workshop, NEW Update:2004, Phoenix, Arizona

Fabris N.: “Experimental Determination of Material Properties Used in Forming”, 2002 ASEE (American Society of Engineering Education) conference, June 2002, Montreal Can.

Fabris N.: “Determination of Redundant Work in Extrusion Using Visio-Plasticity”, paper presented at the 16th Annual National Educators’ Workshop NEW: Update 2001, Oct. 2001 University of Maryland, MD.

Fabris N.,:, "Encouraging High School Girls to Study Engineering Through "Mother & Daughter" Academy", Paper peer-reviewed and presented at 2001 ASEE conference in Albuquerque N.M. June 2001.

**8. Scientific and professional societies of which a member**

American Society of Engineering Education (ASEE)
Society of Manufacturing Engineers (SME)
Society of Women Engineers (SWE)
American Association of University Women (AAUW)

**9. Honors and awards**

Society of Women Engineers, “Distinguished Engineering Educator Award”, Year 2001.

"Distinguished Women Award" awarded at the "Inaugural Reception, Honoring the Women of CSLA" by The Women Resource Center, CSULA, April 1999

Featured as a leader of "Mother & Daughter Workshop" on CBS radio program "Osgood Files " March 1999

"Outstanding Mechanical Engineering Professor for 1999", CSULA Eng. Student Council, 1999

"1998 Manufacturing Educator of the Year" of SME Desert Pacific Region 12

Featured in article "Mother-Daughter Academy" , ASEE Prism, Feb.. 1998

Pi Tau Sigma Mechanical Engineering Honor Fraternity

**10. Institutional and professional service in the last five years**

Department Committee:

Appointment, Retention and Promotion: 2003-2004

College Committee:

Faculty Affairs Committee, 1998-2001, Students Affairs 2005-

University Committee Service:

Academic Senator 2000-2004
Committee on Committee, 1998-2001

Professional service:

Presented a workshop at the California Science Education Conference (K-12), (one-hour long) in 2004 and scheduled to present three hours long in 2005.

Served on NSF Engineering Education review panel, Washington D.C, 2003

Faculty Coordinator for PALS (Partnership in Learning Success) mentoring program for ECST from1995-2003.

Faculty Advisor for Student Chapter of SWE till 2002

Established student SME chapter S318, for CSULA, and served as an Advisor till 2003

Judge of "Manufacturing Challenge Contest", College level Student Competition, WESTEC 1998, 2001, 2003

**11. Professional development activities in the last five years**

Attendance at Teaching Related Courses, Workshops, and Conferences:

ASEE (American Association for Engineering Education), annual Conference 2000, 2002, 2005.

National Educator Workshop (Standard Experiments in Engineering Materials, Science and Technology) 2001, 2003, 2004

WESTEC (Western Tool Exhibit and Conference), 2001, 2002, 2003, 2005

WEPAN (Women in Engineering Programs & Advocate Network), Annual Conf. 2000

Numerous Local SME, SWE and ASME Meetings and Presentations

Society of Women Engineers Annual Conference 2001

California Science Education Conference, 2003, 2004

**1. Name and Academic Rank**

**Felszeghy, Stephen F., Professor (FERP)**

**2. Degrees with fields, institution, and date**

1974 Doctor of Philosophy
Applied Mechanics
University of California, Berkeley

1963 Master of Science in Mechanical Engineering
University of California, Los Angeles

1961 Bachelor of Science in Mechanical Engineering
University of California, Los Angeles

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

| | |
|---|---|
| Number of years service: | 25 |
| Date of original appointment: | 9/79 |
| Professor of Mechanical Engineering: | 1987 to present |
| Associate Professor of Mechanical Engineering: | 1982 to 1987 |
| Assistant Professor of Mechanical Engineering: | 1979 to 1982 |

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

1978 to 1979 Lecturer, Department of Mechanical and Environmental Engineering
University of California, Santa Barbara

1975 to 1977 Lecturer (part-time), Department of Civil Engineering
University of Southern California

Industrial Experience:

1964 to 1968 Engineering Specialist Senior

1974 to 1978 Hughes Missile Systems Company, Canoga Park, CA

1962 to 1964 Associate Preliminary Design Engineer
The Garrett Corporation, Los Angeles, CA

**5. Consulting, patents, etc.**

1978 to 1994 Engineering Specialist Senior (part-time)
1968 to 1974 Hughes Missile Systems Company, Canoga Park, CA

**6. State(s) in which registered**

1960 Engineer-in-Training Certificate (California)

**7. Principal publications of last fifteen years**


Felszeghy, S. F., “Steady-State Residual Vibrations in High-Speed, Dwell-Type, Rotating Disk Cam-Follower Systems,” ASME Journal of Vibration and Acoustics, v. 127, n. 1, p. 12, 2005.

Felszeghy, S. F., "The Timoshenko Beam on an Elastic Foundation and Subject to a Moving Step Load, Part 1: Steady-State Solution, and Part 2: Transient Solution," ASME Journal of Vibration and Acoustics, v. 118, n. 3, p. 277, 1996.

Felszeghy, S. F., "Development of Biorthonormal Eigenvectors for Modal Analysis of Linear Discrete Nonclassically Damped Systems, Journal of Sound and Vibration, v. 176, n. 2, p. 255, 1994.

Felszeghy, S. F., "On Uncoupling and Solving the Equations of Motion of Vibrating Linear Discrete Systems," ASME Journal of Applied Mechanics, v. 60, n. 2, p. 456, 1993.

Felszeghy, S. F., "The Development of Natural Modes of Free Vibration for Linear Discrete Systems from the Synchronous Motion Assumption," ASME Journal of Vibration, Acoustics, Stress and Reliability in Design, v. 111, n. 1, p. 77, 1989.

**8. Scientific and professional societies of which a member**

American Institute of Aeronautics and Astronautics
American Society for Engineering Education
American Society of Mechanical Engineers

**9. Honors and awards**

Elected to Tau Beta Pi, and Pi Tau Sigma.
Held Hughes Doctoral Fellowship.
Received CSULA Grant-in-Aid in December 1983, Faculty Enrichment Award in March 1986,
Meritorious Performance and Professional Promise Awards in May 1986 and April 1987,
Creative Leave Award in Spring 1991, Performance Salary Step Increase in 1996 and 1997, Faculty Merit Increase in 1998 and 1999.

**10. Institutional and professional service in the last ten years**

Department Service

Chair of Department of Mechanical Engineering: 1999 to 2002.
Oversaw re-accreditation of ME program.
Appointment, Retention, Tenure, and Promotion Committee (Yrs. 89/90, 90/91, 91/92, 95/96).
Principal Advisor (1996 to 2002).

College Service

Faculty Affairs Committee (Acad, Yr. 04/05)
Instructional Affairs Committee (Acad. Yr. 88/89, Fall '92, '93 to '97). Served as chairman.
Student Affairs Committee (Fall '98, Spring '99)
Appointment, Retention, Tenure, and Promotion Committee ('95 to '99, Acad. Yr. 04/05).

University Service

Ad Hoc Committee to Review Program Review (Acad. Yr. 04/05).
Academic Advisement Subcommittee (1996 to 1999). Served as chairman.
Academic Information Resources Committee (Winter '95).
Academic Senate (Acad. Yr. 98/99).
Graduate Studies Subcommittee (Acad. Yr. 97/98).
Honors Convocation and Commencement Committee (1995 to 1997).
Risk Management and Safety Committee (1995 to 1999).

Advising

Volunteer faculty advisor and member of the CSULA '90 Solar Eagle Team, the '93 Solar Eagle II Team, and the '97 Solar Eagle III Team.
Volunteer faculty research mentor to MAERC student (Minority Access to Energy-Related Research Careers, U.S. Department of Energy) (Academic Years 93/94, 94/95 and 95/96).

**11. Professional development activities in the last ten years**

Attendance at Teaching Related Courses, Workshops, and Conferences:

| | |
|---|---|
| 2/2003, 7/2003 | Vishay Micro-Measurements, PhotoStress Seminar |
| 4/2000 | CSULA Academic Retreat 2000, "Tidal Wave II," April 7, 2000. |
| 5/1998 | CSULA Acad. Retreat, "Retreat to the Future: A Discussion with Colleagues," |
| 11/1997 | CSULA "Assessment Symposium," |
| 4/1997 | CSULA "Cornerstones Conference," |
| 3/1997 | CSULA "Advisement Workshop for E & T Advisors," presented by the CSULA Advisement Center |
| 1/1997 | CSULA Faculty Retreat 1997, "Making it Work," |
| 10/1996 | Workshop on "Lay-up and Vacuum Bagging" of Composites, Cerritos College |
| 1/1996 | UC Science, Engineering & Mathematics Education Conference, Beckman Center of the National Academies of Sciences and Engineering, Irvine, CA |
| 1/1996 | CSULA Faculty Retreat 1996, "Building a Learning Community: Significance, Challenges and Strategies," |

**1. Name and Academic Rank**

**Guillaume, Darrell W., Professor**

**2. Degrees with fields, institution, and date**

1997 Doctor of Philosophy
Mechanical and Aerospace Engineering
Specialization: Thermal and Fluid Sciences
University of California, Irvine

1987 Master of Science in Mechanical Engineering
Specialization: Thermal and Fluid Sciences
San Diego State University

1983 Bachelor of Science in Mechanical Engineering
San Diego State University

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Date of original Appointment: 1/99
Number of years service: 6

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

1999 to 2002 Assistant Professor
California State University, Los Angeles

1998 Lecturer
California State University, Los Angeles

1997 to 1998 Post-Doctoral Researcher and Lecturer
University of California, Irvine

1991 to 1997 Graduate Student Researcher and Teaching Assistant
University of California, Irvine

1986 to 1987 Graduate Assistant
San Diego State University, San Diego

Industrial Experience:

1990 to 1992 Project Engineer
Bird (Medical) Products Corporation, Riverside CA

1988 to 1990 Senior Mechanical Engineer
Bird (Medical) Products Corporation, Riverside CA

1985 to 1986 Senior Engineer
Ametek/McCrometer Division, Hemet CA

1984 to 1985 Mechanical Engineer
Ametek/McCrometer Division, Hemet CA

**5. Consulting, patents, etc.**

Consulting: Pulmonetics Systems, Inc. Colton, CA (2003 – Present)

Patents: Variable Orifice Flow Sensing Apparatus (U.S. Serial Number 4993269)
Ventilator Exhalation Valve (U.S. Serial Number 5127400)

**6. State(s) in which registered**

1987 Registered Professional Mechanical Engineer (California)
License Number M024943

**7. Principal publications of last five years**

Guillaume, D. W. & LaRue, J. C. (2005). Comparing the Flow on the Bounded and Unbounded Sides of a Plate. International Journal of Heat and Mass Transfer, 48, pp. 1384-1387.

Guillaume, D. W. & Judge, T. A. (2004). Improving the Efficiency of a Jet Pump Using a Swirling Jet. Review of Scientific Instruments, 75, pp. 553-555.

Guillaume, D. W. & LaRue, J. C. (2003). Investigation of Peak Frequencies in the Flopping Regime with a Two-Cylinder Array. Journal of Fluids and Structures, 17, pp. 331-335.

Guillaume, D. W. & LaRue, J. C. (2003). The Effect of Multi-Plate Array Spacing on Grid-Generated Turbulence. Journal of Fluids and Structures, 17, pp. 485-490.

Guillaume, D. W. (2002). A Comparison of Peak Frequency-Time Plots Produced with Hilbert and Wavelet Transforms. Review of Scientific Instruments, 73, pp. 98-101.

Guillaume, D. W. & LaRue, J. C. (2002). Comparison of the Numerical and Experimental Flowfield Downstream of a Plate Array. Journal of Fluids Engineering, 124, pp. 284-286.

Guillaume, D. W. & Jolly III, J. L. (2001). Demonstrating the Achievement of Lower Temperatures with Two-Stage Vortex Tubes. Review of Scientific Instruments, 72, pp. 3446-3448.

Guillaume, D. W. & LaRue, J. C. (2001). Using Matlab to Graphically Illustrate Potential Flow and Related Transformations. Computers in Education Journal, 11, pp. 23-36.

Guillaume, D. W. & LaRue, J. C. (2001). Comparison of the Vortex Shedding Behavior of a Single Plate and a Plate Array. Experiments in Fluids, 30, pp. 22-26.

Guillaume, D. W. & LaRue, J. C. (2000). Investigation of the Flopping Regime of Two-, Three-, and Four-Plate Arrays. Journal of Fluids Engineering, 122, pp. 1-6.

Guillaume, D. W. & LaRue, J. C. (2000). Temporal and Spatial Unmixedness Downstream of a Plate Array. Physics of Fluids, 12, pp.1497-1508.

**8. Scientific and professional societies of which a member**

American Society of Mechanical Engineers
American Society of Engineering Education
American Institute of Aeronautics and Astronautics

**9. Honors and awards**

Mechanical Engineering Professor of the Year, 2001, 2002, 2003, 2004, 2005
UCI Excellence in Undergraduate Teaching Award, 1996 and 1997
Graduate Assistance in Areas of National Need, Fellowship, 1996
Tau Beta Pi Engineering Honor Society
Pi Tau Sigma Mechanical Engineering Honor Fraternity

**10. Institutional and professional service in the last five years**

Recruitment:
Continuously Visits High School and Community Colleges
Department Committee Service
2002 – Present Associate Chair
College Committee Service
1999 – Present Student Assessment Coordinator

**11. Professional development activities in the last five years**

Attendance at Teaching Related Courses, Workshops, and Conferences:

| | |
|---|---|
| 03/2004 | Southern California Forum on Outcomes Assessment, California State Polytechnic University, Pomona, California |
| 05/2002 | Pacific Planning Assessment & Institutional Research Conference, Honolulu, Hawaii |
| 04/2002 | 78th Annual WASC Meeting, San Diego, CA |

**1. Name and Academic Rank**

**Hsia, Lih-Min, Professor**

**2. Degrees with fields, institution, and date**

1979 Doctor of Philosophy
Mechanical Engineering
Specialization: Theoretical Kinematics
University of California, Davis

1974 Master of Engineering in Engineering Mechanics
Specialization: Nondestructive Testing Techniques
Cornell University

1973 Master of Science in Mechanical Engineering
Specialization: Thermal Sciences
Cornell University

1970 Bachelor of Science in Mechanical Engineering
National Taiwan University

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

| | |
|---|---|
| Date of original Appointment: | 9/83 |
| Promoted to Professor | 9/89 |
| Number of years service: | 22 |

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

| | |
|---|---|
| 1991 | Visiting Research Professor<br>National Sun Yat-Sen University, Kaohsiung, Taiwan |
| 1980 to 1981 | Senior Lecturer<br>University of Southern California, Los Angeles |
| 1979 | Lecturer<br>University of California, Davis |
| 1977 | Lecturer<br>California State University, Chico |

Industrial Experience:

| | |
|---|---|
| 1979 to 1983 | Member of Technical Staff<br>Hughes Aircraft Company, Los Angeles CA |

**5. Consulting, patents, etc.**

| | |
|---|---|
| Consulting: | Consultant at Jet Propulsion Laboratory, TRW, The Boeing Company, and CMA Forging Company |
| Patent: | Multi-stage Geneva Mechanism<br>U.S. Serial Number 4,282,778 |

**6. State(s) in which registered**

1982 Registered Professional Mechanical Engineer (California)
License Number M21350

**7. Principal publications of last five years**

Hsia, Lih-Min, Lou, Michael, Fang, Houfei & Huang, John (2004), Deployment of A 7-Meter Inflatable Reflectarray Antenna, AIAA 2004-1502, presented at the 45th AIAA/ASME/ ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Palm Springs, California

Hsia, Lih-Min, Lou, Michael, Fang, Houfei, Huang, John & Kerdanyan, Gregor (2004), Inflatable Structure for a Three-Meter Reflectarray Antenna, AIAA Journal of Space and Rockets, Vol.41, No.4, pp.543-550.

Hsia, Lih-Min, Lou, Michael & Fang, Houfei (2003), Thermal Distortion Analyses of A Three-Meter Inflatable Reflectarray Antenna, AIAA paper 2003-1650, presented at THE 4TH AIAA GOSSAMER SPACECRAFT FORUM, Norfolk, Virginia.

Hsia, Lih-Min, Lou, Michael & Fang, Houfei (2002), Development of A Three-Meter Ka-Band Reflectarray Antenna, AIAA paper 2002-1706, presented at THE 3RD AIAA GOSSAMER SPACECRAFT FORUM, Denver, Colorado.

Hsia, Lih-Min, Lou, Michael & Fang, Houfei (2001). Catenary Systems for Membrane Structures PROCEEDINGS OF THE 2001 AIAA STRUCTURES, STRUCTURAL DYNAMICS, AND MATERIALS CONFERENCE, Seattle, Washington.

Hsia, Lih-Min, Lou, Michael & Fang, Houfei (2000). A Combined Analytical and Experimental Study on Space Inflatable Booms. PROCEEDINGS OF THE 2000 IEEE AEROSPACE CONFERENCE, 2000 IEEE Aerospace Conference, Big Sky, Montana.

Hsia, Lih-Min, Lou, Michael & Fang, Houfei (2000). Development of Space Inflatable/Rigidizable CTR Aluminum Laminate Booms. AIAA Space 2000 Conference, Long Beach, CA.

**8. Scientific and professional societies of which a member**

American Society of Mechanical Engineers
Society of Automotive Engineers
American Institute of Aeronautics and Astronautics

**9. Honors and awards**

Pi Tau Sigma Mechanical Engineering Honor Fraternity

**10. Institutional and professional service in the last five years**

College Committee Service

| | |
|---|---|
| 2001 to 2002 | College Instructional Affairs Committee |
| 2002 | College RTP Committee |
| 2005 | College Associate Dean Search Committee |

Department Committee Service

| | |
|---|---|
| 2003 to 2004 | Department RTP committee |

**11. Professional development activities in the last five years**

Grants received:

| | |
|---|---|
| 1999 to Present | Jet Propulsion Laboratory<br>A multi-year grant to conduct research on inflatable boom technology for space applications |
| 2004 | National Science Foundation<br>A grant to Initiate an International Educational Exchange Program with Tongji University in China |
| 2002 | A CSULA mini-grant to develop a robotic sampling system ("tram") for continuous, autonomous sampling in the field |
| 1998 to 2001 | NASA-Dryden<br>A three-year grant to study the control structure interaction in large flexible space structures |

**1. Name and Academic Rank**

**Landsberger, Samuel E., Professor**

**2. Degrees with fields, institution, and date**

1988 Doctor of Science
Mechanical Engineering
Massachusetts Institute of Technology

1984 Master of Science
Mechanical Engineering
Massachusetts Institute of Technology

1980 Bachelor of Science in Mathematics
UNC-Chapel Hill

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Date of original appointment: 2000
Number of years in service: 5

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

2001-Present Professor of Mechanical Engineering and Kinesiology,
California State University, Los Angeles

1997-Present Adjunct Associate Professor, Dept. of Biomedical Engineering.
University. of Southern California

1993-1996 Visiting Assistant Professor and Research Fellow
California Institute of Technology

1989-1993 Assistant Professor (TenureTrack) Mechanical & Aerospace Engineering
Cornell University

1988-1989 Postdoctoral Fellow, Depts. of Mechanical and Ocean Engineering
Massachusetts Institute of Technology

Industrial Experience:

2002-2005 Director and P.I. of RERC on People with Spinal Cord Injuries
Rancho Los Amigos National Rehabilitation Ctr. (RLANRC), Downey, CA

2000-2005 Director and P.I. of RERC on Children with Orthopedic Disabilities
Rancho Los Amigos National Rehabilitation Ctr. (RLANRC), Downey, CA

1994-2000 Technical Director of Rehabilitation Engineering Research Center
Rancho Los Amigos National Rehabilitation Ctr. (RLANRC), Downey, CA

**5. Consulting, patents, etc.**

Patent: Landsberger, " Prosthetic Hands with Self-Energizing Grasp", U.S.
Landsberger, "Internal Distraction Osteogenesis Device", U.S. Patent
Landsberger, Arai, "Micro-Manipulator for Surgical Applications", Japan
Landsberger, "Flex-Pipe System to Control Mussel Colonization", U.S.
Landsberger et al., "Pipe Crawling Robots for Pipe Cleaning, Inspection, and Maintenance", U.S.
Landsberger&Sheridan, "Parallel link, cable-controlled manipulator", U.S.

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

Landsberger, Leung, et al, Mobile Arm Supports: History, Application and Work in Progress, Topics in Spinal Cord Injury, Fall 2005.

Landsberger, Davidian, &Garibay. Involving Engineering Students in Hands-on Rehabilitation Engineering Projects. Invited Presentation, Capacity Building Workshop for Minority Involvement in Rehabilitation Research, National Institute on Disabilities and Rehabilitation Research, Washington, DC, July, 2005

Landsberger, Keynote Address, "Supportive technology …design strategies for devices to age gracefully, usefully and not prematurely." Int'l Soc. Gerontech, Nagoya, Japan, May 2005

Kerdanyan, Minkel, Landsberger, Measurement of Force and Acceleration Experienced in a Manual Wheelchair, Proc. of Rehab. Eng. Soc. N.A. 2005, Atlanta, GA

Reynolds, Weber, Mulroy, Landsberger,et al, "Dual Action Posterior Strut Ankle Foot Orthosis – A Tunable Brace" Proc. 11th World Con. Int'l Soc. Prosthetics & Orthotics, Hong Kong, Aug '04.

Shaperman, J., Landsberger, S. & Setoguchi, Y. Early upper-limb prosthesis fitting: when and what do we fit? Journal of Prosthetics & Orthotics (JPO). 2003, 15(1):11-17.

Polliack, Craig, Sieh, Landsberger, McNeal. Lab. & Clinical Tests … Pressure Sensor for Clinical Assessment of Prosthetic Socket Fit. Prosthetics&Orthotics Int'l 26 (1) pp. 23-34. 2002

Polliack, Elliot, Caves, McNeal, Landsberger. Lower Extremity Orthoses for Children with Myelomeningocele: User and Orthotist Perspectives. JPO. 13 (4) pp. 123-129. 2002

Polliack, Swanson, Landsberger, McNeal. Development of a Testing Apparatus for Structural Stiffness Evaluation of Ankle-Foot Orthoses. JPO. 13 (3) pp. 74-82. 2002

**8. Scientific and professional societies of which a member**

International Society for Prosthetics and Orthotics
International Society for Gerontechnology
American Society for Engineering Education

**9. Honors and awards**

Centro Maravillo Award for Creative Engagement of East Los Angeles Youth with H.E.R.E., 2004
Certificate of Appreciation for "Outstanding Contributions to Service Learning" CSULA, 2003.
New Partner Award for service to the East Valley Multipurpose.Senior Center, 2002.
Northrop Grumman Endowed Chair, Professor of Design and Manufacturing, CSULA, 2000 – 01
President of Coalition of Rehabilitation Engineering Research Organizations, 2000 – 02
Dean's Prize for Innovation in Teaching, Cornell University,1991
Archibald Henderson Gold Medal in Mathematics, UNC-CH, 1980

**10. Institutional and professional service in the last five years**

Grants received:

$100,000 /yr for 6 yrs for Hands-on Experiences in Rehabilitation Engineering Program (HERE)
Service learning introduced in required introductory Engineering Design course (ME103).
New service-learning course: Rehabilitation Machine Principles, KIN 439 in Kinesiology.
Founded HERO Program: Engages at-risk youth in K-12 Schools with college undergraduates
Manufacturing of Assistive Devices Incubator Laboratory to engage at-risk youth and those with disabilities in higher learning, learn manufacturing skills, and to build small lot sizes of much-needed assistive devices.

Departmental, college and university committees service:

Senator from ECST (2005 – 06).
RTP committees Dept.&College level each year.
Outreach representative to High Schools ('02 -'04).
Scholarship Awards committee of ECST (2004).
HHS Dean's Search Committee (2004).
Sabbatical Leave Cmt, 2004
Grievance committees ('04 - '05).
Faculty and Student Affairs Committees, '05.

**11. Professional development activities in the last five years**

**1. Name and Academic Rank**

**Manvi, Ram, Professor (FERP)**

**2. Degrees with fields, institution, and date**

1968 Doctor of Science
Mechanical Engineering
Washington State University

1980 Bachelor of Science in Mechanical Engineering
Osmania University, Hyderabad, India

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Date of original appointment: 1971
Number of years in service: 36

| | |
|---|---|
| Professor of Mechanical Engineering: | 1979 to present |
| Associate Professor of Mechanical Engineering: | 1974 to 1979 |
| Assistant Professor of Mechanical Engineering: | 1971 to 1974 |

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

1994 to 1996: California State University, Los Angeles campus Coordinator for Southern California Coalition for Education in Manufacturing Engineering (SCCEME), which includes USC, UCLA, Cal State LA, Cal State Long Beach, and Cal State Fullerton. Established a SCCEME office, resource library and conference room. Cal State LA representative of SCCEME coalition Curriculum Development Team (Team A) and Task Team 3, Materials, Processing, and Testing. The objective was to establish course outlines required by ABET covering materials engineering within the manufacturing environment.

1981 to 1985: Dean, School of Engineering and Technology, California State University, Los Angeles

1979 to 1981: Chairman, Department of Mechanical Engineering, California State University, Los Angeles

1976 to 1979: Instructor, P.E. License Review Courses, Southern California Edison Company, Rosemead, CA & Ralph M. Parsons Company, Pasadena, CA

1972 to 1973: Lecturer, Retraining of Aerospace Engineers for Energy Utilities, UCLA Extension.

1964 to 1968: Research Assistant, Shock Dynamics Laboratory, Washington State University, Pullman, WA.

Industrial Experience:

1961 to1964: Senior Scientific Officer, Atomic Energy Establishment, Bombay, INDIA.

1960 to1961: Engineer Trainee, Centre Etudes Nucleaire, Saclay, FRANCE.

1958 to 1960: Engineer Trainee, Atomic Energy Commission, Bombay, INDIA.

1958 (Sp, Su): Engineer Trainee/COOP Study, Praga Machine Tools, Hyderabad, INDIA.

**5. Consulting, patents, etc.**

Consulting:

| | |
|---|---|
| 1988 | Smith Engineering, Duarte, CA, Packed Bed Heat Transfer. |
| 1986 | General Dynamics Corporation, Pomona Division, CA, Integrated Computer-Aided Engineering. |
| 1972 to 1973 | Science Applications Inc.<br>El Segundo, CA (Aero-thermal Missile Reentry) |

**6. State(s) in which registered**

Registered Professional Mechanical Engineer, California

**7. Principal publications of last five years**

R. Manvi, C. Weisbin, W. Zimmerman, & G. Rodriguez, "Technology Portfolio Options For NASA Missions Using Decision Trees," IEEE Aerospace Conference, Big Sky, Montana, March 2002

R. Manvi et.al., "Revolutionary Concepts for Human Outer Planet Exploration (HOPE)," Conference on Human Space Exploration, The Space Technology and Applications International Forum (STAIF), Albuquerque, NM. February 2003

R. Manvi, et al., "Decision Tree Assessment of Challenging Technologies For A Mission To Europa," Paper # AS 22163, Journal of Aerospace Engineering/ASCE, July 2003

R. Manvi & C. Weisbin, "Selection of an Effective Architecture for Precursor Mission to Callisto," Paper # 03ICES-334, SAE/ICES 2003 Conference, Vancouver, BC, July 2003.

A. Howard, W. Lincoln, R. Manvi, G. Rodriguez, C.R. Weisbin, "A Methodology to Determine Impact of Autonomy Technologies on Space Science Mission", 10th International Symposium on Robotics and Applications, Seville, Spain, June 2004.

C. R. Weisbin, G. Rodriguez, A. Elfes, J. Derleth, J.H. Smith, R. Manvi, B. Kennedy, and K. Shelton, "A Multi-Mission, Multi-Program Technology Resource-Allocation Approach for NASA," Paper accepted for publication in: Synergy Between Systems Engineering and Project Management; Joint Conference of the International Systems Engineering Conference (ICSE) and The International Council on Systems Engineering (INCOSE); Las Vegas, Nevada; September 15-18, 2004

A. Howard, W. Lincoln, R. Manvi, C. Weisbin, G. Rodriguez, and M. Drummond, "A Methodology to Determine Impact of Robotic Technologies on Space Exploration Missions," Proceedings of the World Automation Congress, Seville, Spain, 06/28/ 2004.

C.R. Weisbin, R. Manvi, K.E. Shelton, V. Adumitroaie, J.E. Derleth, and A. Elfes, "Capability-Development Return on Investment for the NASA Aeronautics Program," 16th International Conference on Systems Engineering (ICSEng 2005), Las Vegas, NV, pgs. 231-237, August 16-18, 2005.

R. Manvi, C.R. Weisbin, A. Elfes, and G. Rodriguez, "Risk-Driven Interdependent Task Analysis Applied to a NASA R&D Program," IEA/AIE 2005 18th International Conference on Industrial & Engineering Applications (IEA) of Artificial Intelligence & Expert Systems (AIE), Bari, Italy, June 22-25, 2005. Proceedings published in the Springer-Verlag Lecture Notes Artificial Intelligence series, Vol. 3533, 2005.

Elfes, C.R. Weisbin, R. Manvi, V. Adumitroaie, W.P. Lincoln, and K. Shelton, "Extending the START Framework: Computation of Optimal Capability Development Portfolios Using a Decision Theory Approach," Journal of the International Council on Systems Engineering, submitted for publication 2006.

**8. Scientific and professional societies of which a member**

American Society of Mechanical Engineers
American Society of Engineering Education

**9. Honors and awards**

Tau Beta Pi
Sigma Xi
Phi Kappa Phi

**10. Institutional and professional service in the last five years**

Recruitment & Outreach, 1998 & 1999: Visited high schools in CSLA's service area to introduce engineering disciplines and study programs available at CSLA
Department Retention, Tenure & Promotion Committee, 1998 & 1999
Department New Faculty Search Committee, 1998 & 1999
School Faculty Affairs, 1998
University General Education Subcommittee, 1998 – Present
University Faculty Merit Increase Appeals Committee: 2000

**11. Professional development activities in the last five years**

2002 NASA Six Sigma Training Course
2003 NASA Space Systems Course
2004 NASA Systems Engineering Course
2005 Professional Ethics Course

**1. Name and Academic Rank**

**Mirmirani, Maj Dean, Professor, Chair**

**2. Degrees with fields, institution, and date**

1977 Doctor of Philosophy
Mechanical Engineering
University of California, Berkeley

1971 Master of Science
Mechanical Engineering
University of California, Berkeley

1967 Bachelor of Science in Mechanical Engineering
Tehran Polytechnic

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

| | |
|---|---|
| Date of original appointment: | 1981 |
| Promoted to Professor | 1987 |
| Number of years in service: | 24 |

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

1980-1981 Part-time Faculty, Department of Mechanical Engineering
California State University, Los Angeles

1979-1980 Academic Visitor, Department of Electrical Engineering
Imperial College of Science and Technology, London, England

1977-1980 Lecturer, Department of Informatic and Systems Engineering
National University, Tehran, Iran

Industrial Experience:

1980-1981 Senior Project Engineer
C. F. Braun and Co., Alhambra, CA

1977-1980 Senior Analyst
Industrial Management Institute, Tehran, Iran

**5. Consulting, patents, etc.**

Consulting:

Laboratory of Theoretical Biology, National Cancer Institute, Bethesda, Maryland (1982 & 1984)
NuTool-ASMI, Milpitas CA (2001-2005)
SoloPower, Inc, Milpitas, CA, Consultant and member of the Board (2005-present)

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

Clark, A., Wu, C., Mirmirani, M., Choi, S., "Development of an Airframe Integrated Generic Hypersonic Vehicle Model," AIAA Aerospace Conference and Exhibit, Reno, Nevada, January 2006

Xu, H., Ioannou, P. A., Mirmirani, M., "Adaptive Control of a Class of Large-Scale Nonlinear Systems," International Journal of Control, Vol.78, No. 17, 20 November 2005, pp 1359-1377

Mirmirani, M., Wu. C., Clark, A and S. Choi, Colgren, R. "Modeling for Control of a Generic Airbreathing Hypersonic," AIAA, Guidance Navigation and Control Conference and Exhibit, San Francisco, CA, August 2005

Keshmiri, S. Colgren, R., Mirmirani, M., "Development of an Aerodynamic Database for a Generic Hypersonic Air Vehicle," AIAA, Guidance Navigation and Control Conference and Exhibit, San Francisco, CA, August 2005

Mirmirani, M., Wu, C., Clark, Andrew, Fidan, B., "Airbreathing Hypersonic Flight Vehicle Modeling and Control, Review, Challenges, and a CFD-Based Example," Workshop on Modeling and Control of Complex Systems, Ayia Napa, Cyprus, June 30, 2005

Xu, H., Mirmirani, M., and Ioannou, P. A., "Adaptive sliding mode control design for a hypersonic flight vehicle", AIAA Journal of Guidance, Control, and Dynamics, Vol. 27, No 5, 2004.

Huo, Y., Mirmirani, M., Ioannou, P. A., and Colgren, R., "Adaptive Linear Quadratic Design with Application to F-16 Fighter Aircraft," AIAA Guidance, Navigation, and Control Conference and Exhibit, August 2004, Providence, Rhode Island

Keshmiri, S. Mirmirani, M. D. and Colgren, R. D., "Six-DOF Modeling and Simulation of a Generic Hypersonic Vehicle for Conceptual Design Studies," AIAA Modeling and Simulation Technologies Conference, August 2004, Providence, Rhode Island

Fidan, B., Mirmirani, M., and Ioannou, P. A., "Air-breathing hypersonic flight control," in Proc. 16th IFAC Symposium on Automatic Control in Aerospace, Jun. 2004

H. Xu, M. Mirmirani, and S. Choi, "LQG control of a CFD-based aeroelastic wing model", IEEE 2003 Conference on Decision and Control, Maui, HI, Dec. 2003

Xu, H., Mirmirani, M., "Robust Neural Adaptive Control of a Hypersonic Aircraft," AIAA Guidance, Navigation and Control," Austin, Texas, August 2003

Xu, H., Ioannou, P., Mirmirani, M., "Decentralized-Like Adaptive Control for Class of Multi-Input, Multi-Output Nonlinear Systems," IFAC 2003, Milan, Italy

Mirmirani, M., Boussalis, H.R., Florakis, D., "Structures, Pointing, and Control Engineering, a Segmented Reflector Testbed," presented at IASTED International Conference on Control and Application, Cancun, Mexico, June 2002

**8. Scientific and professional societies of which a member**

American Institute for Aeronautics and Astronautics, Senior Member
American Society of Mechanical Engineers, Member
American Society for Engineering Education, Member
Pi-Tau Sigma Mechanical Engineering Honor Society

**9. Honors and awards**

2003-2004 University Outstanding Professor Award, 2004
Meritorious Performance and Promise Award, CSULA, 1990
NASA Technical Brief for software development, "Algorithm for Calibrating Robot Arms," 1986

**10. Institutional and professional service in the last five years**

College Committee Service

| | |
|---|---|
| 1999 to 2002 | College Retention, Tenure, and Promotion Committee |

Department Committee Service

| | |
|---|---|
| 2002 to Present | Department Chair |

**11. Professional development activities in the last five years**

Grants received

| | |
|---|---|
| 2005 | "Modeling, Control, and Simulation of Airbreathing Hypersonic Vehicles," Air Force Office of Scientific Research, Three years, $350K, PI |
| 2004 | "Design and Flight Testing of Intelligent Flight Laws Using the WVUYF-22 Research Aircraft Model," NASA Dryden Flight Research Center, Two Years ($250K), $15K, Subcontractor to West Virginia University, PI |
| 2002 | "Structures, Propulsion, Aerospace, and Control Engineering," NASA Grant to Establish a University Research Center, $6M, Five Years, Senior Co-PI |
| 2002 | "CSULA/USC Collaborative to Integrate Research and Education," NSF, $600K, Three Years, Co-PI |
| 2002 | "Control of High-Performance Flight Vehicles, A multidisciplinary Approach," NASA Dryden Flight Research Center, $80K, One Year, PI |
| 2001 | "Multidisciplinary Analysis and Control of High-Performance Air Vehicles," Air Force Office of Scientific Research, $800K, Three Years, PI |

Attendance at Teaching Related Courses, Workshops, and Conferences:

| | |
|---|---|
| 09/2004 | ASEE International Colloquium on Engineering Education, Begin, China |
| 08/2004 | AIAA GNC, Chaired a Session, Presented a Paper, Providence, RI |
| 08/2004 | AFOSR, Dynamics and Control Annual Contractors Meeting, Pasadena, CA |

**1. Name and Academic Rank**

**Sharif, Adel A., Associate Professor**

**2. Degrees with fields, institution, and date**

1998 Doctor of Philosophy
Materials Science Engineering
Specialization: Structural Materials
University of California, Irvine

1995 Master of Science in Materials Science Engineering
Specialization: High Temperature Materials
University of California, Irvine

1992 Bachelor of Science in Mechanical Engineering
California State University, Los Angeles

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Date of original appointment: 9/2002
Number of years service: 3

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

2000 to 2002 Assistant Professor
University of Michigan, Flint

1998 to 2000 Post-Doctoral Researcher
Los Alamos National Laboratory

1992 to 1998 Graduate Student Researcher and Teaching Assistant
University of California, Irvine

Industrial Experience:

1991 to 1992 Air Quality Engineer
Los Angeles Department of Water and Power, Los Angeles, CA

**5. Consulting, patents, etc.**

N/A

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**


A.A. Sharif, A. Misra, and T.E. Mitchell: "Strength of MoSi2 –based Single Crystals at Ultra-High Temperature", Scripta MaterialiaA vol. 52 pp. 399-402 (2005).

A.A. Sharif and M.L. Mecartney: "Superplasticity in Cubic Yttria-Stabilized Zirconia with 10 wt.% Alumina",: J Europ. Ceram. Soc. 24, pp. 2041-2047 (2004).

A.A. Sharif and M.L. Mecartney: "Superplasticity in Cubic Yttria-Stabilized Zirconia with Intergranular Silica", Acta Mater vol. 51, pp. 1633-1639 (2003).

A.A. Sharif, A. Misra, and T.E. Mitchell: "Deformation Mechanisms of Polycrystalline MoSi2 Alloyed with 1 at% Nb", Materials Science Engineering A vol. A358 pp. 279-287 (2003).

A.A. Sharif, A. Misra, J.J. Petrovic, and T.E. Mitchell, "Alloying of MoSi2 for Improved Mechanical Properties" Intermetallics, vol. 9 No 10-11, 869-873 (2001).

A.A. Sharif, A. Misra, J.J. Petrovic, and T.E. Mitchell, "Solid Solution Hardening and Softening in MoSi2 Alloys", Scripta Mater.vol. 44 No. 6, 879-884 (2001).

A.A. Sharif, A. Misra, J.J. Petrovic, and T.E. Mitchell, "Anomalous Effects of Alloying with Nb on the Yield Strength of of MoSi2" Proceedings of the AeroMat 2001, Long Beach, CA (2001).

A.A. Sharif, A. Misra, J.J. Petrovic, and T.E. Mitchell, "Slip Systems in Erbia Single Crystals" Key Eng. Mater., 171, 801-808 (2000).

A.A. Sharif, A. Misra, J.J. Petrovic, and T.E. Mitchell, "Elastic Constants of Erbia Single Crystals", J. Am. Ceram. Soc., 83, No. 9, pp. 2246-2250 (2000).

A.A. Sharif, A. Misra, J.J. Petrovic, and T.E. Mitchell, "Dislocation Motion in Erbia Single Crystals" Mater. Sci. Eng. A., vol. 290, No. (1-2) pp. 164-170 (2000).

A. Misra, A. A. Sharif, J. J. Petrovic and T. E. Mitchell, "Rapid Solution Hardening at Elevated Temperatures by Substitutional Re Alloying in MoSi2", Acta Mater., vol. 48 No 4, 925-932 (2000).

A. Misra, A. A. Sharif and T.E. Mitchell, "Anomalous Effects of Substitutional Alloying on the Mechanical Behavior of MoSi2" Fab. Adv. Mat. pp. 187-195 (2000).

J. J. Petrovic, A. A. Sharif, A. M. Kukla, R. S. Romero, D. Mendoza, and F. M. Pitek, "Mechanical Behavior of Erbium Oxide Single Crystals", Proceedings, AcerS 24th Annual Cocoa Beach Conference, Cocoa Beach, Florida, January 24-28, 2000.

**8. Scientific and professional societies of which a member**

American Society of Mechanical Engineers

**9. Honors and awards**

N/A

**10. Institutional and professional service in the last five years**

Recruitment:

Introduced Engineering to 6 Different Audiences

Department Committee Service

2002 – Present Mechanical Engineering Department representative for CFA
Advisor for Mini Baja Competition
Advisor for ASME
Advisor for SAE

School Committee Service

2002 – Present Instructional Affairs Committee
Engineering, Computer Science, and Technology Student Council Advisor
School of Engineering and Technology Member of the High School Speakers Bureau

University Committee Service

2004 – Present External Awards Committee

**11. Professional development activities in the last five years**

Attendance at Teaching Related Courses, Workshops, and Conferences:

| | |
|---|---|
| 3/3/03 | TMS Annual Meeting and Exposition, San Diego Convention Center, San Diego, CA |
| 9/15/03 | CSEM: Materials at the Fore: Beckman Institute, California Institute of Technology, Pasadena, CA |
| 9/9/03 | ASME Region IX Leadership Development Seminar, Irvine Spectrum, Irvine, CA |
| 10/28/04 | Fourth Annual Meeting of the Center for the Science and Engineering of Materials, California Institute of Technology, Pasadena, CA. |
| 10/20/04 | NAEE Dane and Louise Miller Symposium, Savannah, GA |
| 8/1/04 | NSF NCSI Workshop, San Diego, CA |
| 4/1/04 | ASEE Pacific Southwest 2004 Conference |

**1. Name and Academic Rank**

**Wu, Chivey C., Professor**

**2. Degrees with fields, institution, and date**

1983 Doctor of Philosophy
Mechanical Engineering
Specialization: Fluid Mechanics
University of Illinois, Urbana-Champaign

1979 Master of Science in Mechanical Engineering
Specialization: Fluid Mechanics
University of Illinois, Urbana-Champaign

1976 Bachelor of Science in Aeronautical Engineering
National Cheng Kung University, Taiwan

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

| | |
|---|---|
| Number of years service: | 22 |
| Date of original Appointment: | 9/83 |
| Promotion to Associate Professor: | 9/87 |
| Promotion to Professor: | 9/92 |

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

2000 to 2001 Part-Time Lecturer
East Los Angeles College, CA

1995 to 1995 Visiting Professor
Kobe University, Japan

1996 to 1997 Visiting Professor
National Cheng Kung University, Taiwan

1977 to 1983 Research and Teaching Assistant
University of Illinois, Urbana-Champaign

1976 to 1977 Teaching Assistant
National Cheng Kung University, Taiwan

National Research Lab Experience:

1991 to 1993 Summer Research Fellow
NASA Langley Research Center, Hampton VA

1990 to 1990 Summer Research Fellow
DOE Lawrence-Berkeley Laboratory, Berkeley CA

Industrial Experience:

1968 to 1972 Mechanical Draftsman
Chillip Kwan & Associates, Hong Kong

**5. Consulting, patents, etc.**

Consulting: Preco, Inc., Pasadena, CA

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

He, C., Choi, S., Mirmirani, M., Wu, C., CFD-Based Aeroelastic Analysis in Transonic Flow Regime, ASME Mechanical Engineering Congress & Exposition, Anaheim, CA, Nov 2004.

Wu, C., Ofoma, U., Design of a Fuel-Cell Powered UAV for Environmental Research, AIAA 3rd Unmanned Unlimited Technical Conference, Chicago, IL, September 2004.

Wu, C., Ofoma, U., He, C., Autonomous UAV Concept for Titanic Missions, American Helicopter Society 60th Annual Forum, Baltimore, MD, June 2004.

Wu, C., A Virtual Wind Tunnel for Aerodynamic Simulation, PLM World 2003 Annual Conference, Anaheim, CA, May 2003.

Wu, C., Integration of Configuration Design and Multidisciplinary Analysis of Aircraft, SAE/AIAA World Aviation Congress, San Diego, CA, Oct 2000.

Wu, C., Mirmirani, M., Development of Multidisciplinary Engineering Analysis Software for Teaching and Research, NASA MU-SPIN/MURED Conference, Atlanta, GA, Sept 2000.

**8. Scientific and professional societies of which a member**

American Society of Mechanical Engineers
American Institute of Aeronautics and Astronautics
Unmanned Vehicle Systems International Association (UVS)

**9. Honors and awards**

CSULA Engineering and Technology Outstanding Professor Award, 1993

**10. Institutional and professional service in the last five years**

Recruitment:

Visited and presented at East Los Angeles College and Don Bosco Technical Institute
Conducted lab demonstrations at all school and university open houses

Department Committee Service

2003 – Present Retention, Promotion and Tenure Committee

School Committee Service

2002 – 2003 Student Affairs Committee

University Committee Service

2005 – Present Academic Senate
2005 – Present Academic Information Resources Committee

**11. Professional development activities in the last five years**

Research Grants

| | |
|---|---|
| 2003 to 2007 | Co-PI, Structures, Propulsion, Aerospace, and Control Engineering, NASA University Research Center grant ($6,000,000) |
| 2001 to 2004 | Co-PI, Multidisciplinary Control of High-Performance Air Vehicles, USAFOSR research grant ($800,000) |
| 2000 to 2003 | PI, Integration of Configuration Design and Multidisciplinary Analysis of Aircraft, NASA research grant ($200,000) |
| 1997 to 2000 | PI, Computer-Simulation of Multidisciplinary Engineering Systems, NASA research grant ($400,000) |

Attendance at Workshops and Conferences:

| | |
|---|---|
| 11/2004 | ASME International Mechanical Engineering Congress & Exposition |
| 6/2004 | Unmanned Vehicle Systems International Conference |
| 12/2003 | SolidWorks/Cosmos Workshop |
| 6/2003 | Paris Air Show and Unmanned Vehicle Systems International Conference |
| 5/2003 | PLM World 2003 Annual Conference |
| 11/2000 | SAE/AIAA World Aviation Congress |
| 9/2000 | NASA MU-SPIN/MURED Conference |

**1. Name and Academic Rank**

**Amar, Ravnesh, Part-time Faculty**

**2. Degrees with fields, institution, and date**

1974 Doctor of Philosophy
Mechanical Engineering
University of California at Los Angeles (UCLA)

1970 Master of Science in Mechanical Engineering
Specialization: Thermal Sciences
California State University, Los Angeles

1967 Bachelor of Science in Mechanical Engineering
I.I.T, New Delhi, India

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of years service: 24
Date of original Appointment 1982

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

1982 to present Part-time Faculty
Have taught several courses in Thermodynamics, Heat & Mass Transfer, Fluid Mechanics and Energy Conversion Systems both at the undergraduate as well as graduate level. Number of times taught exceeds eighty (80)
UCLA, CSUN, CSULA

Industrial Experience:

1978 to present Boeing / Rocketdyne
Molten Fuel- Materials Interactions Program: Responsible for providing analytical support for the design of promising core retention devices for breeder reactor designs.

Decay Heat Removal Systems: Activities included development of analytical methods and code validation experiments in support of innovative and safer liquid fast breeder reactor designs.

Technology Management: As industry representative at the Argonne National Lab in 1980-81, supported the development and management of U.S Department of Energy's Nuclear Safety R&D Program.

Galileo Safety Program: Program Manager for an independent safety review of the safety analyses for the Galileo mission.

System Studies: Provided thermal-hydraulic analytical support for space nuclear power system designs habitability studies and new production reactor projects.

Environmental Programs: As the Program Manager, responsibilities include providing direction for environmental restoration and waste management activities being performed at the Energy Technology Engineering Center operated by the Boeing Company.

1975 to 1978 Fluor Corporation and Department of Water & Power
As a Systems Analyst at Fluor Corporation, responsibilities included development and maintenance of a computer simulation code to perform heat and mass balances for all common (e.g. heat exchangers, distillation columns, reactors, pumps etc.) unit operations.

As a Nuclear Licensing & Safety Engineer for the Department of Water and Power, was involved in the preparation of Environmental and Safety reports, calculation of emissions from power plants and perform power plant siting studies.

**5. Consulting, patents, etc.**

N/A

**6. State(s) in which registered**

PE/CA

**7. Principal publications of last five years**

Ravnesh Amar and R. Soucy, "Testing and Analysis of Passive Decay Heat Removal in liquid Metal Systems", Transactions of the American Nuclear society, vol 2, December 1990

Ravnesh Amar, S. Yuan et al, "Superfluid transport and its applications in space", Cryogenics, vol 30, March 1990.

Ravnesh Amar "ETEC Boeing Legacy Waste Cleanup", Presented at the Mixed Waste User's Forum, Nashville, TN, December 2004.

Ravnesh Amar "D&D of Sodium Facilities at the former Energy Technology Engineering Center", Presented at the DOE TIE conference, Oakland, CA, November 2002.

Ravnesh Amar and Jaime Ampaya, "Waste Minimization during D&D of the Hot Laboratory at Rocketdyne", Presented at Pollution Prevention Conference XIII, Atlanta, August 1997.

Ravnesh Amar, R. Moore et al, "Decontamination of Radioactive Lead for Recycling", Presented at the ER95 conference, Denver, August 1995.

Ravnesh Amar, K. Hartnett et al, "Recycling of sodium and Sodium Components at ETEC using a Water Vapor Nitrogen(WVN) Process", Presented at the ER95 conference, Denver, August 1995.

Ravnesh Amar, K. King et al "Minimization of D&D Waste using Self-Cleaning Filters", Presented at the Pollution prevention Conference XI, Knoxville, May 1995.

Ravnesh Amar, "Elimination of Hazardous waste (Sodium Hydroxide) at ETEC using a Water vapor Nitrogen Process", Presented at the Pollution Prevention conference X, May 1994.

**8. Scientific and professional societies of which ever a member**

ASME

**9. Honors and awards**

1994 UCLA ASME teacher of the year

1993 ETEC/Boeing Engineer of the year

**10. Institutional and professional service in the last five years**

N/A

**11. Professional development activities in the last five years**

N/A

**1. Name and Academic Rank**

**Agrawal, Sudhir K., Part-time Faculty**

**2. Degrees with fields, institution, and date**

1999 Executive Management Course
Specialization: Transportation & Leadership Academy
University of California, Los Angeles (UCLA)

1986 Master of Business Administration
Specialization: Marketing & Finance
University of Phoenix

1976 Master of Science in Mechanical Engineering
Specialization: Thermal Sciences
Southern Methodist University

1973 Bachelor of Science in Mechanical Engineering
Specialization: Thermal Sciences,
Pantnagar University

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of years service: 5 (Part Time Professor)

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

1975 to 1976 Research/ Teaching Assistant
Southern Methodist University, Dallas, Texas

Industrial Experience:

Transportation, Facilities, Nuclear, Commercial and industrial Buildings, Water Treatment Plants, CNG systems, Construction Management, etc. over 32 years experience.

**5. Consulting, patents, etc.**

Patent: Pending Patent, Between Cars Barrier for ADA compliance

**6. State(s) in which registered**

1981 Registered Professional Mechanical Engineer (California)
License Number M20483

**7. Principal publications of last five years**

Published and presented over 18 technical and management papers at various professional organizations Topics – Management related, Tunnel ventilation, Homeland security, Mechanical Systems Maintenance, Between Cars Barrier – ADA compliance, Smoke Management in Subway Tunnels, Gas Monitoring systems, Rail Central Control System Operating Procedures etc

**8. Scientific and professional societies of which ever a member**

American Society of Heating, Ventilation & Air Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers
Society of Automotive Engineers
American Institute of Plumbing Engineers
American Society of Energy Engineers
International Society of Sanitation & Heating

**9. Honors and awards**

ASHRAE – President
ASHRAE – Regional Vice Chair Research Promotion
ASHRAE – Regional Vice Chair Students Activities

**10. Institutional and professional service in the last five years**

California Building Standard Commission – Board Member for Plumbing, electrical, Mechanical and Energy Codes and Standards for the State of California

Fire and Life safety Committee- LACMTA
LA Unified School District – Construction Advisory Board
ASHRAE – Technical Papers review committee.
ASHRAE – Scholarship & Award Committee
ASHRAE – Strategic Planning Committee

**11. Professional development activities in the last five years**

Grants received:

Homeland Security Systems for LACMTA $ 10M +

**1. Name and Academic Rank**

**Azarbayjani, Maryam, Part-time Faculty**

**2. Degrees with fields, institution, and date**

2006 Ed.D. Organizational Leadership (Pending)
Pepperdine University, Los Angeles, California

2000 M.S. in Civil Engineering
Loyola Marymount University, Los Angeles, California

1999 M.A. in Industrial Technology
California State University Los Angeles, California

1987 B.S. in Computer Science
California State University Los Angeles, California

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of years service: 11
Date of original Appointment 1995

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

| | |
|---|---|
| 1995 to present | Part-time Faculty<br>Department of Technology<br>Department of Mechanical Engineering<br>Department of Electrical and Computer Engineering<br>California State University, Los Angeles CA |
| 1995 to 1996 | Research Assistant<br>Global Green USA, Venice, CA |

Industrial Experience:

| | |
|---|---|
| 2002 to present | Civil Engineer Associate<br>Stormwater CIP Group, Financial Management Division<br>Los Angeles, CA |
| 2001 to 2002 | Civil Engineer Associate<br>Sewer Service Group<br>Los Angeles, CA |
| 1998 to 1999 | Contract Safety Trainer<br>COMCO Safety Consulting Inc.<br>Long Beach, CA |

**5. Consulting, patents, etc.**

N/A

**6. State(s) in which registered**

EIT/CA

**7. Principal publications of last five years**

N/A

**8. Scientific and professional societies of which ever a member**

Epsilon PI TAU-Phi Pi Alpha

**9. Honors and awards**

| | |
|---|---|
| 2002 to 2005 | State of California Forgivable Loan Scholarship |
| 1999 | Graduated in Honors Program, California State University, Los Angeles, CA |
| 1996 to 1997 | Outstanding Graduate Student Award |

**10. Institutional and professional service in the last five years**

Created Chamber of Hope art program for homeless, 2004

Developed and orchestrated Christmas Jacket and Blanket Drive serving over 300 families, 2002 – present
Fundraised for medical donor needs through KRSI radio station, 1987 – present
Coordinated and researched programs for debates and discussion involving political and environmental issues through KRSI radio station, 1987 – present
Participated in Habitat for Humanity homebuilding projects, 1995 – 1996
Participated in international project for syphilis education in Guatemala, 1992

**11. Professional development activities in the last five years**

N/A

**1. Name and Academic Rank**

**Choi, Sang B., Part-time Faculty**

**2. Degrees with fields, institution, and date**

2003 Master of Science
Mechanical Engineering
California State University, Los Angeles

1999 Bachelor of Science
Mechanical Design and Production Engineering
Kon-Kuk University, Seoul, Korea

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Date of original appointment: 2003
Number of years in service: 3

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

2003 to Present Lecturer
California State University, Los Angeles

2000 to present Research Engineer
MFDC Laboratory, California State University, Los Angeles, CA

1997 to 1999 Researcher / Part-time Lecturer
Kon-Kuk University, Seoul, Korea

Industrial Experience:

2003 to present Research Associate / Senior Program Engineer
Advanced Engineering Solutions, Inc., Los Angeles, CA

2000 Product Design Engineer
Kittrich Cooperation, La Mirada, CA

1998 to 1999 Internship/Engineer
Transmission Design and Cost Reduction
Hyundai Aerospace & Aircraft Co., Korea

**5. Consulting, patents, etc.**

N/A

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

Clark, A., Wu, C., Mirmirani, M., Choi, S., "Development of an Airframe Integrated Generic Hypersonic Vehicle Model," AIAA Aerospace Conference and Exhibit, Reno, Nevada, January 2006

Mirmirani, M., Wu. C., Clark, A and S. Choi, Colgren, R. "Modeling for Control of a Generic Airbreathing Hypersonic," AIAA, Guidance Navigation and Control Conference and Exhibit, San Francisco, CA, August 2005

H. Xu, M. Mirmirani, and S. Choi, "LQG control of a CFD-based aeroelastic wing model", IEEE 2003 Conference on Decision and Control, Maui, HI, Dec. 2003

Wu, C., and Choi, S., "Integration of Configuration Design and Multidisciplinary Analysis of Aircraft", SAE and AIAA, San Diego, 2002.

**8. Scientific and professional societies of which a member**

American Society of Mechanical Engineers
American Institute of Aeronautics and Astronautics

**9. Honors and awards**

Pi-Tau Sigma Mechanical Engineering Honor Society

**10. Institutional and professional service in the last five years**

N/A

**11. Professional development activities in the last five years**

Attendance at Teaching Related Courses, Workshops, and Conferences:

| | |
|---|---|
| 01/2006 | AIAA Aerospace Conference and Exhibit, Reno, NV |
| 08/2004 | AIAA Guidance, Navigation, and Control Conference and Exhibit, Providence, RI |
| 03/2003 | SDRC/I-DEAS Seminar, Los Angeles, CA |
| 08/2002 | SAE and AIAA Conference, San Diego, CA |

**1. Name and Academic Rank**

**Gratton, Luca, Part-time Faculty**

**2. Degrees with fields, institution, and date**

2000 Doctor of Philosophy
Specialty: Nuclear Engineering
University of California, Berkeley

1995 Master of Science in Mechanical Engineering
UCLA

1993 Bachelor of Science in Mechanical Engineering
UCLA

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of Years on this Faculty: 1
Date of original Appointment: 2005

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

| | |
|---|---|
| 1999 | Teaching Assistant<br>University of California, Berkeley |

Industrial Experience:

| | |
|---|---|
| 2002 to 2003 | Technical Staff<br>Las Alamos National Laboratory |
| 2001 to 2002 | Senior Engineer<br>Bachtel SAIC LLC |
| 2000 to 2001 | Principle Engineer<br>Framatome ANP |
| 2000 | Database Anlayst<br>Arsenault-Legg Inc |

**5. Consulting, patents, etc.**

2004 to current Independent R&D
Sole Proprietor
Asses business climate perform business planning, identify target areas for start-up technical consulting services, publish original technical assessment, solicit technical grant applications

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**


Gratton, L., "Reactivity Characteristics of Soil Moderated Mixtures for Space Reactor Accidents," Proceedings of the ANS Space Nuclear Conference, San Diego, CA, 2005

Gratton, L., "Transient Stephan Flows at Wet and Heated Equipment Boundaries," Proceedings of the ASME Power Conference, Chicago, IL, 2005

Landry, R., Gratton, L. and MacArthur, D. "Multiple Processors vs. A Single Processor in Attribute Measurement Systems," Report LA-UR-02/5318, Los Alamos, NM, 2002

Landry, R., Gratton, L. and MacArthur, D. "Modular Design Consideration," Report LA-UR-02/5319, Los Alamos, NM, 2002

Landry, R., Hirsh, K., MacArthur, D., Gratton, L., and Whiteson, R., "vulnerability Assessments of Measurement Systems," Report LA-UR-02/3106, Los Alamos, NM, 2002

Deng, S.F., Saglam, M., and Gratton, L., "Critical Degraded configuration Probability Analysis of DOE Codisposal Waste Package," ANL-EDC-NU-000001, Yucca Mountain Site Characterization Project, Office of Civilian Radioactive Waste Management, Las Vegas, NV, 2001

Gratton, L., Monroe-Rammsy, J., and Sockman, H., "Software Management Report for ASPRIN V1.0," SAN:LV-2001-065, Yucca Mountain Site Characterization Project, Office of Civilian Radioactive Waste Management, Las Vegas, NV, 2001

Gratton, L., "Software Management Report for fracspc2.c V.1.0," SAN:LV-2001-137, Yucca Mountain Site Characterization Project, Office of Civilian Radioactive Waste Management, Las Vegas, NV, 2001

**8. Scientific and professional societies of which a member**

N/A

**9. Honors and awards**

N/A

**10. Institutional and professional service in the last five years**

N/A

**11. Professional development activities in the last five years**

N/A

**1. Name and Academic Rank**

**Herwerth, Christopher A., Part-time Faculty**

**2. Degrees with fields, institution, and date**

2005 Bachelor of Science, Mechanical Engineering
California State University, Los Angeles

1987 Bachelor of Arts, Liberal Arts
State University of New York, Stony Brook

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of Years on this Faculty: 1
Date of original Appointment, Adjunct Professor, 06/2005

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

2003 to Present Research Assistant, Multidisciplinary Flight Dynamics and Control Laboratory, MFDC Laboratory
California State University, Los Angeles

**5. Consulting, patents, etc.**

N/A

**6. State(s) in which registered**

EIT/CA

**7. Principal publications of last five years**

Herwerth, C., Ofoma, U., Lopez, M.: "Conceptual Design of a Fuel Cell Powered UAV for Environmental Research" Poster Session Presented, Alternate Speaker at Association for Unmanned Vehicle Systems International (AUVSI) 32nd Annual Symposium and Exhibition Baltimore, Maryland ,June 28-30, 2005

Herwerth, C., Ofoma, U., Wu, C. "Development of a Fuel Cell Powered UAV for Environmental Research" Paper presented at the 44th AIAA Aerospace Sciences Meeting and Exhibit, January 9-12, 2006 Reno, Nevada

Herwerth, C., Ko, A., Mirmirani, M.: "Integration of a PEM Fuel Cell into a Slow Speed UAV", Accepted for Poster Session and Alternate Speaker, 33nd Annual Symposium and Exhibition Association for Unmanned Vehicle Systems International (AUVSI) Orlando Florida, August 30, 2006

**8. Scientific and professional societies of which a member**

American Society of Mechanical Engineers (ASME)
American Institute of Aeronautics and Astronautics (AIAA)

**9. Honors and awards**

Pi Tau Sigma Mechanical Engineering Honor Society
Tau Beta Pi Engineering Honor Society

**10. Institutional and professional service in the last five years**

College Committee:

Instructional Related Activities Committee (IRA), 2004-2006

Professional service:

Presented a one hour long workshop at the 17th Annual HEENAC Conference in Anaheim California, October 16, 2005.
NASA Summer High School Apprenticeship Program (NASA SHARP)
Mentored Three High School Students during their research internships at MFDCLab Summer 2004 and 2005

**11. Professional development activities in the last five years**

Attendance at Teaching Related Courses, Workshops, and Conferences:

ASME (American Society of Mechanical Engineers), Fourth International ASME Conference on Fuel Cell Science, Engineering and Technology Irvine California, June 19 – 21 2006

**1. Name and Academic Rank**

**Kerdanyan, Grigor, Part-time Faculty**

**2. Degrees with fields, institution, and date**

2001 Master of Science
Mechanical Engineering
California State University, Los Angeles

1999 Bachelor of Science
Mechanical Engineering
California State University, Los Angeles

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Date of original appointment: 2006
Number of years in service: 1

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

Industrial Experience:

2002-present Research Engineer
Los Amigos Research and Education Institute, Inc.

2001-2002 Associate Engineer / Scientist
Boeing, Huntington Beach

1998-2001 Research Assistant
California State University, Los Angeles, Mechanical Engineering Dpt.

**5. Consulting, patents, etc.**

N/A

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

G. Kerdanyan, "Inflatable Structure for A Three-Meter Reflectarray Antenna," AIAA Journal of Spacecraft and Rockets, 2004;41(4):543-550.

G. Kerdanyan, "4-Bar Linkage Mechanism for Child Prehensors," RESNA conference, June 2000

G. Kerdanyan, "An Inflatable/Self-Rigidizable Structure for the Reflectarray Antenna," 10th European Electromagnetic Structures Conference, Munich, Germany, October 2001

G. Kerdanyan, "An Inflatable/Rigidizable Ka-Band Reflectarray Antenna," AIAA 2002-1706, 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Denver, Colorado, April 2002

G. Kerdanyan, "Measurement of Force and Acceleration Experienced in a Manual Wheelchair," RESNA conference, June 2005

G. Kerdanyan, "Measuring Human Trainers' Skill for the Design of Better Robot Control Algorithems for Gait Training after Spinal Cord Injury," Proceedings of the 2005 IEEE 9th International Conference on Rehabilitation Robotics, June 2005:231-234.

G. Kerdanyan, "The Effects of Wheelchair Vibration as a Function of Wheelchair Suspension, Trunk Muscle Innervation and Velocity," ASIA conference, June 2006

**8. Scientific and professional societies of which a member**

N/A

**9. Honors and awards**

Alumni Certificate of Honor, California State University, Los Angeles, 1999 & 2002
Mechanical Engineering Student of the year, California State University, Los Angeles, 1998-1999
Student Design Competition winner, RESNA Conference, 2000

Certificate of Commendation, Development of a Prototype Inflatable Antenna, Jet propulsion Laboratory, 2000

Special Recognition in graduate studies for outstanding work, California State University, Los Angeles, 2001

Group Achievement Award – Inflatable Reflectarray Antenna Development Team, National Aeronautics and Space Administration (NASA), 2005

Pi-Tau Sigma Mechanical Engineering Honor Society

**10. Institutional and professional service in the last five years**

N/A

**11. Professional development activities in the last five years**

N/A

**1. Name and Academic Rank**

**Khashayar, Kamyar, Part-time Faculty**

**2. Degrees with fields, institution, and date**

2000 Master of Science in Mechanical Engineering
California state University Los Angeles

1981 Bachelor of Science in Engineering
San Francisco State University

**3. Number of years service and places as adjunct faculty, including date of original appointment and dates of advancement in rank**

Number of years service: 3
Date of original appointment: 3/2003

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

2000 to 2004 Multidisciplinary flight dynamics and control lab.
California State University, Los Angeles

Industrial Experience:

1981 to 1997 Diversified Engineering and Project Management
Tehran- Iran

Financial Experience:

2003 to Present: Primerica Financial Services
Burbank, CA

**5. Consulting, patents, etc.**

Consultant for Drivertize Co., a new patented product. 2001

**6. State(s) in which registered**

N/A

**7. Principal publications of last fifteen years**

N/A

**8. Scientific and professional societies of which a member**

Society of Manufacturing Engineers
American Institute of Aeronautics and Astronautics

**9. Honors and awards**

Pi Tau Sigma Mechanical Engineering Honor Fraternity

**10. Institutional and professional service in the last ten years**

N/A

**11. Professional development activities in the last ten years**

N/A

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**1. Name and Academic Rank**

**Parvin, Mohammad, Part-time Faculty**

**2. Degrees with fields, institution, and date**

1976 Doctor of Philosophy
Mechanical Engineering
Specialization: Applied Mechanics
Imperial College of Science and Technology, London, England

1972 Master of Science in Applied Mechanics
Specialization: Applied Mechanics
Imperial College of Science and Technology, London, England

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of years service: 15
Date of original Appointment 1991

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

| | |
|---|---|
| 2003 to 2005 | Part-time Faculty<br>Los Angeles City College |
| 1985 to 1988 | Senior research Fellow<br>Department of Aeronautics, California Institute of Technology, Pasadena |
| 1984 to 1985 | Lecturer<br>Department of Mechanical Engineering<br>California State University, Long Beach |
| 1979 to 1983 | Associate Professor<br>Mechanical Engineering Department<br>Tehran University of Technology |
| 1976-1979 | Research Associate / Assistant Professor<br>Department of Chemical Engineering<br>University of Southern California, Los Angeles |

Industrial Experience:

| | |
|---|---|
| 2005 to Present | Senior Analytical Engineer<br>Argo-Tech, Costa Mesa, California |
| 2002 to 2003 | Senior Mechanical Engineer<br>Barksdale Corporation, Los Angeles, California |
| 1999 to 2002 | Senior Mechanical Engineer<br>Excellon Automation, Torrance, California |
| 1997 to 1999 | Senior Mechanical Engineer<br>AURA Systems, El Segundo, California; EG&G Optoelectronics, Covina, CA |
| 1988 to 1992 | Senior Engineer<br>Eaton Corporation, Aerospace & Commercial Controls Division, Costa Mesa, California |
| 1979 to 1983 | Executive Manager<br>Energy and Industry Consultants, Tehran, Iran |

**5. Consulting, patents, etc.**

| | |
|---|---|
| 2003 to 2005 | CONSULTANT<br>Science & Technology Consultants, Los Angeles, California |
| 1984 to 1985 | CONSULTANT ENGINEER<br>MG Associates, Glendale CA |

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

M. Parvin, “Honeycomb Structure in Micro drilling machines”, Technical Reports, Excellon Automation, 2001

M. Parvin, “Failure Investigation of Ceramics Rotors in Pressure Valves”, Barksdale Co., 2003.

M. Parvin, “ The Effect of Environment on the Fuel Gauging Carbon Composite Probes”, Argo-Tech Corporation, 2005

**8. Scientific and professional societies of which ever a member**

ASME

**9. Honors and awards**

N/A

**10. Institutional and professional service in the last five years**

N/A

**11. Professional development activities in the last five years**

N/A

**1. Name and Academic Rank**

**Ploen, Scott R., Part-time Faculty**

**2. Degrees with fields, institution, and date**

1997 Doctor of Philosophy in Mechanical and Aerospace Engineering
Specialization: Multibody Dynamics, Control Systems, Robotics
University of California, Irvine (UCI)

1994 Master of Science in Mechanical Engineering
Specialization: Control Systems, Robotics
University of California, Irvine (UCI)

1991 Bachelor of Science in Applied Mechanics (Biomedical Engineering)
Specialization: Biomechanics
University of California, San Diego (UCSD)

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of years of service: 3 (Part-time Professor)

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

2003 to Present Adjunct Professor
California State University, Los Angeles

1998 to 1999 Lecturer
University of California, Irvine

Professional Experience

2003 to Present Senior Engineer
Guidance and Control Analysis Group
Jet Propulsion Laboratory, Pasadena, CA

1997 to 2003 Engineer
Guidance and Control Analysis Group
Jet Propulsion Laboratory, Pasadena, CA

**5. Consulting, patents, etc.**

Patent: High Accuracy Inertial Sensors From Inexpensive Components
U.S. Patent, No. 6,882,964 B2

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

S.R. Ploen, H. Seraji, and C. Kinney, "Determination of spacecraft landing-footprint for safe planetary landing", IEEE Transactions on Aerospace and Electronic Systems.(To appear)

S.R. Ploen, D.P. Scharf, F.Y. Hadaegh, and M. Bikdash, "Initialization of distributed spacecraft formations", Journal of the Astronautical Sciences, Vol 52. , No. 4, October-December 2005

E. Mettler, A. Acikmese, and S. Ploen, "Attitude dynamics and control of solar sails with articulated vanes", AIAA Guidance, Control, and Navigation Conference, San Francisco, CA, 2005.

B. Acikmese, and S. Ploen, "A powered descent guidance algorithm for Mars pinpoint landing", AIAA Guidance, Control, and Navigation Conference, San Francisco, CA, 2005.

J.T. Chang, S. Ploen, G. Sohl, and B. Martin, "Parallel multi-step, multi-rate integration of two-time scale dynamic systems", AIAA Guidance, Navigation, and Control Conference, Providence, RI, August 2004.

D.P. Scharf, S. Ploen, F. Hadaegh, and G. Sohl, "Guaranteed spatial initialization of distributed spacecraft formations", AIAA Guidance, Navigation, and Control Conference, Providence, RI, August 2004.

S.R. Ploen, F.Y. Hadaegh, and D.P. Scharf, "Dynamics of Earth orbiting formations", AIAA Guidance, Navigation, and Control Conference, Providence, RI, August 2004.

M. Bikdash, F.Y. Hadaegh, D.P. Scharf, and S. Ploen, "Three-dimensional analysis of basic acquisition algorithms in deep space", American Control Conference, Boston, MA, June 2004.

S.R. Ploen, F.Y. Hadaegh, and D.P. Scharf, "Rigid body equations of motion for modeling and control of spacecraft formations", American Control Conference, Boston, MA, June 2004.

D.P. Scharf, F.Y. Hadaegh, and S.R. Ploen, "A survey of spacecraft formation flying and control (Part 2)", American Control Conference, Boston, MA, June 2004.

F.Y, Hadaegh, V. Jamnejad, D.P. Scharf, and S.R. Ploen, "Self-Organizing control for space-based sparse antennas", IEEE Int. Conf. on Intelligent Technologies, Chiang Mai, Thailand, December 2003.

F.Y. Hadaegh, D.P. Scharf, and S.R. Ploen, "Initialization of distributed spacecraft for precision formation flying", IEEE Conf. Control Applications, 2003.

D.P. Scharf, F.Y. Hadaegh, and S.R. Ploen, "A survey of spacecraft formation flying guidance and control (Part 1) – Guidance", American Control Conference, 2003.

D.P. Scharf, S.R. Ploen, F.Y. Hadaegh, J.A. Keim, and L. Pham, "Guaranteed initialization of distributed spacecraft formations", AIAA Guidance, Navigation, and Control Conference, 2003.

S.R. Ploen, C. Kinney, and H.Seraji, "Determination of terminal landing footprint for on-board terminal assessment and intelligent hazard avoidance", AIAA Guidance, Navigation, and Control Conference, 2003.

E. Mettler and S.R. Ploen, "Solar-sail dynamics and control using a boom mounted bus articulated by a bi-state two-axis gimbal and reaction wheels", AIAA/AAS Astrodynamics Specialist Conference, 2002.

S.R. Ploen and D.S. Bayard, "Dynamics of vibratory microscopes", AIAA Guidance, Navigation, and Control Conference, 2002.

**8. Scientific and professional societies of which ever a member**

ASME, AIAA, IEEE, SIAM

**9. Honors and awards**

NASA Tech Brief Awards – Attitude control for a solar-sail spacecraft

Best Paper of Session Award- AIAA GN&C Conferece, Austin Texas

**10. Institutional and professional service in the last five years**

Associate Editor

IEEE Control Systems Magazine

JPL Mentoring Program

Reviewer

IEEE Transaction on Robotics and Automation,
AIAA J. Guidance, Control and Dynamics
Journal of the Astronautical Sciences

**11. Professional development activities in the last five years**

Courses:

Kalman Filteing and Estimation Theory (UCLA Extension)
Numerical Techniques in Optimization (JPL)
Fuzzy Control Systems (USC)
Technical Writing (JPL)

Funded Proposals:

Dynamics, Control, and Estimation for Formation Flying about L2 (JPL DRDF Proposal w/ Princeton University)

Guidance and Control of Space Based Sparse Antenna (JPL DRDF Proposal)

**1. Name and Academic Rank**

**Yousefiani, Ali, Part-time Faculty**

**2. Degrees with fields, institution, and date**

1976 Doctorate of Philosophy in Materials Science and Engineering
Specialization: Behavior of Materials in Extreme Environments
University of California, Irvine

1972 Bachelor of Science in Metallurgical Engineering
Specialization: Metal Forming
Sharif University of Technology, Tehran/Iran

**3. Number of years service on this faculty, including date of original appointment and dates of advancement in rank**

Number of years service: 06/2006
Date of original Appointment 1

**4. Other related experience--teaching, industrial, etc.**

Academic Experience:

| | |
|---|---|
| 2005 to present | Lecturer<br>University of California, Irvine |
| 1999 to 2000 | Postdoctoral Research/Scientist<br>University of California, Irvine |
| 1994 to 1999 | Graduate Teaching/Research Assistant<br>University of California, Irvine |

Industrial Experience:

| | |
|---|---|
| 2005 to present | Principal Materials Engineer/Scientist<br>The Boeing Company |
| 1999 to 2000 | Senior Materials Engineer/Scientist<br>The Boeing Company |

**5. Consulting, patents, etc.**

N/A

**6. State(s) in which registered**

N/A

**7. Principal publications of last five years**

Yousefiani and K. Hensch, "Inconel 718 Nut Failure Analysis," Boeing Technical Report 02H0006, January 2002.

Yousefiani, "MP159 Bolt Failure Analysis," Boeing Technical Report 02H0037, May 2002.

H. W. Babel, A. Yousefiani, and B. Farahmand, "Assessment of Delaminations in Current Aluminum-Lithium Alloys", Boeing Technical Report 03H0026, April 2003.

Yousefiani and M. L. Tarkanian, "Metallurgical Evaluation of Aluminum-Lithium Alloys and Welding Processes for the Space Launch Initiative Program – FINAL REPORT", Boeing Technical Report 03H0038, July 2003.

Yousefiani, R. R. De Jesus, and M. L. Tarkanian, "Metallurgical Characterization of 0.5-Inch Thick Aluminum-Lithium Alloy L277 Plate", Boeing Technical Report 03H0040, July 2003.

Yousefiani, R. R. De Jesus, and M. L. Tarkanian, "Metallurgical Characterization of 2.4-Inch Thick Aluminum-Lithium Alloy L277 Plate", Boeing Technical Report 03H0041, July 2003.

Yousefiani and M. L. Tarkanian, "Metallurgical Characterization of 1.5-Inch Thick Aluminum-Lithium Alloy L277 Extrusion", Boeing Technical Report 03H0042, July 2003.

Yousefiani, J. M. Comfort, and M. L. Tarkanian, "Metallurgical Characterization of 0.75-Inch Thick Aluminum-Lithium Alloys L277, 2195, and C460, Extrusion", Boeing Technical Report 03H0043, July 2003.

Yousefiani, and M. L. Tarkanian, "Property Variations Observed in Aluminum-Lithium Alloy L277 during Basic and Option 1 Phases of the SLI Program", Boeing Technical Report 03H0065, July 2003.

Yousefiani, and M. L. Tarkanian, "Optimized Aging Parameters for Aluminum-Lithium Alloy L277", Boeing Technical Report 03H0062, July 2003.

Yousefiani, "Assessment of SCC Susceptibility of Austenitic Stainless Steels," Boeing Technical Report 04H0110, September 2004.

Yousefiani, “Feasibility Assessment of Repair Methods for Coating Damage in the Space Shuttle Orbiter Thrusters,” Boeing Technical Report 04H0120, November 2004.

C. Franks and A. Yousefiani, “Mechanical and Metallurgical Evaluation of Inconel X750 Knit Wire Springs Exposed to Extreme Thermal Environments,” Boeing Technical Report 05H0029, April 2005.

Yousefiani, “Evaluation of Thermal Stresses, Distortion, and Temperature Distribution Resulting from Laser Processing of the Space Shuttle Orbiter Thrusters during Coating Damage Repair,” Boeing Technical Report 05H0050, December 2005.

Yousefiani, “Feasibility Assessment of Exothermic and Endothermic Active Brazing Technologies for Joining Ultra High Temperature Structural Components,” Boeing Technical Report 05H0013, January 2006.

Yousefiani, J. C. Earthman, and F. A. Mohamed, "Formation of cavity stringers during superplastic deformation," Acta Mater., 46, 3557 (1998).

Yousefiani and F. A. Mohamed, "Superplastic flow and cavitation in Zn-22 pct Al doped with Cu," Metall. Mater. Trans. A, 29A, 1653 (1998).

Yousefiani and F. A. Mohamed, "Correlation between microstructure evolution and cavity stringer formation in the superplastic Zn-22wt%Al alloy," Philos. Mag. A, 79, 1247 (1999).

Yousefiani and F. A. Mohamed, "Correlation between former alpha boundary growth kinetics and superplastic flow in Zn-22 pct Al," Metall. Mater. Trans. A, 31A, 163 (2000).

A. Yousefiani, F. A. Mohamed, and J. C. Earthman, "Creep rupture mechanisms in annealed and overheated 7075 Al under multiaxial stress states," Metall. Mater. Trans. A, 31A, 2807 (2000).

**8. Scientific and professional societies of which ever a member**

AIAA, ASME, ASM, TMS

**9. Honors and awards**

Fellowship Awards (1995, 1996, 1997) from UC Regents: Outstanding academic achievement and promise.

Innovative Research Award (1996) from ASM International.

Achievement Award (2000): Excellent performance and presentation in the X-37 Propellant Compatibility Meeting.

Achievement Award (2001): Valuable contributions to resolution of critical nut failures.

Cash Award (2001): Contribution to company goals and exceptional performance.

Achievement Award (2001): Contributions to timely resolution of a critical bolt failure.

Achievement Award (2002): Significant technical accomplishments and dedicated customer focus in the SLI Program.

Boeing Stock Options (2002): Personal effort/contributions to Boeing in attaining goals.

Achievement Award (2002): Professional response to crisis, enabling a commit to launch.

Achievement Award (2003): Significant efforts supporting SLI Al-Li testing/analysis.

Achievement Award (2003): Successful demo of SR Friction Stir Welding technology applied cryogenic propellant tank.

Cash Award (2004): Contribution to company goals and exceptional performance.

Achievement Award (2004): Ongoing commitment to the human space flight mission and efforts to ensure that the legacy and journey of Columbia and her crew continues.

**10. Institutional and professional service in the last five years**

N/A

**11. Professional development activities in the last five years**

N/A

**Baker, Phil**

Phil Baker is the Director of Commercial and Industrial Services at the Southern California Gas Company (SoCalGas), a Sempra Energy utility. SoCalGas is the nation's largest natural gas distribution utility serving 20 million consumers through 5.5 million gas meters.

In his current position, Baker is responsible for all marketing needs for the largest commercial and industrial customers. In aggregate, these customers account for approximately 25 percent of total gas deliveries on the SoCalGas system.

Phil Baker began his career with The Southern California Gas Company after graduating from California State University at Los Angeles (CSULA) in 1979 with a degree in Civil Engineering. Over the past 27 years Phil has held positions in Gas Distribution & Customer Services, Engineering, Research, Transmission, Fleet, Facilities, and Material Logistics. He has also worked internationally on energy development projects throughout Mexico and in South America.

Phil is a board member of the Energy Solutions Center (ESC), a North American commercialization and market development organization, and a board member of NGV America, a national trade association dedicated to the development of vehicles powered by natural gas or hydrogen.

**Fang, Houfei**

Jet Propulsion Laboratory, California Institute of Technology
MS 299-100, 4800 Oak Grove Drive, Pasadena, CA 91109-8099
818-354-0829
hfang@jpl.nasa.gov

## EXPERIENCE:

Senior Engineer (10/01-present), Mechanical Systems Engineering and Research Division, Jet Propulsion Laboratory (JPL)

Group leader (12/04-present), Advanced Deployable Space Structures Group, Jet Propulsion Laboratory (JPL)

- Co-Investigator of the Nationa Reconnassance Office DII project "Flexible PVDF Copolymer Film (FPCF) actuators for high precision surface control of large deployable antenna reflectors". Responsibilities include developing innovative Flexible PVDF Copolymer Film (FPCF) actuator technology, establishing analytical models and demonstrating this technology analytically, establishing and monitoring sub-contracts, as well as coordinating activities among multiple entities.
- Co-Investigator of the NASA ESS ACT project "High-Precision Adaptive Control of Large Antenna Surface". Responsibilities include establishing analytical models and analysis methods, developing innovative sensor and actuator technologies, building up control laws and control mechanisims, demonstrating this technology on a 4-m diameter membrane reflector and analytically scaling it up to 35-m diameter refector, establishing and monitoring sub-contracts, and coordinating activities among multiple entities.
- Co-Investigator of the JPL R&TD project "A Low-Cost Highly Efficient Beam Scanning Technology". Developed a new beam scanning technology by using MEMS for large reflectarray antennas.
- Principal-Investigator of the NASA Space Transportation Technology Program project "Structural Analysis and Synthesis Tools for Solar Sails". Responsibilities include developing innovative analytical methodologies, coordinating activities between Universities and NASA centers, reporting to managements, monitoring schedules and budgets.
- Task leader for the mechanical aspect of NASA OES IIP project "NEXRAD in Space". Responsibilities include leading a team to develop all the mechanical and structural sub-systems, develop innovative technologies to implement a 35-meter diameter spherical ultra lightweight space borne precision reflector, developing analytical models and performing case studies, establishing and monitoring sub-contracts, reporting to managements, controlling budgets and schedules.
- Task leader for the mechanical aspect of several inflatable/self-rigidizable membrane reflectarray antenna projects sponsored by JPL Interplanetary Network Directorate Technology Program. These projects include 3-m Ka-band antenna, 3-m X/Ka-band antenna, and 10-m X/Ka-band antenna. Responsibilities include developing structural concepts, developing new structural technologies, leading a team of engineers and academic parttime students to design, analyze, and manufacture engineering models, establishing and monitoring university sub-contracts, reporting to managements, controlling budgets and schedules.

Member Technical Staff (4/98-9/01), Mechanical Systems Engineering and Research Division, JPL

- Worked on ISIS (Inflatable Sunshield In Space), ISAR (Inflatable Synthetic Aperture Radar), Inflatable Microstrip Reflectarray Antenna, and other space inflatable projects.
- Developed analytical and numerical methods for Gossamer Space Structures with partially wrinkled membranes.
- Developed innovative space inflatable/rigidizable structures technologies.

Stress Engineer (4/97-3/98), Stress Department, C & D Aerospace

- Substantiated integrity for commercial airplane subsystems by static test and stress analysis. Subsystems that had been substantiated included drop ceilings, bulkheads, support structures, and other subsystems for installation on DC-10, MD-11, Boeing 747, EMB145, DHC-8, and RJ-700.

Mechanical Engineer (7/96-4/97), Mechanical Systems Engineering and Research Division, JPL

- Developed a gas flow model and performed numerical simulations for inflatable components.
- Conducted dynamic analyses for the LightSAR radar.
- Conducted dynamic analysis for the explorer penetrating system.

Research and Teaching Assistant (9/90-7/96), Department of Mechanical Engineering, USC

- Performed experimental and analytical studies on vibration, shock and stress analysis for a wide range of systems including automobile bodies, frame towers, and rotating machinery.
- Designed vibration and stress reduction controllers for robots.
- Worked as a teaching assistant for following courses: (1) numerical analysis methods, (2) finite element analysis, (3) vibration, (4) linear control theory, (5) mechanics of materials, (6) kinematics, (7) applied elasticity, and (8) engineering mathematics.

Mechanical Engineer (7/82-8/90), Shanghai Marine Diesel Engine Research Institute

- Successfully designed three Double Resilient Vibration & Shock Isolation Systems for Shanghai Marine Power System Manufacturer. Conducted experimental and analytical studies on dynamic behaviors of diesel engines and ship bodies.
- Conducted vibration control, noise reduction, and stress reduction for ship bodies by using viscoelastic and polymer concrete materials. Conducted failure analysis and developed corrective method for crack control of metallic structures.
- Designed and participated in the manufacturing of three models of turbocharger and one model of gas turbine. Conducted thermodynamic and critical speeds analyses for the turbo machinery.
- Performed stress and modal analyses of turbine blades and cases for Xi Cho Turbine Plant.
- Conducted acoustic and vibration testing and troubleshooting for turbochargers.

## EDUCATION:

- Ph.D., Department of Aerospace and Mechanical Engineering, USC, August 1996
- M.S., Department of Aerospace and Mechanical Engineering, USC, December 1991
- M.S., Shanghai Marine Diesel Engine Research Institute, China 7th Research Academy, July 1987
- B.S., Department of Power Machinery Engineering, Shanghai Jiao Tong University, July 1982

## PUBLICATIONS:

- H. Fang, J. Huang, U. Quijano, K. Knarr, J. Perez, L. Hsia, "Design and Technologies Development for an Eight-Meter Inflatable Reflectarray Antenna", AIAA-2006-2230, 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Newport, Rhode Island, May 1-4, 2006
- H. DeSmidt, K. Wang, H. Fang, "Gore/Seam Cable Actuated Shape Control of Inflated Precision Gossamer Reflectors – Assessment Study", AIAA-2006-1902, 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Newport, Rhode Island, May 1-4, 2006
- J. Lin, H. Fang, E. Im and U. Quijano, "Concept Study of a 35-m Spherical Reflector System for NEXRAD in Space Application", AIAA-2006-1604, 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Newport, Rhode Island, May 1-4, 2006
- S. Chodimella, J. Moore and J. Otto, H. Fang, "Design Evaluation of a Large Aperture Deployable Antenna", AIAA-2006-1603, 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Newport, Rhode Island, May 1-4, 2006
- H. Fang, J. Huang, U. Quijano, L-H. Hsia, N. Sorokin, O. Polanco, "An Eight-Meter Inflatable Reflectarray Antenna and Its Inflatable/Self-Rigidizable Booms", ASCE Earth & Space 2006, League City/Huston, Texas, 5-8 March 2006
- H. Fang, J. Huang, M. Lou, "Large Deployable Reflectarray Antenna," NASA Tech Brief, Vol. 30, No. 2, pp.50, February 2006, NPO-41083
- H. Fang , M. Lou, J. Hah, "Deployment Study of a Self-rigidizable Inflatable Boom," AIAA Journal of Spacecraft and Rockets, Vol. 43, No. 1, pp. 25-30, January-February 2006
- B. Yang, H. Ding, H. Fang, M. Lou, "Modeling and Vibration Analysis of Deployable Space Boom Structures," DETC2005-84519, Will be presented at ASME 2005 International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Long Beach, California, 24-28 September 2005
- H. Ding, B. Yang, H. Fang, M. Lou, "Wrinkling and Free Vibration of Catenary-Supported Thin Membranes," DETC2005-85089, Will be presented at ASME 2005 International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Long Beach, California, 24-28 September 2005
- H. Fang , M. Lou, J. Hah, J. Huang, G. L. Davis, U. Quijano, "Deployment Dynamics of an Inflatable/Self-rigidizable Boom," Accepted for publication on AIAA Journal of Spacecraft and Rockets

- H. Fang, M. Lou, J. Huang, U. Quijano, G. L. Davis, L. Hsia, G. Pelaez, V. Svolopoulos, "Development of an Inflatable Reflectarray Antenna Scalable to 7 Meters or Greater Aperture Diameter", Accepted for publication on AIAA Journal of Spacecraft and Rockets
- H. Fang, M. Lou, "Isogrid Membranes for Precise, Singly Curved Reflectors," NASA Tech Brief, Vol. 29, No. 2, pp.46, February 2005, NPO-40035
- J. Huang, H. Fang, R. Lovick, M. Lou, "The Development of Large Inflatable Antenna for Deep-space Communication," AIAA2004-6112, AIAA 2004 Space Conference
- M. Lou, H. Fang, and B. Yang, "Development of New Modeling and Analysis Tools for Solar Sails," AIAA 2004-4888, AIAA Guidance, Navigation, and Control Conference and Exhibit, Providence, Rhode Island, 16-19 August 2004
- H. Fang, M. Lou, J. Huang, L. Hsia, and G. Kerdanyan, "An Inflatable Structure for A Three-Meter Reflectarray Antenna," AIAA Journal of Spacecraft and Rockets, Vol. 41, No. 4, pp. 543-550, July-August 2004
- H. Fang, T. Y. Ho, U. Quijano, W. C. Ledeboer, A. Kissil, G. Agnes, G. Chen, "Development of the Terrestrial Planet Finder Coronagraph Membrane V-Groove sunshield," AIAA 2004-1731, 45th AIAA/ASME/ ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Palm Springs, California, April 2004
- H. Fang, M. Lou, John H, L. Hsia, U. Quijano, G. Pelaez, V. Svolopoulos, "Development of a 7-Meter Inflatable Reflectarray Antenna," AIAA 2004-1502, 45th AIAA/ASME/ ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Palm Springs, California, April 2004
- B. Yang, M. Lou, and H. Fang, "Buckling Analysis of Long Booms with Initial Geometric Imperfections," AIAA 2004-1735, 45th AIAA/ASME/ ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Palm Springs, California, April 2004
- H. Fang, M. Lou, and J. Huang, "Self-Inflatable/Self-Rigidizable Reflectarray Antenna," NASA Tech Brief, Vol. 28, No. 1, pp. 61, January 2004, NPO-30662
- J. Huang, H. Fang, B. Lopez, and M. Lou, "The Development of Inflatable Array Antennas", AIAA Space 2003, Long Beach, California, 23-25 September 2003
- B. Yang, M. Lou and H. Fang, "A Nonlinear Compatible Equation For Three-Dimensional Wrinkling Analysis of Thin Membranes", AIAA 2003-6322, AIAA Space 2003, Long Beach, California, 23-25 September 2003
- H. Fang, M. Lou, and N. Palmer, "Self-deployable Spring-strip Booms," NASA Tech Brief, Vol. 27, No. 8, pp.44, August 2003, NPO-30175
- H. Fang, M. Lou, B. Yang, and Y. Yang, "Modeling of Gossamer Space Structures with Distributed Transfer Function Method", AIAA Journal of Spacecraft and Rockets, Vol. 40, No.4, 2003
- M. Lou, and H. Fang, "Development of Inflatable Antenna structures", European Conference on Spacecraft Structures, Materials & Mechanical Testing, Toulouse, France, 11-13 December, 2002
- H. Fang, M. Lou, and J. Hah, "Deployment Study of a Self-Rigidizable Inflatable Boom", AIAA 2003-1975, 44th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Norfolk, Virginia, April 2003
- H. Fang, M. Lou, J. Huang, U. Quijano, and L. Hsia, "Thermal Distortion Analyses of A Three-Meter Inflatable Reflectarray Antenna" AIAA 2003-1650, 44th AIAA/ASME/ ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Norfolk, Virginia, April 2003
- H. Ding, B. Yang, M. Lou, and H. Fang, "New Numerical Method for Two-Dimensional Partially Wrinkled Membranes," AIAA Journal, Vol 41, No. 1, pp. 125-132, January 2003
- H. Fang, M. Lou, and J. Huang, "Inflatable/Self-Rigidizable Reflectarray Antenna" IND News, Issue 16, September 2002
- H. Fang, M. Lou, J. Huang, L. Hsia, and G. Kerdanyan, "Design and Development of an Inflatable Reflectarray Antenna", The IPN Progress Report, http://ipnpr.jpl.nasa.gov/, Issue 42-149, May 2002
- M. Salama, H. Fang, and M. Lou, "Resistive Deployment of Inflatable Structures Using Velcro", AIAA Journal of Spacecraft and Rockets, Vol. 39, No.5, pp. 711-716, 2002
- M. Lou, H. Fang, and L. Hsia, "Self- Rigidizable Space Inflatable Boom", AIAA Journal of Spacecraft and Rockets, Vol. 39, No.5, pp. 682-690, 2002
- H. Ding, B. Yang, M. Lou, and H. Fang, "A Two-Viable Parameter Membrane Model For Wrinkling Analysis of Membrane Structures", AIAA 2002-1460, 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Denver, Colorado, 22-25 April 2002
- H. Fang, M. Lou, J. Huang, L. Hsia, and G. Kerdanyan "An Inflatable/Rigidizable Ka-Band Reflectarray Antenna", AIAA 2002-1706, 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Denver, Colorado, 22-25 April 2002

- H. Fang, M. Lou, B. Yang, and Y. Yang, “DTFM Modeling, Optimization, and Sensitivity Analysis for Gossamer Structures”, AIAA 2002-0596, 40th AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, 14-17 January 2002
- M. Lou, H. Fang, B. Yang, and N. L. Palmer, “Development of An Innovative Space Boom”, ASME 2001 International Mechanical Engineering Congress & Exposition, New York, NY, Nov. 11-16, 2001
- H. Fang, M. Lou, J. Huang, L. Hsia, and G. Kerdanyan “An Inflatable/Self-Rigidizable Structure for the Reflectarray Antenna”, 10th European Electromagnetic Structures Conference, Munich, Germany, 1-4 October 2001
- H. Fang, M. Lou, and B. Yang “PVP-MP Method for Wrinkling Analysis of Space Membrane Structures,” NASA Tech Brief, Vol. 25, No. 8, pp. 48, August 2001, NPO-21133
- H. Fang, M. Lou, B. Yang “DTFM Modeling and Analysis Method for Gossamer Structures”, Second FEMCI Workshop on Innovative Finite Element Solutions to Challenging Problems, Goddard Space Flight Center, Greenbelt, Maryland, 16-17 May 2001
- B. Yang, H. Dim, and M. Lou, and H Fang “Modeling and Analysis of Wrinkled Membranes—An Overview,” Second FEMCI Workshop on Innovative Finite Element Solutions to Challenging Problems, Goddard Space Flight Center, Greenbelt, Maryland, 16-17 May 2001
- J. Huang, V. A. Feria, and H. Fang, "Improvement of the three-meter Ka-band inflatable reflectarray antenna", IEEE Antennas & Propagation Symposium, AP-S/URSI, Boston, MA, July 2001
- H. Fang, M. Lou, L. Hsia, P. Leung, "Catenary Systems for Membrane Structures," AIAA 2001-1342, 42nd AIAA/ASME/ASCE/AHS/ ASC Structures, Structural Dynamics, and Materials Conference, Seattle, WA, 16-19 April 2001
- B. Yang, H. Ding, M. Lou, and H. Fang, “A New Approach to Wrinkling Prediction for Space Membrane Structures,” AIAA 2001-1348, 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Seattle, WA, 16-19 April 2001
- M. Salama, H. Fang, and M. Lou, “Resistive Control of Deployment of Inflatables: Analysis and Experimental Verification,” AIAA 2001-1339, 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Seattle, WA, 16-19 April 2001
- M. Lou, H. Fang, and L. Hsia “Development of Space Inflatable/Rigidizable STR Aluminum Laminate Booms,” AIAA 2000-5296, Space 2000 Conference & Exposition, Long Beach, California, 19-21 September 2000
- B. Yang, H. Ding, H. Fang, and M. Lou, “Buckling Analysis of Tape-Spring Reinforced Inflatable Struts,” AIAA 2000-1725, 41st AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Atlanta, Georgia, 3-6 April 2000
- M. Salama, M. Lou, and H. Fang “Deployment of Inflatable Space Structures: A Review of Recent Developments,” AIAA 2000-1730, 41st AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Atlanta, Georgia, 3-6 April 2000
- M. Lou, H. Fang, and L. Hsia “A New Type of Space Inflatable/Rigidizable Aluminum Booms,” Poster paper, 41st AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Atlanta, Georgia, 3-6 April 2000
- M. Lou, H. Fang, and L. Hsia “A Combined Analytical and Experimental Study on Space Inflatable Booms,” IEEE 2000, Big Sky, Montana, March 19-25, 2000
- H. Fang, and M. Lou “Tape-Spring Reinforcements for Inflatable Structural Tubes,” NASA Tech Brief, Vol. 24, No. 7, pp.58, July 2000, NPO-20615
- H. Fang, and M. Lou “Analytical Characterization of Space Inflatable Structures—An Overview,” AIAA 99-1272, 40th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, St. Louis, MO, 12-15 April 1999
- H. Fang, and B. Yang “Modeling Synthesis and Dynamic Analysis of Complex Flexible Rotor Systems,” Journal of Sound and Vibration, Vol. 211, No. 4, pp.571-592, 1998
- H. Fang, “Modeling and Analysis of One-Dimensional Complex Distributed Parameter Systems by the Distributed Transfer Function Method,” Ph.D. Dissertation, Department of Mechanical Engineering, University of Southern California, July 1996
- B. Yang, and H. Fang, “Transfer Function Formulation of Non-Uniformly Distributed Parameter Systems,” ASME Journal of Vibration and Acoustics, Vol. 116, No. 4, pp. 426-432, 1994
- B. Yang and H. Fang, “Transfer Function Analysis of Non-uniformly Distributed Parameter Systems,” DE-Vol. 61, Vibration and Control of Mechanical Systems, ASME 1993
- H. Fang, “Vibration Analysis of a Damped Machinery Foundation Structure Using the Mobility Coupling Technique,” Master Degree Thesis, Shanghai Marine Diesel engine Research Institute, China 7th Research Academy, May 1987

**Gomez, Hector R.**
456 Via Los Miradores Redondo Beach, CA 90277 310-375-9562

## OBJECTIVE

To obtain a position that will take advantage of my leadership skills developed through training and 27 years of experience where I can make significant contributions to the development of the industry and the company.

## EXPERIENCE

Northrop Grumman Space Technology – Redondo Beach 9/1987 – Present

Project Manager, 01/2003 - Present

Redwood Project Manager providing oversight of all project activities including coordination between NGST and the customer community. Managing all aspects of the project within the constraints of the contract and applicable NGST policies and procedures, with continual cognizance of meeting program objectives. Securing all resources and facilities necessary to perform the proposed project. Developing plans to execute the program including resource planning (labor and facilities), integrated schedules, and corresponding budgets. Coordinating plans with internal functional management from Engineering and Production & Supply Chain Management. Providing the customer and internal management with status against these plans on a monthly basis through a monthly program review by the collecting and tracking of key technical metrics. Directing daily activities of project personnel.

Department Manager – Mechanical Engineering, 12/2000 – 07/2004

Managed a department of over 120 design and analysis engineers across various programs from test beds, through air- and spaced-based systems. Managed the development and enforcement of standard processes for design reviews, documentation standards, risk management, responsibility checklists, reporting standards, design criteria, and subsystem management. Performed employee assessments and mentorship for senior staff and compensation reviews for the entire department. Hiring manager for various levels of experience from new college graduates to senior engineers. Managed indirect budget while meeting training, resource allocation, and process improvement requirements.

Proposal Lead – Mechanical Systems – Various programs, 01/1997 – 11/2000

Developed cost and schedule inputs to various proposals including Discoverer II, SIM, EO3, Resource21, and SBL. Coordinated and gathered costs from engineering, manufacturing, integration and test to develop integrated cost estimate for the mechanical system. Together with Systems Engineering and other subsystems, developed initial set of criteria to meet customer requirements in order to provide the most value to the customer.

Principal Investigator – LeoSat Structure, 03/1999 – 12/2000

Led the IRAD to develop a Spacecraft Bus Structure used to demonstrate assembly line processes on space programs that met space requirements for various payloads ranging from Space-based Radar to Optical Payloads to communication applications. Supervised the system level coordination to develop a set of mission requirements that enveloped the intended use. Managed the design of the structure from concept development through design, fabrication, and test. Met all technical, cost, and schedule constraints. (IRAD Select Roll of Honor Recipient in 2000)

Lead Structures Engineer – Chandra X-Ray Observatory, 1/1991 – 2/1997

Co-chairman of the AXAF Structures Working Group working closely with counterparts at NASA-MSFC to develop design criteria to be used across the observatory. Supervised stress and performance analyses for the spacecraft bus structure. Reviewed Telescope analyses and verification for compliance with mission requirements. Presented structure design, analysis, and validation to NASA/JSC Shuttle Safety Board. Final sign off responsibility for all mechanical aspects of the Chandra X-Ray Observatory.

Structures Engineer – OMV, P8482 09/1987 – 1/1991

Performed structural analysis on various structures for both programs. Lead the analysis team on the OMV-SRV. Mentored junior engineers on best practices and lessons learned. Completed the analysis and verification testing of a deployable structure for a restricted program.

Bechtel Corporation – Norwalk, CA 07/1978 – 08/1987

Civil-Structural Engineer- Various Programs

Increasing levels of responsibility within the civil-structural discipline from junior engineer through lead engineer responsible for the advanced analyses of structures, drawing signoff, and field liaison. Developed good working relationships with colleagues and customer representatives.

## EDUCATION

| | | |
|---|---|---|
| 5/1999 | University of Southern California | *Los Angeles, CA* |
| | Master in Business Administration – emphasis in Organization & Finance | |
| 6/1978 | University of Southern California | *Los Angeles, CA* |
| | Bachelor of Science in Civil Engineering | |

## PROFESSIONAL AFFILIATIONS

Member – AIAA
Member – ASCE
Registered Professional Engineer - California
Six Sigma Green Belt Certification – P33 Design Review Standardization – February 2003

## CLEARANCE

Active. U.S. Born Citizen

**MORRIS, TERRY L.**
Manager, Engineering Sciences
Engineering & Technology
(310) 512-3614

## PROFESSIONAL EXPERIENCE:

Honeywell, Inc. (Aerospace Division - 25 years)

Manager, Engineering Sciences & Materials and Processes (1994 - Present)
Responsible for all performance and structural integrity efforts to support the Turbomachinery product line, including aerodynamic, thermodynamic, systems, stress, dynamics and rotordynamics. Responsible for materials and process efforts for entire Torrance site. Overall responsibilities include budgets, schedules, manpower, training and technical product excellence. Active member of several cost reduction teams that cut product costs by 30%. Successfully introduced CFD to the site. Developed standard analytical models to cut cycle time.

Supervisor, Applied Mechanics, Engineering Sciences Department (1989 - 1994)
Assistant Supervisor, Applied Mechanics, Engineering Sciences Department (1984 - 1989)
Responsible for the structural integrity of the electrical power systems, space systems and turbomachinery product lines and for department budget, manpower and schedule control. Hired and trained employees in the use of numerous computer programs and computer platforms. Supervised the enhancement of rotordynamics tools which cut preliminary analysis time by 50%. Developed analytical procedure to evaluate whirl flutter stability and bird strike capability for the B777 Ram Air Turbine (RAT). Achieved a 20% reduction in the time required to generate reports for air cycle machine (ACM) structural analysis by developing templates for common sections. Wrote a pre- and post- processor for rotordynamic analysis. Developed the standard procedure (checklist) for drawing review.

Senior Stress and Vibration Engineer, Applied Mechanics, Engineering Sciences Department. (1983 - 1984) Responsible for stress and dynamic analysis of turbomachines, including evaluation of the Navy bilge oil water separator, T46 ACM, F-16 emergency power unit, dc motor particle separator, and the M-1 tank ACM. Analyzed and identified the failure mode of the UMTA bus flywheel. Wrote computer programs that directly interfaced with existing aerodynamic output that increased the accuracy and reduced the cycle time by 75% for blade vibration analysis. Wrote a computer program that interfaced with thermodynamic output files for impulse turbines to reduce stress analysis input time by 50%. Sponsored seminars, wrote technical guidelines and trained engineers in the use of advanced ANSYS techniques.

Engineer, Applied Mechanics, Engineering Sciences Department (1981 - 1983) Performed stress and dynamic analyses on turbomachines, including the D5 turboalternator, C4 Trident GHU, 767 and mini-three-wheel ACM's, MX launcher thermal power unit, and the GRI steam compressor. Performed detailed failure and creep analyses of the Pershing II turbine wheel which required coordinating the efforts of the materials, reliability, and heat transfer groups. Wrote a program enabling designers to check shaft critical speeds. Initiated the use of ANSYS's heat transfer capabilities to reduce the time to input temperatures in finite element models.

University of California, Los Angeles (UCLA)

Engineering Assistant/Research Assistant (1979 - 1980) Calibrated equipment used in an electromechanical systems laboratory. Supervised several undergraduate research projects. Designed, machined and tested an apparatus used in studying machine noise generated due to clearance connections. Developed FORTRAN programs to describe the dynamic motion of a pinned-free beam subjected to repetitive bilateral impacts.

University of California, Irvine (UCI)

Engineering Assistant (1978) Conducted research on vibrational characteristics of resonating tools. Wrote and implemented FORTRAN programs to model vibratory systems.

U.S. Flywheels

Engineering Assistant (1978) Conducted research on composite flywheel design. Analytically evaluated various ballasting schemes to maximize the energy density while maintaining structural integrity.

## ACADEMIC CREDENTIALS:

Master of Science, Mechanical Engineering University of California, Los Angeles, 1980.
Bachelor of Science, Mechanical Engineering University of California, Irvine, 1978.

## HONORS AND PROFESSIONAL AFFILIATIONS:

Registered Professional Mechanical Engineer. Associate member of ASME. ASTM Award for Meritorious Work at UCI. ASME Outstanding Student of the Year. Deborah & Peter Pardoen Memorial Award for Outstanding ME at UCI. UCI Engineer of the Year.

## COMPUTER SKILLS:

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| Platforms: | UNIVAC, IBM, APOLLO, HP, CYBER, VAX, PC, MAC |
| Operating Systems: | UNIVAC, VMS, MSC, DOS, WINDOWS, MAC |
| Programs: | ANSYS, NASTRAN, SAP, IDEAS, CAEDS, PATRAN, RASNA, CADAM, RODA, V0250, NASCRAC, FLAGRO, CARES, PRO/E |
| Languages: | FORTRAN, BASIC, PASCAL, COBOL |
| PC Programs: | Lotus, dBase, Access, Excel, Word, WordPerfect, PowerPoint, Time-Line, MS Project, Tk-Solver, Mathcad, Sigma-Plot, Delta Graph, Autocad |

**Shibata, Raymond F.**

Raymond F Shibata
451 N. Prospect Ave.
Redondo Beach, CA 9027

Res. (310) 376-6624
Bus. (310) 416-2980

A "team building" Manager with over 25 years of line and project management experience in spacecraft structure design, integration and test.

A Manager who "makes things happen and gets things done", committed to high quality, technical expertise and good communications and manages through the Boeing Program Management Best Practices.

A Manager that is sensitive and responsive to both internal and external customer needs.

## KEY QUALIFICATIONS & STRENGTHS

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|---|---|
| Spacecraft Product Management | From 2001 to the present I have been a member of the Spacecraft Products Group in the Boeing Spacecraft Development Center as a Senior Project Manager. My responsibilities include the following; provide help and support to the Spacecraft Product Group IPT's with interface issues with Program Management and interface issues within the Spacecraft Product Group. I provide this support empathizing the Boeing Program Management Best Practices to all of the Spacecraft Products IPT's and their Support Teams. |
| Project Management | From September 1992 to 2001, I was the Project Manager for TW/TC/TA Business Units responsible for the commercial programs PanAmSat, JCSat 3, G8iR & ICO. I have also managed the government programs MCP, ASP, ESP and TDRS. |
| Line Management | From 1985 to late 1992 I had been the GSPL Department Manager for the engineering design activity supporting the Div 44 programs.During 1992 I was the acting Department Manager as well as the Project Manager for Div 44 programs. |
| Financial Leadership | I am more than capable in understanding the importance of meeting program financial commitments. My experience on government and commercial programs have been a great asset. |
| Team Building and Leadership | I am an advocate in team work and leadership. An organization's key asset is its people. Utilizing their talents effectively is the beginning for a strong team producing trust, dedication and team work. |

## KEY QUALIFICATIONS & STRENGTHS

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|---|---|
| Communication | With team building, maintaining good communication is a must. I have always been an advocate of this. One of my strongest skills is keeping the line of communications within a group "open and clear". |
| Creativity | Being an engineering designer, one of my first skills being developed was creativity. My personal growth at Hughes/Boeing can be attributed to being able to develop, promote and utilize unique solutions to solve problems. |
| Management workshop and courses taken | Affirmative Action<br>MAW I, II, III<br>Assertive Training Class @ UCLA<br>Developing Influence Skills<br>Leadership for Performance Program (LFP) |

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|---|---|---|
| | Providing Leadership in the Organization | |
| | Corrective Action Workshop | |
| | UCLA/Hughes SCG Top Management Program | |
| Technical courses taken | Strength and Materials | @ HSC |
| | Manufacturing for Engineering | @ UCLA |
| | Satellite Communications I | @ HSC |
| | Propulsion Engineering | @ HSC |
| EXPERIENCE | Boeing Spacecraft Development Center | 2001 to Present |
| | Hughes Space & Communication Group | 1973 to 2001 |
| | Lockheed Aircraft Company | 1970 to 1973 |
| EDUCATION | University of Southern California | |
| | BSAE February 1970 | |
| SECURITY CLEARANCE | Current EBI and Secret clearance, granted by DISCO, January 30, 1974 | |