

| PROGRAM | No. | CLASSIFICATION       | COURSE TITLE   | CREDITS | GRADUATE OPTION      | GRADUATE OPTION 2 | FACULTY                 | TERM                | YEAR                | updated J. |
|---------|-----|----------------------|--|---------|----------------------|-------------------|-------------------------|---------------------|---------------------|------------|
| IE      | 503 | Grad level           | Thesis   | 1-16    |                      |                   | All IE Graduate Faculty | All                 | All                 |            |
| IE      | 505 | Grad level           | Reading & Conference   | 1-16    |                      |                   | Various                 | Department approval | Department approval |            |
| IE      | 506 | Grad level           | Projects   | 1-16    |                      |                   | Various                 | Department approval | Department approval |            |
| IE      | 507 | Grad level           | Seminar  | 1       |                      |                   | FUNK                    | Winter              | All                 |            |
| IE      | 511 | 400/500 slash course | Visual Programming for Industrial Applications                                 | 4       | ISE                  |                   | PORTER                  | Fall                | ODD                 |            |
| IE      | 512 | 400/500 slash course | Information Systems Engineering  | 4       | ISE / MSE            |                   | PORTER                  | Fall                | All                 |            |
| IE      | 515 | 400/500 slash course | Simulation and Decision Support Systems  | 4       | HSE / MSE            |                   | KIM                     | Winter              | All                 |            |
| IE      | 518 | 400/500 slash course | Telecommunication Concepts   | 3       | ISE                  |                   | PORTER                  | Fall                | EVEN                |            |
| IE      | 519 | 400/500 slash course | Wireless Networks  | 3       | ISE                  |                   | PORTER                  | Winter              | ODD                 |            |
| IE      | 521 | Grad level           | Industrial Systems Optimization I  | 3       | MSE                  |                   | LOGENDRAN               | Fall                | EVEN                |            |
| IE      | 522 | Grad level           | Industrial Systems Optimization II   | 3       | MSE                  |                   | KIM                     | Fall                | ODD                 |            |
| IE      | 545 | Grad level           | Human Factors Engineering  | 4       | HSE                  |                   | FUNK                    | Fall                | All                 |            |
| IE      | 546 | Grad level           | Human-machine Systems Engineering (Course no longer offered (See IE 599))      | 3       | HSE                  |                   |                         |                     |                     |            |
| IE      | 548 | Grad level           | Cognitive Engineering (Course no longer offered (See IE 599 ST/Human Factors)) | 3       | HSE                  |                   |                         |                     |                     |            |
| IE      | 552 | Grad level           | Design of Industrial Experiments   | 3       | Core IE Course / AM  |                   | KIM                     | Winter              | All                 |            |
| IE      | 553 | Grad level           | Design of Industrial Experiments II  | 3       | AM / HSE / ISE / MSE |                   | KIM                     | Fall                | EVEN                |            |
| IE      | 563 | Grad level           | Advanced Production Planning and Control                                       | 3       | Core IE Course / MSE |                   | VERGARA                 | Winter              | All                 |            |
| IE      | 564 | Grad level           | Design and Scheduling of Cellular Manufacturing Systems                        | 3       | MSE                  |                   | LOGENDRAN               | Fall                | ODD                 |            |
| IE      | 570 | 400/500 slash course | Management Systems Engineering   | 4       | EM/HSE               |                   | ESEONU                  | Winter              | All                 |            |
| IE      | 571 | 400/500 slash course | Project Management in Engineering  | 3       | EM / HSE             |                   | CALVO                   | Winter              | All                 |            |
| IE      | 575 | Grad level           | Systems Thinking Theory and Practice   | 4       | HSE / MSE            |                   | CALVO                   | Winter              | All                 |            |
| IE      | 581 | Grad level           | Operations Management (E-CAMPUS)   | 4       | EM / HSE             |                   | CALVO                   | Spring              | All                 |            |
| IE      | 582 | Grad level           | Intro to Management for Engineers and Scientists (E-CAMPUS)                    | 4       | EM / HSE             |                   | ESEONU                  | All                 | All                 |            |
| IE      | 583 | Grad level           | Advanced Engineering Economic Analysis (E-CAMPUS)                              | 4       | EM / HSE             |                   | NG                      | Summer              | All                 |            |
| IE      | 584 | Grad level           | Systems Engineering (E-CAMPUS)   | 4       | EM / HSE             |                   | CALVO                   | Spring              | All                 |            |
| IE      | 585 | Grad level           | Legal Aspect of Engineering Management (E-CAMPUS)                              | 3       | EM / HSE             |                   | NG                      | Summer              | All                 |            |
| IE      | 586 | Grad level           | Project Risk Management (E-CAMPUS)   | 4       | EM / HSE             |                   | NG                      | Fall                | All                 |            |
| IE      | 587 | Grad level           | Management of Information Systems (E-CAMPUS)                                   | 4       | EM / HSE             |                   | PORTER                  | Winter              | All                 |            |
| IE      | 588 | Grad level           | Management of New Product Development (E-CAMPUS / Under development)           | 4       | EM / HSE             |                   | NG                      | Winter              | All                 |            |
| IE      | 589 | Grad level           | Professional Responsibility and Ethics (E-CAMPUS)                              | 3       | EM / HSE             |                   | NG                      | Spring              | All                 |            |
| IE      | 590 | Grad level           | Strategic Planning (E-CAMPUS / Under development, See IE 599)                  | 4       | EM / HSE             |                   | CALVO                   | Summer              | All                 |            |
| IE      | 594 | Grad level           | Research Methods in Engineering  | 3       | Core IE Course       |                   | NG                      | Spring              | All                 |            |
| IE      | 599 | Grad level           | ST / Health Systems Engineering  | 3       | HSE                  |                   | ESEONU                  | Spring              | EVEN                |            |
| IE      | 599 | Grad level           | ST / Human Factors / Ergonomics in Healthcare                                  | 4       | HSE                  |                   | ZHU                     | Spring              | EVEN                |            |
| IE      | 599 | Grad level           | ST / Design of Human Factors / Ergonomics Experiments                          | 4       | HSE                  |                   | ZHU                     | Spring              | ODD                 |            |
| IE      | 599 | Grad level           | ST / Human Factors Engineering II  | 3       | ISE                  |                   | PORTER                  | Fall                | EVEN                |            |
| IE      | 599 | Grad level           | ST / Introduction to Data Mining   | 3       | ISE                  |                   | PORTER                  | Fall                | EVEN                |            |

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|------|-----|----------------------|---|------|----------------|--|-------------------------|------------------------|---------------------|
| IE   | 599 | Grad level           | ST / Integer Programming                                    | 3    | MSE            |  | VERGARA                 | Spring                 | EVEN                |
| IE   | 599 | Grad level           | ST / Network Models and Analysis                            | 3    | MSE            |  | VERGARA                 | Spring                 | ODD                 |
| IE   | 599 | Grad level           | ST / Human Analytics & Behavioral Operations                | 3    | MSE / HSE      |  | NEMBHARD, D             | Fall                   | ODD                 |
| IE   | 603 | Grad level           | Thesis  | 1-16 | ALL            |  | All IE Graduate Faculty | All                    | All                 |
| IE   | 605 | Grad level           | Reading and conference                                      | 1-16 |                |  | Various                 | Department approval    | Department approval |
| IE   | 606 | Grad level           | Projects  | 1-16 |                |  | Various                 | Department approval    | Department approval |
| MATS | 509 | Grad level           | MATERIALS SCIENCE SEMINAR (Taught as ME 507 SEM / MATERIALS | 1    | MATS / MM      |  |                         |                        |                     |
| MATS | 545 | 400/500 slash course | WELDING METALLURGY  | 4    | MATS / MM      |  | TUCKER                  | Spring                 | All                 |
| MATS | 555 | 400/500 slash course | EXPERIMENTAL TECHNIQUES IN MATERIAL SCIENCE                 | 4    | MATS / MM      |  | XU                      | Winter                 | ODD                 |
| MATS | 570 | Grad level           | STRUCTURE PROPERTY RELATIONS IN MATERIALS                   | 4    | AM / MATS      |  | GIBBONS                 | Fall                   | All                 |
| MATS | 571 | Grad level           | ELECTRONIC PROPERTIES OF MATERIALS                          | 4    | MATS           |  | CANN                    | Winter                 | EVEN                |
| MATS | 578 | 400/500 slash course | THIN FILM MATERIALS CHARACTERIZATION AND PROPERTIES         | 4    | MATS           |  | GIBBONS                 | Winter                 | EVEN                |
| MATS | 581 | Grad level           | THERMODYNAMICS OF SOLIDS                                    | 4    | MATS           |  | SANTALA                 | Winter                 | All                 |
| MATS | 582 | Grad level           | RATE PROCESSES IN MATERIALS                                 | 4    | MATS           |  | WARNES                  | Spring                 | All                 |
| MATS | 584 | Grad level           | ADVANCED FRACTURE OF MATERIALS (See ME 584)                 | 4    | MATS / MM      |  |                         |                        |                     |
| MATS | 585 | Grad level           | Fatigue of Materials (See ME 585)                           | 4    | MATS / MM      |  |                         |                        |                     |
| MATS | 587 | Grad level           | DISLOCATIONS, DEFORMATION, AND CREEP                        | 4    | MATS / MM      |  |                         |                        |                     |
| MATS | 588 | Grad level           | COMPUTATIONAL METHODS IN MATERIALS SCIENCE                  | 4    | MATS           |  | XU                      | Spring                 | All                 |
| MATS | 599 | Grad level           | ST / PRINCIPLES OF TRANSMISSION ELECTRON MICROSCOPY         | 4    | MATS           |  | SANTALA                 | Spring                 | ODD                 |
| MATS | 671 | Grad level           | ELECTRONIC PROPERTIES OF OXIDES                             | 4    | MATS           |  | CANN                    | Fall                   | ODD                 |
| ME   | 501 | Grad level           | Research  | 1-16 |                |  | Various                 | Department approval    | Department approval |
| ME   | 502 | Grad level           | Independent Studies   | 1-16 |                |  | Various                 | Department approval    | Department approval |
| ME   | 503 | Grad level           | Thesis  | 1-16 | ALL            |  | All ME Graduate Faculty | All                    | All                 |
| ME   | 505 | Grad level           | Reading and conference                                      | 1-16 |                |  | Various                 | Department approval    | Department approval |
| ME   | 506 | Grad level           | Projects  | 1-16 |                |  | Various                 | Department approval    | Department approval |
| ME   | 507 | Grad level           | Sem / Materials Science                                     | 1    |                |  | GIBBONS                 | Fall / Winter / Spring | All                 |
| ME   | 507 | Grad level           | Sem / Thermal Fluid Science                                 | 1    |                |  | NIEMEYER                | Fall / Winter / Spring | All                 |
| ME   | 507 | Grad level           | Sem / Design  | 1    |                |  | DUPONT                  | Fall and Winter        | All                 |
| ME   | 507 | Grad level           | Sem / Marine Forum  | 1    |                |  | BATTEN                  | Fall / Winter / Spring | All                 |
| ME   | 511 | Grad level           | Precision Machine Design                                    | 3    | AM / DES       |  |                         |                        |                     |
| ME   | 512 | 400/500 slash course | Design of Mechanisms  | 4    | AM / DES / MM  |  | CAMPBELL                | Spring                 | ODD                 |
| ME   | 513 | Grad level           | Bio-Inspired Design   | 4    | DES            |  | STONE                   | Spring                 | ODD                 |
| ME   | 515 | Grad level           | Risk & Reliability Analysis in Engr Design                  | 4    | AM / DES / MSE |  | TUMER, I                | Winter                 | ODD                 |
| ME   | 516 | Grad level           | Modeling and Analysis of Complex Systems                    | 4    | DES            |  | TUMER, I                | Winter                 | EVEN                |
| ME   | 517 | Grad level           | Optimization in Design                                      | 4    | AM / DES / MSE |  | HOYLE                   | Fall                   | All                 |
| ME   | 549 | Grad level           | ST/ Decision-Based Design                                   | 4    | DES            |  | HOYLE                   | Spring                 | EVEN                |
| ME   | 519 | Grad level           | ST/ Sustainable Product Design (will be numbered ME 613)    | 4    | DES            |  | DUPONT                  | Spring                 | EVEN                |
| ME   | 549 | Grad level           | ST/ Human-in-the-Loop Design                                |      | DES            |  | DEMERIL                 |                        |                     |

|    |         |                      |  |   |                      |  |                 |                       |             |
|----|---------|----------------------|--|---|----------------------|--|-----------------|-----------------------|-------------|
| ME | 519     | 400/500 slash course | ST / Design for Manufacture (See ME 514)                 |   | DES                  |  | DuPONT          | Spring                | ODD         |
| ME | 611-618 | Grad level           | (Additional courses taught by MIME's Design faculty)     |   | DES                  |  |                 |                       |             |
| ME | 520     | 400/500 slash course | Applied Stress Analysis                                  | 4 | MM / MATS            |  | ALBERTANI       | Fall                  | All         |
| ME | 521     | Grad level           | Linear Elasticity  | 4 | MM / MATS            |  | PARMIGIANI      | Winter                | EVEN        |
| ME | 522     | 400/500 slash course | Mechanical Vibrations                                    | 4 | MM                   |  | SQUIRES         | Winter                | All         |
| ME | 523     | Grad level           | Advanced Stress Analysis                                 | 4 | MM                   |  | PARMIGIANI      | Winter                | ODD         |
| ME | 524     | 400/500 slash course | Finite Element Modeling of Mech Engr Sys                 | 3 | MM                   |  | BAY             | Spring                | EVEN        |
| ME | 526     | Grad level           | Numerical Methods for Engineering Analysis               | 3 | TFS                  |  | APTE            | Varies (usually Fall) | All         |
| ME | 531     | Grad level           | Linear Multivariable Control Systems I                   | 4 | R&C                  |  | HATTON          | Fall                  | EVEN        |
| ME | 532     | Grad level           | Linear Multivariable Control Systems II                  | 4 | R&C                  |  |                 |                       |             |
| ME | 533     | Grad level           | Nonlinear Dynamic Analysis                               | 4 | R&C/MM               |  | BALASUBRAMANIAN | Winter or Spring      | ODD         |
| ME | 534     | Grad level           | Nonlinear Multivariable Control Systems                  |   | R&C                  |  |                 |                       |             |
| ME | 540     | Grad level           | Intermediate Thermodynamics                              | 4 | TFS                  |  | HAGEN           | Spring                | All         |
| ME | 541     | Grad level           | Liquid-Vapor Phase Change and Heat Transfer              | 3 | TFS                  |  | FRONK           | Spring                | All         |
| ME | 543     | 400/500 slash course | Renewable Energy TFS                                     | 4 | TFS                  |  | LIBURDY         | Spring                | EVEN        |
| ME | 544     | 400/500 slash course | Advanced Power Generation Systems                        | 4 | TFS                  |  |                 |                       |             |
| ME | 545     | 400/500 slash course | Intro to Combustion                                      | 4 | TFS                  |  | BLUNCK          | Winter                | All         |
| ME | 546     | Grad level           | Convection Heat Transfer                                 | 3 | TFS                  |  | GESS            | Spring                | EVEN        |
| ME | 547     | Grad level           | Conductive Heat Transfer                                 | 3 | TFS                  |  | GESS            | Spring                | ODD         |
| ME | 550     | 400/500 slash course | Applied Heat Transfer                                    | 4 | TFS                  |  | MacCARTY        | Winter                | All         |
| ME | 552     | Grad level           | Measurements in Fluid Mech and Heat Transfer             | 4 | TFS                  |  | BLUNCK          | Winter                | All         |
| ME | 553     | 400/500 slash course | Structure and Mechanics Lab                              | 4 | MM                   |  | BAY             | Spring                | All         |
| ME | 560     | 400/500 slash course | Intermediate Fluid Dynamics                              | 4 | TFS                  |  | LIBURDY         | Fall                  | All         |
| ME | 561     | 400/500 slash course | Gas Dynamics   | 4 | TFS                  |  | NIEMEYER        | Fall                  | All         |
| ME | 564     | Grad level           | Turbulence Modelling                                     | 3 | TFS                  |  | APTE            | Spring                | ODD         |
| ME | 565     | Grad level           | Incompressible Fluid Mech                                | 3 | TFS                  |  | LIBURDY         | Fall                  | EVEN        |
| ME | 566     | Grad level           | Viscous Flow   | 3 | TFS                  |  | LIBURDY         | Fall                  | ODD         |
| ME | 567     | Grad level           | Engineering Applications of Computational Fluid Dynamics | 4 | TFS                  |  | PENCE           | Winter                | NOT 2017-18 |
| ME | 568     | Grad level           | Turbulent Flow Dynamics                                  | 4 | TFS                  |  | LIBURDY         | Spring                | EVEN        |
| ME | 580     | 400/500 slash course | MATERIALS SELECTION                                      | 3 | AM / DES / MATS / MM |  | BAY             | Fall                  | All         |
| ME | 583     | 400/500 slash course | Composite Materials                                      | 3 | DES / MM / MATS      |  | ALBERTANI       | Winter                | Even        |
| ME | 584     | Grad level           | ADVANCED FRACTURE OF MATERIALS (not same as ME 484)      | 4 | MM / MATS            |  | GREENE          | Fall                  | All         |
| ME | 585     | Grad level           | Fatigue of Materials                                     | 4 | MM / MATS            |  |                 |                       |             |
| ME | 587     | Grad level           | Dislocations, Deformation, and Creep                     | 4 | MM / MATS            |  |                 |                       |             |
| ME | 588     | Grad level           | COMPUTATIONAL METHODS IN MATERIALS SCIENCE               | 4 | MATS                 |  | XU              | Spring                | All         |
| ME | 589     | Grad level           | ST in Materials  | 3 | MATS                 |  |                 |                       |             |
| ME | 596     | Grad level           | ST in Thermodynamics                                     | 3 |                      |  |                 |                       |             |
| ME | 597     | Grad level           | Precision Motion Generation                              | 4 | AM / R&C             |  | SENCER          | Spring                | ODD         |

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|-------|-----|----------------------|---|------|---------------|--|--------------------------|------------------------|---------------------|
| ME    | 599 | 400/500 slash course | ST/ Computer Programming for Mechanical Systems (Under development) | 4    | R&C           |  | SMART                    | Winter                 | All                 |
| ME    | 599 | Grad level           | ST / Computational Geometry   | 4    | DES           |  | CAMPBELL                 | Winter                 | EVEN                |
| ME    | 599 | Grad level           | ST / Human-in-the-Loop Design                                       |      | DES           |  | DEMERIL                  | Winter                 | EVEN                |
| ME    | 599 | Grad level           | ST / Applied Programming and Numerical Methods                      | 4    | TFS           |  | NIEMEYER                 | Spring                 | EVEN                |
| ME    | 601 | Grad level           | Research  | 1-16 |               |  |                          |                        |                     |
| ME    | 603 | Grad level           | Thesis  | 1-16 |               |  |                          |                        |                     |
| ME    | 605 | Grad level           | R & C   | 1-16 |               |  |                          |                        |                     |
| ME    | 606 | Grad level           | Projects  | 1-16 |               |  |                          |                        |                     |
| ME    | 607 | Grad level           | Seminar   | 1-16 |               |  |                          |                        |                     |
| ME    | 611 | Grad level           | Modern Product Design   | 4    | DES           |  | Stone                    | Fall                   | All                 |
| ME    | 613 | Grad level           | Sustainable Product Design (Under Development)                      | 4    | DES           |  | DuPONT                   | Winter                 | ODD                 |
| ME    | 615 | Grad level           | Design Under Uncertainty  | 4    | DES           |  | HOYLE                    | Spring                 | All                 |
| ME    | 617 | Grad level           | Design Automation   | 4    | DES           |  | CAMPBELL                 | Winter                 | ODD                 |
| ME    | 667 | Grad level           | Computational Fluid Dynamics  | 3    | TFS           |  | Apte                     | Winter or Spring       | Odd                 |
| ME/NE | 526 | Grad level           | Numerical Methods for Engineering Analysis                          | 3    | MM/TFS        |  | Apte                     | Fall                   | All                 |
| MFGE  | 507 | Grad level           | Seminar \ Advanced Manufacturing                                    | 3    | AM            |  | PAUL                     | Fall / Winter / Spring | All                 |
| MFGE  | 511 | Grad level           | Precision Machine Design  | 3    | AM / DES      |  |                          |                        |                     |
| MFGE  | 531 | Grad level           | Micromanufacturing  | 4    | AM            |  | PAUL                     | Fall                   | All                 |
| MFGE  | 535 | Grad level           | Industrial Sustainability Analysis                                  | 3    | AM            |  | HAAPALA                  | Fall                   | All                 |
| MFGE  | 536 | 400/500 slash course | Lean Manufacturing Systems Engineering                              | 4    | AM / EM / HSE |  | ESEONU                   | Fall                   | All                 |
| MFGE  | 538 | 400/500 slash course | Composites Manufacturing  | 4    | AM / MM       |  | ALBERTANI                | Fall                   | All                 |
| MFGE  | 599 | 400/500 slash course | ST / Additive Manufacturing   | 4    | AM            |  | PASEBANI                 | Winter                 | All                 |
| MFGE  | 599 | Grad level           | ST / Sensor Design for Manufacturing                                | 3    | AM            |  | FAN                      | Spring                 |                     |
| ROB   | 501 | Grad level           | RESEARCH  | 1-16 |               |  | Various                  | Department approval    | Department approval |
| ROB   | 503 | Grad level           | THESIS  | 1-16 |               |  | All ROB Graduate Faculty | All                    | All                 |
| ROB   | 505 | Grad level           | R&C   | 1-16 |               |  | Various                  | Department approval    | Department approval |
| ROB   | 506 | Grad level           | PROJECTS  | 1-16 |               |  | Various                  | Department approval    | Department approval |
| ROB   | 507 | Grad level           | SEMINAR   | 1-16 |               |  | MENGUC                   | Fall / Winter / Spring | All                 |
| ROB   | 514 | Grad level           | INTRO TO ROBOTICS   | 4    | R&C           |  | SMART                    | Fall                   | All                 |
| ROB   | 521 | 400/500 slash course | APPLIED ROBOTICS  | 4    | R&C           |  | HURST                    | Spring                 | All                 |
| ROB   | 534 | Grad level           | SEQUENTIAL DECISION MAKING IN ROBOTICS                              | 4    | R&C           |  | HOLLINGER                | Winter                 | ODD                 |
| ROB   | 537 | Grad level           | LEARING-BASED CONTROL   | 4    | R&C           |  | TUMER, K                 | Fall                   | ODD                 |
| ROB   | 538 | Grad level           | AUTONOMOUS AGENTS AND MULTI-AGENT SYSTEMS                           | 4    | R&C           |  | TUMER, K                 | Fall                   | EVEN                |
| ROB   | 541 | Grad level           | GEOMETRIC MECHANICS   | 4    | R&C           |  | HATTON                   | Fall                   | ODD                 |
| ROB   | 542 | Grad level           | ACTUATOR DYNAMICS   | 4    | R&C           |  | HURST                    | Winter                 | EVEN                |
| ROB   | 562 | Grad level           | HUMAN CONTROL SYSTEMS   | 4    | R&C           |  | BALASUBRAMANIAN          | Spring                 | ODD                 |
| ROB   | 564 | Grad level           | SOFT ROBOTICS   | 4    | R&C           |  | MENGUC                   | Spring                 | EVEN                |
| ROB   | 567 | Grad level           | HUMAN ROBOT INTERACTION   | 4    | R&C           |  | GRIMM / ADAMS            | Spring                 | EVEN                |

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|-----|-----|------------|---|------|-----|--|--------|--------|------|
| ROB | 599 | Grad level | Social Robotics (Will be taught as ROB 599 Fall 2017) | 4    | R&C |  | KNIGHT | Fall   | ODD  |
| ROB | 599 | Grad level | ST / Multiple Robot Systems                           | 4    | R&C |  | ADAMS  | Fall   | ODD  |
| ROB | 599 | Grad level | ST / Mobile Robots                                    | 4    | R&C |  | SMART  | Spring | ODD  |
| ROB | 599 | Grad level | ST / Ethics & Philos of Robotics                      | 4    | R&C |  |        | Winter | EVEN |
| ROB | 599 | Grad level | ST / Social Robotics (ROB 568)                        | 4    | R&C |  | KNIGHT | Fall   | ODD  |
| ROB | 601 | Grad level | RESEARCH  | 1-16 |     |  |        |        |      |
| ROB | 603 | Grad level | THESIS  | 1-16 |     |  |        |        |      |
| ROB | 605 | Grad level | R&C   | 1-16 |     |  |        |        |      |