MORK FAMILY DEPARTMENT
Department of Chemical Engineering & Materials Science

Anthony Tritto, Director, MFD Student Affairs
Karen Woo, Assistant Director, MFD Student Services
Jordan Laffin, Assistant Director, MFD Student Services
AGENDA

• Introduction - Mork Family Department
• List of MS programs
• Faculty Advisors
• Student Affairs
• Program Overview
• Registering for courses
• Getting connected
• Q & A
Master’s Programs

- Chemical Engineering
- Materials Science
- Petroleum Engineering
MFD Masters Programs:

- Master of Science in Chemical Engineering
- Master of Science in Materials Engineering
- Master of Science in Materials Science
- Master of Science in Materials Engineering (Machine Learning)
- Master of Science in Petroleum Engineering
- Master of Science in Petroleum Engineering Digital Oilfield Technologies
- Master of Science in Petroleum Engineering Geoscience Technologies
- Master of Science in Petroleum Engineering/Engineering Management
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Mork Family Department
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Chemical Engineering

Requirements for Graduation 28 units total with 3.0 GPA overall
Deficiency courses may be required for students without a CHE background

Group I: Required Core Courses (All 4 required for 16 units total):
ChE 501 Modeling and Analysis of Chemical Engineering Systems – 4 units**
(This is required in your first semester**)
CHE 530 Thermodynamics for Chemical Engineers – 4 units
ChE 538 Transport Processes I – 4 units  (Offered in the Fall)
ChE 542 Chemical Engineering Kinetics – 4 units (Offered in the Fall)

Group II: Elective Courses (Complete 12 units from the list below):
ChE 510 Energy and Process Efficiency – 3 Units
ChE 539 Transport Processes II – 4 units
ChE/PTE 531 Enhanced Oil recovery
ChE/PTE 582 Fluid Flow and Transport Processes in Porous Media
ChE 590 (Directed Research, 1 - 3 units, approval of research advisor required before registering)
Chemical Engineering

Undergraduate courses that could count towards the CHE Graduate Program

Requirements for Graduation 28 units total with 3.0 GPA overall
Deficiency courses may be required for students without a CHE background

Please note that Graduate Students Cannot Count More than 9 units of 400 Level Courses towards Their MS Degree
ChE 450 Sustainable Energy
ChE 475 Physical Properties of Polymers
ChE 487 Nanotechnology and Nanoscale Engineering through Chemical Processes
ChE 489 Biochemical Engineering
ChE 499 Chemical Process Safety

Or other 400-level or above courses in Math, Science & Engineering upon Department Approval*
Chemical Engineering

Non-CHE courses that can be applied as Electives*

Materials Science:
- MASC 515 Basics of Machine Learning for Materials
- MASC 551 Mechanical Behavior of Engineering Materials
- MASC 575 Basics of Atomistic Simulation of Materials
- MASC 583 Materials Selection
- MASC 576 Molecular Dynamics Simulations of Materials and Processes

Petroleum Engineering:
- PTE 519 Integrated Physical and Cyber Security for Oil & Gas Operations
- PTE 500 Computational Reservoir Modeling
- PTE 502 Advanced Reservoir Characterization
- PTE 507 Engineering and Economic Evaluation of Subsurface Reservoirs
- PTE 508 Numerical Simulation of Subsurface Flow and Transport Processes
Chemical Engineering Recommended Electives

**Fall:**
- AME 522: Nonlinear Dynamical Systems, Vibrations, and Chaos
- AME 554: Additive Manufacturing Technology
- BME 559: Nanomedicine and Drug Delivery
- CE 523: Physicochemical Processes in Environmental Engineering
- ISE 562: Decision Analysis

**Spring:**
- BME 559: Nanomedicine and Drug Delivery
- CE 553: Biological Processes in Environmental Engineering
- ISE 525: Design of Experiments
Materials Science

Requirements for Graduation 28 units total with 3.0 GPA overall:

Core Courses: (12 units)
MASC 471 Applied Quantum Mechanics for Engineers (4)
MASC 501 Solid State (4)
MASC 503 Thermodynamics of Materials (4)
MASC 504 Diffusion and Phase Equilibria (4)
MASC 505 Crystals and Anisotropy (3)
MASC 520 Mathematical Methods for Deep Learning (4)
MASC 551 Mechanical Behavior of Engineering Materials (4)

Electives:
8-16 units from MASC elective list and 0-8 units from ENG elective list on the following page
Up to 8 units may be from 400-level courses on approval by department.
Materials Engineering

MASC elective list (20-28 units)

MASC 501 Solid State (3)
MASC 502 Advanced Solid State (3)
MASC 503 Thermodynamics of Materials (4)
MASC 504 Diffusion and Phase Equilibria (4)
MASC 505 Crystals and Anisotropy (4)
MASC 506 Semiconductor Physics (4)
MASC 512 Thin Film Science and Technology (4)
MASC 515 Basics of Machine Learning for Materials (4)
MASC 520 Mathematical Methods for Deep Learning (4)
MASC 534 Materials Characterization (3)
MASC 535L Transmission Electron Microscopy (4)
MASC 551 Mechanical Behavior of Engineering Materials (4)
MASC 559 Creep (3)
MASC 560 Fatigue and Fracture (3)
MASC 566 Dislocation Theory and Applications (3)
MASC 562 Failure Analysis (3)
MASC 564 Composite Processing (4)
MASC 570 Introduction to Photovoltaic Solar Energy Conversion (3)
MASC 575 Basics of Atomistic Simulation of Materials (4)
MASC 576 Molecular Dynamics Simulations of Materials and Processes (4+)
MASC 583 Materials Selection (4)
MASC 599 Special Topics (varies)
MASC 601 Advanced Semiconductor Device Physics (4)
MASC 610 Molecular Beam Epitaxy

ENG elective list (0-8 units)

AME 503 Advanced Mechanical Design
AME 508 Machine Learning and Computational Physics
AME 509 Applied Elasticity
AME 525 Engineering Analysis
AME 526 Engineering Analytical Methods
AME 546 Design for Manufacturing and Assembly
AME 577 Survey of Energy and Power for a Sustainable Future
AME 578 Modern Alternative Energy Conversion Devices
AME 586 Materials Selection
ASTE 557 Spacecraft Structural Strength and Materials
BME 510 Cellular Systems Engineering
CE 507 Mechanics of Solids I
CE 529a Finite Element Analysis
CE 546 Structural Mechanics of Composite Materials
CHE 501 Modeling and Analysis of Chemical Engineering Systems
CHE 630 Fundamentals of Electrochemical Energy System
CHEM 632 Introduction to Surface Chemistry and Electrochemicals
EE 471 (MASC 471) Applied Quantum Mechanics for Engineers (4)
EE 544L Solid State Processing and Integrated Circuits Laboratory
EE 507 (MASC 507) Micro- and Nano-Fabrication Technology
EE 508 (MASC 508) Nano-Fabrication Lithography
EE 512 Stochastic Processes
EE 522 Optics
EE 531 Non-linear Optics
EE 537 Modern Solid-State Devices
EE 601 Semiconductor Devices
EE 607 Microelectromechanical Systems
EE 612 Science and Practice of Nanotechnology
ENE 505 Energy and the Environment
ISE 560 Advances Computational Design and Manufacturing
ISE 515 Engineering Project Management
PTE 586 Artificial Intelligence and Machine Learning in Oilfield Operations (3)
Materials Engineering Machine Learning

MASC core requirements (12 units)

MASC 515 Basics of Machine Learning for materials (4)
MASC 520 Mathematical Methods for Deep Learning (4)
MASC 575 Basics of Atomistic Simulation of Materials (4)

Additional Engineering electives listed on next page

MASC elective courses (8-16 units)

MASC 501 Solid State (3)
MASC 502 Advanced Solid State (3)
MASC 503 Thermodynamics of Materials (4)
MASC 504 Diffusion and Phased Equilibria (4)
MASC 505 Crystals and Anisotropy (4)
MASC 506 Semiconductor Physics (4)
MASC 512 Thin Film Science and Technology (4)
MASC 534 Materials Characterization (3)
MASC 535L Transmission Electron Microscopy (4)
MASC 551 Mechanical Behavior of Engineering Materials (4)
MASC 559 Creep (3)
MASC 560 Fatigue and Fracture (3)
MASC 561 Dislocation Theory and Applications (3)
MASC 562 Failure Analysis (3)
MASC 564 Composite Processing (4)
MASC 570 Introduction to Photovoltaic Solar Energy Conversion (3)
MASC 576 Molecular Dynamics Simulations of Materials and Processes (4)
MASC 583 Materials Selection (4)
MASC 599 Special Topics (varies)
MASC 601 Advanced Semiconductor Device Physics (4)
MASC 610 Molecular Beam Epitaxy (3)
PTE 586 Artificial Intelligence and Machine Learning in Oilfield Operations (3)
ENGR elective courses (0-8 units)

AME 503 Advanced Mechanical Design (3)
AME 509 Applied Elasticity (4)
AME 525 Engineering Analysis (4)
AME 526 Introduction to Mathematical Methods in Engineering II (4)
AME 546 Design for Manufacturing Assembly (4)
AME 577 Survey for Energy and Power for a Sustainable Future (4)
AME 578 Modern Alternative Energy Conversion Devices (3)
ASTE 557 Spacecraft Structural Strength and Materials (3)
BME 510 Cellular Systems Engineering (4)
CE 507 Mechanics of Solids (4)
CE 546 Structural Mechanics of Composite Materials (2)
CHE 501 Modeling and Analysis of Chemical Engineering Systems (4)
CHEM 630 Fundamentals of Electrochemical Energy Systems (2)
CHEM 632 Introduction to Surface Chemistry and Electrocatalysts (2)
EE 471 Applied Quantum Mechanics for Engineers (4)
EE 504L Solid-State Processing and Integrated Circuits Laboratory (4)
EE 507 Micro- and Nano-Fabrication Technology (4)
EE 512 Stochastic Processes (3)
EE 528 Optics (4)
EE 531 Nonlinear Optics (4)
EE 537 Modern Solid-State Devices (4)
EE 601 Advanced Semiconductor Device Physics (4)
EE 607 Microelectromechanical Systems (4)
EE 612 Science and Practice of Nanotechnology (3)
ENE 505 Energy and the Environment (4)
ISE 510 Advanced Computational Design and Manufacturing (3)
ISE 515 Engineering Project Management (3)
Master of Science in Petroleum (POST Code 654)
Course Check List – Fall 2021

Course Breakdown:

Group I: Required Core Courses
(All 6 required for 19 units total):

- PTE 167 Engineering and Economic Evaluation of Subsurface Reservoirs – 3 units
- PTE 108 Numerical Simulation of Subsurface Flow and Transport Processes – 3 units
- PTE 117 Testing of Wells and Aquifers – 3 units
- PTE 131 Enhanced Oil Recovery – 4 units
- PTE 155 Well Completion, Stimulation, and Damage Control – 2 units
- PTE 162 Fluid Flow and Transport Processes in Porous Media – 3 units

Group II: Elective Courses
(Complete 3 courses (9-10) units total from the list below):

- PTE 152 Advanced Reservoir Characterization – 3 units
- PTE 153 Technology of Unconventional Oil and Gas Resources Development – 2 units
- PTE 104 Geophysics for Petroleum Engineers – 3 units
- PTE 105 Inverse Modeling for Reservoir Engineering – 3 units
- PTE 106 Geothermal Reservoirs – 3 units
- PTE 136 Advanced Phase Behavior of Petroleum Reservoir Fluids – 3 units
- PTE 152 Gas Injection Processes – Analytical Solutions and Analysis – 3 units
- PTE 154 Drilling Engineering – 3 units
- PTE 169 Integrated Physical and Cyber Security for Oil and Gas Operations – 3 units
- PTE 163 Carbonate Rocks – 3 units
- PTE 168 Corrosion Control in Petroleum Production – 3 units
- PTE 172 Applied Geostatistical Modeling for Subsurface Characterization – 4 units
- PTE 165 Natural Gas Engineering – 3 units
- PTE 170 Advanced Production Engineering – 3 units
- PTE 164 Environmental Technology in the Petroleum Industry – 3 units
- PTE 166 Artificial Intelligence and Machine Learning in Oilfield Operations – 4 units
- PTE 167 Smart Completions, Oilfield Sensors and Sensor Technology – 3 units
- PTE 168 Smart Oilfield Data Mining – 3 units
- PTE 189 Advanced Oilfield Operations with Remote Immersive Visualization and Control – 3 units
- PTE 190 Directed Research – 1-12 units

Deficiency Courses for non-majors

- PTE 411x Introduction to Transport Processes in Porous Media – 1 units
- PTE 412x Petroleum Reservoir Engineering – 3 units
- PTE 441 Formation Data Sensing with Well Logs – 4 units
- PTE 446 Petroleum Geology – 3 units or PTE 502 Advanced Reservoir Characterization(2)
- PTE 500 Computational Reservoir Modeling – 3 units

Graduation requirements:

- 28-29 units total
- 3.0 GPA overall
- Up to 16 additional units min. of deficiency courses are required for students without a B.S. in Petroleum Engineering
Master of Science in Petroleum Digital Oilfield Technologies (POST Code 1811)
Course Check List – Fall 2021

Course Breakdown:

Group I: Required Core Courses (19 units):
- PTE 507 Engineering and Economic Evaluation of Subsurface Reservoirs
- PTE 508 Numerical Simulation of Subsurface Flow and Transport Processes
- PTE 517 Testing of Wells and Aquifers
- PTE 531 Enhanced Oil Recovery
- PTE 555 Well Completion, Simulation, and Damage Control
- PTE 582 Fluid Flow and Transport Processes in Porous Media

Specialization Course
- Take PTE 566 and PTE 588
- PTE 586 Intelligent and Collaborative Oilfield Systems Characterization and Management
- PTE 588 Smart Oilfield Data Mining

and two of the following courses:
- PTE 519 Integrated Physical and Cyber Security for Oil and Gas Operations
- PTE 587 Smart Completions, Oilfield Sensors, and Sensor Technology
- PTE 589 Advanced Oilfield Operations with Remote Immersive Visualization and Control
- PTE 521* Digital Transformation of Petroleum Industry

*New course proposed

Group II: Elective Courses
(Complete 2 courses total from the list below):
- PTE 502 Advanced Reservoir Characterization – 3 units
- PTE 503 Technology of Unconventional Oil and Gas Resources Development – 3 units
- PTE 504 Geophysics for Petroleum Engineers – 3 units
- PTE 505 Inverse Modeling for Dynamics Data Integration – 3 units
- PTE 506 Geothermal Reservoirs – 3 units
- PTE 511 Advanced Phase Behavior of Petroleum Reservoir Fluids – 3 units
- PTE 512 Gas Inclusion Processes – Analytical Solutions and Analysis – 3 units
- PTE 514 Drilling Engineering – 3 units
- PTE 515 Natural Gas Engineering – 3 units
- PTE 519 Integrated Physical and Cyber Security for Oil and Gas Operations – 3 units
- PTE 542 Carbonate Rocks – 3 units
- PTE 545 Corrosion Control in Petroleum Production – 3 units
- PTE 572 Applied Geostatistical Modeling for Subsurface Characterization – 4 units
- PTE 578 Advanced Production Engineering – 3 units
- PTE 581 Environmental Technology in the Petroleum Industry – 3 units
- PTE 586 Artificial Intelligence and Machine Learning in Oilfield Operations – 4 units
- PTE 587 Smart Completions, Oilfield Sensors, and Sensor Technology – 3 units
- PTE 588 Smart Oilfield Data Mining – 3 units
- PTE 589 Advanced Oilfield Operation with Remote Immersive Visualization and Control – 3 units
- PTE 590 Directed Research – 1-12 units

Deficiency Courses for non majors
- PTE 411x Introduction to Transport Processes in Porous Media – 3 units
- PTE 412x Petroleum Reservoir Engineering – 3 units
- PTE 461x Formation Data Sensing with Well Logs – 4 units
- PTE 466 Petroleum Geology – 3 units
- PTE 500 Computational Reservoir Modeling – 3 units

Graduation Requirements:
37-38 units total
3.0 GPA overall
Up to 15 additional units min. of deficiency courses may be required for students without a B.S. in Petroleum Engineering
Master of Science in Petroleum Engineering/Engineering Management (POST Code 1652)
Course Check List – Fall 2021

Course Breakdown:

Group I: Required Core Courses (36 units):
- ISE 500 Engineering Management: Decisions and Statistics
- ISE 514 Advanced Production: Planning and Scheduling
- ISE 515 Engineering Project Management
- ISE 544 Management of Engineering Teams
- ISE 561 Economic Analysis of Engineering Projects
- 1 Pre-approved Business Management Course (3 units)
- PTE 507 Engineering and Economic Evaluation of Subsurface Reservoirs
- PTE 508 Numerical Simulation of Subsurface Flow and Transport Processes
- PTE 517 Testing of Wells and Aquifers
- PTE 531 Enhanced Oil Recovery
- PTE 555 Well Completion, Stimulation, and Damage Control
- PTE 562 Fluid Flow and Transport Processes in Porous Media

Group II: Elective Courses (Complete 9 units total of PTE electives)

Deficiency Courses
- PTE 411X Introduction to Transport Processes in Porous Media – 3 units
- PTE 412x Petroleum Reservoir Engineering – 3 units
- PTE 461 Formation Damage with Well Logs – 4 units
- PTE 466 Petroleum Geology – 2 units or PTE 502 Advanced Reservoir Characterization (3 units)
- PTE 500 Computational Reservoir Modeling – 3 units

Graduation Requirements:

- 45 units total
- 3.0 GPA overall
- Up to 16 additional units min. of deficiency courses may be required for students without a B.S. in Petroleum Engineering
Graduation requirements:
• 38-39 units total
• 3.0 GPA overall
• Up to 16 additional units min. of deficiency courses may be required for students without a B.S. in Petroleum Engineering

Course Breakdown:

Group I: Required Core Courses (19 units):
• PTE 507 Engineering and Economic Evaluation of Subsurface Reservoirs
• PTE 508 Numerical Simulation of Subsurface Flow and Transport Processes
• PTE 517 Testing of Wells and Aquifers
• PTE 531 Enhanced Oil Recovery
• PTE 555 Well Completion, Stimulation, and Damage Control
• PTE 582 Fluid Flow and Transport Processes in Porous Media

Group II - Specialization Courses
• Take PTE 502 and PTE 503
• PTE 502 Advanced Reservoir Characterization (3)
• PTE 503 Technology of Unconventional Oil and Gas Resources Development (3)

and two of the following courses:
• PTE 504 Geophysics for Petroleum Engineers (3)
• PTE 505 Inverse Modeling for Dynamics Data Integration (4)
• PTE 572 Applied Geostatistical Modeling for Subsurface Characterization – 4 units
• PTE 592 Computational Geomechanics (4)

Deficiency Courses for non-majors
• PTE 411x Introduction to Transport Processes in Porous Media – 3 units
• PTE 412x Petroleum Reservoir Engineering – 3 units
• PTE 461 Formation Data Sensing with Well Logs – 4 units
• PTE 466 Petroleum Geology – 3 units
• PTE 500 Computational Reservoir Modeling – 3 units
Spring 2022 DEN Courses
MASC: https://classes.usc.edu/term-20221/classes/masc/
CHE: https://classes.usc.edu/term-20221/classes/che/
PTE: https://classes.usc.edu/term-20221/classes/pte/

Materials Science
MASC 504
MASC 560
MASC 575
MASC 583

Chemical Engineering
CHE 530

Petroleum Engineering
PTE 412
PTE 515
PTE 517
PTE 599- Don Paul’s class
How To Request D-clearance From DEN

All DEN courses require D-clearance.

1. Login to DEN Desire2Learn: [http://courses.uscden.net](http://courses.uscden.net)
2. Go to DEN@Viterbi Tools on the navigation bar
3. Select “Request D-clearance” link, select the term, and select a course
4. Approval process takes 1-2 business days. To view the status of a request, click on “Check D-Clearance Status”
5. You can register once your request has been processed. D-clearances expire 7 days from when it is issued so register as soon as you obtain it to secure a seat in a course.

For questions on D-Clearance status, contact [den@vase.usc.edu](mailto:den@vase.usc.edu)
Spring Semester Calendar

Jan. 7  Last day to register and settle without late fee
Jan. 10 Spring semester classes begin for Session 001
Jan. 10-14 Late registration and change of program for Session 001
Jan. 17  Martin Luther King Day, university holiday
Jan. 28  Last day to register and add classes for Session 001
Jan. 28  Last day to drop a class without a mark of “W,” except for Monday-
          only classes, and receive a refund for Session 001
Jan. 28  Last day to change enrollment option to Pass/No Pass or Audit for Session 001
Jan. 28  Deadline for purchasing or showing proof of health insurance
Jan. 28  Last day to purchase or waive tuition refund insurance
Feb. 1   Last day to add/drop a Monday-only class without a mark of “W” and
          receive a refund or change to Audit for Session 001
Feb. 21  Presidents’ Day, university holiday
Feb. 25  Last day to drop a course without a mark of “W” on the transcript
          Mark of “W” will still appear on student record and STARS report and tuition
          charges still apply. *Please drop any course by the end of week three for
          session 001 (or the 20 percent mark of the session in which the course is
          offered) to avoid tuition charges.
Feb. 25  Last day to change a Pass/No Pass to a letter grade for Session 001.
March 13-20 Spring recess
April 8   Last day to drop a class with a mark of “W” for Session 001
April 29  Spring semester classes end
April 30-May 3 Study days
May 4-11  Final examinations
May 12   Spring semester ends
May 13   Commencement
**Contact Info**

**VITERBI ADMISSION & STUDENT ENGAGEMENT (VASE)**

**Location**: Olin Hall of Engineering (OHE), Rm. 106  
**Hours**: Mon. - Fri. 8:30 am - 5 pm (Pacific Time)  
**Phone**: (213) 740-4488  |  **Fax**: (213) 821-0851  
[https://viterbigrad.usc.edu/](https://viterbigrad.usc.edu/)

<table>
<thead>
<tr>
<th>DEN@Viterbi Support</th>
<th>Contact Information</th>
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<td>213-740-9356</td>
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<tr>
<td>• Policies &amp; Procedures</td>
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How to make an appointment with your academic advisor

For Chemical Engineering, Material Science & Petroleum students:
MFD Student Affairs Office
Email: mfdinfo@usc.edu

We-are-SC: https://we-are.usc.edu/

Viterbi Career Connections: https://viterbicareers.usc.edu/

Student Health Center: https://studenthealth.usc.edu/

Kortschak Center: https://kortschakcenter.usc.edu/
Get Connected

• Student groups- AIChE, MFD GSA, MRS@USC, SPE, and VGSA
  • Professional Conferences
  • Network Sessions
  • Study Groups
  • Career fairs
  • Faculty panels
  • Alumni Panels
  • Social Events
• Career Services
• VASE Office
• Check in with your advisors
• Research
THANK YOU!