PRESIDENT'S OFFICE

FACULTY SENATE TRANSMITTAL ACTION FORM

TO: **Provost Dan Howard**

FROM: **President Garrey Carruthers**

REFERENCE: Faculty Senate Action Form

REFERENCE NUMBER: Proposition: 09-13/14

NOTE: A Proposal to Change Department Name from the Department of Chemical Engineering (CHE) to the Department of Chemical & Materials Engineering (CHME).

☒ OK FOR PRESIDENT TO SIGN Dan Howard

☐ HOLD WITH COMMENTS

NOTES/COMMENTS:

ADMINISTRATIVE ACTION:

☑ EMAIL SENT TO FACULTY SENATE (DATE): 4-11-14

☑ CAMPUS MAIL SENT TO FACULTY SENATE (DATE): 4-11-14

☐ SIGNED FOR BY: _____

☐ DATE RECEIVED: _____

PRESIDENT@NMSU.EDU
575.646.2035

9:16 AM
4/4/2014 9:16 AM

Faculty Senate Transmittal and Administrative Action Routing Form

To: Office of the University President
From: Faculty Senate Chair, Dr. Dennis Clason
RE: Proposition: 09-13/14
Date: April 02, 2014

Please find enclosed:

☑ Faculty Senate Legislation No. 09-13/14 ; entitled, "A Proposal to Change Department Name from the "Department of Chemical Engineering" (CHE) to the "Department of Chemical & Materials Engineering" (CHME)".

☐ A copy of _____, for informational purposes only.

☐ Other:

The following administrative action is respectfully requested:

☑ Your review and approval; as well as placement of this item on a subsequent Agenda for approval by the Board of Regents. This item affects policy in the NMSU Policy Manual and/or other policy document (e.g. Undergraduate Catalog, Graduate Catalog, Student Handbook, etc). Based on the timeline provided in Policy 1.05.70 B. 2. b. your action to either approve or veto is requested within 40 days from receipt of this transmittal, or May 12, 2014 (date).

☐ A previous veto of legislation affecting academic policy has been overridden by 2/3 vote of the Faculty Senate; pursuant to the timeline provided in Policy 1.05.70 B. 2. c., your action to rescind that veto is requested within five business days of receipt.

☐ Please indicate your availability to meet with Faculty Senate leadership to discuss.

☐ Other:

Action by University President:

☐ I acknowledge receipt of the above, which does not require further administrative action.

☐ I have received the legislation forwarded to this office, and will respond further at a later date.

☑ I approve this legislation, and will place on the Agenda for a future meeting of the Board of Regents.

☐ I approve this legislation on a provisional basis in order for it to become effective immediately, and will place on the Agenda for ratification at a future meeting of the Board of Regents.

☐ I veto this legislation.

☐ Other:

_____ **Date:** 4/11/14
Garrey Carruthers, NMSU President

Please retain copies of this routing form for your files, and return completed, signed form to:

Britney Stout, Faculty Senate Recording Secretary
MSC 3445 Provost's Office
Email: dearbrit@nmsu.edu
Phone: (575)646-2998

Proposition 09-13/14: A Proposal to Change Department Name from the "Department of Chemical Engineering" (CHE) to the "Department of Chemical & Materials Engineering" (CHME).

Sponsors: Igor Sevostianov (Associate Professor, Mechanical & Aerospace Engineering)
Paul K. Andersen (Associate Professor, Chemical Engineering)
David A. Rockstraw (Department Head, Chemical Engineering)

Proposed Committee: Scholastic Affairs

Actual Committee Assignment: Scholastic Affairs

Proposition: The Department of Chemical Engineering (CH E) wishes to be renamed *The Department of Chemical & Materials Engineering* (CHM E). The change shall be effective immediately.

Prior Approvals:

Date	approving group	result of vote
09/18/13	Chemical Engineering Faculty meeting	unanimous approval
12/10/13	Civil Engineering Faculty meeting	no opposition stated
12/11/13	College of Engineering Department Heads meeting	no opposition stated
01/13/14	Associate Deans Academic Council	no opposition stated
01/20/14	Deans Academic Council	

Rationale: Chemical engineering is heavily engaged in materials engineering research. Chemical engineers are with increasing frequency involved in the synthesis and manufacture of *materials* of broad natures. The NMSU Chemical Engineering Department offers a service course in materials science that is a required course of two other degree programs in the engineering college (M E and I E), offers a number of materials-related elective courses, and plans the addition of more materials electives in the areas of expertise of the many new faculty in this program.

(1) The Chemical Engineering Department Head has had 3 interviews with high school students who have come into the department to learn more about NMSU CH E this semester (and a few last spring) who informed him that they were not sure if they wanted to come to NMSU CH E because they were looking for and "preferred a materials engineering program." It was not clear to them that chemical engineering is a materials-based discipline. The title change will directly impact recruitment of students.

(2) Many Chemical Engineering programs across the country have combined with an existing Materials Engineering program without necessarily offering a separate materials degree, or have added "materials" to their title to make this relationship clear (Oklahoma, Minnesota, Kentucky, Dayton, UC Irvine, Nevada-Reno, Idaho, Michigan State…).

(3) All of the research-active CH E faculty are performing materials-based research (short summaries below):

- Catherine Brewer: Biomass collection, pretreatment and processing for use in bio-based materials; Production and characterization of chars for carbon applications.
- Jessica Houston: Biomaterials: reporters for Raman, Raleigh scatter, and fluorescence
- Hongmei Luo: Colloidal synthesis semiconductor quantum dots and metal/semiconductor hybrid nanocrystals for photovoltaics and sensors; nanostructured materials for catalyst, energy storage and conversion devices (e.g, supercapacitors, batteries); epitaxial metal oxides, nitrides, carbides and nanocomposite thin films for microelectronics, optoelectronics, magnetism, ferroelectric, and multiferroic applications.
- Thomas Manz: Computational study of metal organic frameworks or zeolites for gas separation applications; computational study of complex oxides or thin films for magnetism, ferroelectric, or multiferrioc applications.

- Julio Martinez: Synthesis, characterization, and integration of novel nanostructured materials for chemical/bio sensing and energetics; Synthesis, characterization, and integration of hybrid bioinorganic nanostructured materials for bio-sensing and energetics; Thermal and electrical Integration of nanostructured materials for thermal management and energy recovery.
- Reza Foudazi: Porous polymers, Rheology of complex fluids, Physiochemical properties of soft matter, Colloid and interface science
- Shuguang Deng: Synthesis, characterization and application of nanoporous adsorbent materials for gas storage and separation; Synthesis, characterization and application of nanostructured catalysts for biofuel conversion and upgrading; Inorganic membranes for desalination and water treatment; Nanostructured materials as smart sensors for detecting biological and chemicals compounds.
- David Rockstraw: Synthesis, surface modification, characterization, and application of activated carbons from lignocellulosic materials; Evaluation of catalytic materials for conversion of waste materials into fuels.

(4) The Chemical Engineering Department will offer a Materials Engineering minor certificate. As the new tenure-track faculty finish their contractually reduced teaching loads and have initiated funded research programs, each will develop an elective course in their specialty area of materials science. These elective courses, combined with our core service course (CH E 361), existing materials-based electives (CH E 466 and 467), and materials-based courses from across the college will form the basis for this certificate. All interested departments in the college will be engaged in determining which service-level courses will be required, how many total hours will be required, and which interdisciplinary electives will be counted toward the certificate. A draft of the current state of this minor is attached.

Minor: Materials Engineering

The Materials Engineering minor at New Mexico State University is part of a materials education program that addresses the growing demand for engineers and scientists with understanding of the wide range of materials, their properties, and means of characterization. A student must pass 18 credits of courses with a grade C or better. The minor includes one required course, and the balance elective courses chosen from a menus available on the Chemical Engineering website. No courses may be taken S/U. All prerequisites for the classes must be met or consent of the instructor obtained before enrolling in class.

Course List (all are 3 credit hour courses unless noted otherwise).

Required (3 cr. hr)	Description
CH E 361. Engineering Materials	Bonding and crystal structure of simple materials. Electrical and mechanical properties of materials. Phase diagrams and heat treatment. Corrosion and environmental effects. Application of concepts to metal alloys, ceramics, polymers, and composites. Selection of materials for engineering design. Prerequisite(s): CHEM 111, CHEM 114, or CHEM 115. Crosslisted with: CH E 361H
Electives (15 cr. hr)	**Description**
C E 301. Mechanics of Materials	Stress, strain, and elasticity of materials. Prerequisite: C E 233.
C E 311. Civil Engineering Materials	Introduction to the structure, physical properties, testing and mechanical behavior of civil engineering materials and components made from these materials. Prerequisite: C E 301.
C E 357. Soil Mechanics	Engineering properties of soils, consolidation settlement, compaction, water flow through soils, geostatic stresses, soil shear strength, lateral earth pressure, and soil laboratory testing. Prerequisite(s): C E 160 or GEOL 111, and C E 301.
C E 479. Pavement Analysis and Design	Covers stresses and deflections in pavement layers, material characterization, flexible and rigid pavement design by AASHTO, mechanistic design, rehabilitation concepts. Taught with C E 577. Extra work required for graduate credit. Prerequisite(s): C E 357.
CH E 443. Industrial Catalysis	Fundamentals of catalytic processes, including chemistry, catalyst preparation, properties and reaction engineering. Addresses heterogeneous catalytic processes employed by industry. Detailed analysis of existing catalysts and catalytic reactions, and process design in chemical engineering. Prerequisite: CH E 441
CH E 463.* Soft Matter	Bulk soft matter assemblies including polymers, macromolecules, colloids, gels, vesicles, emulsions, surfactants, micelles, suspensions, liquid crystals. self-assembly including molecular self-organization, supramolecular systems, encapsulation, self-assembled films and monolayers. Biological aspects of soft matter including biomacromolecules, , cells, soft tissues. Surfaces, interfaces, and interactions including thin films, Langmuir monolayers, wetting/dewetting. Physiochemistry and characterization of soft matter. Prerequisites: CH E 302, CH E 305 and CH E 361.
CH E 464. Polymer Science	Synthesis, structure, property relationships of synthetic polymers. Prerequisite: CH E 361.
CH E 465.* Rheology or Viscoelasticity	Navier-Stokes equation; non-Newtonian fluids; flow fields; rheometry; viscoelastic models; non-linear viscoelasticity; material functions; complex fluids, including emulsions, suspensions and nanocomposites. Prerequisites: CH E 305 and CH E 306.
CH E 466. Fuel Cell Technology	This course presents an introduction to the fundamentals and applications of fuel cell and hydrogen technology. It includes thermodynamics, electrochemical kinetics, fuel cell electrode catalysts, fuel cell systems, fuel reforming and H_2 production, hydrogen storage, hydrogen safety. The applications of fuel cells in power generation, portable power, and automotives will also be covered. Students will also have a chance to work on a term project, write a term paper and present the term project.

Required (3 cr. hr)	Description
CH E 467. Nanoscience and Nanotechnology	This is a lecture/laboratory course designed to present the basic concepts, the techniques and the tools to synthesize and characterize nanometer scale materials, and the latest achievements in current and future nanotechnology applications in engineering, materials, physics, chemistry, biology, electronics and energy. It is intended for a multidisciplinary audience with a variety of backgrounds. This course should be suitable for graduate students as well as advanced undergraduates. Topics covered will include: nanoscience and nanotechnology, nanofabrication, self-assembly, colloidal chemistry, sol-gel, carbon nanotubes, graphene, thin film, lithography, physical vapor deposition, chemical vapor deposition, quantum dots, lithium batteries, X-ray diffraction, scanning electron microscopy, transmission electron microscopy, nanoelectronics, nanophotonics and nanomagnetics, etc. Crosslisted with: PHYS450 and PHYS520. Prerequisite(s): CHEM 112 AND (PHYS 211 or PHYS 215) AND EH&S Safety training to include the courses: (1) Employee & Hazard Communication Safety (HazCom); (2) Hazardous Waste Management; and (3) Laboratory Standard.
CH E 468.* Calculation of Material and Molecular Properties	The aim is to describe and apply techniques for computing common properties of materials and molecules: optimized geometries, transition states, vibrational spectra, energies (electronic, internal energy, enthalpy, and Gibbs free energy), heat capacities, net atomic charges, atomic spin moments, and effective bond orders. These techniques allow one to estimate the thermodynamic properties of a chemical, as well as to compute the mechanisms and energy barriers for chemical reactions and catalytic processes, and to quantify the electronic, magnetic, and chemical ordering in materials. The theory behind these techniques will be described and students will perform hands-on computer exercises using common computational chemistry programs. Prereq: CHEM 116, MATH192G, and (PHYS 214 or PHYS 216G)
CH E 469. Thermal, Optical, and Electronic Properties of Materials	Fundamentals that dictate the thermal, optical, and electronic properties and their transport phenomena in materials focused on their governing principles. Transport phenomena at the nanometer/quantum scale stressing the differences with bulk systems will be considered. A laboratory component of this course will also be included. Prerequisites: CH E 306, CH E 361.
CH E 470. MEMs, bioMEMs, and nano devices & technologies	Device-fabrication approaches and testing methodologies for micro-electro-mechanical (MEM) systems and nanoscale devices. Applications of such devices, and their working principles will also be part of this course. A laboratory component of this course will also be included. Prerequisites: CH E 361 and CHEM 111.
CH E 476. Nuclear Fuel Cycles	Physical and chemical processes in the conventional nuclear fuel cycle: uranium mining and milling, conversion, enrichment, fuel fabrication, reactor operations, interim storage, reprocessing and recycling, waste treatment and disposal. Alternative fuel cycles and future prospects. Prerequisite(s): CH E 470.
CH E 485.* Materials from Biorenewable Resources	Types, sources, composition and properties of biomass. Production, processing, and applications of biomass materials with energy, water, cost, sustainability, and waste management considerations. Prerequisites: CHEM 111, CHEM 313; course in plant science, soil science, food science, or biology. cross-listed with CHEM and AGRON/HORT
CH E 486. Biofuels	Introduction to the fundamentals and applications of biofuels and bioenergy produced from biomass; renewable feedstocks, their production, availability and attributes for biofuel/bioenergy production; types of biomass-derived fuels and energy; thermochemical conversion of biomass to heat, power, and fuel; biochemical conversion of biomass to fuel; biodiesel production; environmental impacts of biofuel production; economics and life-cycle analysis of biofuel; value-added processing of biofuel residues; term paper of selected topics relevant to biofuels. Prerequisite(s): CHEM 115 or CHEM 111.
CHEM 371. Analytical Chemistry	The fundamentals of quantitative chemical analysis. Prerequisite: CHEM 112G. (4 cr, 2+4P)
CHEM 471. Instrumental Methods of Analysis	Analytical techniques, including optical and procedures. Prerequisites: CHEM 371 and either PHYS 212G or PHYS 216G. (4cr, 3+3P)
E E 425. Introduction to Semiconductor Devices	Energy bands, carriers in semiconductors, junctions, transistors, and optoelectronic devices, including light-emitting diodes, laser diodes, photodetectors, and solar cells. Taught with E E 525. Prerequisite(s): C or better in E E 380 and E E 351.
GEOL 310. Mineralogy	Crystallography and the physical and chemical aspects of minerals. Prerequisite(s): GEOL 111G and CHEM 111. (2+3P)
I E 375. Manufacturing Processes II	Review of basic manufacturing processes. Advanced topics in casting, forming, machining and joining; major process parameters; economics of processes. Prerequisite: I E 217 or E T 217.
PHYS 315. Modern Physics	An introduction to relativity and quantum mechanics, with applications to atoms molecules, solids, nuclei, and elementary particles. Prerequisites: MATH 291G and PHYS 214 or PHYS 216G.
PHYS 488. Condensed Matter Physics	Crystal structure, X-ray diffraction, energy band theory, phonons, cohesive energy, conductivities, specific heats, p-n junctions, defects, surfaces, and magnetic, optical, and low-temperature properties. Prerequisite: PHYS 315.

Required (3 cr. hr)	Description
PHYS 489. Intro to Modern Matls	Structure and mechanical, thermal, electric, and magnetic properties of materials. Modern experimental techniques for the study of material properties. Prerequisite: PHYS 315.

* - course under development and not yet appearing in catalog