Graduate Council Curriculum Report

The Graduate Council Curriculum Report (GCCR), which includes all graduate curricular proposals approved through the Graduate Council curricular review process, is published 12 times each calendar year.

Questions/comments regarding the GCCR or its contents may be directed to the Director of Graduate Council Administration.

April 3, 2019

Graduate Degree Programs

CHANGE

Business Administration – change admission requirements (Smeal College of Business), page 25

Corporate Innovation and Entrepreneurship – change degree title to Master of Management (Smeal College of Business), page 39

Geography – adopt the dual-title in Climate Science for the Ph.D. degree (College of Earth and Mineral Sciences), page 54

Industrial Engineering – add Master of Engineering degree to be delivered online through the World Campus (College of Engineering), page 77

Spanish – adopt the dual-title in Visual Studies for the Ph.D. degree (College of the Liberal Arts), page 163

Strategic Management and Executive Leadership – change degree requirements (Smeal College of Business), page 189

Systems Engineering – change degree requirements (Penn State Great Valley), page 210

Graduate Courses

ADD

HIST 510
Early Modern Environmental History

EARLY MODERN ENVIRON HISTORY (3)

The purpose of this course is to explore the place of the natural environment in the late medieval and early modern world. It does so by revisiting classic episodes in world history, from the Mongol conquests in the thirteenth century until the volcanic eruptions of Laki (1783) and Tambora (1815), and reinterpreting them through the lens of environmental history. Topics considered include climate change, plague epidemics, wetland drainage, urbanization, malaria, forestry, colonization, and the commodification of nature. Horses, mosquitoes, and rats will come under the spotlight as active participants in the great transformations of world history.
Central to our inquiry throughout the semester is the perennial problem of historical agency; how humanity’s freedom to think and act interacts with the limits that nature imposes. Along the way, students will be given an overview of the concepts, methods, and sources of environmental history.

PROPOSED START: SU2019
IE 894
Capstone Design
CAPSTONE DESIGN (3)
Students will apply the analytical and design skills learned in previous courses to solve an industrial problem based on their workplace or industrial partner. Students who do not have an identifiable work-related problem will work collaboratively with the instructor to develop a suitable topic. This is an individual project culminating in a final report.
RECOMMENDED PREPERATION: Recommended preparation is for the student to take this course after taking most of the courses in the program because prior knowledge is needed to perform a capstone design project.
PROPOSED START: SU2019

INTAD 590
Colloquium
COLLOQUIUM (1-3/Repeatable Max: 3)
Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
PROPOSED START: SU2019

INTAF 818
U.S. National Security
U.S. NATIONAL SECURITY (3)
This course examines: 1) how states fight wars and use force; 2) how the characteristics of nuclear and conventional weapons affect strategic thinking; 3) the manner in which the states match interests with capability and domestic politics, 4) civil military relations and 5) how wartime assessment influences policy, and 6) how to present and write professional briefings. The course will focus on both the general pattern among all states and the application of these concepts to U.S. national security. Students will be expected to develop the knowledge and skills to think, speak, and write knowledgeably about the dynamics of U.S. national security specifically and international security more generally.
PROPOSED START: SU2019

MFE 513
Financial Risk Management
FINANCIAL RISK MANAGEMENT (3)
This course covers the core concepts of risk management, allowing risk professionals and non-specialists to interpret risk management information and reports, make critical assessments, and evaluate the implications and the limitations of such results. In addition, they must commit to further uphold the highest professional and ethical standards. This course is directed toward students interested in understanding how large-scale complex risk can be quantified using the latest “cutting edge” techniques and case studies that generate “new knowledge” regarding how complex risk management situations might be managed. We identify the business and technical issues, regulatory requirements and techniques to measure and report risk across a major organization and to generate new ideas about how failures in risk management are resulting in new and improved procedures.
The knowledge obtained in this course provides a theoretically-based approach that is necessary to effectively implement a superior risk management program. Successful candidates will be able to:
1. Acquire and analyze the techniques required to understand and incorporate corporate governance, compliance and risk management.
2. Implement integrated risk management based on sound theoretical underpinnings and new knowledge created by analyzing actual risk management failures.
3. Measure, manage and hedge market, credit (retail and corporate) and operational risk, with an emphasis towards improving existing “best practices” based on new knowledge.
4. Appraise the roles of board members and senior management in managing risk, cultivating potentially new solutions to risk management problems.
PROPOSED START: SU2019
MFE 527
Derivative Securities
DERIVATIVE SECURITIES (3)
This course introduces the student to the major derivative securities that are the tools in the management of financial risk: futures, forwards, swaps and options. The course will expose students to potential critiques of traditional financial theory based on recent empirical results, including the global financial crisis of 2007 – 2009. While examining the characteristics and pricing of these instruments, students will also explore how corporations utilize these contracts to reduce their financial risk exposure. The course also explores the practical differences between hedging, speculation and arbitrage.
The objective of this course is to examine the important financial characteristics of derivative securities such as swaps, forward, futures, and options contracts and their roles in managing individual and corporate financial risk. Students will apply these concepts in an effort to integrate a comprehensive risk management approach. Among the topics explored for each of these securities are the history and evolution of formalized exchanges, the mechanics of each contract, price relationships, and the theory and practice of hedging. Basic valuation concepts as well as applications and strategies will be emphasized, as well as extensions based on recent innovations in financial engineering and the financial literature.
PROPOSED START: SU2019

NUTR 895B
Internship-Food Systems and Organization Management
INTERNSHIP-FOOD SYS & ORG MGMT (1-18/Repeatable Max: 18)
Supervised, professionally oriented, off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique or activity required.
PROPOSED START: SU2019

NUTR 895C
Internship-Community
INTERNSHIP-COMMUNITY (1-18/Repeatable Max: 18)
Supervised, professionally oriented, off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique or activity required.
PROPOSED START: SU2019

SOILS 896
Individual Studies
INDIVIDUAL STUDIES (1-9/Repeatable Max: 9)
Creative projects with a professional orientation, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
PROPOSED START: SU2019

SOILS 897
Special Topics
SPECIAL TOPICS (1-9/Repeatable Max: 9)
Formal courses given on a topical or special interest subject with a professional orientation that may be offered infrequently; several different topics may be taught in one year or semester.
PROPOSED START: SU2019
STAT 805
Multivariate Statistics and Applications
MULTIVARIATE STATS & APPS (3)
This course is designed to build upon a student’s undergraduate quantitative backgrounds by giving an overview of multivariate statistical techniques. Many applied fields often require the use of large, multivariate data sets and students need to be aware of the wide range of statistical tools available to them. Major objectives of this course are to gain a working knowledge of probability theory, univariate and multivariate statistics, the use of copulas, Monte Carlo techniques, and multiple linear regression. Throughout the course, students will have the opportunity to apply these concepts to real world data sets using modern statistical software packages.
RECOMMENDED PREPERATIONS: Three semesters of calculus, one semester of probability and statistics
PROPOSED START: SU2019

STAT 810
Time Series Analysis and Applications
TIME SERIES APPLICATIONS (3)
This course is designed to build upon a student’s background by giving an overview of the techniques of time series analysis often used in applied settings. Many areas of research and application often utilize long time series of data in an effort to model changes and volatility in data measured consistently over time. Major objectives in this course include an overview of linear time series; AR, MA, and ARIMA models; ARCH and GARCH models; nonlinear time series models; multivariate time series models; and models of high-frequency data. Throughout the course, students will have the opportunity to apply these concepts to real world data sets using modern statistical software packages.
PREREQUISITES: MFE 810, STAT 805; STAT 505
PROPOSED START: SU2019

CHANGE

OLD
EDUC 561
Psychology of Reading
PSY OF RDNG (3)
Examination of the theoretical bases for reading which have direct practical implication for teaching reading. EDUC 561 Psychology of Reading (3)This is a required course in the reading specialist certification program. The primary goals for this course are to (1) examine the foundations that affect the fields of literacy and reading education, including philosophical, historical, psychological, and social foundations, and (2) to assist students in becoming more aware of race/ethnicity, linguistic variation, social class, gender, and sexual identity in relationship to literacy and schooling. Throughout the course, the graduate students will examine the complexity of literacy to become aware of how to situate one's own literacy practice and experience in multiple contexts. Students become reacquainted with mainstream theories and are introduced to those of critical theorists who challenge traditional perspectives that have often marginalized race, class, and linguistic variety in learning and in literacy development. At the conclusion of the course, students will be able to utilize traditional and critical theories in thinking about literacy/reading research, theory and practice. Assessments and evaluation of course requirements occur through instructor observations of demonstrations of mastery during a variety of discussion and presentation modes, observation and analysis of children's language use, reflective and reflexive analysis of one's own practice, and development of perspectives and a philosophy of literacy demonstrated through scholarly writing.
PREREQUISITES: EDUC 471, EDUC 425, EDUC 477
NEW
EDUC 561
Theoretical Foundations of Literacy
THEORETICAL FOUNDATIONS OF LIT (3)
The primary goals for this course are to (1) examine the theoretical paradigms that inform the field of literacy education, including philosophical, cognitive, sociocultural, critical literacy, and multimodal/digital literacies and (2) to assist participants in becoming more aware of sociocultural, diversity, gender, and identity in relationship to literacy and schooling. Throughout the course, participants will examine the complexity of literacy to become aware of how to situate one's own literacy practice and experience in multiple contexts. Participants become reacquainted with mainstream theories and explore those of critical theorists who challenge traditional perspectives that have often marginalized race, class, and linguistic variety in learning and in literacy development.
PREREQUISITES: EDUC 477

OLD
EDUC 563
Methods in Teaching Reading
METHODS IN TCH RDG (3)
Development of advanced diagnostic and instructional techniques for teaching reading, with emphasis on individual and small group instruction. EDUC 563 Methods in Teaching Reading (3) This course is required in the graduate Reading Specialist Certification Program and is designed to familiarize graduate students with a wide range of traditional and current instructional strategies and resources for meeting the literacy/reading needs of students across the lifespan. Opportunities will be provided to re-examine connections between theory and assessment and to develop an awareness of how instruction in literacy/reading is informed by social and political forces. As they become familiar with the sub-texts and inter-texts of literacy and schooling, candidates also examine race as a foreground for literacy instructional practices. After successful completion of the course, students will be able to utilize all the language arts in planning and implementing instruction, coaching classroom teachers, and advising others about "best practices" in literacy/reading instruction. The requirements for the course allow candidates to gain additional experience administering standardized and informal assessment instruments; analyze assessment data and write a case study report; develop, present and critique lessons in reading and other language arts; reflect on their own instruction; and discuss "racialized" beliefs about student's abilities. Assessment and evaluation of course requirements occurs through instructor observation of demonstrations of mastery during roundtable discussion, peer-conferencing, and through completion of assignment-specific rubrics for lesson plans and the case study.
PREREQUISITES: EDUC 562

NEW
EDUC 863
Literacy Methods
LITERACY METHODS (3)
This course examines the literacy curriculum and teaching practices in various real world contexts to support the diverse needs of K-12 learners. Graduate students review and apply current literacy research to inform instruction within the context of their individual classrooms. Students also employ a multiliteracies framework in their lessons as they locate digital resources and tools to model critical viewing, representing, and thinking for their K-12 learners. Students enrolled in EDUC 863: Literacy Methods plan, adapt, and implement innovative instructional approaches that will support their professional practice and future role as K-12 literacy educators and reading/literacy specialists.
PREREQUISITES: EDUC 862
OLD

EDUC 564
Reading Clinic
READING CLINIC (3)
This capstone course for the Master of Education in Literacy Education with the Reading Specialist certification is designed to address the major theories and empirical research that addresses the cognitive, linguistic, motivational, and sociocultural foundations of literacy development, processes, and components, including word recognition, language comprehension, strategic knowledge, and reading-writing connections. To demonstrate mastery of these concepts, participants engage in an action research case study project in which they design, develop, and implement curriculum to meet the needs of K-12 students who are struggling with literacy. Through this case study, participants demonstrate and apply pedagogical and professional knowledge, skills, and dispositions. Participants select a variety of appropriate texts, engage students' backgrounds and interests, and administer appropriate assessments to evaluate and monitor progress. Participants also have the opportunity to further enhance their ability to collaborate with professional colleagues, interact with students' families, and demonstrate leadership in literacy education.

PREREQUISITES: EDUC 563

NEW

EDUC 864
Literacy Clinic
LITERACY CLINIC (3)
This capstone course for the Master of Education in Literacy Education with the Reading Specialist certification program is designed to address the major theories and empirical research that addresses the cognitive, linguistic, and sociocultural foundations of literacy development, processes, and components, including word recognition, language comprehension, strategic knowledge, critical literacy, and interdisciplinary connections. To demonstrate mastery of these concepts, students engage in an action research case study project in which they design, develop, and implement within their respective curriculum to meet the needs of K-12 learners who are experiencing difficulties with literacy. Through this case study, students demonstrate and apply pedagogical and professional knowledge, skills, and dispositions. Students select a variety of appropriate texts, consider multimodalities, determine learners' backgrounds and interests, and administer appropriate assessments to evaluate and monitor progress. Students also have the opportunity to further enhance their ability to collaborate with professional colleagues, interact with families, and demonstrate leadership in literacy education.

PREREQUISITES: EDUC 863
Principles of supervision, organization, management, and evaluation of literacy programs will be presented. EDUC 565 Literacy and Leadership (3) This course is required in the graduate Reading Specialist Certification Program and is designed to prepare graduate students to assume the role of literacy leader or literacy coach within a school or school district. This role includes the planning, implementation, management, and evaluation of the literacy/reading program. Objectives for the course allow candidates to connect theory to the development of effective literacy/reading programs and intervention frameworks, to understand the elements of literacy coaching as critical to teacher and staff development, and to understand the interrelated nature of literacy policy, curriculum, assessment, and instruction.

Throughout the course, candidates develop dispositions that allow them to work collaboratively alongside classroom teachers, district officials, and other professionals as advisors and coaches developing curriculum, determining appropriate assessments, conducting professional development training, and evaluating program effectiveness. Course requirements include (1) analyzing journal articles and/or case studies articulating the theories related to the connections among professional dispositions, motivation and achievement; (2) providing assistance to a classroom teacher in creating a professional development plan; (3) working with colleagues to observe, evaluate, and provide feedback on each other's practice; (4) planning; implementing, and evaluating a professional development plan for an elementary or secondary building; (5) working with linguistically diverse learners, parents, paraprofessionals, and teachers.

PREREQUISITES: EDUC 466, EDUC 563

EDUC 865 Literacy Leadership
LITERACY LEADERSHIP (3)
EDUC 865 Literacy Leadership is a required course in the Master of Education in Literacy Education and Reading Specialist certification program that is designed to prepare students to assume the role of literacy leader within a school or school district. This role includes the implementation, management, and evaluation of the literacy program. The course allows students to connect theory to the development of effective literacy programs and intervention frameworks, and to understand the interrelated nature of literacy policy, curriculum, assessment, and instruction. Throughout the course, students develop dispositions that allow them to work collaboratively alongside classroom teachers, district officials, and other professionals as they develop curriculum, determine appropriate assessments, conduct professional learning workshops, and evaluate program effectiveness.

PREREQUISITES: LLED 445, EDUC 863

ESC 545 Scientific and Engineering Foundations of Additive Manufacturing
FOUND OF ADD MANUF (4)
In additive manufacturing (AM), components are fabricated via sequential joining using a bonding agent, curing, sintering, or fusing. AMfabrication of metals, ceramics, polymers, and organics has been demonstrated and is actively being used in industry and academia. ESC 545 explores these processes with a focus on the fundamentals of sintering and fusion of metals, ceramics, and polymers. The topic is multi-disciplinary, requiring examination of individual AM system components, the physics of energy-material interactions, and the materials science at play during heat-reheat cycles. Opportunities for process sensing and real-time control are explored, as well as the role of post-process technologies in realizing serviceable components. These topics will lead to a discussion of methods and strategies to optimize component properties and characteristics. Current and potential impacts of AM on society are also covered.

RECOMMENDED PREPERATION: A course in engineering materials and/or engineering analysis is highly desired but not required.
NEW
ESC 545
Engineering and Scientific Principles of Additive Manufacturing
PRINCIPLES OF ADD MANUF (4)
In additive manufacturing (AM), components are fabricated via sequential joining using a bonding agent, curing, sintering, or fusing. AM fabrication of metals, ceramics, polymers, and organics has been demonstrated and is actively being used in industry and academia. ESC 545 explores these processes with a focus on the fundamentals of sintering and fusion of metals, ceramics, and polymers. The topic is multi-disciplinary, requiring examination of individual AM system components, the physics of energy-material interactions, and the materials science at play during heat-reheat cycles. Opportunities for process sensing and real-time control are explored, as well as the role of post-process technologies in realizing serviceable components. These topics will lead to a discussion of methods and strategies to optimize component properties and characteristics. Current and potential impacts of AM on society are also covered.
RECOMMENDED PREPERATION: A course in engineering materials and/or engineering analysis is highly desired but not required.
CROSS-LISTED COURSES: AMD 545

OLD
LEAD 862
Strategic Leadership
STRATEG LEADERSHIP (3)
LEAD 862 explores and analyzes the requirements for effective strategic leadership in organizations operating in today's technology-driven environments. Students will be given an overview of the various elements of the strategic leadership system, including organizational context/environment, leader's life stream of biographic and demographic elements influencing leadership, and followers' perceptions the leader's behavior. Emphasis in this course is placed on learning from "real world" senior managers/administrators to enhance the practicality and usefulness of the material covered in the course. As the course progresses, new knowledge and skills are integrated into a more sophisticated framework for understanding strategic leadership.
PREREQUISITES: LEAD 501, LEAD 555, LEAD 556

NEW
LEAD 862
Strategic Leadership
STRATEGIC LEADERSHIP (3)
LEAD 862 explores and analyzes the requirements for effective strategic leadership in organizations. Strategic leadership examines the role of executive leaders and their effects on organizations. The primary role of executives is to foster financial success and create wealth in organizations. This course is designed to provide students with an understanding of the requirements for effective strategic leadership in organizations as assessed by the balanced scorecard. The challenges of strategic leadership involve strategic planning, marketing products and services, selecting and training employees, facilitating organizational learning and development, and developing systems to support operations, innovation and human resources. These outcomes are lead indicators of financial success and wealth creation in organizations. Students will be given an overview of the various elements of the strategic leadership system, including organizational context/environment, leader's life stream of biographic and demographic elements influencing leadership, and followers' perceptions the leader's behavior. Emphasis in this course is placed on learning from "real world" senior managers/administrators to enhance the practicality and usefulness of the material covered in the course. As the course progresses, new knowledge and skills are integrated into a more sophisticated framework for understanding strategic leadership.
PREREQUISITES: (LEAD 501; MGMT 501; PSY 532) LEAD 555
RECOMMENDED PREPERATION: Completion of 24 credits including the MLD cornerstone courses (LEAD 501, LEAD 555, LEAD 557) OR with permission of instructor. MPS Psychology of Leadership students must have completed 24 credits including PSY 532 and LEAD 555.
OLD

MATSE 567
Additive Manufacturing of Metallic Materials
ADDITIVE MFG METAL (3-4)
This course will expose students to the state of the art in understanding processing, structure, and property relationships in materials fabricated using additive manufacturing (AM). There will be a strong focus on metallic alloys, but polymers, ceramics, and advanced materials will also be briefly discussed. The emphasis of the course will be on understanding the links between processing and the resulting structure, as well as the microstructure and the mechanics of the fabricated materials. Initially, we will discuss the types of AM and the feedstock materials required for these processes. We will then focus on metals, and discuss the energy sources used in AM (lasers, electron beams), and their interactions with the material. We will discuss the molten pool characteristics and the solidification microstructures. We will relate the microstructures seen in AM to the resulting mechanical properties (elastic deformation, plastic deformation, fracture, fatigue performance, and residual stress/distortion). Finally, we will discuss specific case studies for metals, polymers, ceramics, and advanced materials.

NEW

MATSE 567
Additive Manufacturing of Metallic Materials
ADDITIVE MFG METAL (3-4)
This course will expose students to the state of the art in understanding processing, structure, and property relationships in materials fabricated using additive manufacturing (AM). There will be a strong focus on metallic alloys, but polymers, ceramics, and advanced materials will also be briefly discussed. The emphasis of the course will be on understanding the links between processing and the resulting structure, as well as the microstructure and the mechanics of the fabricated materials. Initially, we will discuss the types of AM and the feedstock materials required for these processes. We will then focus on metals, and discuss the energy sources used in AM (lasers, electron beams), and their interactions with the material. We will discuss the molten pool characteristics and the solidification microstructures. We will relate the microstructures seen in AM to the resulting mechanical properties (elastic deformation, plastic deformation, fracture, fatigue performance, and residual stress/distortion). Finally, we will discuss specific case studies for metals, polymers, ceramics, and advanced materials.

CROSS-LISTED COURSES: AMD 567

OLD

PPATH 505
Fundamentals of Phytopathology
FUNDMNTL PHYTOPATH (3)
An in-depth tutorial of the fundamental theories and concepts of plant pathology. PPATH 505 Fundamentals of Phytopathology (2) Using the primary literature of the discipline, students will explore, in-depth, the knowledge base of plant pathology. Students will write a 3-5 page paper each week summarizing the major points of the topic covered in the primary literature assigned as related to 4 pathogens/diseases chosen by each student from an approved list. Students will also answer, in writing, 1-2 specific questions posed by the instructor each week. These writings constitute 90% of the grade. 5% of the grade is based upon a written final exam and 5% on oral participation in class.
PREREQUISITES: None

NEW

PPATH 505
Fundamentals of Phytopathology
FUNDAMENTAL OF PHYTOPATHOLOGY (4)
Plant Pathology 505 reviews and explores the fundamental theories and concepts, as well as basic principles and new advances in plant pathology. The course also encourages the development of skills to analyze, evaluate, and synthesize information. Other topics covered in the course are new and emerging
molecular tools used in plant pathology, and population biology of plant pathogenic organisms, as a synthesis of ecology, epidemiology and genetics, with an emphasis on soilborne pathogens. We use specific examples to review the different evolutionary forces that shape pathogen populations.

Learning Objectives:
· To review Plant Pathology concepts and the fundamental interactions among pathogens, plants, and the environment that occur over time and result in disease within the conceptual frame of population biology.
· To gain knowledge on the latest technologies applied to plant pathology and develop an ability to formulate research strategies based on this understanding.
· To develop an appreciation for the scientific work upon which the present knowledge rests and become aware of the scientists who developed the concepts and methods currently in use.
· To develop the ability to formulate thorough, accurate, verifiable, fully referenced responses to questions.
· To become a critical thinker.

PREREQUISITES: PPEM 405

DROP

ANTH 501
Human Evolution: The Material Evidence
HUM EVOL/EV (3)
Human origins as seen in the fossil record and comparative biology of humans and their primate relatives.
PROPOSED DROP: SU2019

BA 578
Entrepreneurship
ENTREPRENEURSHIP (3)
Study of the development or acquisition of a business appropriate to the objectives and resources of the individual entrepreneur.
PROPOSED DROP: SU2019

BADM 511
Information Systems Management and Strategy
IS MGT AND STRATEGY (3)
Fundamental uses of IS/T and guiding principles associated with the development and management of IS/T as a strategic organizational asset.
PROPOSED DROP: SU2019

BCHEM 584
Glycobiology A: Carbohydrate Chemistry
GLYCOBIOL A (1)
Graduate course for students interested in carbohydrates. BCHEM 584 BCHEM 584 Glycobiology A: Carbohydrate Chemistry (1) The proposed course is designed to give graduate students interested in studying carbohydrates the basics about their chemistry. Because of their structure and the ability of just two sugars to form a number of different bonds with each other, carbohydrate chemistry is significantly more complex than that of any of the other building blocks found in the body. With the development of new approaches for studying these compounds, the science of glycomics is coming into its own.
PROPOSED DROP: SU2019
BCHEM 585
Glycobiology B: Glycoconjugates
GLYCOBIOL B (1)
Graduate course for students interested in carbohydrates. BCHEM 585 BCHEM 585 Glycobiology B: Glycoconjugates (1) The proposed course is designed to give graduate students interested in studying glycoconjugates the basics about their structure, functions that they serve, exposure to papers pertinent to the field, and the opportunity to integrate what they learn in class with what they read in assigned papers through class discussion.
PROPOSED DROP: SU2019

BCHEM 586
Glycobiology C: Glycans in Health and Disease
GLYCOBIOL C (1)
Graduate course for students interested in carbohydrates. BCHEM 586 BCHEM 586 Glycobiology C: Glycans in Health and Disease (1) Students will learn about the possible role(s) of glycans in health and disease and how that knowledge might be used to ameliorate certain diseases. Students will be expected to read papers and to integrate what they have learned in lecture with what they read when papers are discussed in class.
PROPOSED DROP: SU2019

BIOL 505
Statistical Methods in Evolutionary Genetics
STAT EVOL GENET (3)
Statistical methods that are used for analyzing and interpreting genetic data in molecular evolution will be discussed.
PROPOSED DROP: SU2019

BIOL 572
Integrative and Cellular Mammalian Physiology II Endocrine Physiology
ENDOCR PHYSIOL (3)
The course in Cellular and Integrative Mammalian Physiology II covers all major aspects of endocrine physiology. A special emphasis will be placed on how cellular aspects of physiology are integrated with organ and systems physiology. This course is designed for graduate students in the Physiology or Animal Science graduate programs, or students who are interested in integrating physiology concepts into their work in another program. Although there are no prerequisites for the course, prior courses in physiology, endocrinology, and/or biochemistry are beneficial. The course will include the following topics: gastrointestinal physiology, pancreatic hormones and integrated metabolism, hypothalamic pituitary function, thyroid, parathyroid and bone, as well as physiology of growth and lactation. Additional topics will encompass adrenal function, sexual differentiation, male and female reproduction, embryo and adult derived stem cells, aging, obesity, and metabolic syndrome.
PROPOSED DROP: SU2019

BMMB 510
Current Literature in Molecular Biology
CURR LIT MOL BIOL (1)
Discussion and analysis of recent scientific papers that form the core of current literature in molecular biology and related disciplines.
PROPOSED DROP: SU2019
BUSAD 558
Knowledge Management
KNOWLEDGE MGT (3)
This course examines the strategic value of knowledge and how organizations can manage their knowledge assets for competitive advantage. BUSAD 558 Knowledge Management (3)This course is designed to explore the topic of knowledge management (KM), which differs from information management in critical ways. Knowledge pertains to the subset of all information that embodies experience, experimentation, organizational learning, best practices, and techno-scientific knowledge. Knowledge thus differentiates average firms from great ones; e.g., Google vs Alta Vista. KM is now on the short list of strategic objectives for firms large and small. Future managers thus need to better understand the issues and challenges posed by knowledge management. Students taking the course will learn about KM as a human social process as is evident in Communities of Practice. We will examine the processes of knowledge creation, acquisition, retention and utilization. To understand how knowledge-based systems and practices are implemented in the "real world" (e.g., Merck, Lockheed Martin, Vanguard) we will review various case examples that highlight the unique problems posed by KM to business organizations. Experts from industry will be invited to speak to the class and students are invited to attend the Knowledge Management Group of Philadelphia (www.kmgphila.org) meetings that meet once a month. The course will be run as a graduate seminar designed to maximize the learning of the members of the group including the instructor's. We will learn about each of the topics noted above through a variety of means. Our interaction will include general group discussions, lectures, case discussions, exercises, small group meetings, and on-line chats.
PROPOSED DROP: SU2019

BUSAD 577
Management of Information Technology
MANAGEMENT OF IT (3)
This course focuses upon the challenges of aligning IT strategy with organizational goals. BUSAD 577 Management of Information Technology (3)This course identifies the challenges facing managers of information technology resources and addresses the methods of managing them. These resources include hardware, software, networking, data, information, and personnel. The course takes the approach of high-level management of what has become an important strategic resource in almost every organization. Therefore, it focuses on strategies rather than project management of individual efforts. The course focuses on decision making at the level of chief information officers and their immediate underlings. Its premise is that to succeed, an organization must align its IT strategy with the general organizational and business goals.
PROPOSED DROP: SU2019

BUSAD 583
Future of the Biotechnology and Health Industry: Strategic Implications
FUT (3)
Strategy in biotechnology, pharmaceutical, and health industries; impact of technological innovation and economic, social, political trends, and events. BUSAD 583 BUSAD 583. Future of the Biotechnology and Health Industry: Strategic Implications (3) BUSAD 583 explores and analyzes future trends in the biotechnology, pharmaceutical, and health industries. An analysis of trends in technology, administration and control, advances in research methods, emerging products and services, and preparing for the future will be undertaken. The strategic management impact of these trends will be explored from the perspective of suppliers of goods and services, professional care providers, payors and governmental and regulatory activities. Teaching methods include facilitator led didactic presentations, class discussions/classroom exercises, small group activities centered on case studies, team project/group presentations, and papers. The course will be offered twice annually by the Penn State Great Valley School of Graduate Professional Studies' MBA program and is a required course in the Penn State Great Valley MBA program option in biotechnology and health industry management.
PROPOSED DROP: SU2019
CAS 562
Qualitative Research Methods
QUAL RSCH MTHDS (3)
Qualitative approaches to investigating human experience using tools such as interviewing and observation. CAS 562 CAS 562 Qualitative Research Methods (3) This course provides students with an understanding of both qualitative research methods and the theoretical frameworks that inform qualitative inquiry. Additionally, this course focuses on tools for data collection such as individual and group interviewing and observing and recording interaction. This course provides practical experience for students in collecting and analyzing qualitative data with and without the use of technology and examines particular difficulties in the interpretation and reporting of qualitative findings. Qualitative Research Methods course disciplinary boundaries and is useful to any graduate student who will be investigating human interaction.
PROPOSED DROP: SU2019

CE 552
Coastal and Nearshore Processes
COASTAL PROC (3)
Hydrodynamics of the near-shore environment, including waves, currents, and storm surges. Coastal response, sediment transport, engineering structures.
PROPOSED DROP: SU2019

CNED 516
Helping Skills for Student Affairs Professionals
SA HELPING SKILLS (3)
Develop beginning content knowledge and skills related to practice of active listening, attending, and referral necessary for student affairs work.
PROPOSED DROP: SU2019

CNED 561
Job Development and Employment of Persons with Disabilities
JOB DEV/EMPLOY DIS (3)
Assessing client readiness for work, job-seeking skills training, job placement strategies, modifications to the worksite, methods for employer development.
PROPOSED DROP: SU2019

CNED 595K
Counselor Education Doctoral Counseling Internship
CN ED CNSL INTNSHP (3)
PROPOSED DROP: SU2019

CNED 840
Trends and Issues in Addiction Counseling
TRENDS AND ISSUES (3)
This course provides an overview of current professional and ethical issues facing the addictions field.
PROPOSED DROP: SU2019
**CNPSY 515**  
Family Systems Therapy: Theory, Research and Practice  
FAMILY THERAPY (3)  
Examines theory, research, and interventions grounded in family systems framework (e.g., Bowenian, Structural Strategic, etc.) from a psychological perspective. 

This seminar will (a) familiarize students with the history of family therapy approaches and their contributions to the field of mental health service, (b) provide students with an opportunity to learn about the major approaches in family therapy, (c) introduce students to family therapy research, and (d) encourage students to reflect on the patterns in their own family of origin and family of choice. During this introductory seminar in family systems, theory, students will gain exposure to the field of family therapy through: a variety of readings, including original articles written by theorists and journal articles discussing the research findings; experiential exercises and videotapes of family therapy and consultation sessions conducted by expert family therapists. The course is offered once a year and is open to graduate students in developmental, social and behavioral sciences and related fields. 

PROPOSED DROP: SU2019

**CNPSY 589**  
Seminar on Counseling Supervision  
SEM COUN SUPVN (1)  
Study of research about and theoretical models of clinical supervision of counselors; includes preparation for a practicum in counseling supervision. 

PROPOSED DROP: SU2019

**EBIZ 543**  
e-Marketing  
E-MKTG (2)  
Using the Internet and related technologies to enhance and transform marketing functions and processes. 

PROPOSED DROP: SU2019

**EDPSY 527**  
Psychology of Adults as Learners  
PSY ADULT LEARNERS (3)  
Psychological principles related to learning by adults, with application to instruction and other educational practices. 

This course is oriented to appeal to students who are or will be practitioners who work with teachers in in-service activities. Also, the course will be of interest to those who teach adults in extension service, community planning, adult education, clinical/counseling relationships, or in other activities where intervention is used or where it is desirable simply to know more about the learning capabilities and limitations of adults as learners. As such this course is an application of psychological principles to an area of practical concern to education. This course will provide a foundation for those students who desire to pursue research in the area of adult learning, who want to engage in a practitioner role, or who simply wish to understand this facet of the behavior of an adult. 

PROPOSED DROP: SU2019

**EDTHP 525**  
Alternative Assessment of National Educational and Health Policies  
ALT ED POLICY (3)  
Overview of alternative research strategies in education, nursing and health education studies used to study impact of national policies. 

This course provides alternative methods of qualitative research methods in education, nursing and health education studies, and serves as an advanced research course for degree programs in the
Department of Education Policy Studies. Students will study specific techniques and methods that relate to research and evaluation currently being carried out in the fields of education, health policy in national and international settings. The grade of this course depends on in-class presentation and quality of drafts and the final product, with the final project counting for 30% of the grade. In prior to or the early weeks of the course, students must pass "Office for Regulatory Compliance Human Subject Basic Training Seminar," and also must submit a proof that they have passed it. In addition, students must commit to presenting some of the reading materials during one class session.

PROPOSED DROP: SU2019

**EDUC 500**
Professional Learning Communities
PROF LEARN COMMUN (3)
Defines elements of effective learning communities and explores educators' roles as consumers and creators of research, theory, and best practices. EDUC 500 Professional Learning Communities (3) This course is intended to help teachers' understanding of and skills in assuming leadership roles and responsibilities in the learning community. Elements of effective learning communities are defined and educators' roles are explored. Teachers will analyze the learning community as consumers and creators of research, theory, and best practices. Particular attention will be paid to the relationship among teacher leadership, school effectiveness, and site-based accountability.

PROPOSED DROP: SU2019

**EME 510**
Health and Safety Engineering
HEALTH SAFETY ENG (3)
Develop the ability to use scientific and engineering principles to evaluate and control health and safety hazards in the workplace.

PROPOSED DROP: SU2019

**ENNEC 541**
Economics of Energy and the Environment
ENERGY AND ENVIRON (3)
Economic analysis of topics such as global warming, alternative energy sources and new technologies, and resources and sustainable development.

PROPOSED DROP: SU2019

**ENTR 571**
Strategic Innovation in Corporate Networks
STRAT INV CORPNTWK (2)
Capstone course integrating themes related to innovation by exploring entrepreneurship as strategic force throughout a full range of corporate entities.

PROPOSED DROP: SU2019

**FIN 515**
Nittany Lion Fund Manager
NLF MGR (3)
Focuses on applied issues and topics in the management of investments. FIN 515 Nittany Lion Fund Manager (3) FIN 515 is not a lecture course. Rather it is a "hands-on" investing course. Students enrolled in the course will help manage the Nittany Lion Fund, which is a student run fund with approximately $5 million under management as of December, 2007. With the help of the faculty advisor (Randall Woolridge), the Advisory Board, and outside experts students are responsible for all aspects of managing the fund, from making buy and sell decisions to fulfilling the legal reporting requirements.

PROPOSED DROP: SU2019
**FIN 541**  
Security Analysis  
SECURITY ANAL (3)  
Discussion and application of analytical techniques in security valuation, including use of computers.  
PROPOSED DROP: SU2019

**GEOEE 596**  
Individual Studies  
INDIVIDUAL STUDIES (1-9/Repeatable Max: 9)  
Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.  
PROPOSED DROP: SU2019

**GEOEE 600**  
Thesis Research  
THESIS RESEARCH (1-15/ Repeatable Max: 15)  
No description.  
PROPOSED DROP: SU2019

**GEOEE 601**  
Ph.D. Dissertation Full-Time  
PHD DIS FULL-TIME (0)  
No description.  
PROPOSED DROP: SU2019

**GEOG 501A**  
Research Perspectives in Physical Geography  
PHYSICAL GEOGRAPHY (1)  
This course presents contemporary perspectives on Physical Geography, emphasizing the major issues and integrative themes of the sub-discipline. GEOG 501A Research Perspectives in Physical Geography (1)The contemporary study of Physical Geography unites all sub areas of Earth's physical environment--biogeography and ecology, climatology, and geomorphology--according to the following cross-cutting themes: water and mass in the environment; energy; scale and scale interactions; systems approach; and historical perspective. These themes are emphasized in each of the seven lectures comprising 501A, through discussion of theory (e.g., feedback processes) and application (e.g., vegetation-soil-cloud-precipitation interactions). Beyond the topical treatment of Physical Geography, the course covers the role of instrumentation and measurement as well as numerical modeling (statistical, dynamical) in the systems approach to studying landscape processes. The role of cross-scale spatial interactions (micro-meso-macro) in the flows of mass and energy at and near the Earth's surface are presented, along with the statistical techniques for extracting those scale interactions (e.g., Artificial Neural Networks, Self-Organizing Maps). The temporal perspective on landscape processes involves particularly the role of humans in rapidly modifying--both intentionally and inadvertently--the transfers of energy and mass through land-cover modifications (e.g., deforestation/afforestation, urbanization) and atmospheric impacts. The course aims are achieved through lectures, and by student readings of two or three seminal papers per week and a half-term paper. Although GEOG 501A is a stand-alone course, it dovetails with the three other new graduate-level courses proposed in Geography (Nature-Society, Human Geography, Geographic Information Science).  
PROPOSED DROP: SU2019
GEOG 501B
Research Perspectives in Human Geography
HUMAN GEOGRAPHY (1)
This course presents contemporary perspectives on Human Geography, emphasizing the major issues and integrative themes of the sub-discipline. GEOG 501B GEOG 501B Research Perspectives in Human Geography (1) The contemporary study of Human Geography reflects the heritage of place-based analysis that was typically regional geography and the space-based (yet often placed-grounded) work of those that seek to explore spatial patterns associated with various economic, political, social and cultural processes. These patterns and processes are explored at a variety of scales, from the local through regional and global, and each sub-discipline has its own ways of operationalizing the emphases on place and space. The extent to which practitioners draw on theories from cognate disciplines in the social sciences and humanities often colors recent research in the subfields and confirms the ongoing subdivisions rather than point towards a singular integrated field of human geography. The course aims are achieved through lectures, and by student readings of two or three seminal papers per week and a half-term paper. Although GEOG 501B is a stand-alone course, it dovetails with the three other new graduate-level courses proposed in Geography (Nature-Society, Physical Geography, and Geographic Information Science).
PROPOSED DROP: SU2019

GEOG 501C
Research Perspectives in Human-Environment Geography
HUMAN-ENVT GEOG (1)
Contemporary perspectives on Human-Environment Geography, emphasizing major issues and integrative themes of the sub-discipline.
PROPOSED DROP: SU2019

GEOG 501D
Research Perspectives in GIScience
GISCIENCE PERSPECT (1)
This course presents contemporary perspectives on Geographic Information Science, emphasizing the major issues and integrative themes of the sub-discipline. GEOG 501D Research Perspectives in GIScience (1) The field of GIScience concerns the investigation of the properties of data and information relating to Earth, the creation of information from observational facts, how information is transferred from one person to another, and optimal means for making that transfer, in both natural and artificial systems. GIScience is also concerned with the individual, organizational and societal effects of generating and providing this information. GIScience has its own body of theory focused on geographic scale, geographic representation, spatial information, and systems for the capture and use of spatial data. This theory draws heavily from a variety of other disciplines beyond Geography, including: computer science, information science and technology, cognitive science, graphic design, statistics, geodesy, and geometry. This course introduces these various underpinnings, with a focus on current research themes and directions within an integrative framework. The objective is to help graduate students become familiar with GIScience research, specifically: the major intellectual foundations of GIScience, the current state of the field, and the ongoing researcher agenda. The course aims are achieved through a combination of lectures, discussion of 2-3 seminal papers per week, and a half-term paper. Although GEOG 501D is a stand-alone course, it dovetails with the 3 other graduate-level courses proposed in Geography (Physical, Nature-Society, and Human).
PROPOSED DROP: SU2019

GEOSC 540
Ore Deposits I
ORE DEPOSITS I (3)
Geochemistry and geology of ore deposits formed by igneous and high-temperature hydrothermal processes.
PROPOSED DROP: SU2019
GEOSC 541
Ore Deposits II
ORE DEPOSITS II (3)
Geochemistry and geology of ore deposits formed by low-temperature hydrothermal, sedimentary, and metamorphic processes; continuation of GEOSC 540.
PROPOSED DROP: SU2019

GEOSC 545
Glacial Geology
GLACIAL GEOLOGY (3)
Glaciers: their characteristics, causes, deposits, landforms, effects in periglacial regions.
PROPOSED DROP: SU2019

HIED 820
Studying Students & Student Affairs Program
STUDENT AFFRS PROG (3)
Studying the relationship of college activities to academic success by students. HI ED 820 Studying Students & Student Affairs Programs (3)This course examines the characteristics of post secondary education students, both traditional and non-traditional. It draws upon the voluminous research documenting the changes that take place in various populations of students during college. The course equips institutional researchers and student affairs administrators to engage in research on student growth, campus climate, and evaluation of student services. Curricular goals for students in HI ED 820:• To examine changing student demographics and how these influence student outcomes and institutional operation• To understand how different populations of student change while in college and what factors contribute to the change• To become familiar with theories and research on student development• To gain a general knowledge of the functional areas of student affairs and their intended purposes for the students they serve• To learn about the tools available to assess student/student affairs program outcomes• To learn how to plan assessment in the area of student affairs HI ED 820 is designed for higher education professionals who seek a fuller understanding of Students and Student Affairs Programs. During this particular institutional research course, the on-line experiences are aimed at applying the readings, obtaining hands-on experience in analyzing data, and developing reporting skills. Each Unit lists supplementary readings and weblinks where students can find additional information to explore the topic in greater depth. The methods of teaching and learning include Readings and Supplemental Resources, Professor's Notes, Discussion Forums, Drop Boxes, Collaborative Learning Opportunities in small groups, Individual Learning Opportunities on a personal project, and Essays or Papers. This course has established start and end dates and includes interaction with other students throughout the course. Pre-requisite: Working knowledge of basic statistics.
PROPOSED DROP: SU2019

HIST 555
Topics in American Labor History
AMERICAN LABOR (3-6/Repeatable Max: 6)
American working-class experience from its artisanal and agricultural roots through the rise, maturation, and transformations of industrial capitalism.
PROPOSED DROP: SU2019

HIST 560
Topics in American Religion
TOPICS IN AM REL (3/Repeatable Max: 6)
The social, political, and intellectual contexts of American religious thought.
PROPOSED DROP: SU2019
HIST 592
Proseminar
PROSEMINAR (3-9/Repeatable Max: 9)
Readings in fundamental historical works; different sections will treat such topics as United States History and Early Modern History.
PROPOSED DROP: SU2019

HIST 593
Research Seminar
RSRCH SEM (2)
Seminar in research methods of the discipline. HIST 593 Research Seminar (3) HIST 593 is a required course for all MA and PhD students in the graduate program in History. HIST 593 sections are paired with sections of HIST 592 and are a prerequisite to taking 593s. CAMS 592 and 593 meet the same requirements. Each student will produce for every 593 they take a paper of the length appropriate for submission to a scholarly journal (25-45 pages). The use of original sources for the paper is essential, and early class sessions will emphasize the diligent use of intelligent interpretation of such sources (as available and field-appropriate) as manuscripts (such as presidential papers), the government serial set or non-US equivalents, legal records, notorial documents, parish records, diplomatic correspondence, newspapers, census records, and popular prints and photographs. Students (and the instructor, of course) will read and criticize preliminary drafts of the papers. While each 593 will have a single instructor, other faculty will participate as discussants and mentors, according to the needs of the seminar students.
PROPOSED DROP: SU2019

HLHED 516
Evaluation of Health Education and Promotion Programs
EVAL HLTH DED PROMO (3)
Criteria and strategies to assess the impact of health education and health promotion programs in school, community, and corporate settings.
PROPOSED DROP: SU2019

INSYS 525
Instructional Design Models, Strategies, and Tactics
DSGN MDL/STRAT/TAC (3)
Application of instructional design models and design of appropriate instructional strategies and tactics.
PROPOSED DROP: SU2019

INSYS 551
Performance Technology for Instructional Designers
PERFORMANCE TECH (3)
Methods of identifying human performance problems in organizations and developing instructional and non-instructional interventions.
PROPOSED DROP: SU2019

MATL 596
Individual Studies
INDIVIDUAL STUDIES (1-9/Repeatable Max: 9)
Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
PROPOSED DROP: SU2019
MATL 600
Thesis Research
THESIS RESEARCH (1-15/ Repeatable Max: 15)
No description.
PROPOSED DROP: SU2019

MATL 601
Ph.D. Dissertation Full-Time
PHD DIS FULL-TIME (0)
No description.
PROPOSED DROP: SU2019

MATL 610
Thesis Research Off Campus
THES RES OFF CMPUS (1-15/ Repeatable Max: 15)
No description.
PROPOSED DROP: SU2019

MATSE 505
Irreversible and Statistical Thermodynamics of Materials
IRREV STAT THERMO (3)
Introduction to statistical and irreversible thermodynamics as applied to chemical and materials systems.
MATSE 505 Statistical and Irreversible Thermodynamics (3) This course will introduce students to statistical and irreversible thermodynamics as models of describing equilibrium and rate process starting from the atomic/molecular level. The course will begin with a review of relevant concepts from classical thermodynamics, including the four laws, entropy, Gibbs and Helmholtz functions, and chemical and electrochemical equilibrium. The formulation of classical thermodynamics does not require the existence of atoms, as it is largely concerned with average, bulk properties and, indeed, much of classical thermodynamics was developed before the existence of atoms, and molecules was accepted unequivocally in the scientific disciplines. However, knowledge of the properties of atoms and molecules allows one to predict the thermodynamic properties of bulk materials through the discipline of statistical thermodynamics (statistical mechanics) in an ab initio manner. Indeed, many tabulated thermodynamic properties, particularly for unstable systems, have been calculated rather than measured. Finally, we live in an irreversible world (i.e., one that evolves, such that the entropy of the system and surroundings continuously increases), and statistical thermodynamics cannot provide a satisfactory description of this change. Spontaneous change is best described in terms of the discipline of Irreversible Thermodynamics, which addresses the rate of generation of total entropy of the system plus surroundings. The framework of Irreversible Thermodynamics will be established in terms of coupled fluxes and Onsager's Reciprocity Principle and these concepts will be employed to explain thermal diffusion and electro-osmosis, among other phenomena.
PROPOSED DROP: SU2019

MATSE 562
Solid to Solid Phase Transformations
SOLID/SOLID PHASE (3)
Mechanisms and rate-determining factors in solid-phase reactions in metals; diffusion processes, nucleation theory, precipitations from solid solution, eutectoid decomposition and order-disorder phenomena. MATSE 562 Solid to Solid Phase Transformations (3) This is the fundamental science of microstructural control in the solid state for inorganic materials. The course begins with a review of the crystallography of solid materials, from the simple concept of a lattice through the description of the stereographic projection to the point group notation. Solid to solid nucleation theory is examined in detail
as it forms the basis of microstructural development and control. Both "civilian" and "military" transformations are considered. The theory of interface structure, the influence of orientation relationships, and the development of equilibrium precipitate morphologies are discussed in detail. It is argued that both thermodynamic and kinetic considerations may, however, dictate precipitate shapes. The kinetics of precipitate growth and coarsening are derived from first principles and employed to analysis overall transformation kinetics. Changes in precipitate shape during these kinetically driven processes are also examined. The phenomena of nucleation, growth, and coarsening are all modified, and/or even controlled, by defects such as dislocations and grain boundaries. The course reviews dislocation theory and, e.g., the 0-lattice description of high angle grain boundaries and interphase interfaces. A series of prototypical phase transformations are described in detail. These include: homogeneous and heterogeneous precipitation reactions; spinodal decomposition; order–disorder transformations, discontinuous precipitation, the eutectoid reaction, bainite and martensite. Finally, experimental methods for the quantitative characterization of microstructure are presented.

PROPOSED DROP: SU2019

METEO 501
Atmospheric Phenomena
ATMOS PHENOM (3)
Overview of the complex interactions within the atmosphere, ranging from molecular to global scale.
PROPOSED DROP: SU2019

METEO 581
Topics in Atmospheric Chemistry
TOP ATMOS CHEM (1-3/ Repeatable Max: 15)
Discussion of recent research papers in, and concepts pertinent to, acidic deposition, photochemical air pollution, and global chemical budgets.
PROPOSED DROP: SU2019

MGMT 534
Leadership and Change in Organizations
LDRSHP AND CHG ORGS
Understanding yourself as a leader, particularly as a leader in organizations and especially a leader of organizations undergoing change. MGMT 534 Leadership and Change in Organizations (2) This course mixes concept with practical, workable knowledge. We will focus on how you think about leadership, how things get done, and how things might be improved in organizations. This is the course that will allow you to discover, consider, and alter your leadership tendencies and values. Self-management is the major emphasis. Another is learning to lead organizations and the people in them humanely. It is also a course that will allow you to see the differing viewpoints and perspectives of your peers concerning many leadership and organizational issues.
PROPOSED DROP: SU2019

OPMGT 510
Operations Management
OPERATIONS MGMT (3)
Integration and application of decision making to operational and policy problems within the business firm.
PROPOSED DROP: SU2019
PADM 514
Public Organization and Managerial Consultation
ORG AND MGMT CONSUL (3)
This course will review the theories, approaches, methods, and expected outcomes of organization and management consultation. PADM 514 Public Organization and Managerial Consultation (3) is a course in organization and management consultation and problem-solving, covering philosophy, approaches, consulting techniques, and processes. Analyses are made of managerial and organizational problems through the use of recent developments in socio-technical systems analysis. The specific objectives are to increase student knowledge of organization and managerial consultation and problem-solving systems thinking in relation to organization and managerial problem-solving and to introduce students to the design issues in organization and managerial consultation. Grades are based on a mid-term (50%) and final examination (50%), case analyses, abstracts and presentations. PADM 514 is an elective course for the MPA degree and is usually offered over the summer in a six-week session.
PROPOSED DROP: SU2019

PHARM 504
Molecular Pharmacology II
MOLECULAR PHAM II (4)
Continuation of PHARM 503.
PROPOSED DROP: SU2019

PHS 581
Clinical Trials: Case Studies
CLIN TRIALS CASES
This course emphasizes case studies in clinical trials design, conduct, and analysis.
PROPOSED DROP: SU2019

PLSC 554
The Politics of Development
POLITICSDEVELOPMNT (3)
The course explores the origins of modernity, its proliferation globally, and problems associated with initiating and sustaining development. PLSC 554 The Politics of Development (3) This graduate seminar is intended to provide a long-term and in-depth guide to questions of development in a global perspective. It begins with a consideration of the rise of modernity in political, economic, and social terms in the West. It then looks at how modernity proliferated globally through interstate conflict, reform and revolution across the great powers and then via colonization to other non-western areas of the globe. It then turns to several central topics in research about development in the social sciences. It begins with large statistical models about the sources of growth from economics. The next topic is how the political system affects economies by considering the impact of regime and state policies. A series of the topics are geared toward understanding non-mainstream conceptions of development including alternative ways of thinking about development (human capital, capabilities, freedom), does economic dependence matter, the role of gender in development, and post-modernity. The course concludes with a discussion of the current period of neoliberal globalization, exploring how it creates a more integrated world economy, but with consideration of certain negative externalities (inequality, vulnerability to external shocks, social disintegration, and institutional). The course has been designed to expand the substantive, thematic offerings available to students studying comparative politics. This is a graduate course intended for majors and minors in the field of comparative politics. It is intended to develop competence in the literature to help students develop their own research questions and competence in the area, and to allow students whose primary research focus is elsewhere to integrate a developmental perspective into their other work. Student evaluation will be on a research paper.
PROPOSED DROP: SU2019
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLSC 564</td>
<td>International Organization</td>
<td>3/6</td>
<td>Research on international governmental and non-governmental organizations in the international system, emphasizing the United Nations and collective security.</td>
</tr>
<tr>
<td>PSIO 503</td>
<td>Cellular Physiology</td>
<td>1</td>
<td>PSIO 503 is a physiology course that focuses on cellular aspects of physiology. PSIO 503 Cellular Physiology is a one semester, one credit course that will cover aspects of physiology that are cellular-based. Topics in organ physiology will be included in more comprehensive 3 credit course (PSIO 504). The course will meet for 1 hour sessions, three times per week for approximately one month. The course will be offered in the fall semester. It is designed for graduate students in other disciplines who are interested in integrating the cellular aspects of physiology into their graduate education, Although there are no prerequisites for the course, prior courses in physiology and/or biochemistry is beneficial. The course will expand upon material in an assigned physiology textbook. Text chapters will be assigned as reading material prior to each meeting. The instructor will review the assigned material during the beginning of each meeting, after which more detailed aspects of the material will be discussed. The course will have one final examination. The exam will be composed of a mixture of short essays, multiple choice and problem-solving questions. The lectures in PSIO 503 form the first block of the lectures in the more comprehensive PSIO 504 course. Students should enroll in either PSIO 503 or PSIO 504.</td>
</tr>
<tr>
<td>SCIED 559</td>
<td>Analysis of Instruction in Elementary Science Education</td>
<td>3</td>
<td>Analysis of the history, issues, trends, and research in elementary science education.</td>
</tr>
<tr>
<td>SOC 515</td>
<td>Research Methods in Criminology and Deviance</td>
<td>3</td>
<td>Review of methodological issues; design and conduct of research; analysis and interpretation of findings; ethical and policy issues. SOC (CRIM) 515 Research Methods in Criminology and Deviance (3) Review of methodological issues; design and conduct of research; analysis and interpretation of findings; ethical and policy issues.</td>
</tr>
<tr>
<td>SSED 530</td>
<td>Instructional Practices in the Social Studies</td>
<td>3</td>
<td>Social studies innovations in the classroom, new programs, new materials, new methods, and evaluation.</td>
</tr>
</tbody>
</table>
SSED 532
Curriculum Models in Social Studies Education
CURRIC IN SS ED (3)
Study of past and proposed curricula in elementary and secondary social studies. Various means of judging curricula will be offered.
PROPOSED DROP: SU2019
Graduate Council
Program, Option, or Minor Proposal Form

Submit 1 original, signed Graduate Council proposal form and 2 hardcopies of the graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Office of the Dean of the Graduate School, 211 Kern Building, University Park. For more information about the process, see the Overview of the Graduate Council Curricular Review Process.

The Program Proposal Procedures provide guidance for the development of a graduate program proposal. If you have questions regarding the preparation of a graduate program proposal or how to complete this Graduate Council proposal form, contact the Office of the Dean of the Graduate School.

| College/School: Smeal College of Business |
| Department or Instructional Area: Business Administration |

New Graduate Program, Option, or Minor: Add

- Designation of new graduate program: 
- Classification of Instructional Programs (CIP) Code: 
- Designation of new graduate option: 
- Designation of new graduate minor: 

Indicate effective semester:
- First semester following approval
- Second semester following approval

Penn State Graduate School

JAN 18 2019

Office of the Vice Provost and Dean of the Graduate School

Existing Graduate Program Option, or Minor: Change Drop

- Current designation of graduate program: Master of Business Administration
- Current designation of graduate option: 
- Current designation of graduate minor: 

New designation of existing graduate program (if changing):
New designation of existing graduate option (if changing):
New designation of existing graduate minor (if changing):

Brief description of the change (if not noted above): Change to Admission Requirements

Indicate effective semester:
- First semester following approval
- Second semester following approval

Submitted by Graduate Program Head

| Lou Gattis |
| Printed name |
| Signature |
| Date: 1/18/19 |

Noted by College/School Representative to Graduate Council Subcommittee on New and Revised Programs and Courses:

| Arvind Rangaswamy |
| Printed name |
| Signature |
| Date: 1/17/19 |

Approved by College/School Dean/Chancellor (or Designee):

<p>| Steven Huddart |
| Printed name |
| Signature |
| Date: 1/16/19 |</p>
<table>
<thead>
<tr>
<th>Recommended by Chair, Graduate Council Subcommittee on New and Revised Programs and Courses:</th>
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</thead>
<tbody>
<tr>
<td>On Behalf of David Babb</td>
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<tr>
<td>Printed name:</td>
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<td>Signature:</td>
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<td>Date: 3/28/2019</td>
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<th>Recommended by Chair, Graduate Council Committee on Programs and Courses:</th>
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<tbody>
<tr>
<td>On Behalf of C. Andrew Cole</td>
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<tr>
<td>Printed name:</td>
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<td>Signature:</td>
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<th>Noted by Dean of the Graduate School:</th>
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<tr>
<td>On Behalf of Regina Vasilatos-Younken</td>
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<tr>
<td>Printed name:</td>
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<td>Signature:</td>
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</table>
PROGRAM CHANGE PROPOSAL—

MASTER OF BUSINESS ADMINISTRATION

THE PENNSYLVANIA STATE UNIVERSITY — SMEAL COLLEGE OF BUSINESS

DR. LOU GATTIS—CLINICAL PROFESSOR OF FINANCE, MBA PROGRAM FACULTY DIRECTOR
A. Program Change Justification

Change to test requirement and JD/MBA program enrollment in the bulletin is required because these changes have already been put into effect in practice. All comparable MBA programs allow either the GMAT or GRE for admission, and the number of students submitting GRE scores has been steadily increasing over the past 5 years. Currently, approximately 1/4 of MBA applicants submit GRE scores. The JD/MBA change is required because the American Bar Association requires joint degree Law students to complete their prescribed first year of Law School before they may deviate in their program of study. As a result, students wishing to pursue a JD/MBA degree cannot apply for the joint degree until their first year of Law School.

B. Learning Goals and Objectives

The learning goals of the redesigned program will remain consistent with the current Penn State Smeal MBA program. These goals are:

1. Communication Skills–Argue your point persuasively whether in written, oral, or presentation form.
2. Global Perspective–Anticipate, understand, and explain the global forces that influence business decisions.
3. Professional Skills–Be both a principled leader and a valuable member of a team.
4. Problem Solving Skills–Analyze a complicated business problem using the best tools, theories, and evidence, complemented by the ability to recommend solutions and implementation plans.
5. Integrative Understanding–Consider many perspectives in analyzing and recommending solutions to business problems.

As they are now, these goals will be assessed by faculty members in particular courses for which the goal can be assessed.

C. Comparison of Changes

Old Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission. Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions.

Applicants to the M.B.A. program are required to take the Graduate Management Admission Test (GMAT); whereas applications to the doctoral program are required to take either the GMAT or the Graduate Record Examination (GRE). The program does not admit applicants for the terminal Master of Science (M.S.) degree.

Criteria for evaluating applicants include professional and academic accomplishments, GMAT/GRE scores, recommendations, and personal data from application forms that provide indications of future academic and professional accomplishment.

Work on the M.B.A. degree may be started fall semester only. Ph.D. candidates may begin either the fall or spring semester. However, only rarely are admissions for the Ph.D. programs granted for spring semester. Individuals from all undergraduate disciplines are encouraged to apply.

New Admission Requirements
Applicants apply for admission to the program via the Graduate School application for admission. Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions.

Applicants to the M.B.A. and doctoral programs are required to take the Graduate Management Admission Test (GMAT) or the Graduate Record of Examination (GRE). The program does not admit applicants for the terminal Master of Science (M.S.) degree.

Criteria for evaluating applicants include professional and academic accomplishments, GMAT/GRE scores, recommendations, and personal data from application forms that provide indications of future academic and professional accomplishment.

Work on the M.B.A. degree may be started fall semester only. Ph.D. candidates may begin either the fall or spring semester. However, only rarely are admissions for the Ph.D. programs granted for spring semester. Individuals from all undergraduate disciplines are encouraged to apply.

Old Admission Requirement Joint Degrees (JD/MBA)

In order to be admitted to the program, students may:

1. first be admitted and enrolled in either Smeal College or Penn State Law and subsequently admitted to the other program; or

2. be admitted to the joint program prior to commencing studies at Penn State. Each program will make a separate admission decision. Students admitted to both programs will be admitted as joint degree candidates.

New Admission Requirement Joint Degrees (JD/MBA)

In order to be admitted to the program, students must first be admitted and enrolled in Penn State Law and subsequently admitted to the Smeal College of Business.

BUSINESS ADMINISTRATION (SMEAL)

Graduate Program Head
Brent Ambrose (Ph.D. and M.S.)

Program Code
BA, BUSA

Campus(es)
University Park (Ph.D., M.S., M.B.A.)

Degrees Conferred
Doctor of Philosophy (Ph.D.)
Master of Science (M.S.)
Master of Business Administration (M.B.A.)
Dual-Title Ph.D. and M.S. in Business Administration and Operations Research
Integrated B.S. in Science and M.B.A. in Business Administration
Joint J.D./M.B.A. with Penn State Law
Joint M.D./M.B.A. with the College of Medicine

The Graduate Faculty
BUSA Graduate Faculty (Ph.D., M.S.) (https://secure.gradsch.psu.edu/gpms/index.cfm?searchType=fac&prog=BUSA)
BA Graduate Faculty (M.B.A.) (https://secure.gradsch.psu.edu/gpms/index.cfm?searchType=fac&prog=BA)
The Master of Business Administration program is a professional degree designed to prepare individuals for managerial positions in business, government, and nonprofit institutions. The M.B.A. curriculum blends technical rigor, managerial theory, and integrative learning experiences through case studies and other teaching methods. A managerial communications course is fully integrated into the program.

The Master of Science in Business Administration program is highly flexible and designed for advanced study in a specialized field. The M.S. program is directed toward the development of competency within a defined area of management. Fields such as accounting and management science are examples of career opportunities requiring specialized knowledge and skill, including research.

The Doctor of Philosophy degree in the Business Administration program offers advanced graduate education for students focused on research careers at leading business schools. The faculty of the college views the Ph.D. as evidencing scholarship at the highest level.

Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (http://gradschool.psu.edu/prospective-students/how-to-apply). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions (http://gradschool.psu.edu/graduate-education-policies).

Applicants to the M.B.A. program are required to take the Graduate Management Admission Test (GMAT) (http://www.mba.com); whereas applications to the doctoral program are required to take either the GMAT or the Graduate Record Examination (GRE) (http://www.ets.org/gre). The program does not admit applicants for the terminal Master of Science (M.S.) degree. Applicants to the M.B.A. and doctoral programs are required to take the Graduate Management Admission Test (GMAT) or the Graduate Record of Examination (GRE). The program does not admit applicants for the terminal Master of Science (M.S.) degree.

Criteria for evaluating applicants include professional and academic accomplishments, GMAT/GRE scores, recommendations, and personal data from application forms that provide indications of future academic and professional accomplishment. The program does not admit applicants for the terminal Master of Science (M.S.) degree.

Work on the M.B.A. degree may be started fall semester only. Ph.D. candidates may begin either the fall or spring semester. However, only rarely are admissions for the Ph.D. programs granted for spring semester. Individuals from all undergraduate disciplines are encouraged to apply.

Degree Requirements

Master of Business Administration (M.B.A.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-700 Professional Degree Requirements (http://gradschool.psu.edu/graduate-education-policies).

The M.B.A. program consists of two distinct portions:

1. preprogram competency expectations, including accounting, economics, mathematics, and statistics; and
2. a minimum of 54 credits at the 400, 500, or 800 levels, with a minimum of 18 at the 500 or 800 level and at least 6 credits at the 500 level.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BA 512</td>
<td>Quantitative Analysis for Managerial Decision Making</td>
<td>2</td>
</tr>
<tr>
<td>BA 533</td>
<td>Economics for Managers</td>
<td>2</td>
</tr>
<tr>
<td>BA 800</td>
<td>Marketing Management</td>
<td>2</td>
</tr>
<tr>
<td>BA 801</td>
<td>Management</td>
<td>2</td>
</tr>
<tr>
<td>BA 802</td>
<td>Team Process and Performance</td>
<td>1</td>
</tr>
<tr>
<td>BA 804</td>
<td>Ethical Leadership</td>
<td>2</td>
</tr>
<tr>
<td>BA 805</td>
<td>Negotiation Theory and Skills</td>
<td>1</td>
</tr>
<tr>
<td>BA 810</td>
<td>Supply Chain and Operations Management</td>
<td>2</td>
</tr>
<tr>
<td>BA 811</td>
<td>Financial Accounting</td>
<td>2</td>
</tr>
<tr>
<td>BA 815</td>
<td>Business Statistics for Contemporary Decision Making</td>
<td>2</td>
</tr>
<tr>
<td>BA 817</td>
<td>Communication Skills for Management</td>
<td>4</td>
</tr>
<tr>
<td>BA 821</td>
<td>Foundation in Managerial Accounting</td>
<td>2</td>
</tr>
<tr>
<td>BA 831</td>
<td>Foundations in Finance</td>
<td>2</td>
</tr>
<tr>
<td>BA 832</td>
<td>Global Business Environment</td>
<td>1</td>
</tr>
<tr>
<td>BA 835</td>
<td>Global Perspectives</td>
<td>2</td>
</tr>
<tr>
<td>BA 836</td>
<td>Global Immersion</td>
<td>1</td>
</tr>
</tbody>
</table>

Electives

The remaining 22 elective credits must be chosen from a list of 22
Culminating Experience

BA 571 Strategic Management 1  2
Total Credits 54

1 The culminating experience for the M.B.A. is BA 571. This course is designed to bring together the many functional areas previously studied and integrate them into a strategic analysis of the entire firm.

Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements. (http://gradschool.psu.edu/graduate-education-policies)

Admission to the M.S. program is only available to students previously admitted to the Ph.D. program, with the approval of the Director of the Ph.D. program. The M.S. degree requires a minimum of 30 credits at the 400, 500, 600, or 800 level in business administration or related areas, including a thesis or scholarly paper. Students who complete a thesis must take at least 18 credits at the 500 or 600 level, with a minimum of 6 credits in thesis research (BA 600 or BA 610). The thesis must be accepted by the committee members, the head of the graduate program, and the Graduate School. Students who choose the non-thesis option must take at least 18 credits at the 500 level, and complete a satisfactory scholarly paper while enrolled in BA 596.

Doctor of Philosophy (Ph.D.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements. (http://gradschool.psu.edu/graduate-education-policies)

Competency Expectations

Entrance into the doctoral program in business administration does not require the completion of an undergraduate degree specifically in business. While almost any major at the undergraduate level may be acceptable, graduate study in business administration does presume a minimum level of competency in mathematics, statistics, and computing. No transcript credit is required for entering doctoral students in these areas, except where specified by particular fields of specialization. However, it must be emphasized that lack of minimum competency in mathematics, statistics and computing could be a significant disadvantage to the student.

Breadth Requirement

All students are expected to develop a broad understanding of the functions of the business organization. To achieve breadth, all Ph.D. students must show competency by completing 12 credits at the 400, 500, or 800 level in a minimum of two of the approved fields of study within the Smeal College of Business and/or in Economics in the College of the Liberal Arts. The 12 credits in the breadth requirement must be taken in fields outside or separate from a student’s primary, supporting, and research competency fields.

Primary Field Requirements

All students are required to achieve competency in a primary field of business administration. The primary field is the sphere of scholarship that commands the most extensive and intensive portion of a program and is the area in which the student’s dissertation research is conducted and the dissertation committee chair is selected. Primary fields may be selected from the following:

- accounting;
- finance;
- insurance and real estate;
- management and organization;
- marketing;
- supply chain and information systems.

Graduate work in a selected primary field may require competency in prerequisite areas, including undergraduate work in the field itself as well as prior work in mathematics, statistics, computer science, economics, and social and behavioral sciences. The prerequisite work will be specified by each primary field.
Supporting Field Requirements

All students must select a supporting field of study from business administration or related outside areas. Those spheres of scholarship complement the student's primary field. Supporting fields from business administration include all the primary fields. Outside supporting fields include, but are not limited to,

- anthropology,
- civil engineering,
- computer science,
- economics,
- industrial engineering,
- mathematics,
- political science,
- psychology,
- sociology,
- statistics.

Research Methods Field

All students must develop a broad understanding of the scientific research process and in-depth competency in the research methods used in the primary field. Each student’s dissertation committee shall specify a minimum of 4 courses/12 credits at the 400, 500, or 800 level (beyond the M.B.A. core courses) to constitute a supporting field in research methods. These courses should cover specific methods and tools relevant for research in the primary fields. A member of the dissertation committee shall be designated to represent the research methods field and shall be responsible for evaluating the student's competence in the field.

Research Paper and Presentation Requirement

To introduce students early to the research process, each Ph.D. student must complete a written research paper within two years after admission to the Ph.D. program. The student must then present the paper at an open departmental workshop or seminar within one semester after the paper is approved by the department committee and chair. The student must work under the guidance of a Research Paper Supervisor (who may or may not later be the dissertation adviser). The research paper supervisor mentors the student, possibly suggesting the research topic, monitoring progress, providing ideas and feedback, and helping the student develop appropriate research, writing, and presentation skills. The paper must substantially represent the student’s work, and must be written by the student. The paper must clearly define and motivate the problem being addressed, contain a comprehensive literature review, and present the research contributions and conclusions. Approval of written paper and presentation can be used as a means to satisfy the Graduate Council English competence and communication requirement (to be completed before the comprehensive examination).

Dissertation

To earn the Ph.D. degree, doctoral candidates must write a dissertation that is accepted by the dissertation committee, the head of the graduate program, and the Graduate School, and the student must pass a final oral examination (the dissertation defense).

Dual-Titles

Dual-Title M.S. and Ph.D. in Business Administration and Operations Research

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-title-graduate-degree-programs).

M.S. and Ph.D. students in Smeal College of Business can elect to participate in the Operations Research dual-title graduate program. Operations Research is the use of scientific methodology in the formulation, analysis, and solution of problems of decisionmaking.

Admissions Requirements

Students must apply and be admitted to the graduate program in Business Administration and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Operations Research dual-title program. Refer to the Admission Requirements section of the Operations Research Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/operations-research). Doctoral students must be admitted into the dual-title degree program in Operations Research prior to
Degree Requirements

To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Business Administration, listed on the Degree Requirements tab. In addition, students must complete the degree requirements for the dual-title in Operations Research, listed on the Operations Research Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/operations-research).

For the dual-title M.S. degree in Business Administration and Operations Management, the thesis or scholarly paper must reflect the student’s education and interest in both Business Administration and Operations Research. The master’s committee must include at least one Graduate Faculty member from Operations Research. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role.

The qualifying examination committee for the dual-title Ph.D. degree will be comprised of Graduate Faculty from Business Administration and must include at least one Graduate Faculty member from the Operations Research program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Business Administration and Operations Management. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees (http://gradschool.psu.edu/graduate-education-policies/gcac/600/phd-dissertation-committee-formation), the dissertation committee of a Business Administration and Operations Research dual-title Ph.D. student must include at least one member of the Operations Research Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Operations Research, the member of the committee representing Operations Research must be appointed as co-chair. The Operations Research representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in Business Administration and Operations Research. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

Integrated Undergrad-Grad Programs

Integrated B.S. in Science and M.B.A. in Business Administration

Requirements listed here are in addition to requirements listed in GCAC-210 Integrated Undergraduate-Graduate (IUG) Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-210-integrated-undergraduate-graduate-degree-programs).

This program is the result of collaboration between the Eberly College of Science and Smeal College of Business. With the accelerated nature of the program, students can earn a B.S. degree in science and an M.B.A. degree in five calendar years after graduation from high school. For the first three and one-half years, including the first semester of the M.B.A. curriculum, students are enrolled as undergraduates in the Eberly College of Science. For the remaining three semesters, participants are graduate students formally enrolled in the Smeal College of Business M.B.A. program. Successful completion of this program results in a B.S. degree in Science awarded by the Eberly College of Science during year four and an M.B.A. from the Smeal College of Business at the end of year five.

Students must apply to the program via the Graduate School application for admission (http://www.gradschool.psu.edu/prospective-students/how-to-apply), and must meet all the admission requirements of the Graduate School and the Business Administration graduate program for the Master of Business Administration degree. Students shall be admitted to an IUG program no earlier than the beginning of the third semester of undergraduate study at Penn State (regardless of transfer or AP credits accumulated prior to enrollment) and no later than the end of the second week of the semester preceding the semester of expected conferral of the undergraduate degree, as specified in the proposed IUG plan of study. Students must be admitted to the program prior to taking the first course they intend to count towards the graduate degree.

In consultation with an advisor, students must prepare a plan of study appropriate to this integrated program, and must present their plan of study in person to the head of the graduate program or the appropriate committee overseeing the integrated program prior to being admitted to the program. The plan should cover the entire time period of the integrated
Students must fulfill all requirements for each degree in order to be awarded that degree. Degree requirements for the B.S. degrees can be found in the Undergraduate Degree Program Bulletin (http://bulletins.psu.edu/undergraduate). Degree requirements for the M.B.A. degree are listed on the Degree Requirements tab.

Up to 12 credits may be double-counted towards the degree requirements for both the graduate and undergraduate degrees; a minimum of 50% of the double-counted courses must be at the 500 or 800 level. Credits associated with the culminating experience for the graduate degree cannot be double-counted.

Courses Eligible to Double Count for Both Degrees

<table>
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<td>Foundations in Finance</td>
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</tr>
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</table>

Students must sequence their courses so all undergraduate degree requirements are fulfilled before taking courses to count solely toward the graduate degree. If students accepted into the IUG program are unable to complete the M.B.A. degree, they are still eligible to receive their undergraduate degree if all the undergraduate degree requirements have been satisfied.

Joint Degrees

Joint J.D./M.B.A. with Penn State Law

Requirements listed here are in addition to requirements listed in GCAC-211 Joint Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-211-joint-degree-programs).

Smeal College of Business and the Penn State Law offer a joint degree program leading to the degrees of Juris Doctor (J.D.) and Master of Business Administration (M.B.A.). We live in a global society where complex legal structures interact with dynamic and powerful market forces. Individuals with backgrounds in both business and law have a distinct advantage in understanding this interaction and are uniquely positioned for success in our modern society. The Juris Doctor/Master of Business Administration (J.D./M.B.A.) joint degree program provides outstanding, highly motivated students the opportunity to combine a Juris Doctor degree from Penn State Law with an M.B.A. degree from Penn State’s internationally ranked Smeal MBA Program (Smeal). Participants in this program earn both a Juris Doctor degree and a Master of Business Administration in four years compared to the five years required to earn the two degrees separately.

In order to be admitted to the program, students must first be admitted and enrolled in Penn State Law and subsequently admitted to the Smeal College of Business.

In order to be admitted to the program, students may:

1. First be admitted and enrolled in either Smeal College or Penn State Law and subsequently admitted to the other program, or
2. Be admitted to the joint program prior to commencing studies at Penn State. Each program will make a separate admission decision. Students admitted to both programs will be admitted as joint degree candidates.
Admission Requirements

Candidates must apply to Penn State Law and Smeal separately and must meet each school's requirements. The admission requirements for the Master of Business Administration degree are listed on the Admission Requirements tab. Admissions requirements and applications for admission for Penn State Law are available at the J.D. Admissions (https://www.pennstatelaw.psu.edu/penn-state-law- jd-admissions) section of the Penn State Law website. Students must be admitted to the program prior to taking the first course they intend to count towards the M.B.A. degree. JD/M.B.A. applicants are still required to submit the GMAT or GRE scores.

Degree Requirements

Credit Requirements: Students must fulfill all requirements for each degree in order to be awarded that degree, subject to the double-counting of credits as outlined below. Degree requirements for the J.D. program are listed on the Penn State Law website (https://www.pennstatelaw.psu.edu/jd-degree-requirements). Degree requirements for the M.B.A. degree are listed on the Degree Requirements tab.

Double Counting of Credits: M.B.A. A maximum of 16 credits from Penn State Law course work may be double counted toward the M.B.A. degree at Smeal. Courses for which such credit may be applied shall be subject to approval by Smeal based on relevance to the M.B.A. program. Students must obtain a grade satisfactory to Smeal for any J.D. course work to be credited toward the M.B.A. degree.

Double Counting of Credits: J.D. A maximum of 12 credits for M.B.A. course work may be double counted for credit toward the J.D. degree at Penn State Law. Courses for which such credit may be applied shall be subject to approval by the Penn State Law faculty. Students must obtain a grade satisfactory to Penn State Law for any M.B.A. course work to be credited toward the J.D. degree.

Advising of Students: All students in the program shall have two advisers, one from Smeal and one from Penn State Law. Periodic interaction between the two advisers is encouraged.

Graduation: If students accepted into the joint degree program are unable to complete the J.D. degree, they are still eligible to receive the M.B.A. degree if all the M.B.A. degree requirements have been satisfied.

Joint M.D./M.B.A. with the College of Medicine

Requirements listed here are in addition to requirements listed in GCAC-211 Joint Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-211-joint-degree-programs).

Smeal College of Business and the Penn State Hershey College of Medicine offer a joint degree program leading to the degrees of Medical Doctor (M.D.) and Master of Business Administration (M.B.A.). The objective of the program is to produce highly qualified clinicians who also understand the challenges of running a business. The Medical Doctor/Master of Business Administration (M.D./M.B.A.) joint degree program provides outstanding students the opportunity to combine a Medical Doctor degree from the College of Medicine, a highly respected medical college and medical center, with an M.B.A. degree from Penn State's internationally ranked Smeal MBA Program (Smeal). Participants in this program earn both a Medical Doctor degree and a Master of Business Administration in five years compared to the six years required to earn the two degrees separately.

In order to be admitted to the program, students must first be admitted and enrolled in the COM as a medical student and subsequently admitted to Smeal. Each program will make a separate admission decision. Students admitted to both programs will be admitted as joint degree candidates.

Students currently enrolled at the College of Medicine in the M.D. program may apply to the M.D./M.B.A. program during their first three years at the College of Medicine by applying to the M.B.A. program, as described on the Admission Requirements tab.

Admission Requirements

The admission requirements for the Master of Business Administration degree are listed on the Admission Requirements tab. Admissions requirements and applications for admission for Penn State College of Medicine are available at the M.D. Program (http://www.med.psu.edu/md) section of the Penn State College of Medicine website. Students must be admitted to the program prior to taking the first course they intend to count towards the M.B.A. degree. M.D./M.B.A. applicants are still required to submit the GMAT or GRE scores.

Degree Requirements

Credit Requirements: Students must fulfill all requirements for each degree in order to be awarded that degree, subject to the double-counting of credits as outlined below. Degree requirements for the M.D. program are listed on the College of Medicine
Sequence: Students may choose to conduct their study in either of the two sequences shown below. Each "Year" refers to the traditional academic year beginning in late August and concluding in May. The College of Medicine students can expect to take courses during the summer. The Smeal College of Business does not offer any classes over the summer term.

Years 1-3: M.D. foundation and advanced course work at the College of Medicine.

Year 4: M.B.A. foundation course work at the University Park location.

Year 5: Combination of M.D. and M.B.A. course work at the University Park location.

Double Counting of Credits: M.B.A.: 15 credits from the College of Medicine course work may be double counted toward the M.B.A. degree at Smeal. Courses for which such credit may be applied shall be subject to approval by Smeal based on relevance to the M.B.A. program. Students must obtain a grade satisfactory to Smeal (High Pass or Low Pass) for any M.D. course work to be credited toward the M.B.A. degree.

Double Counting of Credits: M.D.: A maximum of 45 credits for M.B.A. course work may be double counted for credit toward the M.D. degree at the COM. Courses for which such credit may be applied shall be subject to approval by the College of Medicine faculty. Students must obtain a grade satisfactory to the College of Medicine (a grade of "C" or higher) for any M.B.A. course work to be credited toward the M.D. degree.

Advising of Students: All students in the program shall have two advisers, one from the Smeal College of Business and one from the College of Medicine. Periodic interaction between the two advisers is encouraged.

Graduation: If students accepted into the joint degree program are unable to complete the M.D. degree, they are still eligible to receive the M.B.A. degree if all the M.B.A. degree requirements have been satisfied.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (http://gradschool.psu.edu/graduate-funding) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (http://gradschool.psu.edu/graduate-education-policies/gsad/gsad-500/gsad-501-credit-loads-graduate-assistants) set by The Graduate School.

Students applying to the M.B.A. program are eligible for Fellowships and Scholarships which are awarded by the Smeal College of Business at the time of admission. Graduate assistantships are not available to students in this program due to course load limits set by The Graduate School.

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the Student Aid (http://www.bulletins.psu.edu/bulletins/whitebook/general_information.cfm?section=tuition2) section of the Graduate Bulletin on the Graduate School's website, other awards are available to graduate students in Smeal College of Business.

Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Business Administration (BA) Course List (https://bulletins.psu.edu/university-course-descriptions/graduate/ ba)

Contact

Master of Science (M.S.) and Doctor of Philosophy (Ph.D.)

Campus: University Park

Graduate Program Head: Brent William Ambrose

Professor-in-Charge (PIC): Brent William Ambrose

Program Contact: Dana Rae Campolongo 351 Business Building University Park PA 16802
drc21@psu.edu
Program Website
View (https://www.smeal.psu.edu/phd)

Master of Business Administration (M.B.A.)

Campus
University Park

Graduate Program Head
Brian Harold Cameron

Director of Graduate Studies (DGS)
Louis Gattis

or Professor-in-Charge (PIC)
Andrea Lyn Murphy-Faust
220 Business Building
University Park PA 16802
alm205@psu.edu
(814) 863-0474

Program Website
View (http://www.smeal.psu.edu/mba)
Graduate Council
Program, Option, or Minor Proposal Form

Submit 1 original, signed Graduate Council proposal form and 2 hardcopies of the graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Office of the Dean of the Graduate School, 211 Kern Building, University Park. For more information about the process, see the Overview of the Graduate Council Curricular Review Process.

The Program Proposal Procedures provide guidance for the development of a graduate program proposal. If you have questions regarding the preparation of a graduate program proposal or how to complete this Graduate Council proposal form, contact the Office of the Dean of the Graduate School.

<table>
<thead>
<tr>
<th>College/School: Smeal College of Business</th>
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<tbody>
<tr>
<td>Department or Instructional Area: Corporate Innovation and Entrepreneurship</td>
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<thead>
<tr>
<th>New Graduate Program, Option, or Minor:</th>
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Indicate effective semester:
- First semester following approval
- Second semester following approval

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<th>Existing Graduate Program Option, or Minor:</th>
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<tr>
<td>Current designation of graduate option:</td>
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New designation of existing graduate program (if changing): _______________________________________________________________
New designation of existing graduate option (if changing): _______________________________________________________________
New designation of existing graduate minor (if changing): _______________________________________________________________

Brief description of the change (if not noted above): Title Change

Indicate effective semester:
- First semester following approval
- Second semester following approval

Submitted by Graduate Program Head

Vilmos Misangyi
Printed name
Signature
Date: 2/13/19

Noted by College/School Representative to Graduate Council Subcommittee on New and Revised Programs and Courses:

Arvind Rangaswamy
Printed name
Signature
Date: 2/13/19

Approved by College/School Dean/Chancellor (or Designee):

Steven Huddart
Printed name
Signature
Date: 2/14/19
Recommended by Chair, Graduate Council Subcommittee on New and Revised Programs and Courses:

On Behalf of David Babb  
Printed name ___________________________  
Signature ___________________________  
Date: 3/28/2019

Recommended by Chair, Graduate Council Committee on Programs and Courses:

On Behalf of C. Andrew Cole  
Printed name ___________________________  
Signature ___________________________  
Date: 3/28/2019

Noted by Dean of the Graduate School:

On Behalf of Regina Vasilatos-Younken  
Printed name ___________________________  
Signature ___________________________  
Date: 3/28/2019
PROGRAM CHANGE PROPOSAL —
MASTER OF PROFESSIONAL STUDIES IN CORPORATE INNOVATION AND ENTREPRENEURSHIP

THE PENNSYLVANIA STATE UNIVERSITY — SMEAL COLLEGE OF BUSINESS
DR. SHAWN M. CLARK — CLINICAL PROFESSOR OF INNOVATION AND ENTREPRENEURSHIP
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B. Learning Goals and Objectives ............................................................. 7  
C. Comparison of Changes ...................................................................... 9  

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<thead>
<tr>
<th>Old Program Title</th>
<th>New Program Title</th>
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</thead>
<tbody>
<tr>
<td>Master of Professional Studies in Corporate Innovation and Entrepreneurship</td>
<td>Master of Management in Corporate Innovation and Entrepreneurship</td>
</tr>
</tbody>
</table>

D. Revised Bulletin ............................................................................. 9
A. Program Change Justification

The degree title will be changed from a Master of Professional Studies in Corporate Innovation and Entrepreneurship to a Master of Management in Corporate Innovation and Entrepreneurship. After receiving feedback from the market, The Smeal College of Business feels strongly that this program should not utilize a Master of Professional Studies (MPS) degree designation.

The MPS designation for business-related master’s programs puts our programs at a competitive disadvantage. Almost all business schools use the MS designation for many of their professional master’s programs. The MPS designation is never used at other leading business schools. Through discussions with counterparts at other leading business schools, we have learned that these schools often point out to prospective master’s students that Penn State awards an MPS degree and that they aren’t quite sure what that is but assure the prospective students that they will earn an MS degree at their institutions. Many prospective students question whether MPS designated business master’s programs are “real” master’s degrees as the MPS designation is not a recognized business master’s designation. Some prospective students have not selected our programs because of the MPS designation. We strongly believe that the MPS designation puts our business professional master’s programs at a disadvantage nationally and internationally.

Below is a table with a substantial list of very reputable business schools that use Master of Science (MS) for their specialized business master’s programs in this field. Most business schools today do not have functioning traditional research-oriented MS programs and have transitioned from traditional research MS degrees to professional MS degrees. As you can see in the list below, there are many MS degrees in Innovation and Entrepreneurship at leading competing business schools. If we really wanted to use the most common degree title in use today, it would be an MS degree. However, we realize that use of the MS designation for professional business master’s programs at Penn State is not a likely possibility and instead suggest that Smeal be allowed to use the “Master of” designation for this degree and feel that we have made a strong case for this usage.

While MS is by far the most common professional master’s designation within our business school peer group, the “Master of” designation is also used, but to a lesser extent. Exceptions to the use of the MS designation occur in other commonly used master’s programs’ titles such as the Master of Accounting, the Master of Finance, and the Master of Business Administration (MBA).

No examples of major business school competitors that use the MPS designation exist. Here are two examples of major business school competitors that use the MS designation for their professional master’s programs – many additional examples exist and are included in the table below:

Kelley School of Business (Indiana): [https://kelley.iu.edu/programs/online/degrees/index.cshtml](https://kelley.iu.edu/programs/online/degrees/index.cshtml)

Temple University: [https://www.fox.temple.edu/specialized-masters/](https://www.fox.temple.edu/specialized-masters/)
Below is additional research related to masters in innovation and entrepreneurship degree titles.

<table>
<thead>
<tr>
<th>University of Michigan</th>
<th>Master of Entrepreneurship</th>
<th><a href="http://entrepreneurship.umich.edu/">http://entrepreneurship.umich.edu/</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Carnegie Mellon University</td>
<td>Master of Integrated Innovation for Products &amp; Services</td>
<td><a href="https://www.cmu.edu/iii/degrees/miips/">https://www.cmu.edu/iii/degrees/miips/</a></td>
</tr>
<tr>
<td>Indiana University</td>
<td>Master of Science in Entrepreneurship &amp; Innovation</td>
<td><a href="https://kelley.iu.edu/programs/online/degrees/ms-entrepreneurship-innovation/index.csh.html">https://kelley.iu.edu/programs/online/degrees/ms-entrepreneurship-innovation/index.csh.html</a></td>
</tr>
<tr>
<td>Northeastern University</td>
<td>Master of Science in Innovation</td>
<td><a href="https://pages.northeastern.edu/msi-sf-ppc-1819.html?utm_source=google&amp;utm_medium=search&amp;utm_campaign=msi-mofu&amp;gclid=Cj0KCQiA8f_eBRDcARIsAEKwRQdf8Qrx25p4VnnXT51I79LvnEqhaVrhEWG6z8kDoxmiCXR8dLN444aAg3kEALw_wcB">https://pages.northeastern.edu/msi-sf-ppc-1819.html?utm_source=google&amp;utm_medium=search&amp;utm_campaign=msi-mofu&amp;gclid=Cj0KCQiA8f_eBRDcARIsAEKwRQdf8Qrx25p4VnnXT51I79LvnEqhaVrhEWG6z8kDoxmiCXR8dLN444aAg3kEALw_wcB</a></td>
</tr>
<tr>
<td>University of Southern California</td>
<td>Master of Science in Entrepreneurship and Innovation</td>
<td><a href="http://catalogue.usc.edu/preview_program.php?catoid=6&amp;poid=5131">http://catalogue.usc.edu/preview_program.php?c atoid=6&amp;poid=5131</a></td>
</tr>
<tr>
<td>University</td>
<td>Program</td>
<td>Website</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UT Dallas</td>
<td>Master of Science in Innovation and Entrepreneurship</td>
<td><a href="https://jindal.utdallas.edu/osim/ms-innovation-entrepreneurship/">https://jindal.utdallas.edu/osim/ms-innovation-entrepreneurship/</a></td>
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<tr>
<td>Temple University</td>
<td>Master of Science in Innovation Management &amp; Entrepreneurship</td>
<td><a href="https://www.fox.temple.edu/specialized-masters/innovation-management-entrepreneurship/about-the-program/">https://www.fox.temple.edu/specialized-masters/innovation-management-entrepreneurship/about-the-program/</a></td>
</tr>
<tr>
<td>Oklahoma State University</td>
<td>Master's in Entrepreneurship</td>
<td><a href="https://business.okstate.edu/watson/mse/index.html">https://business.okstate.edu/watson/mse/index.html</a></td>
</tr>
<tr>
<td>Drexel University</td>
<td>Master of Science in Entrepreneurship and Innovation</td>
<td><a href="https://online.drexel.edu/online-degrees/business-degrees/ms-entrepreneurship/index.aspx">https://online.drexel.edu/online-degrees/business-degrees/ms-entrepreneurship/index.aspx</a></td>
</tr>
<tr>
<td>RIT</td>
<td>Master of Science in Entrepreneurship and Innovative Ventures</td>
<td><a href="https://saunders.rit.edu/graduate/programs/ms-entrepreneurship-and-innovative-ventures-overview">https://saunders.rit.edu/graduate/programs/ms-entrepreneurship-and-innovative-ventures-overview</a></td>
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<tr>
<td>UMass Lowell</td>
<td>Master of Science in Entrepreneurship</td>
<td><a href="https://www.uml.edu/MSB/Departments/Marketing-Entrepreneurship-Innovation/Programs/MSITE.aspx">https://www.uml.edu/MSB/Departments/Marketing-Entrepreneurship-Innovation/Programs/MSITE.aspx</a></td>
</tr>
<tr>
<td>University of Washington</td>
<td>Master of Science in Entrepreneurship</td>
<td><a href="https://foster.uw.edu/academics/degree-programs/master-of-science-in-entrepreneurship/">https://foster.uw.edu/academics/degree-programs/master-of-science-in-entrepreneurship/</a></td>
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<tr>
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<td>Program Link</td>
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<tr>
<td>-----------------------------</td>
<td>-------------------------------------------</td>
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</tr>
<tr>
<td>Tufts University</td>
<td>Master of Science in Innovation &amp; Management</td>
<td><a href="https://gordon.tufts.edu/programs/m-s-in-innovation-and-management-2/">https://gordon.tufts.edu/programs/m-s-in-innovation-and-management-2/</a></td>
</tr>
<tr>
<td>Australian National University</td>
<td>Master of Entrepreneurship and Innovation</td>
<td><a href="https://programsandcourses.anu.edu.au/2017/program/MEINV">https://programsandcourses.anu.edu.au/2017/program/MEINV</a></td>
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<tr>
<td>University of Luxembourg</td>
<td>Master in Entrepreneurship and Innovation</td>
<td><a href="https://wwwfr.uni.lu/formations/fdef/master_in_entrepreneurship_and_innovation">https://wwwfr.uni.lu/formations/fdef/master_in_entrepreneurship_and_innovation</a></td>
</tr>
</tbody>
</table>
B. Learning Goals and Objectives

The Master of Professional Studies in Corporate Innovation and Entrepreneurship Learning Goals and Objectives:

1. **Creativity and New Thinking**

   The Master of Corporate Innovation and Entrepreneurship graduates will master a broad core of foundational knowledge related to corporate innovation and creativity, and be able to integrate and apply this knowledge to new ventures, but in startups and mature organizations. Learning Objectives:
   - Graduates will be able to demonstrate competency in the underlying concepts, theory, and tools related to innovation and creativity.
   - Graduates will learn the techniques involved in thinking creatively, innovatively, and strategically.
   - Graduates will understand the benefits and purpose of invention and innovation in multiple business domains.
   - Graduates will acquire the analytical and critical thinking skills needed to identify, analyze, generate, and evaluate alternative solutions to business problems.
   - Graduates will be able to articulate and defend their ideas, concepts, and analyses, and recommended solutions to a variety of business audiences.
2. **Corporate Innovation Domains**
Master of Corporate Innovation and Entrepreneurship graduates will master a broad core of foundational knowledge related to innovation, and be able to integrate and apply this knowledge to a wide variety of business domains.
Learning Objectives:
- Graduates will be able to demonstrate competency in understanding how to perform product, service, technology, process, policy, and strategy innovation.
- Graduates will be able to demonstrate competency in analyzing, developing, and implementing new business models.

3. **New Venture Creation**
Master of Corporate Innovation and Entrepreneurship graduates will master a broad core of knowledge related to new venture creation, and be able to integrate and apply this knowledge in different organizational contexts.
Learning Objectives:
- Graduates will be able to demonstrate competency in the methods, practices, and activities associated with launching a new venture or startup and turning it into a viable business initiative.
- Graduates will be able understand and manage the issues, barriers, and enablers associated with launching a successful new venture.
- Graduates will be able to understand the best approaches new venture business planning and strategy implementation.
- Graduates will be able to understand the implications and best practices associate with protecting and managing intellectual property.

4. **Corporate Innovation, Entrepreneurship, and Organization**
Master of Corporate Innovation and Entrepreneurship graduates will master a broad core of foundational knowledge related to leading and managing organizations in a manner that encourages innovation.
Learning Objectives:
- Graduates will be able to demonstrate competency in how to make an organization more innovative leveraging business strategy and corporate culture.
- Graduates will be able to demonstrate competency in applying the principles of innovation to human resource policy, reward systems, business processes, marketing, and strategic decision making.
- Graduates will be able to demonstrate competency in understanding how to establish, develop, and manage innovative teams.

5. **Core Business Knowledge**
Master of Corporate Innovation and Entrepreneurship graduates will master a broad core of foundational business knowledge and be able to integrate and apply this knowledge to business situations requiring innovation, and interdisciplinary perspectives.
Learning Objectives:
- Graduates will be able to demonstrate competency in the underlying concepts, theory, and tools of general business.
- Graduates will be able to use their knowledge of different business disciplines to identify, analyze, and recommend solutions to complex business problems, blending functional expertise and multi-disciplinary perspectives.

6. **Leadership and Communication Skills**
Graduates will demonstrate the interpersonal skills needed to be effective managers and
Learning Objectives:
- Graduates will increase their skills in leadership, team building, interpersonal influence, and the management of innovation and change.
- Graduates will be able to communicate and work effectively with others in an increasingly diverse workplace. These learning outcomes will be achieved by a combination of lectures by faculty, invited guest speakers, reading of key literature, case method, individual and team projects, and practical involvement in a leadership immersion capstone experience.

C. Comparison of Changes

**Old Program Title**

Master of Professional Studies in Corporate Innovation and Entrepreneurship

**New Program Title**

Master of Management in Corporate Innovation and Entrepreneurship

D. Revised Bulletin

**CORPORATE INNOVATION AND ENTREPRENEURSHIP**

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<th>Brian Cameron</th>
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</tbody>
</table>

The Master of Management in Corporate Innovation and Entrepreneurship program prepares graduates to stand out in the workplace and/or a competitive job market by studying at a highly-reputed business school with some of the world's leading academic thinkers and industry experts. This program provides students with the business, leadership, and organizational skills needed to lead and facilitate corporate innovation in its many forms, new venture creation, effective change management, and entrepreneurial business planning. Students will acquire the skills needed to succeed in today's dynamic work environments, gain a firm understanding of business and technology issues and problems, and be prepared to become leaders of innovation. The two primary concentration areas provided through this program, involving business and engineering, will give students the opportunity to develop competencies tailored to their needs in a corporate setting. Additional secondary academic concentrations are
offered to allow students to explore focused business domains in-depth that relate directly to innovation and entrepreneurship. The program is taught by the same world-class professors who teach our M.B.A., executive education, and engineering students. A solid foundation in innovation, entrepreneurship, strategy, decision analysis, management, organizational behavior, accounting, marketing, business planning, and finance will make graduates more attractive to hiring managers and enable them to advance more rapidly into management and leadership positions. These learning outcomes are achieved by a combination of online learning experiences, lectures by faculty, invited guest lecturers, reading of key literature, individual and team projects, and a capstone experience that synthesizes and integrates past learning.

Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (http://gradschool.psu.edu/prospective-students/how-to-apply). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions (http://gradschool.psu.edu/graduate-education-policies).

Applicants will be required to:

- Have completed an average of three years of post-undergraduate, professional work experience. Managerial or team leadership experience is preferred but not required. Less experienced candidates will be considered at the discretion of the program director.
- Submit two strong letters of recommendation.
- Submit official transcripts from all post-secondary institutions attended. (http://www.gradschool.psu.edu/prospective-students/how-to-apply/new-applicants/requirements-for-graduate-admission)
- Submit a statement of purpose (a 600 word essay articulating career and education goals) and a current resume.

GRE/GMAT scores are NOT required.

The language of instruction at Penn State is English. English proficiency testscores (TOEFL/IELTS) may be required for international applicants. See GCAC-305 Admission Requirements for International Students (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/gcac-305-admission-requirements-international-students) for more information.

Applicants to the Penn State Smeal Master of Management in Corporate Innovation and Entrepreneurship Master of Professional Studies in Corporate Innovation and Entrepreneurship program must have a minimum TOEFL score of 585 on the paper-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test (iBT). The minimum acceptable composite score for the IELTS for applicants is 6.5.

Degree Requirements

Master of Professional StudiesManagement (M.P.S.) (M.Mgt.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-700 Professional Degree Requirements (http://gradschool.psu.edu/graduate-education-policies).

A minimum of 33 credits is required for the Master of Management in Corporate Innovation and Entrepreneurship Master of Professional Studies in Corporate Innovation and Entrepreneurship program. At least 18 credits must be at the 500 or 800 level, with at least 6 at the 500 level. In addition to the 15 required core credits listed below, students are required to complete 9 elective credits in a Primary Concentration area, and 9 elective credits in a Secondary Concentration. The list of courses that fulfill the Primary and Secondary Concentration areas is maintained by the graduate program office.

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<thead>
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<th>Code</th>
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<td><strong>Required Courses</strong></td>
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</table>
Primary Concentration 1
Secondary Concentration 1

Culminating Experience

Total Credits

1 The list of courses that will fulfill the Primary and Secondary Concentration areas is maintained by the graduate program office.

The capstone course, ENTR 830, serves a critical role in helping students synthesize and integrate past learning in the M.P.S. program, providing additional education on how to write a formal business case or business plan, implement plans and new venture strategies, and scale new ventures to become mature business organizations. Additionally, this class requires students to write a robust, in-depth research paper on a topic related to innovation and entrepreneurship.

2 Corporate Innovation and Entrepreneurship

Student Aid

World Campus students in graduate degree programs may be eligible for financial aid. Refer to the Tuition and Financial Aid section (http://www.worldcampus.psu.edu/tuition-and-financial-aid) of the World Campus website for more information.

Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Contact

Campus World Campus
Graduate Program Head Shawn Mitchell Clark
Program Contact

Michelle Kristen Rockower
220 Business Building
University Park PA 16802
mkk114@psu.edu
(814) 863-0474

Program Website

View (http://www.worldcampus.psu.edu/degrees-and-certificates/penn-state-online-corporate-innovation-and-entrepreneurship-masters/overview)
Graduate Council
Program, Option, or Minor Proposal Form

Submit 1 original, signed Graduate Council proposal form and 2 hardcopies of the graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Office of the Dean of the Graduate School, 211 Kern Building, University Park. For more information about the process, see the Overview of the Graduate Council Curricular Review Process.

The Program Proposal Procedures provide guidance for the development of a graduate program proposal. If you have questions regarding the preparation of a graduate program proposal or how to complete this Graduate Council proposal form, contact the Office of the Dean of the Graduate School.

College/School: College of Earth and Mineral Sciences
Department or Instructional Area: Department of Geography

New Graduate Program, Option, or Minor: Add
Designation of new graduate program:
Classification of Instructional Programs (CIP) Code: FEB 21 2019
Designation of new graduate option:
Designation of new graduate minor:

Indicate effective semester:
First semester following approval
Second semester following approval

Existing Graduate Program Option, or Minor: X Change Drop
Current designation of graduate program: Geography
Current designation of graduate option:
Current designation of graduate minor:
New designation of existing graduate program (if changing): Dual-Title Ph.D. in Geography and Climate Science
New designation of existing graduate option (if changing):
New designation of existing graduate minor (if changing):

Brief description of the change (if not noted above): Adopting Dual-Title Ph.D. in Geography and Climate Science
Indicate effective semester:
First semester following approval X
Second semester following approval

Submitted by Graduate Program Head

Brian King
Printed name
Signature Date: 2/18/19

Noted by College/School Representative to Graduate Council Subcommittee on New and Revised Programs and Courses:

David Babb
Printed name
Signature Date: 2/19/19

Approved by College/School Dean/Chancellor (or Designee):

John Hellmann
Printed name
Signature Date: 2/20/19
<table>
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<tr>
<th>Role</th>
<th>Printed name</th>
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<tr>
<td>Recommended by Chair, Graduate Council Subcommittee on New and Revised Programs and Courses:</td>
<td>On Behalf of David Babb</td>
<td></td>
<td>3/28/2019</td>
</tr>
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<td></td>
<td>On Behalf of C. Andrew Cole</td>
<td></td>
<td>3/28/2019</td>
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<tr>
<td>Noted by Dean of the Graduate School:</td>
<td>On Behalf of Regina Vasilatos-Younken</td>
<td></td>
<td>3/28/2019</td>
</tr>
</tbody>
</table>
A Proposal to Graduate Council to
Adopt the Dual-Title Doctoral Program in Climate Science

Submitted by
Department of Geography
College of Earth and Mineral Sciences

Contact:
Cynthia A. Brewer
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Professor of Geography
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bhk2@psu.edu
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3. Degree Requirements for the Climate Science Dual Title..........................................4
4. Proposed Graduate Program Bulletin Listing for Climate Science Dual-Title..........6
5. Consultation for Dual-Title Doctoral Program in Climate Science.......................19
1. **Preamble**

The Department of Meteorology and Atmospheric Science spearheaded the formation of a new dual-title doctoral degree in Climate Science, as overviewed in the next section. That dual-title program was approved by the Graduate Council Joint Curricular Committee and officially began Fall Semester 2018. As an equal contributing partner to teaching and research in climate science within the College of Earth and Mineral Sciences, the Department of Geography seeks to offer the dual-title doctoral degree in Geography and Climate Science to its students (this proposal).

2. **Justification for Adopting the Dual-Title Climate Science Program**

Climate Science is a field devoted to the study of the Earth’s climate in the past, present and future. The effects of human (anthropogenic) and natural forcing, and their interactions, on climate and society are of increasing interest and importance as the Earth enters the Anthropocene – the epoch in which human activity has become the dominant influence on our global environment. The need for this dual title climate science program is seen daily as stories on climate and climate science appear in the news. Past predictions on how climate change would alter the character of weather events are being verified. International organizations, such as the Intergovernmental Panel on Climate Change, were formed in the past few decades to assess the state of the science on climate and now play important roles in the global climate conversation. Current and future impacts of climate change on the environment are being sought after by government agencies, companies, non-profit organizations, and citizens. These groups and individuals are looking to climate scientists to provide this guidance.

The approved dual-title Ph.D. program in Climate Science is intended to serve these needs for experts in climate science, while also expanding graduate student recruitment at Penn State. In a survey of 106 departments of meteorology and/or atmospheric science in 2015, only three department names included the word “climate”. This suggests that the dual-title program in Climate Science would provide our graduate students a unique advantage as career opportunities in Climate Science continue to grow. Indeed, many graduate student applicants are interested in climate and climate change, and climate impacts on society, and want to pursue a Ph.D. in this field, but can be challenged to find the department that best fits their interests. This is owing to the many departments at Penn State that have faculty members involved in Climate Science. The dual-title program thus provides an important link between departments, allowing graduate student applicants to see how they can develop research projects that span departments and capture the increasingly interdisciplinary nature of Climate Science. The Climate Science dual-title doctoral program provides critical skills and cross-disciplinary knowledge that enhance the students’ education, training, and research, and thereby enhances their ability to compete for academic and non-academic positions after graduation.

The techniques used to study climate have expanded dramatically over the past several decades from simple energy balance approaches to sophisticated global climate models, from the analysis of instrumental climate records to the development of proxy climate records including ice cores, tree rings, corals, speleothems, sub-fossil pollen, ocean and lake sediments spanning many thousands of years. There is an increasing use of Geographical Information Systems (GIS) and
sophisticated statistical methods that are used to inter-compare data sets, uncover the relationships between variables, assess the statistical significance of interrelationships, and map and interpret those relationships. New observational systems to measure concentrations of greenhouse gases and emissions, along with land use/land cover changes resulting from human activity, are becoming common and more affordable. Global climate models are being run at finer and finer scales and are beginning to provide information on regional climate and climate change that can be applied to planning and climate impacts assessment. Physical process parameterization schemes within these models are becoming increasingly faithful as they are verified against special observational data sets, including line-by-line solar and infrared radiation spectra retrieved using satellite remote sensing. Assessments of climate risk are becoming more robust, backed by detailed scientific and statistical analyses. A better understanding has been developed of the relationship between climate change and extreme weather and climate events, such as droughts and floods, and their link to teleconnection patterns such as El Niño Southern Oscillation. Many of these approaches to climate science have origins in diverse specific disciplines, emphasizing the ability of the dual-title program to span departments and allow Geography students to gain knowledge not easily available from a single perspective. This approach will give our PhD students a richer and more diverse education and training than any department could offer alone.

The Climate Science dual title doctoral degree program provides a rich curriculum in climate dynamics and observations, numerical and statistical methods, the physical climate system, biogeochemistry, and human dimensions of climate change to ensure that all of our Climate Science students have a broad and deep understanding of the science and its application to society. It also is developing a cohort of PhD students across departments, leading to enhanced appreciation for and understanding of the various facets of Climate Science, while also helping to generate stronger connections among our talented faculty. Last, the Climate Science program will provide highly-trained PhDs to the academic, government and private sectors to meet the growing need for climate information and climate impacts.

3. Degree Requirements for the Climate Science Dual Title

**Graduate Program Head** Michael Mann  
**Program Code** CLSCI  
**Campus(es)** University Park  
**Degrees Conferred** Dual-Title

Students electing this degree program through participating programs earn a degree with a dual title in the Ph.D., i.e., Ph.D. in Geography and Climate Science.

The following graduate program offers the dual-title degree in Climate Science: Meteorology and Atmospheric Science.

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.
To qualify for a dual-title degree, students must satisfy the requirements of the primary graduate program in which they are enrolled. In addition, they must satisfy the degree requirements for the dual-title in Climate Science, listed below.

The minimum course requirements for the dual-title in Climate Science are as follows:

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 3 credits of approved 400-, 500-, or 800-level courses in each of two specific areas:</td>
<td>6</td>
</tr>
<tr>
<td>Climate dynamics seminar</td>
<td></td>
</tr>
<tr>
<td>Climate dynamics and observations</td>
<td></td>
</tr>
<tr>
<td>3 credits of approved 400-, 500-, or 800-level courses in each of three of the four remaining areas:</td>
<td>9</td>
</tr>
<tr>
<td>Physical climate system</td>
<td></td>
</tr>
<tr>
<td>Biogeochemistry of the climate system</td>
<td></td>
</tr>
<tr>
<td>Numerical methods and data analysis</td>
<td></td>
</tr>
<tr>
<td>Human dimensions of climate change</td>
<td></td>
</tr>
<tr>
<td>Total Credits</td>
<td>15</td>
</tr>
</tbody>
</table>

Students are not eligible to take a 400-level course in any one of the areas if the course is offered by their primary graduate program. All students must take at least one 500-level course, and at least one course must be from outside of their core disciplinary expertise. Finally, all of the courses offered in Climate Dynamics and Observations will include sufficient material in radiative transfer and the greenhouse effect to ensure that the students clearly understand the underlying physics of climate and climate change. A list of the approved courses that will satisfy each of the area requirements is maintained by the graduate program office. Students or faculty may request that the Climate Science Committee consider approval of elective designations for any course, including temporary approvals for experimental or variable-title courses.

The qualifying examination committee for the dual-title Ph.D. degree must include at least one Graduate Faculty member from the Climate Science program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both the primary graduate degree program and Climate Science. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees, the dissertation committee of a Climate Science dual-title doctoral degree student must include at least one member of the Climate Science Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Climate Science, the member of the committee representing Climate Science must be appointed as co-chair. The Climate Science representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.
Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in both their primary graduate program and Climate Science. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

4. Proposed Graduate Program Bulletin Listing

Graduate Program Head
Cynthia A. Brewer

Program Code
GEOG

Campus(es)
University Park (Ph.D., M.S.)

Degrees Conferred
Doctor of Philosophy (Ph.D.)
Master of Science (M.S.)
Dual-Title Ph.D. in Geography and African Studies
Dual-Title Ph.D. in Geography and Climate Science
Dual-Title Ph.D. and M.S. in Geography and Demography
Dual-Title Ph.D. and M.S. in Geography and Human Dimensions of Natural Resources and the Environment
Dual-Title Ph.D. and M.S. in Geography and Operations Research
Dual-Title Ph.D. and M.S. in Geography and Women's, Gender, and Sexuality Studies

The faculty encourages graduate students to arrange courses of study appropriate to their individual needs and aspirations. Programs in Geography may be directed toward a career in public service, teaching and research, private industry, or one of the many other vocational opportunities open to geographers.

Students typically concentrate their study on topics that fall within the special skills and interests of the faculty. Current specialties include behavioral geography; biogeography; cartography; climatology; cultural geography; feminist geography; geo-computation; geographic education; geographic information science; geography of the developing world; geographic theory; geographic visualization; historical geography; human dimensions of global change; nature and
society; political geography; population geography; regional economic development and industrial location; remote sensing; and urban geography.

Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission. Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions.

Scores from the Graduate Record Examinations (GRE) are required for admission, as well as a personal statement.

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course work in geography or a related discipline will be considered for admission to the M.S. program or to the five-year Ph.D. program. Applicants with master's degrees from high-quality graduate programs in geography will be considered for admission to the four-year doctoral program. The best-qualified applicants will be admitted up to the number of places that are available for new students. All students must have or must acquire a broad competence in physical geography, human geography, environment and society, GIScience, and analysis methods (qualitative or quantitative).

Baccalaureate students must earn a master's degree before they will be considered for admission to the doctoral program.

Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements.

Penn State's graduate program in Geography works with incoming students to design programs tailored to their specific interests and needs. Thus there are few formal requirements and a maximum of opportunities for students to pursue their own interests under the guidance of the faculty. Each student's work is supervised by his or her academic adviser and by a committee consisting of two additional members of the Graduate Faculty for M.S. students. The M.S. program is broadly based. It is designed to provide beginning graduate students with basic training in systematic fields, geographical theory, and research techniques.

The M.S. degree may be earned by completing a thesis or two papers. The thesis option requires completion of at least 30 credits at the 400, 500, 600, and 800 level, with at least 18 credits in the 500 and 600 series, combined. If the two-paper option is elected, the student must earn 35 credits at the 400, 500, or 800 level, with at least 18 credits at the 500 level. In both cases, at least 18 credits in the 500 and 600 series, combined, must be included in the program. The master's papers are usually expanded versions of course or semester papers that are of sufficiently high quality that they can be submitted to scholarly journals. At least one of the papers offered to
fulfill the M.S. papers requirement must have been written in connection with a departmental course or seminar.

All M.S. students are required to enroll in the following courses during their first year of residence:

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 500</td>
<td>Introduction to Geographic Research</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 502</td>
<td>Research Scholarship in Geography</td>
<td>3</td>
</tr>
</tbody>
</table>

Select at least three of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 501A</td>
<td>Research Perspectives in Physical Geography</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 501B</td>
<td>Research Perspectives in Human Geography</td>
<td></td>
</tr>
<tr>
<td>GEOG 501C</td>
<td>Research Perspectives in Human-Environment Geography</td>
<td></td>
</tr>
<tr>
<td>GEOG 501D</td>
<td>Research Perspectives in GIScience</td>
<td></td>
</tr>
</tbody>
</table>

All M.S. students are required to complete at least one seminar at the 500 level. Supporting courses are chosen in consultation with an entrance committee (in year one) or the adviser (in subsequent years).

**Doctor of Philosophy (Ph.D.)**

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements.

There are three paths to a Ph.D. One is a five-year Ph.D. with M.S. degree, which is available to students who enter Penn State Geography’s graduate program without a master’s degree. These students are on an accelerated schedule and earn an M.S. along the way to the Ph.D. The second is a four-year Ph.D., which is available to those students who have already received a master’s degree in another program either at Penn State or at another university. The third is an M.S.-to-Ph.D. path, which is available to Penn State Geography M.S. students who decide either to continue into the Ph.D. program after they have started their master’s program, or to return for the Ph.D. after having graduated with the M.S. Students on this path are not accelerated and therefore will usually require two years to earn the master’s and four years to earn the doctorate.

There is no fixed number of credits; courses are prescribed according to the student's prior experience and academic goals. Graduate Council’s communication and foreign language requirement for the Ph.D. degree shall be satisfied in a manner approved by the candidate’s doctoral committee. A student’s Ph.D. committee can require reading knowledge and/or demonstrated working knowledge of a foreign language, specialized training in linguistics, or training in computer programming languages, depending on the student’s research interest.
All doctoral students are required to enroll in GEOG 500 and GEOG 502 during their first year of residence.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding section of The Graduate School’s website. Students on graduate assistantships must adhere to the course load limits set by The Graduate School.

Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Learning Outcomes

1. Know: Graduates will demonstrate knowledge of the core theories and methods in geography as well as deeper knowledge of three out of four subfields. Graduates will demonstrate specialized knowledge within their chosen sub-field: Human Geography, Environment-Society, Physical Geography, or Geographic Information Science.

2. Create: Graduates will be able to creatively synthesize theory and literature within their field of specialization. They will be able to generate new ideas and if appropriate formulate hypotheses in geographic knowledge. Graduates will be able to select from a range of methodological options and create a research framework to provide solutions to geographical problems.

3. Apply: Graduates will be able to carry out independent, original, and ethical research that addresses problems in the subfields of geography.

4. Critical thinking: Graduates will be able to critically analyze work in their field of specialization.

5. Communicate: Graduates will be able to convey ideas or arguments in a professional manner with clear, concise, well-organized papers, proposals, and oral presentations.

Contact

Campus

University Park

Graduate Program Head

CYNTHIA ANN BREWER

Director of Graduate Studies (DGS) or Professor-in-Charge (PIC)

Brian Hastings King

Program Contact

Jessica Perks
302 Walker Building
Dual-Title Degree in Geography and African Studies

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Geography doctoral students – who are already in the program and who have research and scholarly interests in comparative, sub-regional, national and thematic analyses, environmental change, livelihood systems, socio-economic and political change, and other aspects of African development – may apply to the dual-title doctoral degree program in African Studies. The goal of the dual-title program is to enable graduate students from Geography to complement their knowledge and skills in a major area of geographic specialization with in-depth knowledge of prevailing theories and problem-solving approaches to thematic, regional, or national issues pertaining to African Studies.

The dual-title degree program will provide interested Geography doctoral students with a multidisciplinary approach that will enhance their analytical capabilities for addressing key issues in African development and broad aspects of livelihood change. It thereby will add value to their Geography degree and increase their competitiveness in the job market. The well-rounded, regional specialist who graduates from the program is likely to be employed in an international setting. The program has the potential, therefore, to enhance the reputation of the Geography Department, the College of Earth and Mineral Sciences, the College of the Liberal Arts, and Penn State.

Admission Requirements

Students must apply and be admitted to the graduate program in Geography and The Graduate School before they can apply for admission to the dual-title degree program. Applicants interested in the dual-title degree program may make their interest in the program known clearly on their applications to Geography and include remarks in their statement of purpose that address the ways in which their research and professional goals in Geography reflect an interest in African Studies-related research.

To be enrolled in the dual-title doctoral degree program in African Studies, a student must submit a letter of application and transcript, which will be reviewed by the African Studies Admissions Committee. Refer to the Admission Requirements section of the African Studies Bulletin page. Students must apply for enrollment into the dual-title degree program in African Studies prior to taking their qualifying examination.

Academic Advisers and Course Selection
To qualify for the dual-title degree, students must satisfy the requirements of the Geography graduate program. In addition, students must complete the degree requirements for the dual-title in African Studies, listed on the African Studies Bulletin page. Within this framework, final course selection is determined by the student in consultation with the Geography and African Studies academic advisers.

Upon acceptance into the dual-title degree program by the African Studies admissions committee, the student will be assigned an African Studies academic adviser in consultation with the African Studies director and the African Studies admissions committee.

As a student develops specific scholarly interests, s/he may request a different African Studies adviser from the one assigned by the African Studies admissions committee. The student and the Geography and African Studies academic advisers will establish a program of study that is appropriate for the student’s professional objectives and that is in accordance with the policies of the Graduate Council, the Geography graduate program, and the African Studies dual-title graduate degree program.

Requirements for the Geography-African Studies Ph.D.

The Dual-Title Doctoral Degree in Geography and African Studies is awarded only to students who are admitted to the Geography doctoral program and admitted to the dual-title degree program in African Studies. To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Geography, listed in the Degree Requirements section. In addition, students must complete the degree requirements for the dual-title in African Studies, listed on the African Studies Bulletin page. The minimum course requirements for the Dual-Title Ph.D. degree in Geography and African Studies are as follows:

- Completion of all course work and other requirements for the Geography Ph.D.
- 18 credits of Africa-related coursework at the 400-, 500-, or 800-level, of which the following are required:

  - AFR 501 Key Issues in African Studies  3
  - Select at least two of the following:  6
    - AFR 532 Environment and Livelihoods in Africa
    - AFR 534 Political Economy of Energy and Extractive Industries in Africa (Oil and Mining)
    - AFR 537 Gender, Sexuality and Islam in Africa: Exploring Contemporary Feminist Scholarship
    - SOC/AFR 527 Migration, Urbanization, and Policy in the Developing World

- As many as 6 of the 18 credits may come from 400-, 500-, or 800-level Geography courses, as approved by the student’s Geography and African Studies Program advisers
The remaining credits can be taken in AFR or in any department other than Geography; of these, no more than 6 credits may be taken at the 400-level and no more than 3 combined credits may come from AFR 596 and GEOG 596.

Communication and foreign language requirements will be determined by the student and the Geography and African Studies advisors in accordance with the existing Geography language requirements.

The choice of electives in African Studies is to be proposed by the student and is subject to approval by the Geography and African Studies academic advisors. The suite of selected courses should have an integrated, intellectual thrust that probes a thematic, national, or regional issue and that complements the student’s specialty in Geography.

Language Requirement

The language requirement for a student in the dual-title doctoral degree program will be determined by the student and the Geography and African Studies Program advisors in accordance with the existing Geography language requirements.

Qualifying Exam

The qualifying exam in Geography is an oral exam designed to help students to “...think analytically and critically in their field of expertise and to understand and apply ideas from other fields of geography to their research domain” (Geography Graduate Student Handbook 2011-2012, p. 30). The format of the qualifying exam for the dual-title degree student will be unchanged from the existing Geography qualifying exam and will be guided directly by the requirements outlined in the Geography Graduate Student Handbook. The only difference from the Geography qualifying exam will be an explicit African studies component. The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Geography and must include at least one Graduate Faculty member from the African Studies program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Geography and African Studies. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

Dissertation Committee Composition

In addition to the general Graduate Council requirements for dissertation committees, the dissertation committee of a Geography and African Studies dual-title Ph.D. student must include at least one member of the African Studies Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in African Studies, the member of the committee representing African Studies must be appointed as co-chair. The African Studies representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.
Comprehensive Exam

After completing all course work, doctoral candidates for the dual-title doctoral degree in Geography and African Studies must pass a comprehensive examination that includes written and oral components. Written components will be administered on a student’s major Geography subfields and on African Studies. The African Studies representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the oral component of the comprehensive examination. The African Studies component of the exam will be based on the student’s thematic, national, or regional area of interest and specialization in African Studies.

Dissertation and Dissertation Defense

Ph.D. students enrolled in the dual-title degree program are required to write a dissertation on a topic that reflects their education and research interest in Geography and African Studies. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

Dual-Title Ph.D. in Geography and Climate Science

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Climate Science is a field devoted to the study of Earth’s climate in the past, present, and future. A particular focus is understanding the effects of human activities (anthropogenic impacts) and natural forcing on climate. The Climate Science dual-title degree program is administered by the Department of Meteorology and Atmospheric Science for the participating graduate programs. The dual-title degree program is offered through participating programs in the College of Earth and Mineral Sciences and, where appropriate, other graduate programs in the University. The program enables students from several graduate programs to gain the perspectives, techniques, and methodologies of Climate Science, while maintaining a close association with major program areas of application (https://bulletins.psu.edu/graduate/programs/majors/climate-science/#text)

Admission Requirements

Students must be admitted to Geography and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Climate Science dual-title program. Refer to the Admission Requirements section of the Climate Science Bulletin page. Students must be admitted into the dual-title degree program in Climate Science prior to taking the qualifying examination in Geography.

Degree Requirements
To qualify for the dual-title degree, students must satisfy the Ph.D. degree requirements of the Geography graduate program. In addition, they must satisfy the degree requirements for the dual-title in Climate Science, listed on the Climate Science Bulletin page.

The qualifying examination committee for the dual-title Ph.D. degree must include at least one Graduate Faculty member from the Climate Science program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Geography and Climate Science. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees, the dissertation committee of a Climate Science dual-title doctoral degree student must include at least one member of the Climate Science Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Climate Science, the member of the committee representing Climate Science must be appointed as co-chair. The Climate Science representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in both Geography and Climate Science. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the Geography graduate program, and the Graduate School.

**Dual-Title M.S. and Ph.D. in Geography and Demography**

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

**Admission Requirements**

Students must apply and be admitted to the graduate program in Geography and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Demography dual-title program. Refer to the Admission Requirements section of the Demography Bulletin page. Doctoral students must be admitted into the dual-title degree program in Demography prior to taking the qualifying examination in their primary graduate program.

**Degree Requirements**
To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Geography, listed in the Degree Requirements section. In addition, students must complete the degree requirements for the dual-title in Demography, listed on the Demography Bulletin page.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Geography and must include at least one Graduate Faculty member from the Demography program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Geography and Demography. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees, the dissertation committee of a Geography and Demography dual-title Ph.D. student must include at least one member of the Demography Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Demography, the member of the committee representing Demography must be appointed as co-chair. The Demography representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in Geography and Demography. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

Dual-Title M.S. and Ph.D. in Geography and Human Dimensions of Natural Resources and the Environment

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Admission Requirements

Students must apply and be admitted to the graduate program in Geography and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the HDNRE dual-title program. Refer to the Admission Requirements section of the HDNRE Bulletin page. Doctoral students must be admitted into the dual-title degree program in HDNRE prior to taking the qualifying examination in their primary graduate program.

Degree Requirements
To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Geography, listed in the Degree Requirements section. In addition, students must complete the degree requirements for the dual-title in HDNRE, listed on the HDNRE Bulletin page.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Geography and must include at least one Graduate Faculty member from the HDNRE program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Geography and HDNRE. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees, the dissertation committee of a Geography and HDNRE dual-title Ph.D. student must include at least one member of the HDNRE Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in HDNRE, the member of the committee representing HDNRE must be appointed as co-chair. The HDNRE representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in Geography and HDNRE. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

**Dual-Title M.S. and Ph.D. in Geography and Operations Research**

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

**Admission Requirements**

Students must apply and be admitted to the graduate program in Geography and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Operations Research dual-title program. Refer to the Admission Requirements section of the Operations Research Bulletin page. Doctoral students must be admitted into the dual-title degree program in Operations Research prior to taking the qualifying examination in their primary graduate program.
Degree Requirements

To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Geography, listed in the Degree Requirements section. In addition, students must complete the degree requirements for the dual-title in Operations Research, listed on the Operations Research Bulletin page.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Geography and must include at least one Graduate Faculty member from the Operations Research program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Geography and Operations Research. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees, the dissertation committee of a Geography and Operations Research dual-title Ph.D. student must include at least one member of the Operations Research Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Operations Research, the member of the committee representing Operations Research must be appointed as co-chair. The Operations Research representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in Geography and Operations Research. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

Dual-Title M.S. and Ph.D. in Geography and Women’s, Gender, and Sexuality Studies

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Admission Requirements

Students must apply and be admitted to the graduate program in Geography and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Women’s, Gender, and Sexuality Studies dual-title program. Refer to the Admission Requirements section of the Women’s, Gender, and Sexuality Studies Bulletin page.
Doctoral students must be admitted into the dual-title degree program in Women's, Gender, and Sexuality Studies prior to taking the qualifying examination in their primary graduate program.

**Degree Requirements**

To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Geography, listed in the Degree Requirements section. In addition, students must complete the degree requirements for the dual-title in Women's, Gender, and Sexuality Studies, listed on the Women's, Gender, and Sexuality Studies Bulletin page.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Geography and must include at least one Graduate Faculty member from the Women's, Gender, and Sexuality Studies program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Geography and Women's, Gender, and Sexuality Studies. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for dissertation committees, the dissertation committee of a Geography and Women's, Gender, and Sexuality Studies dual-title Ph.D. student must include at least two members of the Women's, Gender, and Sexuality Studies Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in Women's, Gender, and Sexuality Studies, the member of the committee representing Women's, Gender, and Sexuality Studies must be appointed as co-chair. The Women's, Gender, and Sexuality Studies representative on the student’s dissertation committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in Geography and Women's, Gender, and Sexuality Studies. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the dissertation committee, the head of the graduate program, and the Graduate School.

**5. Consultation for Dual-Title Doctoral Program in Climate Science**

There was early and frequent consultation by Geography with the Climate Science program head Michael Mann, Distinguished Professor of Atmospheric Science that has continued subsequent to adoption of the dual-title Climate Science Ph.D. program by the Department of Meteorology and Atmospheric Science. Moreover, Geography was represented on the Climate Science dual-title committee by physical geography Professors Andrew M. Carleton and Alan H. Taylor.
Input on the present proposal was provided by Vicki L. Hewitt, Ed. D., Director of Penn State’s Graduate Council Administration, Kern Graduate Building.
Fw: Formal submission of Geography and Climate Science dual-title PhD proposal

Perks, Jessica
Fri 2/15/2019 12:08 PM
To: Perks, Jessica <jdw213@psu.edu>

From: Mann, Michael
Sent: Thursday, February 14, 2019 5:44 PM
To: Brewer, Cynthia Ann
Cc: Carleton, Andrew Mark
Subject: Re: Formal submission of Geography and Climate Science dual-title PhD proposal

Dear Cindy:

I am aware of and approve of the proposal by Geography to adopt the Dual-Title Ph.D. and I look forward to Geography’s participation in this new program.

Please don’t hesitate to let me know if I can be of further help.

Thanks,
Mike Mann

On Feb 14, 2019, at 4:12 PM, Carleton, Andrew Mark <amc7@psu.edu> wrote:

Hi again Mike:
For Geography to formally submit our faculty-approved proposal for the dual-title PhD in Geography and Climate Science to the Graduate School, we "need to include a memo or email from the head of the Climate Science program (Michael Mann) indicating his awareness and approval of the proposal to adopt" (please refer Vicki Hewitt’s email to Cindy, reproduced below).

If you would send such a memo or email to Cindy (copied to me) before next Thursday, February 21st, that would allow us to meet the next submission deadline, bringing us one step closer to Grad School approval of the Geography and Climate Science dual-title PhD.

Many thanks in advance!
Andrew

Cindy,

To officially submit the proposal for central curricular review, you will need to submit an original signed proposal form and 2 copies of the complete graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Dean’s office, 211 Kern. The next deadline for submission for the JCC March agenda is Thu. Feb. 21.
Note that the proposal form needs to be signed by the Graduate Program Head, the College Representative to the Graduate Council Subcommittee on New and Revised Programs and Courses, and the College Dean or designee.

I also didn’t see consultation attached here. You will need to include a memo or email from the head of the Climate Science program (Michael Mann) indicating his awareness and approval of the proposal to adopt.

Michael E. Mann  
Distinguished Professor  
Director, Earth System Science Center (ESSC)

Department of Meteorology  
514 Walker Building  
The Pennsylvania State University  
University Park, PA 16802-5013  

Phone: (814) 863-4075  
FAX: (814) 865-3663  
email: mann@psu.edu  
www.michaelmann.net
Graduate Council
Program, Option, or Minor Proposal Form

Submit 1 original, signed Graduate Council proposal form and 2 hardcopies of the graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Office of the Dean of the Graduate School, 211 Kern Building, University Park. For more information about the process, see the Overview of the Graduate Council Curricular Review Process.

The Program Proposal Procedures provide guidance for the development of a graduate program proposal. If you have questions regarding the preparation of a graduate program proposal or how to complete this Graduate Council proposal form, contact the Office of the Dean of the Graduate School.

———

College/School: __ Engineering __
Department or Instructional Area: __ Industrial and Manufacturing Engineering __

———

New Graduate Program, Option, or Minor: Add

Designation of new graduate program: __ MEngIE
Classification of Instructional Programs (CIP) Code: __
Designation of new graduate option: __
Designation of new graduate minor: __

Indicate effective semester:
First semester following approval
Second semester following approval

Office of the Vice Provost and Dean of the Graduate School

———

Existing Graduate Program Option, or Minor: Change Drop

Current designation of graduate program: __
Current designation of graduate option: __
Current designation of graduate minor: __

New designation of existing graduate program (if changing): __
New designation of existing graduate option (if changing): __
New designation of existing graduate minor (if changing): __

Brief description of the change (if not noted above): __

Indicate effective semester:
First semester following approval
Second semester following approval

———

Submitted by Graduate Program Head

Janis Terpenning
Printed name
Signature
Date: 3/23/2018

Noted by College/School Representative to Graduate Council Subcommittee on New and Revised Programs and Courses:

Matt Parkinson
Printed name
Signature
Date: 3/23/18

Approved by College/School Dean/Chancellor (or Designee):

George A. Lesieutre
Printed name
Signature
Date: 28 Mar 2018
Recommended by Chair, Graduate Council Subcommittee on New and Revised Programs and Courses:

On Behalf of David Babb
Printed name: ________________  Signature: ________________
Date: 3/28/2019

Recommended by Chair, Graduate Council Committee on Programs and Courses:

On Behalf of C. Andrew Cole
Printed name: ________________  Signature: ________________
Date: 3/28/2019

Noted by Dean of the Graduate School:

On Behalf of Regina Vasilatos-Younken
Printed name: ________________  Signature: ________________
Date: 3/28/2019
Proposal for Off-Campus (On-Line) Delivery of a New Master of Engineering in Industrial Engineering Degree

Submitted by:

Dr. Andris Freivalds
Lucas Professor
Industrial & Manufacturing Engineering (IME) Department
The Pennsylvania State University
310 Leonhard Building
University Park, PA 16801

Revised: May 11, April 9, March 23, February 1, 2018;
December 6, November 7, August 3, April 19, 2017
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Proposal for Off-Campus (On-Line) Delivery of a New Master of Engineering in Industrial Engineering Degree

A. Justification Statement

1. Program Goals

For well over 60 years, a Master of Science with thesis degree program in Industrial Engineering (MSIE) has been offered as a resident program at Penn State - University Park. With the arrival of the new Dean of the College of Engineering (COE) in 2014, there was a strong push for a one-year Master of Science (MS) with paper degree program. To accommodate a new degree, the Graduate School required that an existing degree program, the Master of Engineering (MEngIE) be dropped. The original MS with thesis was retained. Two main factors have led to this proposal of requesting the renewal of the MEng degree but in an online format. First, nine years of experience with the Human Factors Engineering and Ergonomics (HFEE) Post-Baccalaureate Certificate has indicated that many of these graduates have requested further education in the form of a master’s degree. In addition, many potential certificate applicants have been holding off until there is a strong possibility of such a degree. Secondly, a 2015 marketing study by the World Campus Outreach group (Appendix A), strongly recommended pursuing a full master’s degree rather than extending or developing additional graduate certificates.

The goal of this proposal is to seek approval for offering an off-campus (online) MEngIE degree. This initiative also supports the Core Council’s recommendation for the COE (Appendix B) to explore revenue opportunities through more expansive World Campus programs. A professional master's degree with a culminating industrial experience rather than a research master’s degree (with a thesis or paper requirement) seems to be appropriate vehicle for distance students who would not be able to have the day-to-day contact with advisors that resident students have.

The proposed MEngIE will have comparable content and rigor to our on-site degrees, since most of the faculty who will be teaching the online graduate courses will be the same IE Graduate Faculty who are research-active, advise doctoral students, and will be teaching the same courses to our resident students. In fact, in the early stages, until enrollment grows, the courses may be taught in parallel, i.e. on-site students in one-section and distance students in another section, as is done presently for the HFEE Certificate courses.

Presently the IME department has approximately: 170-180 BSE degree recipients per year and 80 PhD and 110 MS students. However, the primary focus of the proposed MEngIE degree will not be for the current students but will be for the thousands of IE alumni who are working as professional engineers and cannot easily take leave from their careers to return physically to the University Park campus for on-site courses and degrees. Coincidentally, the proposed MEngIE degree may also help alleviate some of the overcrowding of the classrooms for our popular graduate classes. It may also assist us in increasing enrollments in less popular graduate level courses that have few enrolled on-site students and are often canceled.

In summary, there are two program goals for offering an online MEngIE degree: i) to provide an opportunity for our employed alumni and other professionals to seek further education in the
form of a professional graduate degree and ii) to provide the HFEE Certificate graduates a further opportunity to continue their education.

2. Needs Assessment

The motivation for developing an online MEngIE degree is being driven largely by an increased demand for advanced degrees, especially for those working as a practicing engineer. There are approximately 240,000 practicing industrial engineers in the United States (https://collegegrad.com/careers/industrial-engineers), many of which could be seeking advanced degrees that could be obtained online. There are many universities providing this service, but, interestingly, of the top 10 IE programs in 2016 (actually 12 schools due to ties), only four, including Penn State, do not have an online master’s degree. Therefore, it is imperative that the Penn State IE program, being one of the top 10 IE programs in the country, both in quality and size, provide such a desired service to its thousands of alumni (at least 4,300 on the active mailing list). There are no other online MEngIE degree programs offered within Penn State.

3. Proposed Course Offerings and Schedule

The MS with thesis IE degree has been offered for decades at Penn State - University Park. The objective of the existing and the proposed online degree programs is to provide students with the opportunity to gain advanced knowledge for analysis and design in industrial engineering. Our proposal is to offer essentially the same program in an online, professional format, replacing the thesis requirement with a culminating professional experience.

The requirements for the online MEngIE degree program include:
1. Minimum of 30 course credits at the 400, 500, or 800 level or higher, of which 21 course credits must be earned at Penn State (i.e. only 9 credits can be transferred from other institutions).
2. All students must successfully complete three credits of IE 894, Capstone Design.
3. At least 18 credits in 500- or 800- level courses, with at least 6 at 500 level (including IE 894).
4. At least 15 credits in 500- level or 800-level IE courses (including IE 894).
5. At least 21 credits of IE courses (including IE 894).
6. The culminating experience for this professional degree will be satisfied with IE 894, Capstone Design, which includes a written report summarizing the analyses and designs used to solve a problem in their workplace submitted to the course instructor.

Presently there are ten courses (30 credits) of 500-level IE courses and four courses (12 credits) of 400-level IE courses regularly offered. Based on our experience from the HFEE graduate certificate, students generally enroll in three courses per year, which would allow them to complete their degree in approximately three years. The exact distribution of the course offerings may change based on both on-site and online enrollment needs, since many of these courses, as mentioned previously for the HFEE Certificate, will be offered in parallel, one section on-site in parallel to another section online. However, a tentative schedule is as follows:
<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
<th>Summer Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE 427</td>
<td>IE 478</td>
<td>IE 402*</td>
</tr>
<tr>
<td>IE 479</td>
<td>IE 505(?)</td>
<td>IE 478</td>
</tr>
<tr>
<td>IE 505(?)</td>
<td>IE 552**</td>
<td>IE 479</td>
</tr>
<tr>
<td>IE 558</td>
<td>IE 553</td>
<td>IE 505</td>
</tr>
<tr>
<td>IE 575</td>
<td>IE 557</td>
<td>IE 511</td>
</tr>
<tr>
<td>IE 894</td>
<td>IE 894</td>
<td>IE 894</td>
</tr>
</tbody>
</table>

(?) depends on which semester the instructor in charge teaches it  
* instructor retired, need new one to take over  
** every other year

There are numerous other courses already online within engineering at Penn State (particularly in mechanical engineering, systems engineering, data analytics, and business supply chains), that the online students will be able to select from throughout their degree program. There are specifically three online IE courses that have already been developed and offered for the Smeal College of Business Online Supply Chain MPS, but haven't received final University approval (IE 587, Additive Manufacturing; IE 573, Manufacturing with Materials; IE 574, Advanced Manufacturing) and one offered through the online Master of Engineering in Additive Manufacturing (IE 427, Additive Manufacturing). Once those have final approval, they will also be available to the students desiring the MEng IE degree.

4. Admission Requirements for Online Degree

To maintain a high quality program, it is important that our students be of the caliber to successfully complete the degree. As such, the admission requirements for the students enrolling in the online program will not differ from those of our resident students. The IME Graduate Admissions Committee (made up of IME Graduate Faculty) will provide recommendations to the Graduate Program Coordinator and Director on accepting online students to the MEngIE degree program. It is expected that students have a Bachelor of Science degree in engineering or an Engineering Technology degree from a 4 year ABET accredited institution. Admission decisions will also be based upon the undergraduate GPA, GRE scores, and recommendation letters.

5. Size of Program and Duration

Estimates on the size of the program are based on two pieces of data: i) the number of HFEE Certificate students and ii) the size our current graduate program. The HFEE Certificate handles approximately eight students per class/year (each takes three classes per year and finishes). The human factors specialty accounts for 10% of the faculty and 10% of the graduate study body in the IME Department. Therefore, it is expected that eventually there could be ten times as many
or 80 students per year in the steady-state MEngIE program. Given it takes most students to
complete their degrees in three years (~3 courses per year); we would eventually graduate 25
students per year.

6. Impact on Existing Programs

The initial impact on the existing graduate programs in the IME Department would be nominal,
in the sense that the increase in the number of students will be gradual over 3-4 years as word of
the program spreads. Any increase in the size of existing courses can be compensated by using
PhD level teaching assistants for large mainly MS courses. Eventually, there may be need to start
offering certain courses or sections more than once per year, in which case (probably after 4-5
years) there may be a need to hire more faculty. That cost of that would be covered by the
additional revenue generating by the online student tuition money.

7. Fiscal Responsibility

Financial arrangements between the COE and World Campus will follow the COE Plan for
Online Delivery of Engineering Programs and the Development of a New Office for Digital
Learning in the College of Engineering (March 3, 2016, Appendix C) report, in which existing
capture-stream video methods will be utilized. Most of the IE courses have already been
developed using this approach and we will continue to use this approach for any IE courses being
prepped for online delivery. The on-line MEng in IE will be advertised and operated through the
IME Department and, thus, will fall under the SAVE plan. However, some of the IE courses were
originally developed for other programs (e.g. Smeal College of Business Online Supply Chain
MPS) and may have received instructional support from World Campus and, thus, may operate
on different financial plan.

8. Scholarship and Research Integrity (SARI) Training

During the first year of enrollment, all MEngIE students will be required to complete an online
RCR training program provided by the Collaborative Institutional Training Initiative (CITI). The
Office for Research Protections (ORP) provides a link to this training via the SARI Resource
Portal. An additional five hours of SARI training will be obtained from online material prepared
by both the IME Department and the COE (Attached in Appendix G).

B. Graduate Degree Programs Bulletin Listing

The proposed MEngIE degree Bulletin listing is given in Appendix D.

C. Essential Elements of Residency

1. Interaction Between Faculty and Students Beyond Direct Instruction

Interaction between faculty and students will take place through the courses and through the
completion of their capstone design report to fulfill the degree requirements. During course
offerings, the distance students will interact with the faculty during specified office hours either
by phone or through some type of web-conferencing such as that provided by Skype and through email exchanges.

2. Interaction among Students

Some of the courses utilize laboratories as part of the course instruction. Typically, for the HFEE Certificate instructors have utilized ‘mixed’ teams of on-site and online students. This will be continued for the other courses offered in the MEngIE program. So as to provide the online students opportunities to be engaged with resident students and faculty at Penn State.

3. Access to Information and Instructional Resources

The Penn State library system is one of the largest research libraries in North America with more than 100,000 e-books. Online students enrolled in the MEngIE degree program will have access to the library resources to access e-journals, e-books, course reserves, and database searches. The University Libraries also provides access to interlibrary loan and document delivery materials in both hard copy and electronic format, which would also be available to online students. In addition, assistance can be requested anytime from reference librarians via email, phone calls, or chat services.

4. Access to Suitable Academic Advising and Support Services

Just as our Graduate Program Coordinator advises our resident MSIE students, the Director of MEngIE will advise our online MEngIE students. The Director will closely monitor the course selections made by the online students to ensure the appropriate technical courses are taken normal degree progression is maintained. Advising for students in the online program will take place through a mutually agreeable combination of email, web/audio conferencing, telephone calls, and in-person meetings when appropriate.

World Campus Admissions and Financial Aid will typically be the first point of contact for prospective students for the online program. The Admissions staff will address questions from prospective students, and discuss financial aid options.

5. Students’ Contribution to the Program, College, and University

As was previously mentioned, the work experiences that the online students will bring into the classroom will be of benefit to our faculty and to our on-campus students. These contributions could lead to enhanced discussions as well as potential research collaborations. These discussions are expected to take place between our residential and online students through the use of course chat rooms and joint office hours administered by the faculty member for the course.

6. Identification with Penn State and the Field of Study

The students enrolling in the online MEngIE degree program will identify with Penn State through several avenues:
i) interacting directly with Penn State faculty through courses and office hours; and being advised by a Penn State IME faculty member
ii) being part of the on-site class if they choose to watch the course synchronously
iii) watch research seminars on-line and participate in departmental research exhibitions by submitting a research poster

D. Program Operation and Maintenance

1. Program Coordination

The coordination for the MEngIE will reside within the Industrial & Manufacturing Engineering Department at Penn State at University Park, with the primary operations occurring within the IME Graduate Office. Those involved in administering the online program will include the following:

Dr. Janis Terpenny, Professor and Peter and Angela Dal Pezzo Department Head, IME Department

Dr. Andris Freivalds, Lucas Professor and Director of the MEngIE degree, IME Department

Dr. Robert Voigt, Professor and Graduate Program Coordinator, IME Department

Ms. Lisa Fuoss, Graduate Staff Assistant, IME Department, who will serve as the primary contact within the Department for the online students

Ms. Cathy Holsing, Director, COE Office for Digital Learning, who will serve as the liaison with World Campus

Ms. Sonya Leitzell, Director of Academic Affairs, World Campus, who will serve as the person who will coordinate the online MEngIE degree program with the World Campus

2. Academic Support to Students

In addition to the support listed above in section D.1, online students will be supported through student scheduling, registration, and billing which are all integrated into the World Campus support system for students. The reporting of grades will occur through LionPath. In addition, the Help Desk will provide the needed technical support through email or by phone. As stated on Penn State’s World Campus website, the following support will be provided to our online students:

i) walking students through the program application process, including identifying the required supporting documentation; finding financial aid, scholarships, and other types of financial support; and preparing them for learning in an online environment;

ii) using University systems to access course syllabi and assignments; interact with professors and peers; make tuition payments; order textbooks and software through the online bookstore; and use the University Libraries system;

iii) providing resources for online students including career counseling, exam proctoring
and tech support;

iv) linking online students with communities and special services for military members and veterans, international students, alumni, corporate education, students with disabilities, and those transferring from other universities and colleges; and,
v) providing connections for the online students to the Penn State community by keeping students up-to-date with events, important dates, and Penn State news.

3. Instructional Design Support and Available Facilities

The online course delivery for the MEngIE degree will mostly coincide with the resident course delivery such that the courses will be offered both synchronously and asynchronously. While the online students will be able to view the lecture synchronously or asynchronously, the resident students will receive the information live at the specified course meeting times and will have access to the recorded classes to further promote learning. During the Summer Semester, all courses will be solely on-line.

Canvas will be the primary web-based course management system. Through Canvas, students will receive the needed course materials (syllabi, readings, etc.) and lectures. Canvas also supports access to course content including asynchronous threaded discussion and real-time chat, automated quizzing with immediate feedback, grade management, and reporting functions. To assist faculty members in converting existing course material to a fully online environment, we will primarily utilize the COE Office for Digital Learning, which will assist with course or program design and course or program implementation and delivery. Note, that the current streaming videos will be updated with more innovative approaches being developed by the COE Office for Digital Learning.

4. Technological Resources Needed by Students

Students in the online MEngIE degree program are expected to possess or have access to a personal computer and a broadband internet connection. The minimum system and software specifications are outlined at http://www.worldcampus.psu.edu/general-technical-requirements

E. Consultation with Other Units Affected by the Proposed Program

Written responses from April 17, 2018, e-mail requests are included in the Appendix E.

Agricultural & Biological Engineering, Paul Heinemann, Department Head. Supportive
Aerospace Engineering, Philip Morris, Interim Department Head. No Response
Architectural Engineering, M. Kevin Parffitt, Interim Department Head. No Response
Bioengineering, Cheng Dong, Department Head. No Response
Capitol Campus, School of Science, Engineering, Technology, Rafic Bachnak, Supportive
Chemical Engineering, Philip Savage, Department Head. Supportive
Civil and Environmental Engineering, Patrick J. Fox, Department Head. Supportive
Computer Science and Engineering, Chitarayan Das, Department Head. No Response
Electrical Engineering, Kultegin Aydin, Department Head. Supportive
Engineering Science and Mechanics, Judith Todd, Department Head. No Response
Mechanical and Nuclear Engineering, Karen Thole, Department Head. Supportive
Office of Research Protection, Debrah A. Poveromo Supportive
SEDAPP, Sven Bilén, Department Head.
Great Valley, Colin Neill, Online Data Analytics MPS,
Smeal College of Business, Gary Gittings, Online Supply Chain
World Campus, Karen Pollack, Director of Academic Affairs.

No Response
Supportive
No Response
Supportive

F. Program Quality

Assessment of the program quality will be done continuously through many avenues. It will be the responsibility of the Department Head, Director of the MEngIE degree, Graduate Program Coordinator, and the Director of the Academic Affairs in World Campus to ensure that the program is maintained at a high quality. Final exit surveys will also be given to each student upon their degree completion. Peer teaching reviews will be conducted each semester for non-tenured faculty members and annually for Associate Professors. Students’ assignments will be submitted electronically through their online classroom environment-just, as they would turn them in to their professor on campus. Most exams will be taken either through an approved University proctor or through online proctoring services (such as Examity)
Appendix A:  
Market Scan: Opportunities in Human Factors Engineering and Ergonomics and Industrial Engineering

Prepared By:  
Brianne Hennel  
Outreach Market Research  
bnh10@psu.edu
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Market Scan: Opportunities in Human Factors Engineering and Ergonomics and Industrial Engineering

> **Context**

- The College of Engineering has proposed a graduate level Advanced Human Factors Engineering and Ergonomics (HFEE) Certificate to be offered online through Penn State World Campus. There is currently a Human Factors Engineering and Ergonomics graduate certificate offered through World Campus, in partnership with the College. This existing nine credit certificate program would be a prerequisite for the proposed advanced certificate program.

- The proposed certificate is intended to provide additional courses for the four to five students taking the current HFEE certificate program. For the fall 2015 semester, there are only three students enrolled in the existing World Campus HFEE certificate program. The unduplicated student headcount for BAY 2014-15 was nine.

- The courses for the existing World Campus certificate program are listed below.

  **Table 1: Courses for Existing World Campus HFEE Certificate**

<table>
<thead>
<tr>
<th>Course</th>
<th>Prerequisites</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I E 479 Human-Centered Product Design and Innovation</td>
<td>I E 408 Cognitive Work Design or I E 419 Work Design–Productivity and Safety</td>
<td>3</td>
</tr>
<tr>
<td>I E 553 Engineering of Human Work</td>
<td>BIOL 141 (GN) Introductory Physiology or BIOL 472 Mammalian Physiology</td>
<td>3</td>
</tr>
<tr>
<td>I E 558 Engineering of Cognitive Work</td>
<td>I E 323 Statistical Methods in Industrial Engineering and I E 408 Cognitive Work Design</td>
<td>3</td>
</tr>
</tbody>
</table>

- The courses for the proposed advanced certificate are listed in Table 2. All three courses exist in-residence. According to the intake form, I E 552 is already prepared for online delivery, while I E 511 and I E 557 will be developed and taught in an online format during the 2015-2016 academic year.

  **Table 2: Courses for Proposed Advanced HFEE Certificate**

<table>
<thead>
<tr>
<th>Course</th>
<th>Prerequisites</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I E 511 Experimental Design in Engineering</td>
<td>I E 323 Statistical Methods in Industrial Engineering</td>
<td>3</td>
</tr>
<tr>
<td>I E 552 Mechanics of the Musculoskeletal System</td>
<td>BIOL 472 Mammalian Physiology</td>
<td>3</td>
</tr>
<tr>
<td>I E 557 Human-in-the-Loop Simulation</td>
<td>I E 453 Simulation Modeling for Decision Support (bulletin also says I E 418)</td>
<td>3</td>
</tr>
</tbody>
</table>
Recommendations

- Based on market factors and current enrollments in the existing HFEE certificate, development of an additional certificate in HFEE carries significant risk and is not recommended. The existing HFEE certificate program has only three students enrolled for fall 2015. The intent of the proposed certificate is to provide additional courses for this audience and therefore is expected to be very small, as well.
  - Students who would earn the 18 credits required for both certificates would only be able to apply 15 of those credits toward a Penn State master’s degree. This may make the second certificate less appealing to some who may want to continue their studies and earn a degree.
  - Rather than develop a second, advanced certificate, it is recommended that the current certificate be extended to 12 credits and the proposed new courses be developed as electives.
  - It should also be noted that adding courses is not likely to attract net new students, and so enrollments are expected to be very low, regardless of the number of courses offered.

- There does not appear to be a high demand for a graduate-level credential in this area, as most related job postings only desired bachelor’s degrees, primarily in engineering. Coursework in human factors and ergonomics is typically included within industrial engineering programs. There are few online programs in the market focusing solely on human factors or ergonomics.

- The College may want to consider developing the master’s degree in Industrial Engineering. The market for the master’s degree is more viable than the proposed certificate and would be a better opportunity for the College. There were approximately 2,000 master’s degrees in industrial engineering conferred in 2012-13. There are around 3,000 bachelor’s degree conferred in this area each year to serve as a pipeline into a master’s program. While jobs in the field typically require a bachelor’s degree for entry into the field, a master’s degree will reach an audience of engineers looking for advanced study or wanting to enter the industrial engineering field.
  - HFEE could be a potential emphasis area within a broader industrial engineering master’s program. Additional options in a broad master’s degree might also be viable. An intake form and additional research would need to be conducted to explore these options.
Key Findings

- For the fall 2015 semester, there are only three students enrolled in the existing World Campus HFEE certificate program. The unduplicated student headcount for BAY 2014-15 was nine.

- The educational attainment required for certification as a Certified Professional Ergonomist (CPE), Certified Human Factors Professional (CHFP), or a Certified User Experience Professional (CUXP) through the Board of Certification in Professional Ergonomics (BCPE) is only a bachelor’s degree.

- One-hundred job postings were collected from the indeed.com online job postings aggregation site, using the keywords ergonomics, human factors, human factors engineer, and industrial engineer. Overall, 75 percent of the job postings required a bachelor’s degree. Only a limited number of jobs included human factors or ergonomics related tasks as primary aspects of the job or desired experience.

- The target occupations for the proposed certificate program are industrial engineers, occupational health and safety specialists, and health and safety engineers. Industrial engineers make up the majority of the target audience, with 243,926 workers currently employed in the occupation and seven percent growth anticipated over the next ten years. The typical level of education required for entry into the field for all three of the target occupations is a bachelor’s degree. One-half of current industrial engineers and health and safety engineers and approximately one-third of occupational health and safety specialists already have bachelor’s degrees. Twenty-two to twenty-three percent of current employees in these occupations have master’s degrees or higher.

- There were 3,624 bachelor’s degrees and 2,023 master’s degrees in industrial engineering conferred in 2012-13. Conferrals for certificates are significantly fewer than those for the full degrees. There were only 58 postbaccalaureate certificates conferred in 2012-13. None of these certificates were awarded by Penn State.

- There were 25 online industrial engineering master’s degree programs identified in the market. Competitors of note include Arizona State University, Auburn University, Columbia University, New York University, Purdue University, Texas A&M University-College Station, and University of Southern California. More than half of these programs include human factors or ergonomics content in their marketing or course content. There were only seven online master’s degrees and four online graduate certificates in human factors identified in the market. Auburn University offered a certificate in occupational safety and ergonomics.

- The average in-state total program cost for a master’s degree in industrial engineering within the competitive set was $25,930, while the average out-of-state total program cost was $33,047. A 32-credit World Campus engineering degree would cost $29,760 at the $930 tuition rate.

- The average in-state cost for an online graduate certificate program in human factors/ergonomics was $10,599, while the average out-of-state cost was $11,551. While a nine-credit World Campus HFEE certificate would cost $7,245, placing it toward the bottom of the small competitive set, completion of the first certificate would be required for students to take the proposed advanced certificate program. At the standard graduate tuition rate of $805, 18 credits would cost $14,490, which is more expensive than the other certificates in the competitive set.
Overview of Professional Human Factors/Ergonomics Organizations

- Board of Certification in Professional Ergonomics (BCPE)
  - The BCPE provides professional certification for practitioners of human factors/ergonomics (HFE) who demonstrate expertise and comprehensive understanding of the discipline.
  - There are two levels of certification available, professional and associate, with choice of designation dependent on the applicant’s career focus. Available professional certifications are Certified Professional Ergonomist (CPE), Certified Human Factors Professional (CHFP), and Certified User Experience Professional (CUXP), with an associate certification also available in each area. Professional certification requires a non-specific bachelor’s degree and coursework covering core competencies, a minimum of three years of related work experience, and a passing score on the certification exam.
  - The core competencies are displayed in Figure 1 below.

Figure 1: Core Competencies for BCPE Certification

Source: bcpe.org
A specific number of academic units are required in each of the core competencies, as listed in Table 3. A total of 24 semester units of content are required.

**Table 3: Core Competencies for BCPE Certification**

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester Units</th>
<th>Quarter Units or CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods and Content Specific to Application Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Human-Machine Interaction</td>
<td>7</td>
<td>10.5</td>
</tr>
<tr>
<td>• Human-Environment Interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Human-Software Interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Human-Job Interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Human-Organization Interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Methodology: Analysis and Design of Processes and Product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Statistics and Design of Investigations</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>• Basic Process Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Design Methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Basic Usability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Background Relevant to Ergonomics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Human Attributes (Anthropometry &amp; Demography, Physiology &amp; Biomechanics, Psychology)</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>• Environmental Context (Physical Environment, Social Environment, Organizational Environment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Principles of Ergonomics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• System Concepts</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>• Design Concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>Professional issues</td>
<td>1</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Source: bcpe.org

There is one exam for Professional certification. It covers the core competencies, consists of 125 multiple choice questions, and takes approximately three hours to complete. The exam is proctored and administered electronically twice a year. Successful candidates receive a certificate, access to the Private Certificant Directory, and use of the credential selected at the time of application.

Certification fees include an application processing fee ($150), an examination fee ($350), a certification maintenance fee ($150), and an additional one-time fee ($150) for a total of $800.
Human Factors and Ergonomics Society (HFES)

- The Human Factors and Ergonomics Society is a multidisciplinary professional association of more than 4,500 persons in the United States and throughout the world. Its members include psychologists, engineers, designers, and scientists, all of whom have a common interest in designing systems and equipment to be safe and effective for the people who operate and maintain them.

- Members are employed in industries, universities and colleges, government agencies, consulting firms, military research centers, public utilities, and other settings. More than 40% hold a doctoral degree, a third hold a master's degree, and about 15% have a bachelor's degree. Students make up about 15% of the total membership.

- There are several categories of membership. The regular membership categories include full member, associate member, and affiliate member. A full member must have a bachelor's degree and five years of full-time, applicable experience. Educational attainment beyond a bachelor's degree can substitute for up to four years of work experience. Full members can vote and hold office. An associate member needs two years of full-time, relevant experience and an affiliate member can be someone who is interested in the human factors field, but does not qualify for the full or associate member status. Dues for a regular membership at full, associate, or affiliate level are $215. Dues for a student membership are $35. Members can pay additional money for special membership categories and additional acknowledgment.

- Membership benefits include access to journals and publications, events, the HFES career center, technical groups, webinars, local and student chapters, an online member directory, an online consultants directory, the HFES LinkedIn group, and special discounts from companies like Academic Press and Hertz.
Current Job Postings

- A search of the indeed.com online job postings aggregation site was conducted to better understand what jobs are currently available, as well as to determine what education, skills, and work experience employers desire.

- Overall Summary
  - One-hundred job postings were collected for analysis, using the keywords ergonomics, human factors, human factors engineer, and industrial engineer. Nearly half of the job postings were for industrial engineers.

Table 4: Summary of Job Titles

<table>
<thead>
<tr>
<th>Job Titles</th>
<th>Industrial/Manufacturing Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of User Experience</td>
<td></td>
</tr>
<tr>
<td>Environmental Health and Safety Director</td>
<td>Lean Facilitator</td>
</tr>
<tr>
<td>Environmental Health and Safety Engineer</td>
<td>Occupational Health and Safety Specialist</td>
</tr>
<tr>
<td>Environmental Health and Safety Specialist</td>
<td>Operations Industrial Engineer</td>
</tr>
<tr>
<td>Ergonomist</td>
<td>Senior Human Factors and Ergonomics Engineer</td>
</tr>
<tr>
<td>Health and Safety Engineer, Ergonomics</td>
<td>Senior Industrial Engineer</td>
</tr>
<tr>
<td>Human Centered Design/Human Factors</td>
<td>Specialty Engineer</td>
</tr>
<tr>
<td>Human Factors Engineer</td>
<td>Usability Engineer</td>
</tr>
<tr>
<td>Human Factors/Industrial Engineer</td>
<td>User Experience Designer/Human Factors Engineer</td>
</tr>
<tr>
<td>Human Systems Analyst/Systems Engineer</td>
<td>User Experience Specialist</td>
</tr>
<tr>
<td>Industrial Engineer</td>
<td>UX Designer/Researcher</td>
</tr>
</tbody>
</table>

Source: indeed.com

- Overall, 75 percent of the job postings only required a bachelor’s degree. Only six percent of job postings required a master’s degree.

- More than half of the job postings desired an engineering credential, most commonly in industrial engineering.

- Only 27 percent of job postings specifically mentioned human factors within the job description, job responsibilities, desired experience, and or desired skills, while slightly more (35%) mentioned ergonomics. Human factors and ergonomics job postings are discussed in more detail below, as are industrial engineering job postings.

- Human Factors
  - There were 26 job postings that specifically mentioned human factors within the job description, job responsibilities, desired experience, and/or desired skills. Only seven job postings mentioned both human factors and ergonomics.

Table 5: Human Factors Job Titles

<table>
<thead>
<tr>
<th>Human Factors Job Titles</th>
<th>Industrial Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Centered Design/Human Factors</td>
<td></td>
</tr>
<tr>
<td>Human Factors Engineer</td>
<td></td>
</tr>
<tr>
<td>Human Factors/Industrial Engineer</td>
<td></td>
</tr>
<tr>
<td>Human Systems Analyst/Systems Engineer</td>
<td></td>
</tr>
<tr>
<td>Human Factors Engineer</td>
<td>Senior Human Factors and Ergonomics Engineer</td>
</tr>
<tr>
<td>Human Factors/Industrial Engineer</td>
<td>User Experience Designer/Human Factors Engineer</td>
</tr>
</tbody>
</table>

Source: indeed.com
More than half of the 26 human factors job postings (57%) required a bachelor's degree. Human factors was mentioned as a preferred field of study in fifteen of the job postings. Engineering was mentioned in nine of the job postings, typically general or industrial, while psychology (primarily general or cognitive) was mentioned in eight job postings.

For slightly more than half of the human factors job postings, (14 of the 26), human factors tasks were a primary part of the job. These job postings were almost exclusively for human factors engineers. For the other job postings, human factors duties were part of a wider variety of unrelated responsibilities.

Most would-be employers were interested in human factors in terms of knowledge, design, research, data and analysis, the establishment and understanding of standards, prior experience in the field, and testing.

- *The Human Factors Engineer will develop human factors design, testing, and applied research.*
- *Demonstrated knowledge and ability of developing valid test plans and experimental design to support the Human Factors Engineering research metrics.*
- *A background in human factors/ergonomics, product support, system analysis, industrial analysis, product/process design activities, and/or system safety is desired.*
- *Actively participate on device program teams to ensure sound human factors principles are considered and implemented.*

**Ergonomics**

- There were 35 job postings that specifically mentioned ergonomics within the job description, job responsibilities, desired experience and/or desired skills. Only seven job postings mentioned both human factors and ergonomics.

- Job titles are listed in Table 6 below.

<table>
<thead>
<tr>
<th>Ergonomics Job Titles</th>
<th>Human Factors/Industrial Engineer</th>
<th>Human Factors Engineer</th>
<th>Industrial Engineer</th>
<th>Senior Human Factors and Ergonomics Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Health and Safety Specialist</td>
<td>Environmental Health and Safety Director</td>
<td>Ergonomist</td>
<td>Health and Safety Engineer, Ergonomics</td>
<td></td>
</tr>
</tbody>
</table>

*Source: indeed.com*

More than three-quarters of the 35 ergonomics job postings (77%) required a bachelor's degree. Engineering as a field of study was mentioned in nineteen of the job postings (54%), most commonly industrial or general engineering. Human factors as a field of study was only mentioned in nine of the job postings, while ergonomics was mentioned in three of them.

Only 11 of the 35 ergonomics job postings included ergonomics as a primary part of the job, with most of these job postings being for ergonomists. For the other job postings, ergonomics related duties were secondary and part of a larger list of responsibilities.

Would-be employers were interested in ergonomics assessments, experience, possessing and sharing ergonomics knowledge, and training.
Market Scan: Opportunities in Human Factors Engineering and Ergonomics and Industrial Engineering

- Lead the evaluation and subsequent revision of all work methods and workflow for all functions to ensure they are ergonomically correct.
- You must have 3+ years of proven experience in occupant packaging, human factors, or ergonomics, 7+ years preferred.
- Must have a strong working knowledge of Industrial Ergonomics.
- Provides advice to Legal on issues requiring ergonomic expertise.
- Identify and implement ergonomic opportunities, including education and retraining with respect to work station evaluation, posture review and body mechanics.

- **Industrial Engineers**
  - There were 47 job postings with ‘industrial engineer’ as part of the job title.
  - Nearly all of the job postings (45 of 47) required a bachelor’s degree. Approximately three-quarters (34 of 47) of the industrial engineering job postings mentioned industrial engineering as a preferred field of study. Manufacturing engineering was mentioned in ten job postings, while general engineering and mechanical engineering were mentioned in six postings each.
  - Employers desired engineering-related and general skills like project planning/management, analysis skills, problem-solving skills, Microsoft Office, AutoCAD or CAD, familiarity with lean manufacturing, the ability to work in teams, and presentation skills.
  - Thirteen of the industrial engineer job postings mentioned ergonomics somewhere within the description, responsibilities, desired experience, and/or desired skills; however, ergonomics was only a primary part of one of the job postings.
  - Only three of the job postings mentioned human factors, and human factors were a primary part of two of the postings.

- **Industrial Engineers and Ergonomics**
  - Thirteen of the forty-seven industrial engineer job postings (28%) mentioned ergonomics somewhere within the job description, responsibilities, or desired experience. Ergonomics was only a primary part of one of the job postings.
  - Employers were most interested in ergonomic and performance assessment, experience in ergonomics, and the ability to determine opportunities and improvements in ergonomics.
    - Experience using ergonomic principles to develop and improve tools, equipment, and work stations preferred.
    - Lead the evaluation and subsequent revision of all work methods and workflow for all functions to ensure they are ergonomically correct.
    - Perform time studies, ergonomic/safety assessments, process flow analysis, line balancing, and productivity evaluations for all production areas and implement identified improvements.
    - Typical projects could include spearheading a redesign effort for the inbound unload, evaluating the ergonomic needs and issues induct work areas, or conducting a capacity planning and analysis study for peak season.
Industrial Engineers and Human Factors

- Only three of the job postings mentioned human factors. Human factors were a primary part of two of the job postings. All three of the industrial engineer job postings that mentioned human factors also mentioned ergonomics.

  ♦ Other responsibilities will include initiating and participating in concurrent engineering efforts, evaluating conceptual designs, technical analysis and resolution of engineering problems on all aspects of human factors engineering discipline.

  ♦ A background in human factors/ergonomics, product support, system analysis, industrial analysis, product/process design activities, and/or system safety is desired. Certified Human Factors professional or prior military acquisition program experience a plus. Experience in developing and conducting Human Factors test and evaluation programs is highly preferred.

  ♦ Identify opportunities, and successfully implement improvements, in the area of human factors (ergonomics)
Market Scan: Opportunities in Human Factors Engineering and Ergonomics and Industrial Engineering

- **Target Audience**

  - The Occupational Information Network (O*NET) was used to match job titles found in the market with their corresponding occupational codes. Occupational data is reported at the Standard Occupational Classification (SOC) level.
  
  - Most of the job titles fell under the O*NET classification of human factors engineers and ergonomists, which is reported under the SOC classification for industrial engineers. Environmental health and safety positions were reported under occupational health and safety specialists and/or health and safety engineers.
  
  - The three occupations in the right hand column are the target occupations for the proposed certificate program.
  
  - Examples are shown in Figure 2 below.

**Figure 2: Matching Job Titles in the Market to Target Occupations**

<table>
<thead>
<tr>
<th>Job Title</th>
<th>O*Net Sub-Categorization</th>
<th>SOC Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Health and Safety Director</td>
<td>17-2111.01 Industrial Safety and Health Engineers</td>
<td>17-2111 Health and Safety Engineers, Except Mining Safety Engineers and Inspectors</td>
</tr>
<tr>
<td>Industrial Engineer</td>
<td>17-2112.00 Industrial Engineers</td>
<td></td>
</tr>
<tr>
<td>Director of User Experience</td>
<td>17-2112.01 Human Factors Engineers and Ergonomists</td>
<td>17-2112 Industrial Engineers</td>
</tr>
<tr>
<td>Ergonomist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Factors Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Human Factors and Ergonomics Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>User Experience Specialist</td>
<td>28-9011.00 Occupational Health and Safety Specialists</td>
<td>29-9011 Occupational Health and Safety Specialists</td>
</tr>
<tr>
<td>Environmental Health and Safety Specialist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupational Health and Safety Specialist</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Target Occupations**

- Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
- Industrial Engineers
- Occupational Health and Safety Specialists

*Source: Indeed.com, O*NET, Bureau of Labor Statistics (BLS)*
> **Occupation and Employment Trends**

- Industrial engineers make up the majority of the target audience, with 243,926 workers currently employed in the occupation and seven percent growth from new jobs anticipated over the next ten years. There are approximately 90,000 openings anticipated over the next ten years due to replacement needs (i.e. retirements, layoffs).

- The typical level of education required for entry into the field for all of the target occupations is a bachelor’s degree.

**Table 7: Projected Occupational Growth in Target Occupations, 2015-2025**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and Safety Engineers, Except Mining Safety Engineers and Inspectors</td>
<td>25,357</td>
<td>28,118</td>
<td>2,761</td>
<td>11%</td>
<td>10,533</td>
<td>Bachelor’s degree</td>
</tr>
<tr>
<td>Industrial Engineers</td>
<td>243,926</td>
<td>261,812</td>
<td>17,886</td>
<td>7%</td>
<td>91,293</td>
<td></td>
</tr>
<tr>
<td>Occupational Health and Safety Specialists</td>
<td>67,150</td>
<td>74,059</td>
<td>6,909</td>
<td>10%</td>
<td>26,220</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>336,433</td>
<td>363,980</td>
<td>27,557</td>
<td>8%</td>
<td>128,047</td>
<td></td>
</tr>
</tbody>
</table>

*Source: EMSI 2015.2–Employees*

- Approximately one-quarter of the work force in all three of the target occupations are age 55 or older, but the split between the various age ranges is relatively even.

**Figure 3: Age Ranges of Current Workforce in Target Occupations, 2015**

- Occupational Health and Safety Specialists
  - Age 21 and below: 21%
  - Age 22-24: 22%
  - Age 25-34: 25%
  - Age 35-44: 25%

- Industrial Engineers
  - Age 21 and below: 18%
  - Age 22-24: 23%
  - Age 25-34: 30%
  - Age 35-44: 26%

- Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
  - Age 21 and below: 18%
  - Age 22-24: 21%
  - Age 25-34: 29%
  - Age 55+: 28%

*Source: EMSI 2015.2–Employees*
Market Scan: Opportunities in Human Factors Engineering and Ergonomics and Industrial Engineering

- One-half of current industrial engineers and health and safety engineers already have bachelor's degrees, while only about one-third of current occupational health and safety specialists already have bachelor's degrees.

- Around 20 percent of current industrial engineers, health and safety engineers, and occupational health and safety specialists already have master's degrees.

**Figure 4: Educational Attainment for Workers 25 Years and Older by Target Occupation, 2010-11**

![Bar chart showing educational attainment for different occupations.]

- **Health and safety engineers, except mining safety engineers and inspectors**
  - 5% High school or less
  - 13% Some college, no degree
  - 8% Associate degree
  - 50% Bachelor's degree
  - 19% Master's degree
  - 19% Doctoral or professional degree

- **Industrial engineers**
  - 5% High school or less
  - 13% Some college, no degree
  - 9% Associate degree
  - 50% Bachelor's degree
  - 19% Master's degree
  - 19% Doctoral or professional degree

- **Occupational health and safety specialists**
  - 13% High school or less
  - 19% Some college, no degree
  - 33% Associate degree
  - 37% Bachelor's degree
  - 20% Master's degree

*Source: BLS*
Degrees Awarded

- There were 3,624 bachelor's degrees in industrial engineering conferred in 2012-13. While this number is 27 percent higher than conferral numbers five years ago, it is still small compared to areas of engineering like civil, electrical, and mechanical.

![Figure 5: Five-Year Trends in Engineering Bachelor's Degrees](image)

Source: IPEDS

- Master's degree conferrals have remained relatively consistent over the last five years, up by one percent since 2008-09. There were 2,023 master's degrees in industrial engineering conferred in 2012-13, but more than half of those master's degrees were earned by international students.

- Conferrals for certificates are significantly fewer than those for the full degrees. There were only 58 postbaccalaureate certificates conferred in 2012-13, down from the 81 postbaccalaureate certificates conferred five years ago. None of these certificates were awarded by Penn State.

![Figure 6: Five-Year Trends in Industrial Engineering Conferrals](image)

Source: IPEDS
Market Scan: Opportunities in Human Factors Engineering and Ergonomics and Industrial Engineering

> **Competition**

- **Graduate Certificates**
  - There were four online graduate certificate programs found in the market that were related to human factors and/or ergonomics. Two of the programs were in human systems integration, one was in occupational safety and ergonomics, and one was in lean ergonomics for manufacturing and healthcare.
  - Auburn University is a peer institution and offers the certificate in occupational safety and ergonomics.

**Table 8: Online Graduate Certificate Programs in Human Factors/Ergonomics**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn University</td>
<td>Graduate Certificate in Occupational Safety and Ergonomics</td>
</tr>
<tr>
<td>Missouri University of Science and Technology</td>
<td>Graduate Certificate in Human Systems Integration</td>
</tr>
<tr>
<td>Naval Postgraduate School</td>
<td>Graduate Certificate in Human Systems Integration</td>
</tr>
<tr>
<td>Wright State University</td>
<td>Graduate Certificate in Lean-Ergonomics for Manufacturing and Healthcare</td>
</tr>
</tbody>
</table>

- **Non-credit Certificates**
  - There were three online non-credit certificate programs found in the market that related to human factors and/or ergonomics. Colorado State University offers a non-credit professional development certificate in occupational ergonomics.
  - OccuPro is owned by a Physical Therapist and Occupational Therapist with a combined 40 years of experience in industrial rehab, on-site services, and owning businesses. The Office Ergonomics Certification continuing education course is designed for professionals and taught by Certified Professional Ergonomists. Students can participate through a live webcast or on demand. A certificate and CEUs are awarded.
  - The Occupational Safety and Health Administration (OSHA) Training Institute offers a one-hour ergonomics certificate course that awards an OSHA Training Institute Education Center Certificate of Completion.

- **Master’s Degrees**
  - There were 25 online industrial engineering master’s degree programs found in the market. A table listing all of the competitive programs can be found in the Appendix. Competitors of note include Arizona State University, Auburn University, Columbia University, New York University, Purdue University, Texas A&M University-College Station, and University of Southern California.
  - Fourteen of the competitors mentioned human factors and/or ergonomics in the program description, within the curriculum, or had a concentration available. Primarily, this entailed having human factors or ergonomics courses available within the curriculum. For some programs, curricular information was not available.
    - Wright State University’s program was in both industrial and human factors engineering.
Table 9: Online Industrial Engineering Programs with Human Factors/Ergonomics Content

<table>
<thead>
<tr>
<th>Institution</th>
<th>Concentration</th>
<th>Curriculum</th>
<th>Program Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn University</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Iowa State University</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Mississippi State University</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>North Carolina State University</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Oklahoma State University</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purdue University</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Texas A&amp;M University-College Station</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Texas A&amp;M University-Kingville</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>University of Central Florida</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>University of Michigan-Dearborn</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>University of Southern California</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>University of Tennessee Space Institute</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>University of Texas-Arlington</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Wright State University</td>
<td></td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

While there were 25 master’s degrees in industrial engineering, more than half of which mentioned human factors or ergonomics somewhere in the marketing or course requirements, there were only seven online master’s degree programs found in the market that related to human factors and/or ergonomics. These included specific areas of human factors like design or aeronautics.

Table 10: Online Master’s Degree Programs in Human Factors/Ergonomics

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentley University</td>
<td>Masters of Human Factors in Information Design</td>
</tr>
<tr>
<td>Brandeis University</td>
<td>M.S. User-Centered Design</td>
</tr>
<tr>
<td>Embry-Riddle Aeronautical University</td>
<td>M.S. Human Factors: Tracks in Aerospace and Systems Engineering</td>
</tr>
<tr>
<td>Florida Institute of Technology</td>
<td>M.S. Human Factors in Aeronautics</td>
</tr>
<tr>
<td>Grand Canyon University</td>
<td>M.S. Psychology: Emphasis in Human Factors</td>
</tr>
<tr>
<td>University of Idaho</td>
<td>M.S. Human Factors</td>
</tr>
<tr>
<td>Wright State University</td>
<td>M.S. Industrial and Human Factors Engineering: Tracks in Human-Computer Integration, Logistics and Supply Chain, Systems Modeling, Ergonomic Engineering and Neuroengineering</td>
</tr>
</tbody>
</table>

Outreach Market Research (November 2015)
According to IPEDS, 84 institutions conferred the 2,023 master’s degrees in industrial engineering earned in 2012-13. This number does not separate out degrees earned through distance education from degrees earned in-residence. Seven of the top ten programs appear on the competitive list, while Penn State University Park’s in-residence program is eleventh.

Table 11: Top Ten Master’s Degree in Industrial Engineering Conferrals

<table>
<thead>
<tr>
<th>Institution</th>
<th>2013 Master’s Degree Conferrals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgia Institute of Technology-Main Campus*</td>
<td>129</td>
</tr>
<tr>
<td>Florida International University</td>
<td>114</td>
</tr>
<tr>
<td>University of Michigan-Ann Arbor</td>
<td>92</td>
</tr>
<tr>
<td>Texas A&amp;M University-College Station*</td>
<td>84</td>
</tr>
<tr>
<td>University of Central Florida*</td>
<td>74</td>
</tr>
<tr>
<td>University of Southern California*</td>
<td>69</td>
</tr>
<tr>
<td>Columbia University in the City of New York*</td>
<td>63</td>
</tr>
<tr>
<td>New Mexico State University-Main Campus*</td>
<td>59</td>
</tr>
<tr>
<td>North Carolina State University at Raleigh*</td>
<td>51</td>
</tr>
<tr>
<td>Virginia Polytechnic Institute and State University</td>
<td>50</td>
</tr>
<tr>
<td>Pennsylvania State University-Main Campus</td>
<td>47</td>
</tr>
</tbody>
</table>

*On competitor list

Key Competitors

- Auburn University—Graduate Certificate in Occupational Safety and Ergonomics
  - The certificate is offered by the Department of Industrial and Systems Engineering and includes six courses for a total of eighteen credits. Auburn’s graduate programs in this area are recognized by the National Institute of Occupational Safety and Health (NIOSH). (Note: Information on this program was not found on NIOSH’s website.)
  - Courses are listed in Table 12 below:

Table 12: Auburn Occupational Safety and Ergonomics (OSE) Graduate Certificate Courses

<table>
<thead>
<tr>
<th>Auburn OSE Certificate Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 6016: Safety I</td>
</tr>
<tr>
<td>INSY 7026: Safety II: System Safety</td>
</tr>
<tr>
<td>INSY 7056: Industrial Hygiene and Environmental Hazards</td>
</tr>
<tr>
<td>INSY 7066: Ergonomics I: Fundamentals</td>
</tr>
<tr>
<td>INSY 7076: Ergonomics II: Biomechanics</td>
</tr>
<tr>
<td>INSY 7086: Human Factors Engineering</td>
</tr>
</tbody>
</table>

- According to Auburn’s website, 51 OSE graduate certificates have been earned to date and 146 students are currently enrolled in OSE graduate certificate courses.
- The engineering course fee per credit hour is $795 for a total certificate program cost of $14,310. Auburn also offers an online Master of Industrial and Systems Engineering with coursework available in human factors/ergonomics.
Tuition

- The average in-state cost for an online graduate certificate program in human factors/ergonomics was $10,599, while the average out-of-state cost was $11,551. The least expensive graduate certificate was Wright State University’s 15-credit certificate at $5,751 in-state ($9,560 out-of-state).

- While a nine-credit World Campus HFEE certificate would cost $7,245, placing it toward the bottom of the small competitive set, completion of the first certificate would be required for students to take the proposed advanced certificate program. At the standard graduate tuition rate of $805, 18 credits would cost $14,490, which is more expensive than the other certificates in the competitive set.

- The other certificates in the competitive set have 12-18 credits. Auburn’s 18-credit certificate costs $14,310 ($795 per credit hour).

Figure 7: Tuition Costs for Online Graduate Certificate Programs

![Graph showing tuition costs for various programs.]

*Converted from quarter credits to semester credits*

- Online non-credit certificate options are significantly less expensive than for-credit options. Colorado State University’s certificate was the most expensive non-credit certificate at $395. OSHA’s training certificate only cost $25.

Table 13: Total Costs for Online Non-Credit Certificates

<table>
<thead>
<tr>
<th>Institution</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado State University</td>
<td>$395</td>
</tr>
<tr>
<td>OccuPro</td>
<td>$350</td>
</tr>
<tr>
<td>OSHA Training Institute</td>
<td>$25</td>
</tr>
</tbody>
</table>
The average in-state total program cost for a master’s degree in industrial engineering within the competitive set was $25,930, while the average out-of-state total program cost was $33,047.

The in-residence industrial engineering master’s degree offered through Penn State University Park is 32 credits. A 32-credit World Campus engineering degree would cost $29,760 at the $930 tuition rate. At the standard $805, it would cost $25,760.

- Non-thesis program options were used to calculate tuition amounts, as a World Campus degree would likely be a non-thesis program with some sort of capstone.

**Figure 8: Online Master's Degree Programs in Industrial Engineering**
### Appendix: Online Master's Degree Programs in Industrial Engineering

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona State University</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>Auburn University*</td>
<td>Master of Industrial and Systems Engineering</td>
</tr>
<tr>
<td>Clemson University</td>
<td>Master of Engineering in Industrial Engineering</td>
</tr>
<tr>
<td>Columbia University</td>
<td>M.S. Industrial Engineering: Concentration in Systems Engineering</td>
</tr>
<tr>
<td>Georgia Institute of Technology</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>Iowa State University*</td>
<td>Master of Engineering in Industrial Engineering</td>
</tr>
<tr>
<td>Lawrence Technological University</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>Mississippi State University*</td>
<td>M.S. Industrial Engineering: Concentrations In Human Factors and Ergonomics, Industrial Systems, Management Systems Engineering, Manufacturing Systems, and Operations Research</td>
</tr>
<tr>
<td>NC State University*</td>
<td>Master of Industrial Engineering</td>
</tr>
<tr>
<td>New Mexico State University</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>New York University e-Poly</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>Purdue University*</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>SUNY at Binghamton</td>
<td>M.S. In Industrial and Systems Engineering: Concentration in Health Systems</td>
</tr>
<tr>
<td>Texas A&amp;M University-College Station*</td>
<td>Master of Engineering in Industrial Engineering</td>
</tr>
<tr>
<td>Texas A&amp;M University-Kingsville*</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>University of Alabama in Huntsville</td>
<td>M.S. Engineering: Concentration in Industrial Engineering</td>
</tr>
<tr>
<td>University of Arizona</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>University of Southern California*</td>
<td>M.S. Industrial and Systems Engineering</td>
</tr>
<tr>
<td>University of Tennessee Space Institute*</td>
<td>M.S. Industrial and Systems Engineering: Concentration in Engineering Management</td>
</tr>
<tr>
<td>University of Texas-Arlington*</td>
<td>M.S. Industrial Engineering</td>
</tr>
<tr>
<td>University of Washington</td>
<td>Master of Industrial and Systems Engineering</td>
</tr>
<tr>
<td>Wright State University*</td>
<td>M.S. Industrial and Human Factors Engineering: Tracks in Human-Computer Integration, Logistics and Supply Chain, Systems Modeling, Ergonomic Engineering and Neuroengineering</td>
</tr>
</tbody>
</table>

*Includes human factors/ergonomics in program description, concentrations, and/or curricula*
Market Scan: Opportunities in Human Factors Engineering and Ergonomics and Industrial Engineering

> Sources

Board of Certification in Professional Ergonomics (BCPE) http://www.bcpe.org/
EMSI Complete Employment 2015.2 Class of Worker http://www.economicmodeling.com
Indeed.com http://www.indeed.com
The Integrated Postsecondary Education Data System http://nacs.ed.gov/ipeds/datacenter/
Occupational Information Network (O*NET) http://www.onetcenter.org
Appendix B: Core Council Recommendation Memo (excerpt)

David N. Wormley  
October 20, 2010  
Page 4

5. World Campus and Outreach. The Core Council encourages the College of Engineering to aggressively explore revenue opportunities through a more expansive World Campus program. Data suggest that there are untapped markets for online or blended learning engineering programs, especially professional Master’s programs. There may also be potential for delivering some of the very successful curricular offerings in engineering leadership and engineering entrepreneurship to an online audience. If we don’t move on this initiative soon, other universities and organizations will fill the online market. We recommend that you consult with the World Campus leadership concerning potential online markets that mesh with the College’s strengths, and consult deans and peers with more expansive programs to discuss ways of increasing faculty capacity. We also understand that the faculty in Computer Science and Engineering have suggested an option in computer and network security within the new professional Master’s program in Homeland Security. We encourage the College to pursue this aggressively given the market research suggesting that this would be an important specialization in considerable demand.

We encourage you to take a look at your Continuing Education administrative structure. In addition, the College should discuss areas of collaboration with Outreach regarding their Continuing Education (CE) offerings. The recent decision to move non-credit CE programs to an auxiliary fiscal model pushes all colleges and campuses to re-examine the costs and management of their CE operations. There may be opportunities to eliminate redundancies and to maximize administrative performance through collaboration with Outreach’s CE units.
Appendix C
Plan for Online Delivery of Engineering Programs and the Development of a New Office for Digital Learning in the College of Engineering

Date: March 3, 2016

Prepared by:

Peter Butler
Associate Dean for Education, College of Engineering

Thomas Litzinger
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Director, The Leonhard Center for the Enhancement of Engineering Education

Committee members who contributed:

Susan Stewart
Research Associate, Aerospace Engineering and Architectural Engineering

Gary Chinn
Director, eLearning Institute, College of Arts and Architecture
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Executive Summary

We propose a significant refocusing and expansion of online engineering education by the College of Engineering. The goal of expansion is to increase Penn State’s market share in engineering education and preparation of the engineering workforce, increase in the geographic reach and intellectual impact of Penn State engineering faculty, and enhance revenue generation for the college. The goal of refocusing will be to innovate in online engineering education, with the expectation that innovation will translate into improved reputation and revenue. The committee has met with the major institutes and centers offering online education on the Penn State campus, and with World Campus representatives from program planning and management, financial operations, marketing, corporate sales, international opportunities, academic learner support services, learning design, and faculty development. The committee has also heard from faculty and program administrators already offering engineering content online, and with faculty whose main research focus is on how people learn in the online environment.

Year 0 (Summer/Fall 2016): We will create the College’s Office of Digital Learning (COE-ODL). World campus will staff this with an interim-director and instructional designer. This interim director will assist in designing the office (job descriptions, etc.). This office will also work with Continuing and Distance Education to develop new graduate certificates comprised of existing and new courses taught using capture-stream technology. A plan will be developed to transition this office and all existing online activity to oversight by a college-wide committee on graduate education chaired by the director.
Year 1 (Fall 2017): We will extend four (4) existing Master’s of Engineering programs to distance learners using synchronous delivery via capture-stream (CS) methods. The goal will be to recruit 100 students per program, for a total of 300 enrollments per year.

Year 2 (Fall 2018): We will deliver two (2) purely online, novel professional master’s programs that integrate traditional engineering disciplines with state-of-the art instruction in professional practice. These programs will be developed using World Campus instructional design (ID) and new guidelines for online delivery crafted by the COE ODL. The goal will be to recruit 133 students per program for a total of 400 enrollments year.

Year 3 (Fall 2019): Four (4) Master’s of Engineering programs will be brought online using synchronous delivery via capture-stream (CS) methods. The goal will be to recruit 100 students per program, for a total of 300 enrollments per year.

---

Overview of online engineering education

Interest in engineering disciplines continues to grow each year. However, capacity for resident instruction in the College of Engineering has remained stagnant, making capturing this market increasingly difficult. The building of larger buildings, more classrooms, and hiring additional faculty to meet this demand are not feasible in the near term. Furthermore, some of the clientele who could benefit from a Penn State Engineering degree are highly mobile professionals, military personnel, and international students, and others who may not be able to move to State College because of practical, professional, or personal reasons. One way to address these challenges is to take advantage of advances and accessibility of high-speed internet and deliver engineering content online.

Despite the promise of the internet to reach an expanding group of students, there are significant challenges to providing online education. While delivering a course online can provide some efficiencies of scale, preparation of course materials and teaching online can be more challenging than resident instruction. Research suggests that students at a distance need much of the same engagement with faculty as resident students. Such engagement can be hampered by the fact that students are accessible only through the internet and are at a distance. In addition, the preparation of material for online delivery can take extensive preplanning, careful consideration of pedagogical/andragogical methods, and design of assessment tools. So the cost of delivering online engineering
content must take into account the costs of faculty time or the hiring of highly qualified instructors and instructional designers. Further, there may be particular differences in resident instruction and distance education that require special innovations. Pedagogical techniques that work well in resident instructions (e.g. team work, question and answer periods, demonstrations, laboratory exercises, etc.) require careful planning to replicate or modify them for distance learners. Conversely, it is possible that an online course could have advantages over resident instruction because its students come from many geographical locations, exhibit multiple types of learning styles, and bring a wider array of professional and personal experiences than the typical resident graduate student who might be 22-25 years old. These unique perspectives and experiences could, in turn, enrich the traditional resident-instruction (RI)-based courses.

This plan seeks to chart a course for a world-class online program in engineering education. The main goal is to create a professional office of sustainable, high quality, online programs that serve the needs of existing programs that seek to expand their intellectual impact, and to create new programs at the interface of traditional disciplines and novel professional practice. This goal will be implemented with careful collaboration between the World Campus, College of Engineering administration, academic departments, and the Leonhard Center staff in order to guide the development along sound economic, administrative, and educational standards. The next section describes the plan itself, which takes into account the challenges and promises of online education. The appendix contains all of the results of meetings, considerations of principles of online education, benchmarking against highly ranked online education programs, and all calculations and assumptions used in revenue projections. The ultimate goal will be to capitalize on the potential of online education to reinvigorate residential instruction, increase market share and impact in engineering education, and to provide substantial revenue to the college, departments, and faculty.

The plan recognizes that the important elements of online education are student engagement by faculty, academic and technical support and advising for students, efficient collection and distribution of tuition revenues, and continual quality improvement of online instruction through assessment by educational experts and constituents, and the development of content and delivery mechanisms consistent with the latest pedagogical and andragogical methods. The plan highlights income and expenses primarily because these are the important elements of sustainability. There are implicit assumptions that program quality will follow after the competitive hiring of qualified directors, administrators, and instructional designers. The plan arises from consideration of the collaboration necessary between faculty, departments, the college, and World Campus. It describes the resulting administrative and financial structures necessary for the development of sustainable, world-class programs in online engineering education.
Plan for online engineering education

Year 0 (2016): A new Office for Digital Learning (ODL) will be staffed and charged with creating new certificate programs and transitioning existing programs and courses to oversight by this office.

World Campus administrators have pledged to cover the cost of an interim director of digital learning in the college and one instructional designer. This interim director will help create the administrative structure of the Office of Digital learning (ODL) by designing positions and writing job descriptions. The interim director will also interface with the Continuing and Distance Education group to transition all online (WC courses) to be delivered through WC mechanisms and supported by WC. Effects of transition of summer “web-only” courses to WC will be assessed with the goal of increasing quality and support without sacrificing summer revenue to the college. There will also be a select group of courses developed to comprise graduate certificates in engineering. These will be delivered using capture stream (CS) technologies (described in the appendix). Revenue sharing for CS courses is described in the next section.

Years 1 and 3 (2017 and 2019): To existing Master’s of Engineering programs, we will add 4 online sections each in years 1 and 3, using capture-stream technology.

All revenue projections are based on an agreement (still to be negotiated) that all CS-based courses will share revenue as follows: 20% to WC, 80% to the College of Engineering. Of the college portion, 2/3 will go to the departments offering the course or program, 1/3 will go to the college. This results in the following revenue sharing mode for a CS-based course/program: WC (20%), COE (26%), Dept. (54%). We anticipate an aggressive recruitment of 100 students per semester per program under this model. Students will register for, on average, one course per semester (fall/spring/summer) for a total of 300 enrollments per year per program. In a typical program 3 courses are added in the first year, 8 in year 2, and 12 in year 3.

Instructional costs for the college include course set up, capture/delivery/operation, course maintenance, fringe (36%) resulting in a cost per course of $8,636 and a total per program cost of $103,632 (12 courses per program) (see Figure 1 and appendix).
Figure 1: Gross and net revenue to the College of Engineering per program for 12 CS-based courses. In a typical program 3 courses are added in the first year, 8 in year 2, and 12 in year 3.

Instructional costs per program for departments are $300 per student resulting in $90,000 for 300 enrollments (100 students taking 3 courses per year). Net revenue projections are gross tuition (at $1,100 per credit) minus these instructional costs (see Figure 2).

Figure 2: Income per program to a department for CS-based delivery of 12 courses per year, 300 enrollments total with instructional costs of $300 per enrollment. In a typical program 3 courses are added in the first year, 8 in year 2, and 12 in year 3. Net income is gross income from tuition minus instructional costs.
Year 2 (2018): We will deliver 2 full programs created using Instructional Design-based (ID) courses.

All revenue projections for WC-developed courses (here called Instructional designed (ID)) are based on the RDC1 graduate program model. Revenue sharing will be as follows: 45% to WC, 55% to the College of Engineering. Of the college portion, 2/3 will go to the departments offering the course or program, 1/3 will go to the college. This results in the following revenue sharing mode for ID-based course: WC (45%), COE (18%), Dept. (37%). We anticipate an aggressive recruitment of 133 students per semester per program under this model. Students will register for one course per semester (fall/spring/summer) for a total of 400 enrollments per year per program. There are no course development costs for the college because under RDC1, the World Campus assumes all development costs (faculty release time and instructional design). Net revenue to the college under this program is shown in Figure 3. In a typical program year 0 is used for instructional design, 4 courses are delivered in the first year, 8 courses in the second year, and 12 in year 3.

![World Campus ID-based (RDC1) Single Program - COE Income & Costs](image)

**Figure 3**: Revenue to COE for an ID program. Under RDC1, World Campus pays the cost of course development. There are no costs to COE. In a typical program year 0 is used for instructional design, 4 courses are delivered in the first year, 8 courses in the second year, and 12 in year 3.

Instructional costs per course for departments are $17,000. This number assumes $100,000 instructor salary, 36% fringe, and 8 sections per instructor. The total instructional cost is then $204,000 for 12 sections. Net revenue projections are gross tuition minus these instructional costs (Figure 4).
Figure 4: Revenue to a department for an ID program. Under RDC1, World Campus pays the cost of course development. Department cost for instruction is $17,000 per course. In a typical program year 0 is used for instructional design, 4 courses are delivered in the first year, 8 courses in the second year, and 12 in year 3.

Impact of plan on the institution

It is expected that online education will allow departments to extend the reach of expertise of their faculty. In many disciplines, Master’s degrees are becoming valuable entry level degrees, are mechanisms for promotion in the workplace, count as experience for professional engineering exams, and can help make students more competitive for PhD and MD programs and other advanced professional degrees. By providing a residence experience to distance learners, CS technology can allow students to reach these objectives without the burden of travelling to State College.

Faculty: Projections of revenue predict that this goal can be accomplished in a sustainable way by generating income for faculty, which can be used as supplemental salary or for supporting additional research objectives. Under CS technologies, faculty can generate $300 per student. This can be a necessary incentive for faculty to teach online, as online instruction can carry with it an extra burden of preparing lessons and in managing an increased student load. A program that offers 12 courses a year that can attract 100 students will have instructional costs of $90,000 if each student is enrolled in 1 course per semester (fall, spring, summer). So, on average, a faculty member can generate **$7,500 per course** ($90,000/12) to teach these additional students. Our analysis suggests that faculty teaching a fully instructional-design-based course on load is not economically viable (see appendix). However, for ID courses, a fixed term instructor can earn **$100,000 to teach 8 sections of a course**. This competitive salary is likely to attract high quality instructors.
Departments: In addition, the revenue projections appear to be adequate for the generation of funds for departments that can be used to design innovative programs, accumulate funds for improved faculty start-up packages, fund graduate students, and other initiatives. For example, after instructional costs, a full Master’s of Engineering program that has an online section for each course could generate $440,000 per year (see table 1 and figure 2) using capture-stream methods. This suggests that 12 courses would be available to students over the course of a year and that 100 students would be enrolled over 3 of those courses on average. An ID-based program could net $284,278 per year at 133 students per semester (figure 4). Therefore at steady state, the plan described herein could generate $728,878 per year, for a department offering 1 CS program and 1 ID program.

College: Similarly, revenue projections appear to be adequate for the generation of funds for the college to run the ODL, hire instructional designers for college-wide courses and programs, contribute to improved faculty start-up packages, fund graduate student stipends and support programs, and other initiatives. For example, after instructional costs, 8 full Master’s of Engineering programs that have an online section for each course could generate a net for the college of $1,230,144 per year (figure 5) using CS methods and enrolling 800 students per semester. Two ID-based programs with 266 enrollments could net $475,081 per year (figure 5). Therefore at steady state, the plan described herein could generate for the college, a net of $1,705,225 per year (figure 5).

Figure 5: Total revenue predictions for the college under a program that combines 8 CS-based programs and 2 ID-based programs. Revenue is based on 26% of revenue from CS-based courses and 18% of ID-based courses comes to the college. This revenue will be used to support salaries for the ODL, creation of new programs and courses, and support of capture stream and ID equipment (details in appendix).
Figure 6: Total revenue predictions for the departments under a program that combines 8 CS-based programs and 2 ID-based programs. Revenue is based on 54% of revenue from CS-based courses and 37% of ID-based courses comes to the department. This revenue will be used to support salaries of instructional designers and faculty salaries (supplemental pay for tenure track faculty and salaries for fixed term instructors), and creation of new programs and courses.

Because ID programs can accommodate more students than CS courses, the revenues per ID program can be comparable to CS-based programs, despite disparities in percent revenue sharing. All existing programs (e.g. Acoustics, Mechanical Engineering, Electrical Engineering, Nuclear Engineering) will be reviewed, and transitioned to governance by ODL and appropriate revenue sharing over 3 years (described in appendix).

Overall, this aggressive approach would yield new revenues of $791,852 to the World Campus and a total gross of $10,559,340 to the departments, college, and university. Such revenues would reduce strain of current resident programs on the college by providing funds for new faculty, TAs, and enhanced digital learning resources for resident students.

It is hoped that the RDC1 model for these ID-based courses could be renegotiated to RDC2 so that the ODL and the Leonhard Center could better influence course revisions with the goal of employing the best pedagogical/andragogical practices in engineering education. Nevertheless, as the College transitions into instructional-design-based courses, the model proposed could scale to much larger numbers than indicated here.
Appendix

Development of the plan:

The interviews

The committee met with each of the major institutes providing online education, most of the engineering departments with significant investment in putting courses online, instructors, and with our own continuing and distance education group. Significantly, the committee had 3 meetings covering six major topics in online course delivery provide by World Campus personnel. Here is a list of the interviewees:

WC Presentation #1 of 3: Program Planning & Management and Financial Operations
Scheduled: Nov 13, 2015, 11:00 AM to 12:30 PM
Location: 241 Outreach Building

Larry Ragan @ COIL--Center for Online Innovation in Learning
Scheduled: Nov 13, 2015, 1:00 PM to 2:00 PM
Location: 329 Building - 313C Conference Room

Avis Kunz @ Filippelli Institute for e-Education and Outreach
Scheduled: Nov 13, 2015, 3:30 PM to 4:30 PM
Location: 127 Sparks

Lunch Discussion for One-year Master’s Online Delivery
Scheduled: Nov 16, 2015, 12:00 PM to 2:00 PM
Location: 125 Reber

Brian Cameron and Pete Forster RE: Online Engineering Programs Meeting
Scheduled: Nov 20, 2015, 12:00 PM to 1:00 PM
Location: 387 Business Building

Ann Taylor @ the John A. Dutton e-Education Institute
Scheduled: Nov 25, 2015, 9:30 AM to 10:30 AM
Location: 418 EES Bldg.

WC Presentation #2 of 3: World Campus Marketing, Corporate Sales and International Opportunities
Scheduled: Nov 25, 2015, 12:00 PM to 1:30 PM
Location: 241 Outreach Building

WC Presentation #3 of 3: World Campus Academic Learner Support Services, Learning Design, and Faculty Development
Scheduled: Nov 30, 2015, 12:00 PM to 1:30 PM
Location: 324 Outreach Building

1-year Masters Directors, User group (current professors teaching online; e.g. from Acoustics, ME, EE, NuE, others)

Continuing and Distance Ed group (Led by Terry Reed).

Principles for online education

We propose 4 main principles of online education, specific for the College of Engineering. These principles arise from recognition, after many interviews, that online education has similar goals as resident instruction, but may be fundamentally different in its delivery and in its ability to successfully achieve key learning outcomes. It also recognizes the important work faculty do in research and the need to incentivize faculty, departments, and the college to offer online versions of courses. Finally, it recognizes that online delivery of engineering content has the potential to significantly extend the impact of Penn State College of Engineering.

1. **Faculty**: Online education should not significantly divert research faculty (tenured and tenure line) from research, service to the university, or resident instruction.
2. **Students**: The quality of online instruction should be dictated by student learning outcomes, positive student experiences, and academic integrity.
3. **College and Departments**: online education should enhance the prestige and financial well being of the college and its departments.
4. **Engineering education**: Efforts in the college should lead to increased innovation in online learning; increased dissemination of faculty expertise; and increased dissemination of technical content to the public.

Models for online courses

**Delivery methods**: In our interviews we identified three main types of content delivery, each of which is best carried out by a specific method of course design.

1. **Synchronous**: in this model, a faculty member delivers a lecture much like he/she might do in a typical classroom. This lecture is streamed live to students at a distance synchronously using software such as Adobe Connect. The software provides a means for distance students to interact with the faculty member in real time, with a technician monitoring the classroom, and with the students in the classroom. Because the content is streamed it can be captured and recorded and provided to both the resident and distance students for later viewing. In addition, the stored lectures could potentially be used for instruction in subsequent semesters of the instructor could not deliver them, or for flipped classrooms.
2. **Asynchronous** – lectures are recorded in a special recording studio or during a lecture and delivered to distance students asynchronously. These lectures can be used in subsequent semesters. They could also be used to create course content that is enriched with multimedia, reinforcement exercises, and assessments. Content could be used in resident flipped courses.

3. **Multimodal** – all course content is converted to exercises that are predominately based on reading, assessment, followed by interaction with a lead instructor. A tenured faculty member would provide consultation on actual content and methods of presenting material. However, they might provide little or no actual lectures to supplement the content. This method is labor intensive but is very scalable. Course content could be used in flipped courses.

---

**Figure A1:** From [http://www.acs.psu.edu/DistanceEducation/](http://www.acs.psu.edu/DistanceEducation/). Technician monitors lecture in acoustics and streams to distance students in addition to recording for future views. Technician also monitors live comments from distance students.

**Figure A2:** Example of an instructional design course. Note the lesson followed by an assessment tool.

**Figure A3:** Hybrid (instructional design and lecture capture) online course. Course consists of chunked video with integrated learning assessment tools.
**Course Development Process**: For each of these delivery modes there are course development processes that are more or less appropriate for the delivery mode. Each of the models is described based on development process, and costs associated with course development.

<table>
<thead>
<tr>
<th>Course Development Process</th>
<th>Description of Process</th>
<th>Costs associated with course development</th>
</tr>
</thead>
</table>
| Lecture Capture            | • Ideal for synchronous delivery mode; but can provide lectures for asynchronous delivery mode  
                             • Instructor teaches a resident course in a classroom equipped to capture teaching into digital format. Instructor uses digitizing tablet or similar technology so that online students can see what is being written or projected.  
                             • The lecture is streamed live using software like Adobe Connect and also captured for later viewing.  
                             • The video is typically posted with minimal processing other than that required by ADA compliance.  
                             • Classrooms may be equipped with microphones and speakers to allow online students to engage in Q&A | • Videography and any related processing costs  
                             • Minimal faculty time is needed for course development  
                             • Amortized cost of equipment needed for lecture capture |
| (Nuclear Engineering, Acoustics) |                         |                                          |

| Instructional Design       | • Works best for multimodal delivery mode  
                             • Instructor works with instructional designer to create multi-media materials for asynchronous course delivery.  
                             • Duration of development process is 1 to 2 semesters | • Faculty time – one or two course buyout or the equivalent amount of time  
                             • Instructional designer, typically 1/3 to ½-time |
| (Aero, AE, EE as well as World-campus, Dutton, Fillipelli, A&A, Smeal and IST) |                         |                                          |
| Hybrid model - Lecture Capture + Instructional Design (Aero) | • Works well for asynchronous/multimodal delivery mode  
• Can be appropriate for Asynchronous delivery mode provided the captured lectures are acknowledged  
• Lectures are captured as the starting point for multimedia-based, instructional design. Since the lectures are not captured for direct streaming, a special classroom is not required.  
• Faculty member works with instructional designer to create the online course materials  
• Substantial processing/editing of videos is required | • Instructional designer, typically 1/3 to ½-time  
• Faculty time - some faculty compensation may be required |

**Criteria for a high quality online program**

The US News and World Report uses particular best practices to rank programs. We have found that these metrics are consistent with best practices articulated by the World Campus and by online instructors at Penn State. These are as follows: (From [http://www.usnews.com/education/online-education/articles/engineering-methodology](http://www.usnews.com/education/online-education/articles/engineering-methodology))

**Student engagement (30 percent):** Quality engineering programs promote participation in courses, allowing students opportunities to readily interact with their instructors and classmates. In turn, instructors are not only accessible and responsive, but they are also tasked with helping to create an experience rewarding enough that students stay enrolled and complete their degrees in a reasonable amount of time.

**Faculty credentials and training (25 percent):** Strong online engineering programs employ instructors with academic credentials that mirror those of instructors for campus-based programs, and they have the resources to train these instructors on how to teach distance learners.

**Student services and technology (20 percent):** Programs that incorporate diverse online learning technologies allow greater flexibility for students to take classes and labs from a distance. Outside of classes, strong support structures provide learning assistance, career guidance and financial aid resources commensurate with quality campus-based programs.

**Peer reputation (15 percent):** A survey of high-ranking academic officials in engineering helps account for intangible factors affecting program quality that are not captured by
statistics. Also, degrees from programs that are well respected by academics may be held in higher regard among employers.

**Admissions selectivity (10 percent):** Student bodies entering with proven aptitudes, ambitions and accomplishments can handle the demands of rigorous course work. Furthermore, online degrees that schools award judiciously will have greater legitimacy in the job market.

**Benchmarking the top 12 online programs**

The following tables are assembled from US News and World Report data from the top 12 ranked online graduate programs in the United States. Each table is described with conclusions about what the relevance is for CoE online education.

**Program metrics and Rankings:** We found that rankings were tightly correlated to faculty credentials and student services. According to our benchmarking, Penn State could improve its rankings by focusing on student services and admissions selectivity. Penn State’s tuition is competitive with others in the top 12, and its enrollment is comparable. Almost all Penn State programs arise from Great Valley.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Faculty Credentials and Technology</th>
<th>Student Engagement</th>
<th>Admission Selectivity</th>
<th>Peer Assessment Score ($)</th>
<th>Total Enrollment</th>
<th>Tuition*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of California—Los Angeles</td>
<td>98</td>
<td>100</td>
<td>94</td>
<td>99</td>
<td>3.4</td>
<td>312</td>
</tr>
<tr>
<td>2</td>
<td>Columbia University</td>
<td>94</td>
<td>60</td>
<td>100</td>
<td>100</td>
<td>3.8</td>
<td>210</td>
</tr>
<tr>
<td>3</td>
<td>University of Southern California</td>
<td>84</td>
<td>56</td>
<td>78</td>
<td>95</td>
<td>4</td>
<td>888</td>
</tr>
<tr>
<td>4</td>
<td>Purdue University—West Lafayette</td>
<td>90</td>
<td>90</td>
<td>48</td>
<td>67</td>
<td>3.9</td>
<td>731</td>
</tr>
<tr>
<td>5</td>
<td>Pennsylvania State University—World Campus</td>
<td>89</td>
<td>56</td>
<td>78</td>
<td>39</td>
<td>3.6</td>
<td>437</td>
</tr>
<tr>
<td>6</td>
<td>University of Wisconsin—Madison</td>
<td>53</td>
<td>50</td>
<td>98</td>
<td>61</td>
<td>3.9</td>
<td>201</td>
</tr>
<tr>
<td>7</td>
<td>University of Tennessee—Chattanooga</td>
<td>78</td>
<td>85</td>
<td>95</td>
<td>69</td>
<td>1.9</td>
<td>205</td>
</tr>
<tr>
<td>8</td>
<td>New York University</td>
<td>66</td>
<td>69</td>
<td>81</td>
<td>50</td>
<td>3</td>
<td>138</td>
</tr>
<tr>
<td>9</td>
<td>University of Michigan—Ann Arbor</td>
<td>90</td>
<td>42</td>
<td>46</td>
<td>49</td>
<td>3.9</td>
<td>409</td>
</tr>
<tr>
<td>10</td>
<td>Cornell University</td>
<td>57</td>
<td>51</td>
<td>68</td>
<td>39</td>
<td>3.9</td>
<td>88</td>
</tr>
<tr>
<td>11</td>
<td>North Carolina State University</td>
<td>95</td>
<td>49</td>
<td>34</td>
<td>63</td>
<td>3.5</td>
<td>690</td>
</tr>
<tr>
<td>12</td>
<td>Johns Hopkins University (Whiting)</td>
<td>45</td>
<td>76</td>
<td>72</td>
<td>34</td>
<td>3.3</td>
<td>2,626</td>
</tr>
</tbody>
</table>
**Faculty Composition:** Rankings were not tightly coupled to whether a program used tenured faculty. Most programs provided training for faculty to teach online. This table indicates that the top programs have high involvement of tenure-track faculty. These faculty and instructors have dedicated training in online course delivery; with good technical staff. It also indicates that class size for online courses are comparable to resident classes. Many classes in the top schools mix online and resident students. Such a mix is consistent with the synchronous mode, but could also indicate that some resident students are allowed to take online courses. Average time to completion is less than 3 years (not shown), indicating most students are part time ad take approximately 1 course per semester.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Instructional faculty that teach courses accessible online</th>
<th>Tenured/tenure-track faculty</th>
<th>Average experience teaching online courses (years)</th>
<th>Required hours of training</th>
<th>Technical Staff Supporting faculty</th>
<th>Average class size</th>
<th>Maximum class size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of California—Los Angeles</td>
<td>39 full-time; 8 part-time</td>
<td>39</td>
<td>5</td>
<td>8</td>
<td>14 full, 22 part</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Columbia University</td>
<td>75 full-time; 35 part-time</td>
<td>70</td>
<td>10</td>
<td>10</td>
<td>69 full, 10 part</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>University of Southern California</td>
<td>104 full-time; 64 part-time</td>
<td>83</td>
<td>8</td>
<td>8</td>
<td>24 full, 75 part</td>
<td>46</td>
<td>125</td>
</tr>
<tr>
<td>4</td>
<td>Purdue University—West Lafayette</td>
<td>65 full-time; 61 part-time</td>
<td>61</td>
<td>5</td>
<td>3</td>
<td>70 full, 30 part</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Pennsylvania State University—World Campus</td>
<td>40 full-time; 26 part-time</td>
<td>26</td>
<td>4</td>
<td>20</td>
<td>17 full, 3 part</td>
<td>19</td>
<td>35</td>
</tr>
<tr>
<td>6</td>
<td>University of Wisconsin—Madison</td>
<td>47 full-time; 33 part-time</td>
<td>33</td>
<td>7</td>
<td>4</td>
<td>15 full, 2 part</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>7</td>
<td>University of Tennessee—Chattanooga</td>
<td>20 full-time; 20 part-time</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>1 full, 2 part</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>New York University</td>
<td>17 full-time; 11 part-time</td>
<td>11</td>
<td>8</td>
<td>4</td>
<td>28 full, 40 part</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>University of Michigan—Ann Arbor</td>
<td>15 full-time; 15 part-time</td>
<td>15</td>
<td>6</td>
<td>5</td>
<td>5 full, 3 part</td>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>Cornell University</td>
<td>10 full-time; 8 part-time</td>
<td>8</td>
<td>4</td>
<td>N/A</td>
<td>3 full, 32 part</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>11</td>
<td>North Carolina State University</td>
<td>125 full-time; 10 part-time</td>
<td>120</td>
<td>10</td>
<td>5</td>
<td>403 full, 16 part</td>
<td>45</td>
<td>80</td>
</tr>
<tr>
<td>12</td>
<td>Johns Hopkins University—Whiting</td>
<td>4 full-time 133 part-time</td>
<td>3</td>
<td>4</td>
<td>24</td>
<td>12 full, 0 part</td>
<td>14</td>
<td>20</td>
</tr>
</tbody>
</table>
**Student experience:** The top programs blended online and resident instruction. Online programs tended to have a similar imbalance between male and female students as resident programs (resident: 21% female), but higher than average number of underrepresented minorities (resident: 8.8% UR). Most students are working while taking courses and the average age is significantly higher than our resident courses (not shown). Many, though not all, programs offer 24-7 technical support (not shown).

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Can earn degree entirely online</th>
<th>Classes include campus-based students</th>
<th>2013-14 retention rates</th>
<th>3-year graduation rate</th>
<th>Male</th>
<th>Female</th>
<th>UR**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of California—Los Angeles</td>
<td>Yes</td>
<td>Yes</td>
<td>88%</td>
<td>84%</td>
<td>80%</td>
<td>20%</td>
<td>67%</td>
</tr>
<tr>
<td>2</td>
<td>Columbia University</td>
<td>Yes</td>
<td>Yes</td>
<td>99%</td>
<td>88%</td>
<td>77%</td>
<td>23%</td>
<td>19%</td>
</tr>
<tr>
<td>3</td>
<td>University of Southern California</td>
<td>Depends</td>
<td>Yes</td>
<td>95%</td>
<td>73%</td>
<td>76%</td>
<td>24%</td>
<td>27%</td>
</tr>
<tr>
<td>4</td>
<td>Purdue University—West Lafayette</td>
<td>Yes</td>
<td>Yes</td>
<td>92%</td>
<td>44%</td>
<td>77%</td>
<td>23%</td>
<td>19%</td>
</tr>
<tr>
<td>5</td>
<td>Pennsylvania State University—World Campus</td>
<td>Yes</td>
<td>No</td>
<td>86%</td>
<td>78%</td>
<td>82%</td>
<td>16%</td>
<td>23%</td>
</tr>
<tr>
<td>6</td>
<td>University of Wisconsin—Madison</td>
<td>Depends</td>
<td>No</td>
<td>99%</td>
<td>91%</td>
<td>90%</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>7</td>
<td>University of Tennessee—Chattanooga</td>
<td>Yes</td>
<td>Yes</td>
<td>96%</td>
<td>N/A</td>
<td>71%</td>
<td>29%</td>
<td>29%</td>
</tr>
<tr>
<td>8</td>
<td>New York University</td>
<td>Yes</td>
<td>Yes</td>
<td>77%</td>
<td>78%</td>
<td>84%</td>
<td>16%</td>
<td>23%</td>
</tr>
<tr>
<td>9</td>
<td>University of Michigan—Ann Arbor</td>
<td>Yes</td>
<td>Yes</td>
<td>90%</td>
<td>28%</td>
<td>85%</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>10</td>
<td>Cornell University</td>
<td>No</td>
<td>No</td>
<td>90%</td>
<td>90%</td>
<td>82%</td>
<td>18%</td>
<td>30%</td>
</tr>
<tr>
<td>11</td>
<td>North Carolina State University</td>
<td>Yes</td>
<td>Yes</td>
<td>95%</td>
<td>N/A</td>
<td>82%</td>
<td>18%</td>
<td>21%</td>
</tr>
<tr>
<td>12</td>
<td>Johns Hopkins University (Waltham)</td>
<td>Yes</td>
<td>No</td>
<td>83%</td>
<td>60%</td>
<td>78%</td>
<td>22%</td>
<td>26%</td>
</tr>
</tbody>
</table>
Most popular programs: The table below is compiled from all of the most highly subscribed programs from each school. The most popular programs are Electrical Engineering, Mechanical Engineering, and Computer Science (Computer Science may be the more popular if one adds Computer engineering (3 programs). Industrial engineering and Engineering Management are also popular.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Number of programs</th>
<th>Electrical / Electronic/ Communications</th>
<th>Mechanical</th>
<th>Computer Science</th>
<th>Industrial</th>
<th>Engineering Management</th>
<th>Aerospace / Aeronautical / Astronautical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of California—Los Angeles</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Columbia University</td>
<td>16</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>University of Southern California</td>
<td>40</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Purdue University—West Lafayette</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Pennsylvania State University—World Campus</td>
<td>5</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>University of Wisconsin—Madison</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>University of Tennessee—Chattanooga</td>
<td>3</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>New York University</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>University of Michigan—Ann Arbor</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Cornell University</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>11</td>
<td>North Carolina State University</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Johns Hopkins University (Whiting)</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SUM</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
Assumptions used in revenue models

Estimates of Tuition Income from “Nominal” Online Masters Program
Disclaimer: Making these estimates is quite challenging because there are many variables. Results should be used with caution!

Models for online course development
Across most of the groups that we spoke with, including the World Campus, online courses are developed using a formal instructional design (ID) process. This process requires a close collaboration between a content expert and an instructional designer. A multi-media designer is often involved as well. The process takes roughly two semesters. The content expert is compensated for the time spent on developing the course. Within the College of Engineering, Aerospace, Architectural Engineering, and Electrical Engineering are using this approach for development of online courses.

The College of Engineering appears to be the only unit on campus that uses simultaneous resident instruction and lecture capture to create online courses. The instructor teaches a resident course in a classroom equipped to capture teaching into digital format. An instructor uses a digitizing tablet or similar technology so that online students can see what is being written or projected. The lecture is streamed live using software such as Adobe Connect and also captured for later viewing (Capture-stream, CS). The video is typically posted with minimal processing (it is not clear if the College is currently in compliance with ADA processing of the videos.) The classrooms may be equipped with microphones and speakers to allow online students to engage in Q&A. This approach is used in Acoustics and Nuclear Engineering as well as the new MS in Mechanical Engineering. Table A1 contains the overall revenue sharing details proposed for CS courses.
<table>
<thead>
<tr>
<th>Cap-Stream Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of Gross Tuition Income</td>
</tr>
<tr>
<td>World Campus/University</td>
</tr>
<tr>
<td>Department*</td>
</tr>
<tr>
<td>College*</td>
</tr>
<tr>
<td>Total number of students</td>
</tr>
<tr>
<td>Total enrollments per year</td>
</tr>
<tr>
<td>Courses/sections per year</td>
</tr>
<tr>
<td>Faculty compensation</td>
</tr>
<tr>
<td><em>(for illustration purposes only)</em></td>
</tr>
</tbody>
</table>

* 80% of gross income to Department/College is split approximately 2/1

Table A1: Structure of capture stream program

These two approaches have different costs structures. The first approach, capture-stream, does not require nearly as much upfront investment. However, there are continuing costs for lecture capture because the courses are captured live for most semesters. Also there is capital equipment costs as well as the need to have dedicated classrooms. The second approach, Instructional Design or ID, requires substantial upfront investment. A typical course development process costs approximately $50K. Structure of an ID program is shown in table A2.
<table>
<thead>
<tr>
<th>World Campus ID-based courses (RDC1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of Gross Tuition Income</td>
</tr>
<tr>
<td>World Campus/University</td>
</tr>
<tr>
<td>Department*</td>
</tr>
<tr>
<td>College*</td>
</tr>
<tr>
<td>Total number of students</td>
</tr>
<tr>
<td>Total enrollments per year</td>
</tr>
<tr>
<td>Courses/sections per year</td>
</tr>
<tr>
<td>Faculty compensation</td>
</tr>
<tr>
<td><em>(for illustration purposes only)</em></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

* 55% of gross income to Department/College is split approximately 2/1

Table A2: Structure of instructional design program
Calculations for revenue and expenses for both CS and ID courses is presented in table A3. The total gross income is the appropriate number to consider for total money coming into the program that can be used for all elements of the program in addition to initiatives not directly related to online instruction.

<table>
<thead>
<tr>
<th></th>
<th>Cap-Stream</th>
<th>WC-ID (RDC1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Programs</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Number of students</td>
<td>100</td>
<td>133</td>
</tr>
<tr>
<td>Avg. annual course enrollment per student</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Annual course enrollments</td>
<td>300</td>
<td>400</td>
</tr>
<tr>
<td>Courses/sections per year</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Average students per course/section</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td>Tuition per course</td>
<td>$3,300</td>
<td>$3,300</td>
</tr>
<tr>
<td>Total Annual Gross Tuition</td>
<td>$990,000</td>
<td>$1,319,670</td>
</tr>
<tr>
<td>WC % of Gross Tuition</td>
<td>20%</td>
<td>45%</td>
</tr>
<tr>
<td>CoE % of Gross Tuition</td>
<td>26%</td>
<td>18%</td>
</tr>
<tr>
<td>DEPT % of Gross Tuition</td>
<td>54%</td>
<td>37%</td>
</tr>
<tr>
<td>WC Gross Tuition</td>
<td>$198,000</td>
<td>$593,852</td>
</tr>
<tr>
<td>COE Gross Tuition</td>
<td>$257,400</td>
<td>$237,541</td>
</tr>
<tr>
<td>DEPT Gross Tuition</td>
<td>$534,600</td>
<td>$488,278</td>
</tr>
<tr>
<td>COE Course Development Costs</td>
<td>$8,636</td>
<td>($103,632)</td>
</tr>
<tr>
<td>COE Net Annual Income per program</td>
<td>$153,768</td>
<td>$237,541</td>
</tr>
<tr>
<td>COE Total Annual Income at SS</td>
<td>$1,230,144</td>
<td>$475,081</td>
</tr>
<tr>
<td>DEPT Instructional Costs</td>
<td>Cap-Stream $ per student</td>
<td>$300</td>
</tr>
<tr>
<td></td>
<td>ID-based course $ per section</td>
<td>$17,000</td>
</tr>
<tr>
<td>DEPT Net annual income</td>
<td></td>
<td>$444,600</td>
</tr>
<tr>
<td>Total income to 8 DEPTS</td>
<td></td>
<td>$3,556,800</td>
</tr>
<tr>
<td>Total (gross):</td>
<td>$7,920,000</td>
<td>$2,639,340</td>
</tr>
</tbody>
</table>

Table A3

The total for the whole program is **$10,559,340** which is the amount that can be apportioned to WC for operations of student support, advertising, restoration services, and other administrative duties and the college and departments for instructional and student support services. Even though tuition is not specifically being earmarked for the University, this income can be used to offset financial obligations the university has to support COE functions.
Note: We found that developing courses in the College under RDC 2 does not lead to substantially greater income compared to partnering with the World Campus under RDC1.

Models for Faculty Compensation

Prior to settling on the formula for cap stream of $300 per student; or the $17K course for ID-based courses, we tried other scenarios listed below. To illustrate the impact of faculty compensation on the net income from a nominal online Masters, RDC1 is used as a base model, and three faculty compensation models are compared:

1. Tenure-track faculty teaching the online courses “on load”
2. Fixed-term faculty teaching the online courses “on load”
3. Tenure-track faculty teaching both resident and online students simultaneously (this corresponds most directly to the Capture-Stream model.)

For sake of simplicity, these three models are compared when the Master's program has reached full enrollment, and 12 courses are being offered each year with 25 students per section. Assuming a cost per credit of $1100 (from MS ME program), RDC1 leads to a gross income before instructional costs of approximately $45K per course.

The table below shows that having tenure-track faculty in the College of Engineering teach on-load in a nominal Master’s program is not financially viable.

The assumptions used to make the estimates are:

1. Tenure-track on load: AY salary $140K; 4 courses per year; fringe 36%
2. Fixed-term on load: AY salary $96K; six courses per year; fringe 36%
3. Tenure-track teaching both resident and online students: $10,000 per course

<table>
<thead>
<tr>
<th></th>
<th>Instructor cost per course</th>
<th>Income per course after instructor costs</th>
<th>Estimated Annual Income after instructor costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenure-track &quot;on load&quot;</td>
<td>($47,600)</td>
<td>($2,225)</td>
<td>($26,700)</td>
</tr>
<tr>
<td>Fixed-term &quot;on load&quot;</td>
<td>($21,760)</td>
<td>$23,615</td>
<td>$283,380</td>
</tr>
<tr>
<td>Tenure track teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>resident and online</td>
<td>($10,000)</td>
<td>$35,375</td>
<td>$424,500</td>
</tr>
<tr>
<td>simultaneously</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table A4
There are additional costs related to having a master's program, which are not included here. These additional program costs include:

- Costs associated with faculty supervision of “culminating experience”
- Administrative costs of advising an additional 100 students per year

**Summary of costs for CS-based and ID-based courses.**

The table below contains the detailed calculations for costs for CS and ID delivery of courses for the college and for departments. These costs are used to calculate net revenue to the college and departments for CS and ID programs.

<table>
<thead>
<tr>
<th>Estimated course development costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(Using estimates from Terry Reed)</td>
<td></td>
</tr>
<tr>
<td>Course set up, capture</td>
<td>$3,100</td>
</tr>
<tr>
<td>Delivery/operation</td>
<td>$3,000</td>
</tr>
<tr>
<td>Course maintenance</td>
<td>$250</td>
</tr>
<tr>
<td>Fringe (36%)</td>
<td>36%</td>
</tr>
<tr>
<td>Cost per course</td>
<td>$8,636</td>
</tr>
</tbody>
</table>

**COE costs per ID-course**

Faculty comp for course development.
(Assumes max amount of $15K. WC pays 11% of 36 week salary up to $15K).
Instructional designer (1/3 per course at $60K).
Fringe (estimated at 36%)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty comp</td>
<td>($15,000)</td>
</tr>
<tr>
<td>Instructional designer</td>
<td>($20,000)</td>
</tr>
<tr>
<td>Fringe</td>
<td>36%</td>
</tr>
<tr>
<td></td>
<td>($47,600)</td>
</tr>
</tbody>
</table>

**DEPT costs for ID-based sections**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>48 week salary</td>
<td>$100,000</td>
</tr>
<tr>
<td>Fringe</td>
<td>36%</td>
</tr>
<tr>
<td>Course per year</td>
<td>8</td>
</tr>
<tr>
<td>Cost per course</td>
<td>17,000</td>
</tr>
</tbody>
</table>

Table A5
Organizational and governance structure

Based on all of the available data, we conclude that the best structure would be to adopt a three-component approach to cover the needs of existing and future online programs:

1. **Master's of Engineering**: We propose to add online sections to Master's of Engineering programs using the synchronous delivery model (CS). We propose to negotiate with the World Campus to apply a revenue sharing model already in place with acoustics. Under this agreement, World Campus recovers 20% of the revenue, while the college receives 80%. The revenue to the college would be split 2:1 between departments and college. Departments would cover the cost of a technician to support each of the online sections. A benefit of this model is that there are minimal instructional costs beyond the cost of a technician, and faculty can teach using the teaching load adopted for the 1-year masters. Some of the video content could be used later by instructional designers in an asynchronous or multi-modal version of the course, and the students have the maximum engagement with the instructor. This model fits in well with the 4 principles outlined earlier in this paper. One caveat is that we will need to offer M.Eng. versions of the one-year masters because the graduate school has not yet approved the M.S. to be offered online. If the 80:20 model cannot be negotiated, we will use the RDC2 model (34% to WC, 44% to department, 22% to college).

2. **Existing Programs**: The transition for existing online programs to ones that are under the ODL still needs to be negotiated. Currently, Mechanical Engineering is working with World Campus to develop a master's of science under the RDC2 model. Under a possible transition, the Mechanical Engineering department would phase in a 27%: 53% split between the college and department, respectively, after year 3 at which point the college would begin to assist the department in development and revision costs. Electrical Engineering and Computer Science will also be invited to deliver M.Eng programs, although they could adopt a synchronous delivery mode as well. These programs would be phased in similarly to Mechanical Engineering. While the percentage share for the college is less (11%) under this mode, once the courses are authored using an ID or hybrid model, they can be delivered to a larger number of students than under CS.

3. **Office of Digital Learning**: We will create an Office of Digital Learning with a new director for that office. This office will oversee all aspects of modern digital aspects of engineering education. These include:
   
   a. **Learning Management Systems**
i. CANVAS
   1. Training of faculty, collection of aggregate data
b. Online Programs
   i. Development of New Professional Master’s
c. Integration of LMS and Civitas, a predictive analytics software
d. Oversight of the Continuing and Distance Education Group
   i. Web-only courses
   ii. Summer Courses
e. Research in digital learning
f. Interface with COIL and Leonhard Center
   i. Seed grant proposals
g. Clickers and other in-class instructional tools

One major goal of the new office will be to develop online only professional master’s degrees that would be centered on core technical content in engineering (e.g. fluids mechanics, solid mechanics, heat and mass transfer, research and design methods and ethics, presentation skills, corporate teams; these would be supplemented by discipline-specific certificates (e.g. drug delivery, structures, supply chain). The new office would be funded initially by the college and later by revenues from revenue sharing of online master’s programs. These master’s programs would be developed under RDC1 model and phased in to RDC2 over time (to be negotiated with WC).

We would work with CD&E to transition their cost recovery system to one that reflects the revenue sharing outlined in this plan.

Proposed organizational chart is as follows:
Industrial Engineering (I E)

Program Home Page (Opens New Window)

JANIS P. TERPENNY, Peter and Angela Dal Pezzo Chair and Department Head, Harold and Inge Marcus Department of Industrial and Manufacturing Engineering
310 Leonhard Building
814-865-7601

Degrees Conferred:
M.Eng. M.S., Ph.D.

The Graduate Faculty

Graduate study and research are conducted in manufacturing process, information engineering operations research-management science, production engineering, process design, systems engineering, human factors, ergonomics, quality engineering, and robotics.

Admission Requirements

Requirements listed here are in addition to requirements stated in the General information section of the Graduate Bulletin. Applicants apply for admission to the program via the Graduate School application for admission.

Scores from the Graduate Record Examination (GRE) are required for admission. Graduates in engineering, physical sciences, and mathematics who present a 3.00 grade-point average will be considered for admission.

The language of instruction at Penn State is English. English proficiency test scores (TOEFL/IELTS) may be required for international applicants. Consult the English Proficiency section of the Graduate Bulletin Application and Admission Procedures page for more information.

Degree Requirements

Requirements listed here are in addition to requirements stated in the DEGREE REQUIREMENTS section of the Graduate Bulletin.

Three degrees are offered: Master of Science (M.S.) with thesis and non-thesis tracks, on-line Master of Engineering (M.Eng) and the Doctor of Philosophy (Ph.D.).
The M.S. degree program is intended for students to gain advanced knowledge for research, analysis, and design in industrial engineering. The M.S. degree is offered with thesis or research paper tracks, both requiring 32 credits. The M.S. degree with thesis track requires 24 credits of coursework and two credits of I E 590 (Colloquium). Out of the 24 credits of coursework, at least 15 must be I E courses, and at least 12 must be at the 500 level. Of the 12 credits at the 500 level, at least nine must be I E courses. A thesis is required, for which six credits of I E 600 or I E 610 must be taken. The M.S. degree with non-thesis track requires 27 credits of coursework, two credits of I E 590 (Colloquium). Out of the 27 credits of coursework, at least 18 must be I E courses, and at least 15 must be at the 500 level. Of the 18 credits at the 500 level, at least fifteen must be I E courses. A scholarly paper is required for the MS degree with non-thesis track for which three credits of I E 596 must be taken. For both tracks, a core curriculum is required that is composed of I E 505 (Linear Programming) (3 credits) and I E 511 (Experimental Design in Engineering) (3 credits), which all the students must satisfy. The thesis must demonstrate comprehensive and in-depth knowledge of a topic in industrial engineering, and it should be suitable for submission for publication in a refereed journal as approved by the committee. The thesis must be accepted by the advisers and/or committee members, the head of the graduate program, and the Graduate School. The paper should demonstrate the ability of the student to integrate and apply concepts and techniques learnt in the courses to solve an engineering problem.

The students seeking the Master of Science degree in Industrial Engineering with non-thesis track are expected to start their degree in the Fall semester of every year and complete their degree including all the required coursework and three credits of research resulting in a paper and graduate by the end of summer following the second semester. A research adviser will be assigned to students in their first semester. Students who need more time to complete the final paper will be allowed to complete the paper, and have it reviewed and approved after the third semester has ended. Students are not required to remain in residence while they complete the final paper. However, extensions granted to students in this program must comply with the Graduate Council policy on deferred grades. Non-thesis track students are typically not eligible for assistantships and therefore their plan of study is as follows:

- Fall semester: Twelve credits of coursework, one credit of colloquium and one credit of research (I E 596).
- Spring semester: Twelve credits of coursework, one credit of colloquium and one credit of research (I E 596).
- Summer semester: Three credits of coursework and one credit of research (I E 596).

For the M.S. degree, area options are available in Human Factors/Ergonomics Engineering, Manufacturing Engineering and Quality Engineering. M. S. dual-title degree program in Industrial Engineering and Operations Research is also offered.

The primary focus of the proposed M,Eng. degree is not current students, but the thousands of IE alumni who are working as professional engineers and cannot easily take leave from their careers to return physically to the University Park campus for on-site courses and degrees. This degree provides an opportunity for these professionals to seek further education in the form of a professional graduate degree.
The requirements for the online M.Eng. degree program include:
1. Minimum of 30 course credits at the 400, 500, or 800 level, of which 21 course credits must be earned
   at Penn State (i.e. only 9 credits can be transferred from other institutions).
2. All students must successfully complete three credits of IE 894, Capstone Design.
3. At least 18 credits in 500- or 800- level courses, with at least 6 at 500 level (including IE 894).
4. At least 15 credits in 500- level or 800-level IE courses (including IE 894).
5. At least 21 credits of IE courses (including IE 894).
6. The culminating experience for this professional degree will be satisfied with IE 894, Capstone Design, which includes a written report summarizing the analyses and designs used to solve a problem in their workplace submitted to the course instructor.

The Ph.D. program emphasizes scholarly research, and prepares students for research and development careers in industry, government, and academe. Official entrance into the Ph.D. program occurs upon successful completion of a written candidacy examination. The Ph.D. is awarded upon completion of a program of advanced study that includes a minimum period of residence, passing the English competence and comprehensive examinations, completing a satisfactory dissertation, and passing the final oral examination. To earn the Ph.D. degree, doctoral candidates must write a dissertation that is accepted by the doctoral committee, the head of the graduate program, and the Graduate School. The degree requirements consist of 45 credits of course work and four IE 590 (Colloquium) credits. Of the 45 credits of required course work, 36 must be prefixed IE, and at least 30 must be at the 500 level. Nine credits must be from outside the Department and must include a six-credit sequence, with at least three credits at the 500 level. A Ph.D. dual-title degree program in Industrial Engineering and Operations Research is also available.

Continuous registration is required for all graduate students until the paper, thesis, or dissertation is approved.

**Master of Science (M.S.) Degree with thesis and non-thesis tracks- Human Factors/Ergonomics Engineering Option**

In addition to the requirements for the M.S. degree listed above, the credits for the Option in Human Factors/Ergonomics Engineering must include the following:

All the following three courses: (9 credits)
IE 549 Design Decision Making
IE 553 Engineering of Human Work
IE 558 Engineering of Cognitive Work

**Master of Science (M.S.) Degree with thesis and non-thesis tracks- Manufacturing Engineering Option**
In addition to the requirements for the M.S. degree listed above, the credits for the Option in Manufacturing Engineering must include the following:

All the following three courses: (9 credits)
I E 528 Metal Cutting Theory
I E 550 Manufacturing Systems
I E 563 Computer - Aided Design for Manufacturing

**Master of Science (M.S.) Degree with thesis and non-thesis tracks- Quality Engineering Option**

In addition to the requirements for the M.S. degree listed above, the credits for the Option in Quality Engineering must include the following:

All the following three courses (9 credits)
I E 555 Statistical Process Monitoring and Analysis
I E 566 Quality Control
I E 583 Response Surface Methodology and Process Optimization

**Other Relevant Information**

Students in this program may elect the dual-title degree program in Operations Research for the Ph.D. and M.S. degrees.

**Dual-title M.S. and Ph.D. in Operations Research**

Admissions Requirements

Students must apply and be admitted to the graduate program in Industrial Engineering and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Operations Research dual-title program. Refer to the Admission Requirements section of the Operations Research Bulletin page. Doctoral students must be admitted into the dual-title degree program in Operations Research prior to taking the candidacy examination in their primary graduate program.

Degree Requirements

To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Industrial Engineering, listed above. In addition, students must complete the degree requirements for the dual-title in Operations Research, listed on the Operations Research Bulletin page.
The candidacy examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Industrial Engineering and must include at least one Graduate Faculty member from the Operations Research program. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. There will be a single candidacy examination, containing elements of both Industrial Engineering and Operations Research. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the candidacy examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for doctoral committees, the doctoral committee of a Industrial Engineering and Operations Research dual-title Ph.D. student must include at least one member of the Operations Research Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the doctoral committee is not also a member of the Graduate Faculty in Operations Research, the member of the committee representing Operations Research must be appointed as co-chair. The Operations Research representative on the student's doctoral committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their doctoral committee and reflects their original research and education in Industrial Engineering and Operations Research. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the doctoral committee, the head of the graduate program, and the Graduate School.

**Student Aid**

Graduate assistantships available to students in this program and other forms of student aid are described in the Student Aid section of the Graduate Bulletin. Students on graduate assistantships must adhere to the course load limits set forth in the Graduate Bulletin. In addition, the following awards typically have been available to graduate students in this program. HAROLD & INGE MARCUS GRADUATE FELLOWSHIPS—Consideration for these fellowships shall be given to all students exhibiting academic excellence who have been admitted to Penn State as candidates for a graduate degree in the Department of Industrial and Manufacturing Engineering, College of Engineering.

BENJAMIN W. NIEBEL MANUFACTURING FELLOWSHIP
Consideration for this fellowship shall be given to all students exhibiting academic excellence who have been admitted to Penn State as candidates for a graduate degree in the Department of Industrial and Manufacturing Engineering, College of Engineering.

**Courses**

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements.
when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

**INDUSTRIAL ENGINEERING (IE) course list**

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06

Review Date: 04/14/2015

UCA Revision #2: 7/30/07

Faculty linked: 6/20/14
Appendix E: Consultation Responses for Proposed M.Eng. in IE Distance Degree Program

From: Karen Thole
Sent: Thursday, May 18, 2017 5:34 PM
To: Andris Freivalds <axf@engr.psu.edu>
Cc: Janis P. Terpenny <jpt5311@engr.psu.edu>; Mary Frecker <mxf36@engr.psu.edu>
Subject: RE: On-line MEng in IE

Dear Andris

Thank you very much for providing these helpful and detailed answers. I have no concerns and concur with the proposal. I wish you much success. The more online programs we have, the better it is for all of us.

Karen

Karen A. Thole

Distinguished Professor and Department Head
Department of Mechanical and Nuclear Engineering
The Pennsylvania State University
136 Reber Building, University Park, PA 16802-1412
(814)865-2519 FAX (814)865-1280
kthole@psu.edu www.mne.psu.edu

From: Andris Freivalds
Sent: Thursday, May 18, 2017 9:39 AM
To: Karen Thole <kthole@engr.psu.edu>
Cc: Janis P. Terpenny <jpt5311@engr.psu.edu>
Subject: RE: On-line MEng in IE

Karen,

Thanks for your comments. To answer your concerns.

- Does the IE594 capstone design course involve team project(s)? If so, how will the course be done with online students?

No these were meant to be individual projects, most typically for the industrial practitioners using a work-related problem. For those, not having any workplace project, we will use existing 'canned' problems/data sets for them to use. Also, not fully explained in the proposal, eventually once the numbers get higher, we would probably have several sections of IE 594 geared toward the different concentrations: human factors, manufacturing and operations research type problems. I will indicate 'individual' in the proposal to clarify that.
• The math on the number of students in section 5 is confusing, but graduating 25 students per year seems like an attainable goal. I am sure it will take quite a while to reach a steady state of 50 students per year. But I am basing that on my experience with the HFEE Certificate, which now has steady state numbers approaching 10 per year. Obviously, human factors is a small component of the IE discipline and extrapolating up based on departmental percentages would indicate at least 50 per year. But I will change the number to 25 in the proposal.

• The program would be much stronger if it were not simply video capture but rather a program that embraces pedagogical methods for online delivery. Yes, that is probably true, but presently all the courses listed already exist and have been taught on-line. Most of those are in the video capture format. So rather than wait and see what happens with the COE CDE office, we wanted to proceed. Once things get settled down there and they have time and manpower, we can talk about converting courses. Also, by that time we might have some money in the system to pay for the conversion. The startup costs with the World Campus instructional design approach would be cost prohibitive, as I have learned with the slow start of the HFEE Certificate. We would never have gotten off the ground if we had to pay for the World Campus ID costs.

• Even with the video capture, given the College’s closing of Continuing and Distance Ed and only two employees left, how will IME support the effort? (note Mr. Terry Reed listed on pg. 7 is no longer available).
At the present, we are running about a dozen courses this summer (most are undergrad, three are graduate on the list for the on-line degree) with minimal help from CDE. I think once we have established the new procedures (as being proposed by Tom Litzinger), we should be able to move ahead mostly on our own.

• Based on our experiences, the online students require significantly more advising than do resident students. Does IME have the resources to do so?
Again, based on our experiences, the two faculty involved with the steady state five (approaching 10) HFEE Certificate students have been able to take care of their academic advising needs. Since more faculty will be involved with the full degree, I think we should be able to handle it as other faculty join in. Also, our graduate staff support person helps in the admission process. Probably, with greater numbers, we may need to hire additional help for this staff person. I think she gets some such help during the admission crunch time and we obviously would get more help when needed.

I hope this answered your concerns. If not, we can talk a bit more. Or do you wish to meet with Janis and myself?

Andy
From: Paul Heinemann-Forward  
Sent: Monday, May 22, 2017 9:30 AM  
To: Andris Freivalds <axf@engr.psu.edu>  
Subject: Re: On-line MEng in IE

Yes, it is a “yes”.

Paul

Paul Heinemann  
Professor and Head  
Department of Agricultural and Biological Engineering  
814-865-2633  
hzh@psu.edu

From: Andris Freivalds <axf@engr.psu.edu>  
Date: Monday, May 22, 2017 at 9:28 AM  
To: Paul Heinemann <hzh@PSU.EDU>  
Subject: RE: On-line MEng in IE

Paul,

Thanks for the correction on the ‘typo’ (I guess I didn’t think of the implication as how you stated it).

Yes, we currently admit students to our on-site program with math or other science degrees (i.e. non engineering).

Thanks again, and I assume that it was a ‘yes’ to the program.

Thanks

Andy

From: Paul Heinemann-Forward  
Sent: Friday, May 19, 2017 2:07 PM  
To: Andris Freivalds <axf@engr.psu.edu>  
Cc: Jeff Catchmark <JCatchmark@engr.psu.edu>  
Subject: Re: On-line MEng in IE

Andy,

Our department has no concerns or issues related to the program.

A few minor notes:
It appears that the students entering the program do not need to have an engineering degree. I noted it states “engineering, physical sciences, and mathematics”. This presumes that none of the courses have engineering fundamentals as prerequisite, is this correct? Also, what else is included in the term “physical
sciences" besides physics? And finally, shouldn't it be “engineering, physical sciences, or mathematics”? I would assume someone wouldn’t need all three!

Paul

Paul Heinemann
Professor and Head
Department of Agricultural and Biological Engineering
814-865-2633
hzh@psu.edu

From: Kultegin Aydin
Sent: Saturday, May 20, 2017 2:35 PM
To: Andris Freivalds <axf@engr.psu.edu>
Subject: RE: On-line MEng in IE

Dear Prof. Freivalds,

I support your proposal for the on-line MEng in IE. This is a well prepared proposal and the program has the potential to be very successful.

Best regards,

Kultegin

Kultegin Aydin
Professor and Head
Department of Electrical Engineering

School of Electrical Engineering and Computer Science
The Pennsylvania State University
129 EE East, University Park, PA 16802
Phone: (814) 863-2788
From: Phillip Savage
Sent: Saturday, May 20, 2017 9:28 PM
To: Andris Freivalds <axf@ engr.psu.edu>
Subject: Re: On-line MEng in IE

Andy

I scanned the documents you had attached. ChE has no objections. Good luck launching the new on-line degree.

Phil

Phillip E. Savage | Department Head, Chemical Engineering | Penn State

Walter L. Robb Family Chair | Editor-in-Chief, Industrial & Engineering Chemistry Research
160 Fenske Lab | University Park, PA 16802 | ☏: 814-867-5876 | ☏: psavage@psu.edu

---

From: Patrick J. Fox
Sent: Wednesday, May 17, 2017 11:43 AM
To: Andris Freivalds <axf@ engr.psu.edu>
Subject: Re: On-line MEng in IE

Hi Andy - CEE supports this proposal. Please proceed from our standpoint.
Thanks for inquiring.

Pat

Patrick J. Fox, Ph.D., P.E., D.GE, F.ASCE
Department Head
John A. and Harriette K. Shaw Professor
Department of Civil and Environmental Engineering
212 Sackett
Pennsylvania State University
University Park, PA 16802
Tel: (814) 863-3084
pjfox@ engr.psu.edu
Board of Governors, ASCE Geo-Institute
R. BACHNAK <rab65@psu.edu>  Andris Freivalds
Re: On-line MEng in IE

You replied to this message on 4/9/2018 8:44 AM.

Bing Maps

Dear Andris,

I reviewed the proposal, and don't have any concerns. Good luck,

Ray

Rafic Bachnak, Ph.D., P.E.
Director, School of Science, Engineering, and Technology
Pennsylvania State University-Harrisburg
777 West Harrisburg Pike
Middletown, PA 17057-4898
Voice: 717-948-6541, Email: rab65@psu.edu

CHAUSTIN B TAYLOR <cbt9@psu.edu> on behalf of KAREN IRENE POLLACK <kiw1@
Proposal to offer the Master of Engineering in Industrial Engineering through World

You replied to this message on 4/17/2018 8:59 AM.

MENG in Industrial Engineering Support Letter_4-16-2018.pdf 152 KB

Bing Maps  Action Items

Good Morning,

Please view the attached document above sent on behalf of Karen Pollack.

Best,
Karen I. Pollack, Ph.D.
Assistant Vice Provost for Online and Blended Programs
Penn State Online, The World Campus
222M Outreach Building
University Park, PA 16802
(814) 863-6347 (w)
kiw1@psu.edu
Hello, Dr. Freivalds,

I am attaching a copy of the approval letter for your SARI@PSU plan for a MEng On-Line Program in Industrial Engineering. I am also attaching a copy of the SARI tracking form to be used by your program administrator. Please look over the form and make sure I have the SARI requirements entered correctly.

I have noted in the letter that the start date for the new program will be the fall of 2018. Let me know if this is incorrect and I will send you a new letter.

I will be out of the office the rest of the day but can make any necessary changes on Monday when I return.

Let me know if there is anything else I can do to assist you.

Best wishes for success,

Deb

Debrah A. Poveromo
Research Protections Education Coordinator
Office for Research Protections
The 330 Building, Suite 205
The Pennsylvania State University
University Park, Pa. 16802
dap192@psu.edu
(814) 863-1441
April 6, 2018

Dear Dr. Freivalds,

I am pleased to inform you that your SARI@PSU Plan for an on-line MEng program in Industrial Engineering has been received and approved for implementation beginning in the fall semester of 2018. Thank you very much for your time and attention to detail.

We will be sending you a SARI tracking form spreadsheet. Once the SARI@PSU program is underway, please use the spreadsheet to enter information regarding your students’ progress in meeting your SARI@PSU requirements. You will be notified each June to submit the spreadsheet back to us. We will keep a folder with your current plan and tracking form in our files. Our goal is to make this system as simple and transparent as possible, so please let us know if you have any comments or suggestions.

Additionally, graduate students attending ORP workshops for SARI credit will be required to swipe their PSU ID card to verify attendance. Program administrators will no longer be receiving electronic certificates via email from students. The ORP will email program administrators to verify attendance for individual students.

If, in the future, you find that circumstances require you to modify your SARI@PSU plan, please let us know and submit a revised SARI@PSU program plan form to the Office for Research Protections at least 30 days prior to the change. You may do this by email. Documents to support the SARI@PSU program can be found on the SARI@PSU website (www.research.psu.edu/training/sari), which includes additional resources for SARI@PSU education. As always, your questions, comments, and suggestions concerning any aspect of the SARI@PSU program are welcome.

Thank you again for your participation in this important initiative, and for supporting Penn State’s commitment to modeling and teaching the responsible conduct of research and scholarship in our community.

Sincerely,

Deb

Debrah Poveromo
Education Coordinator
To: Janis Terpenny, Peter and Angela Dal Pezzo Department Head of Industrial and Manufacturing Engineering

Fr: Karen Pollack, Assistant Vice Provost for Online and Blended Programs

Da: April 16, 2018

Re: Proposal to offer the Master of Engineering in Industrial Engineering through World Campus

The World Campus is pleased to continue its partnership with the Department of Industrial and Manufacturing Engineering, College of Engineering, and to support the proposed Master of Engineering in Industrial Engineering, for delivery via the World Campus at the Strategic Value Academic Exception (SAVE) level.

Based on market research findings and the program’s anticipated target audience and capacity, minimal enrollments are projected for the Master of Engineering in Industrial Engineering on an annual basis. Operation of the program at the SAVE level will offer the benefits of the Penn State World Campus brand marketing, while program-specific marketing will be the responsibility of the department.

We applaud the efforts of the department to offer an opportunity to students who have successfully completed the existing Graduate Certificate in Human Factors Engineering and Ergonomics (HFEE), to further their education through a professional master’s degree while staying at Penn State. As noted in the program proposal, Penn State is ranked in the top ten institutions offering residential Industrial Engineering but is one of only a few that do not yet have an online IE Master’s degree. However, the small overall market size and slow projected growth rate make this program best suited for the SAVE category.

If there are questions or concerns to which the World Campus can help respond during the review process for the Master of Engineering in Industrial Engineering program, please contact me.

Cc: Peter Butler, Associate Dean for Education, College of Engineering
    Andris Freivalds, Lucas Professor, Department of Industrial and Manufacturing Engineering
    Sonya Leitzell, Director of Academic Affairs, World Campus
Hi Phil,

The IME Department has decided to go ahead with an on-line MEng in IE. Attached is the proposal and the official memo. If you could please respond within two weeks, we would greatly appreciate it.

Thanks

Andy

Hi Dr. Parflitt,

The IME Department has decided to go ahead with an on-line MEng in IE. Attached is the proposal and the official memo. If you could please respond within two weeks, we would greatly appreciate it.

Thanks

Andy

Hi Cheng,

It was nice to catch up with you at the IDGP meeting.

The IME Department has decided to go ahead with an on-line MEng in IE. Attached is the proposal and the official memo. If you could please respond within two weeks, we would greatly appreciate it.

Thanks

Andy
Hi Dr. Das,

The IME Department has decided to go ahead with an on-line MEng in IE. Attached is the proposal and a the official memo.
If you could please respond within two weeks, we would greatly appreciate it.

Thanks

Andy

Hi Dr. Todd,

The IME Department has decided to go ahead with an on-line MEng in IE. Attached is the proposal and a the official memo.
If you could please respond within two weeks, we would greatly appreciate it.

Thanks

Andy

Hi Sven,

On a different topic, the IME Department has decided to go ahead with an on-line MEng in IE. Attached is the proposal and the official memo.
If you could please respond within two weeks, we would greatly appreciate it.

Thanks

Andy
Dear Dr. Gittings

The IME Department has decided to go ahead with an on-line MEng in IE. Since three of the potential courses (IE 573, 574, 587, once they get approved) are from your Supply Chain MPS, it would be appropriate for you to review our proposal. Attached is the proposal and the official memo.

If you could please respond within two weeks, we would greatly appreciate it.

Thanks

Andy
Appendix F:

Graduate Council Subcommittee On New And Revised Programs And Courses

COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member Proposing Course: ANDRIS FREIVALDS
College: ENGINEERING
Department or Instructional Area: INDUSTRIAL AND MANUFACTURING ENGINEERING
College/Academic Unit With Curriculum Responsibility: ENGINEERING
Type of Proposal: ☑Add ☐Change ☐Drop
Type of Review: ☑Full ☐Expedited
(See Guide to Curricular Procedure for definitions of a full or expedited review.)
Course Designation: (IE 894) Capstone Design

Proposed Bulletin Listing
Abbreviation : IE
Number : 894
Title : Capstone Design
Abbreviated Title : Capstone Design
Credits : Min: 3 Max: 3
Repeatable : No
Description : Apply analytical and design tools to solve an industrial problem:
Prerequisites
Concurrent Courses
Cross Listings
Does this Course have a Travel Component: No

Course Outline
A brief outline or overview of the course content
Students will apply the analytical and design skills learned in previous courses to solve an industrial problem.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion

 Prepare a proposal describing the problem and the approach used to solve it (2 weeks)

Work on solving the problem and prepare progress report (5 weeks)

Continue working and write report (8 weeks)
Long Course Description:
A succinct stand-alone course description (up to 400 words) to be made available to students through the on-line Bulletin and Schedule of Courses.
Students will apply the analytical and design skills learned in previous courses to solve an industrial problem based on their workplace or industrial partner. They will start with writing a proposal to clearly identify the problem and procedures to be used in solving the problem. The instructor will provide feedback on the approach and allow the students to proceed. Mid-way the students will write a progress report. Again based on the instructor feedback, the students will continue working and then summarizing the work in a final report. This will be submitted both to the instructor for a course grades, as well as to the sponsor of the project. Those students that do not have an identifiable work-related problem, will be able to choose among several case studies with data. This is an individual project.

The name(s) of the faculty member(s) responsible for the development of the course
Dr. Andris Freivalds, Lucas Professor of Industrial Engineering

Justification Statement
Instructional, Educational, and Course Objectives
This course is the culminating experience for the on-line Master of Engineering in Industrial Engineering degree. It will demonstrate whether the students can apply the analytical and design skills learned in the courses leading up to this point to an industrial problem of their choosing. After successfully completing this course, a student should be able to do similar work at their workplace.

Evaluation Methods:
Proposal: 10%
Progress Report: 20%
Final Report: 70%

Relationship/Linkage of Course to Other Courses
This course is meant for Industrial Engineering students to complete their MEng degree. A prior course in industrial engineering is necessary for this class.

Relationship of Course to Major, Option, Minor, or General Education
This course is the culminating experience for industrial engineering students to complete their MEng degree.
Appendix G

Completing the Graduate Program in Scholarship and Research Integrity (SARI) Industrial and Manufacturing Engineering

All scholars, from graduate students to senior investigators, confront ethical issues in their professional activities. Each year, thousands of Penn State investigators conduct research with integrity that would withstand the highest levels of scrutiny. Unfortunately, however, each year some Penn State personnel are involved in research misconduct allegations, inquiries, and investigations. Misconduct allegations have involved research personnel of every rank, and some findings have been serious enough to lead to recommendations of dismissal from the university.

Many cases involve situations where the responsible or ethical course of action was not clear to the investigator. Advance discussion of core principles and possible scenarios can help inform choices frequently made under pressure, helping to eliminate poor decisions.

The Scholarship and Research Integrity (SARI) program provides graduate students with opportunities to identify, examine, and discuss ethical issues relevant to their disciplines.

The SARI@PSU program is composed of two parts: an online training component (Part 1), and an interactive, discussion-based component (Part 2). The online training provides a common language and understanding of the history and principles of the responsible conduct of research. The discussion-based component provides an opportunity for in-depth exploration of important issues unique to each field of study.

**Effective Fall 2016:** IME graduate students must complete all SARI requirements by the end of admission semester.

**Satisfying Part 1 Requirement:** Please got to [http://citi.psu.edu/](http://citi.psu.edu/) and use the following instructions:
- Select “University Park, Commonwealth, and other non-Hershey personnel”
- Select “Add a Course or Update Learner Groups”
- Select “I need to take RCR training to satisfy SARI@PSU training requirements”
- Select “Graduate”
- Select “Responsible conduct of research (RCR) course....”

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<th>CITI Program RCE course models</th>
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<td><strong>Required Modules:</strong></td>
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<td>Authorship</td>
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<td>Collaborative Research</td>
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<td>Data Management</td>
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<td>Research Misconduct</td>
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<td>Plagiarism</td>
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**NOTE:** After successful completion of 80% or higher, you will receive a certificate of completion (**keep for your SARI records**).

**Satisfying Part 2 Requirement (Attend the SARI portion of Fall and Spring New Grad Student Orientation):**
- Attend Fall New Grad Student Orientation: 3 hrs/ Freivalds/ethics-academic
- Attend Spring New Grad Student Orientation: 2 hrs/Voigt/ethics-professional

Note: **Part 2 is complete with 5 hours**
How to satisfy Part 2 SARI requirement (Only if unable to attend fall and/or spring SARI orientation):

You will need a total of 5 hours for Part 2. If you attended one of the SARI orientations, you can subtract that number of hours from the 5 required hours. In order to obtain the remaining hours, you can do the following:

College of Engineering (COE) Component (typically 1-hour video segment and quiz)
- Email Danielle (drs199@psu.edu) to request access to view the video segments in CANVAS
  - No limit to the number of hours obtained via video segments.
  - After logging into http://canvas.psu.edu/, you will be able to view the available SARI video segments.
- A score of 80 points is considered a passing score on the associated quiz.
- Request your certificate at the completion of the module (keep for your SARI records).
  NOTE: If you attended Dr. Freivalds orientation in person, you cannot receive credit for the corresponding 2-hour video segment.

Office of Research Protections (ORP) Component: NOTE: MAXIMUM of 2 hours in this component
- Upcoming events can be found at: https://www.research.psu.edu/education/sari/sari-events.
Graduate Student SARI Checklist
Department of Industrial and Manufacturing Engineering

Name: ____________________________ Email Address: ____________________________

Admission Semester: ____________________________

Effective Fall 2016: IME graduate students must complete all SARI requirements by the end of their admission semester.

PART 1. Online CITI tutorial on Responsible Conduct of Research (RCR)

Date completed ____________________________

PART 2. Note for ORP Workshops: You can obtain only two of the five hours from ORP sponsored workshops. You will be required to swipe PSU ID to verify attendance at ORP workshops. Danielle Fritchman will forward to you your attendance confirmation; please keep for your SARI records.

1. SARI activity (underline one: ORP or COE-video segment or Departmental-Orientation)
   Title: ____________________________
   Date attended: ____________________________

2. SARI activity (underline one: ORP or COE-video segment or Departmental-Orientation)
   Title: ____________________________
   Date attended: ____________________________

3. SARI activity (underline one: ORP or COE-video segment or Departmental-Orientation)
   Title: ____________________________
   Date attended: ____________________________

4. SARI activity (underline one: ORP or COE-video segment or Departmental-Orientation)
   Title: ____________________________
   Date attended: ____________________________

5. SARI activity (underline one: ORP or COE-video segment or Departmental-Orientation)
   Title: ____________________________
   Date attended: ____________________________

Once all requirements have been met AND this checklist completed, email Danielle Fritchman (drs199@psu.edu) your checklist along with your completion certificates, attendance confirmations, and CITI transcript or hand deliver all documentation to 310 Leonhard Building. Once reviewed, Danielle will send you an email confirming all SARI requirements have been met.

AN INCOMPLETE CHECKLIST WILL BE RETURNED FOR COMPLETION.
Graduate Council
Program, Option, or Minor Proposal Form

Submit 1 original, signed Graduate Council proposal form and 2 hardcopies of the graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Curriculum Coordinator, University Faculty Senate, 101 Kern Graduate Building, University Park. The proposals will be transmitted to the Office of the Dean of the Graduate School for entry into the Graduate Council curricular review process; for more information about the process, see the Overview of the Graduate Council Curricular Review Process.

The Program Proposal Procedures provide guidance for the development of a graduate program proposal. If you have questions regarding the preparation of a graduate program proposal or how to complete this Graduate Council proposal form, contact the Office of the Dean of the Graduate School.

College/School:  College of the Liberal Arts
Department or Instructional Area: Spanish and Visual Studies

New Graduate Program, Option, or Minor:  [✓] Add
Designation of new graduate program:  Dual Title in Spanish and Visual Studies
Classification of Instructional Programs (CIP) Code:
Designation of new graduate option:
Designation of new graduate minor:

Indicate effective semester:
[✓] First semester following approval
☐ Second semester following approval

Existing Graduate Program Option, or Minor: [ ] Change  [ ] Drop
Current designation of graduate program:
Current designation of graduate option:
Current designation of graduate minor:

New designation of existing graduate program (if changing):
New designation of existing graduate option (if changing):
New designation of existing graduate minor (if changing):

Brief description of the change (if not noted above):

Indicate effective semester:
[ ] First semester following approval
[ ] Second semester following approval

Submitted by Graduate Program Head
Matthew J. Marr
Printed name
Signature
Date: 1/9/18

Noted by College/School Representative to Graduate Council Subcommittee on New and Revised Programs and Courses:
Michael Pfaff
Printed name
Signature
Date: 1/10/19

Approved by College/School Dean/Chancellor (or Designee):
Dr. Scott Bennett
Printed name
Signature
Date: 1/9/18
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<th>Recommended by Chair, Graduate Council Subcommittee on New and Revised Programs and Courses:</th>
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A Proposal to the Graduate Council by the Graduate Program in Spanish to Adopt the Dual-Title Graduate Degree Program in Visual Studies

Submitted by the Department of Spanish, Italian, and Portuguese
Dr. Giuli Dussias, Head

Prepared by Dr. Matthew Marr, Associate Professor of Spanish
January 23, 2019
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I. Program Justification and Objectives

A. The Department and Interdepartmental Context

The Department of Spanish, Italian, & Portuguese at Penn State offers two discrete tracks at the doctoral level, both of which aim to prepare graduate students for careers as university and college faculty. One track, in Hispanic linguistics, focuses on the scientific study of the Spanish language. The other—of sole relevance to this proposal—centers on the integrative study of the literatures of Spain, Latin American (including Brazil), and U.S. Latinx authors. In keeping with evolving disciplinary norms in most top U.S. university Spanish programs over the past quarter century, this doctoral track at Penn State blends diachronic training in the aforementioned literary traditions with exceptional theoretical preparation, while also emphasizing the broader field of extraliterary cultural production as it has emerged across the national and regional boundaries of the Hispanophone world.

In this latter respect, a core component of students’ training directly involves visual culture, now a key area of interdisciplinary interest for many top journals and presses, for the foremost conferences in the field, and for institutions seeking to hire junior colleagues with profiles that challenge and diversify canonical conceptions of literary studies. The research interests and course offerings of all SIP graduate faculty members who regularly teach and advise in the literature and culture Ph.D. program engage with visual culture on a variety of fronts and through a host of methodological approaches. Some main areas of faculty strength in this regard include film studies (Spanish, Luso-Brazilian, Inter-American); Mexican and Brazilian theater, performance, and media studies; Spanish early modern print and material culture; contemporary Latin American literature, architecture, and the production of social space;
Spanish art deco, cubism, documentary photography, and political propaganda; Chicano performance art; Spanish contemporary graphic novel and comics; European children’s picturebooks; the aesthetics of the body and disease; and intersections between visual and sound studies in both the Latin American and Peninsular contexts.

Offering the dual-title Ph.D. in Spanish and Visual Studies will provide a meaningful student credential building both on these existing faculty strengths and ongoing partnerships with other Penn State Ph.D.-granting units, the Humanities Institute, the Center for Humanities and Information, the library, and the Palmer Museum. The dual-title Ph.D. will provide an additional tool in our yearly efforts to attract a larger and more dynamic pool of graduate applicants (results in evidence, indeed, with our linguistics track’s recent addition of a dual-title Ph.D. in Spanish and Language Science), and it will provide another platform for current students to pursue grant-writing, other forms of fund-raising, and field research at sites that extend beyond conventional literary archives. As a program feature uncommon in most peer departments nationally, the dual-title degree program will also serve as a potential means of attracting future faculty hires in the SIP literature and culture section.

B. Program Justification

1. The College Context

The dual-title Ph.D. program in Spanish and Visual Studies contributes to the primary goal outlined in the College of Liberal Arts 2014-19 strategic plan: “to sustain and broaden our national leadership in research and graduate education … by focusing on areas of strength and expanding our dual-title offerings.” The program will raise the profile and improve the quality of graduate education in the College of Liberal Arts by enhancing or supplementing various
approaches to graduate-level work in visual studies that have already emerged at Penn State over
the past several years. The university offers many resources for this work, but until the recent
creation of the Visual Studies Program, these were spread across an array of departments and
other units. The Visual Studies Program currently offers dual-degree Ph.D. tracks in English,
Comparative Literature, French and Francophone Studies, and German (with other departments
having submitted recent proposals). Collaboration on the part of the Department of Spanish,
Italian, & Portuguese will offer additional support to the organization of Visual Studies resources
in the college, contributing toward a coherent field of study in which doctoral students can
receive training and credentialing.

The dual-title Ph.D. aligns perfectly with the vision set forth in the 2014 SIP Strategic
Plan, which emphasizes how research and teaching in the Spanish, Latin American, and Latinx
literature and culture section reflect a strong embrace of methodological interdisciplinarity, a
major aspect of which involves moving beyond the study of canonical literature to other forms of
cultural production—much of which, as clearly outlined in the areas of faculty research outlined
above, is definitively visual in nature.

2. Justification for the Degree Title

The degree title, “Visual Studies” was chosen in consultation with representatives from
the College of Liberal Arts, the College of Arts and Architecture, and the College of
Communications to signify the critical methodology and breadth of this course of study, which is
both distinct from existing programs at the university and open to a wide range of collaborating
units now and in the future. The term “Visual Studies” underscores that virtually all modern and
contemporary discourses are bound in myriad ways to images, making it essential for any
graduate student of the cultures of Spain, Latin American, and U.S. Latinx populations to have a critical understanding of how pictures and other optical modes have been deployed to produce cultural meaning. This doctoral degree will raise the visibility of our existing graduate programs with a credential that will invite strong doctoral applicants and confer a competitive edge in the job market for our graduates.

C. Program Objectives

The principal aim of the dual-title Ph.D. in Spanish and Visual Studies is to provide students on the literature and culture track of the Spanish graduate program with the opportunity to formalize the Visual Studies-related interdisciplinary components of their training so as to enhance their scholarly work and competitiveness on the job market. It will do this by combining the resources of SIP faculty, other departments, and relevant facilities across the college and university into a formal structure for training graduate students in the knowledge, analysis, and evaluation of a wide range of visual culture, and by providing sustained attention to critical and theoretical scholarship from across this interdisciplinary field. Such training will cultivate breadth by pushing students to think across conventional disciplinary boundaries and domains of practice, and it will ensure rigor through exposure to a variety of faculty working in closely related historical and methodological fields informed by a rich mixture of approaches and institutional perspectives. Adopting the dual-degree will boost visibility for what is already a rich harvest of SIP curricular and research initiatives of relevance to visual culture, while broadening the potential for growth in this direction under what will be a formalized program banner. This enhancement of the profile and quality of the program will aid in attracting
ambitious graduate students, and it will offer a credential that will contribute to success in job placement.

D. Size of Program and Impact on Course Offerings and Faculty Load

The graduate program in Spanish on average admits ten students per year, with approximately four of these enrolling on the literature and culture track. Though these four yearly students are admitted with the expectation that they will continue to the Ph.D. degree, the road to candidacy—along which a terminal M.A. is available—has tended over time to yield an attrition rate of about 50%, which means that the five-year doctoral program typically has a total population of about ten students in any given year. Taking into account trends in students’ pursued areas of scholarly interest over the past five years (as measured by dissertation topics, independent studies, conference presentations, and publications), it would be safe to project that between a quarter and half of our students—around 2 to 5 total—would express interest in joining the dual-degree Visual Studies program.

The two required programs for the dual-title Ph.D. program, VSTUD 501 (Visual Culture Theory and History) and VSTUD 502 (Visual Studies in Digitality) are taught on rotation by core graduate faculty (currently from English, German, French and Francophone Studies, and Comparative Literature) as part of their commitment to teach in the Visual Studies Program. In Spanish, faculty on the literature and culture track generally offer three total seminars per semester, the topics of which often engage directly with visual studies in the Hispanic world. For example, in the academic year 2017-18 alone (the first year in which the Visual Studies Program was officially active), the Department of Spanish, Italian, & Portuguese offered three topical seminars listed on the Visual Studies website as elective courses: SPAN 597: “Poetry
and Material Culture in Habsburg Spain” (Spring 2018); SPAN 597: CMLIT/SPAN 597: “Race, Performance, and Possession in the Americas” (Fall 2017), and SPAN 597: “Spanish Cinema Studies: Current Methods and Theoretical Approaches” (Fall 2017). In the coming months, SIP faculty members will move to convert these and other relevant courses from 597-status to permanent entries in the Graduate Bulletin, as was recently done for a course on Spanish filmmaker Pedro Almodóvar (now listed as SPAN 561).

E. Student Recruitment and Employment Prospects

Increasingly, SIP faculty members, the DGS, and the department as a whole receive yearly inquiries from prospective graduate students asking how our research and teaching interests in Visual Studies play out in course offerings and other program opportunities. The dual-title Ph.D. will improve our ability to demonstrate these existing strengths and resources, thus enhancing our ability to recruit and retain doctoral students in a formalized program that actively publicizes, coordinates, and credentials work in the field.

Students will enter the dual-title program either from the ranks of existing graduate students on the literature and culture track in Spanish, or as students newly admitted therein. In either case, students will have to declare their intention and secure permission to complete the dual-title degree in accordance with all program requirements (detailed below). The dual-title program will be advertised on the SIP website, as well as on the web pages of other units and in the Graduate Bulletin. Professional meetings, conferences, undergraduate programs in Spanish and in Visual Studies will also be mined for recruitment publicity.

Providing our doctoral graduates with an edge on a job market in Hispanic Studies that is increasingly oriented toward visual media and issues of visuality is a fundamental rationale for
this dual-title degree. The training and credentialing at the core of this program will offer our
graduate students an important advantage when they apply for positions as university and college
faculty, or if they ultimately pursue alternative career paths in the culture and media industries.
Successful results vis-à-vis job placement will fortify the reputation of our graduate program,
thereby improving our future ability to attract outstanding students and enabling a cycle that will
continue to strengthen the department as a whole in the long run.

F. Costs and Funding

Because the two required core seminars for the dual-title Ph.D. will be taught as part of
each Visual Studies faculty member’s commitment to teach graduate seminars on a rotating
basis, these courses will not require new faculty lines. Existing and soon-to-be-processed
graduate-level courses in Visual Studies in the Spanish Graduate Bulletin (including, but not
limited, to those listed in section D above), topical Spanish 597-level electives, and seminars in
program-affiliated departments will ensure a curriculum and make more efficient use of existing
resources across the college and university. SIP will communicate with other graduate programs
to explore the possibility for concurrent course listings, where applicable. While the value added
in any dual-title program may require some students to take additional time to complete their
degrees, they will not incur additional costs by participating in the program. It should be noted
that graduate students carrying a full-time course load typically accumulate more than the
required number of courses for the Ph.D. in Spanish; with proper planning, these extra courses
can be devoted to the Visual Studies dual-degree. Advisers will help students select their courses
in order to ensure that all degree requirements are satisfied in a timely manner, and the
Department of Spanish, Italian, & Portuguese will distribute its funding awards in accordance
with standing practices for duly admitted graduate students. Graduate assistantships available to
students in this program and other forms of student aid are described in the Student Aid section
of the Graduate Bulletin. Students supported by funds from the Spanish program will perform
teaching and other academic duties determined by the SIP Head and Director of Graduate
Studies in Spanish. Students will receive all possible assistance from the graduate faculty to
write grants in support of field research and other academic endeavors.

II. List of Courses

A. Core Courses

VSTUD 501 (3 credits): Visual Culture Theory and History. This course examines
foundational theoretical texts that have come to define visual culture as a historically delineated
academic discipline. The goal is to examine the interdisciplinary relationships that emerged with
modern technologies, media, aesthetic agendas, and social relationships to produce visual culture
as a field of study. This course will review structuralist, semiotic, rhetorical, and technological
approaches to understanding the relationship between word and image in modern media. These
methods are applied to studying museum exhibitions, photography, film, fashion, and book arts
as they developed in the twentieth century. These media will be examined in their specifically
modern context, first as a specific outgrowth of industrial urban environments and then within
post-industrial media networks. This course is a required seminar for the dual-title degree in
Visual Studies.

VSTUD 502 (3 credits): Visual Studies and Digitality. This course explores the theoretical,
historical, and operational aspects of visual culture as they relate to the production and
consumption of information via digital technologies. Students will gain familiarity with theories of the visual nature of digital technology and the history of these technologies as they relate to humanistic disciplines and ideals of public pedagogy. This background will inform an engagement with the tools of rhetorical analysis and critical media theory as students hone skills in critical literacy or digital media, including organizing scholarship and pedagogy for digital presentation and assessing such presentations with regard to both technical issues concerning the integration of the visual and the textual, and broader questions concerning the ideological, economic, and institutional effects of the digitization of learning. This course is a required seminar for the dual-title degree in Visual Studies.

B. Seminars to be Developed by SPAN

The Department of Spanish, Italian, & Portuguese is in the process of transferring several of its Visual Studies electives from 597-status to permanent catalogue offerings in the Graduate Bulletin (the process for one such course, SPAN 561 [listed directly below] was completed in 2017). Beyond the courses here listed (all of which have been taught in at least one iteration), other seminars aligned with faculty members’ Visual Studies-related research interests—outlined in section IA—are also in development. In those courses where the language of instruction is English (and course materials are available in translation), faculty members may elect to cross-list with a VSTUD course number.
SPAN 561: The Cinematic Pluriverse of Pedro Almodóvar. This seminar will examine the cinematic imagination of Spain’s most internationally celebrated filmmaker, Pedro Almodóvar. Topics to be considered will include Almodóvar’s lensing of gender politics, sexuality, multiculturalism, and national identity in post-dictatorial Spain; his nimble negotiation of the local and the global; his taste for cinephilic self-referentiality and hybridity of genre; and a distinctive tendency toward thematic idiosyncrasy, all of which are signature features of his postmodern brand. Significant attention will be devoted to approaches and trends within the vast corpus of scholarly criticism dealing with the filmmaker’s oeuvre, and our engagement with film theory will arise organically out of the references from these texts. Some basic tools, techniques, and language of film analysis will be considered, as will a general understanding of field-specific norms of film studies as practiced in North American and U.K. Hispanism. This course will be conducted primarily in English, though a few critical essays and all films will be in Spanish (most will have subtitles in English or Spanish). Students may write papers in Spanish or English, but are encouraged (though not obligated) to develop their skills in both languages by writing in their weaker language for at least one assignment.

SPAN 597: Poetry and Material Culture in Habsburg Spain. With the rise of Spain in the sixteenth century as a trans-European and global power, social, political, and aesthetic ideals were aligned with the court, empire and modernity. This course will focus on how major poets of Habsburg Spain used artifacts as material sites of discourse to explore connections to antiquity, cultural memory, political and social events, space, self-representation, and status. Artifacts range from large decorative objects, like tapestries, paintings, and frescoes, to trinkets and accessories gathered in “cabinets of curiosities.” The course will examine diverse topics: the city as text, specifically how a “pilgrim” and learned humanist from Spain reads Rome’s ruins and
museum artifacts, a dynamic palimpsest of objects that are carriers of ancient culture and history; how objects like tapestries and paintings are used to explore questions of patronage, social networking, and gift-giving as well as to both celebrate and critique the politics and ideology of empire; how mirrors and portrait miniatures are used for examining questions of introspection and self-reflexivity of an incipient modern subject; and how inscriptions on tombs and urns explore the interplay between orality and writing, voice and memory. Since the topic is part of a larger European phenomenon, the course will include Spain’s cross-cultural relations with Italy, a major source of objects, ranging from archaeological discoveries in Rome to paintings and printed books. The course also will consider the role of early modern collectionism in textual and artistic production. This course will be taught in Spanish. Students are encouraged to give oral presentations in Spanish, but may write their papers in Spanish or in English.

SPAN/CMLIT 597: Race, Performance, and Possession in the Americas. This course will take a hemispheric approach to examining the connections between race, performance, and “possession”—both in the sense of property ownership to spirit possession. We will explore the complexities of this term and ask what it can tell us about the equally complex notions of “race” and “performance” by studying theater, performance art, films, literature, historical documents, music, etc. from throughout the Americas. Possible topics include: the exhibition of racially marked bodies and “scenes of subjection”; examples of racial impersonation such as blackface performance; slaves as objects of conspicuous consumption and the racialization of conspicuous consumption in the present; Haitian vodou, and links between zombies and whiteness in recent popular culture; avant-garde engagements with ritual practices of trance; struggles over copyright and cultural appropriation; and the politics of archives and museum
collections. This course will be taught in English, with all materials available in the original (English, Spanish, Portuguese, or French) and in English translation.

**SPAN 597: Spanish Cinema Studies: Current Methods and Theoretical Approaches.** This course will focus on current theoretical trends in Spanish film studies. Moving beyond a set of traditional methodologies rooted in film history, genre studies, notions of a “national” cinema, auteurism, and/or formalism, much recent work in the field has embraced the insights of scholarship from areas ranging from sound studies to geocriticism, from ecocriticism to disability studies, from the politics of social activism to televisuality and media studies. While foregrounding critical readings which have broadened the field in this regard, this course will also emphasize—as a secondary concern—the fundamentals of reading film. It will offer an overview of cinematic practices vis-à-vis performance, cinematography, sound, direction, editing, and production, namely with the goal of enhancing students’ ability (as seasoned literary critics) to move beyond the application of interpretive tools bound to the realm of narrative. This course will be conducted primarily in English, though a few critical essays and all films will be in Spanish (most will have subtitles in English or Spanish). Students may write papers in Spanish or English, but are encouraged (though not obligated) to develop their skills in both languages by writing in their weaker language for at least one assignment.

**SPAN 597: Latin American Modernisms and (Old) New Media** (3 credits). In recent years, the rise of digital technologies has led critics to reconsider the category of “literature” and look back at the ways in which it has changed throughout history in response to the advent of new media. In this course we will take up this question in the context of Latin America, beginning in the late nineteenth century and continuing into the present. Among the questions we will ask:
How might shifting the focus to regions often regarded as “backward” and “behind” help challenge the rhetoric of rupture and historical amnesia that often accompanies the introduction of “new” media? Given the (in some places) high rates of illiteracy, has literature in Latin America responded differently to the challenges posed by new media? How has the "embodied" art of theater responded to changes in the mediascape, including the invention of the phonograph, film, radio, and digital media? Each week we will read key works of media theory and criticism alongside literary and artistic works by a wide array of Latin American writers. The course will cover a number of works on the MA list for students in SIP, including modernista poetry and other types of texts by José Martí, Miguel Ángel Asturias’s *El señor presidente*, Roberto Arlt’s play *Saverio el cruel*, Gabriel García Márquez’s *Cien años de soledad*, and stories by Jorge Luis Borges; it will also include a few texts in Portuguese by writers such as the Brazilian concrete poets, which we will consider in relation to the rise of cybernetics. For those with no background in Portuguese, these texts will either be available in translation, or (as in the case of concrete poetry) will be simple for readers of Spanish to decipher.

III. Proposed Graduate Bulletin Copy

**Graduate Program Head:** Paola (Giuli) Dussias

**Program Code:** SPAN

**Campus:** University Park (Ph.D., M.A.)

**Degrees Conferred:** Ph.D., M.A.

- Dual-Title Ph.D. in Spanish and Language Science
- Dual-Title Ph.D. in Spanish and Visual Studies

**The Graduate Faculty:** [View](#)
The Spanish program offers an option in Applied Linguistics for the M.A. and Ph.D. degrees, and an emphasis in literature and linguistics for the M.A. and Ph.D. degrees.

**Admission Requirements**

Applicants apply for admission to the program via the Graduate School application for admission. Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions.

Scores from the Graduate Record Examinations (GRE) are required of all students educated (high school and college) in the continental United States.

The minimum requirement for admission normally will be the equivalent of an undergraduate Spanish major.

Applicants must submit a statement of purpose and a single-authored sample of representative research. One of these must be in Spanish and one in English.

The language of instruction at Penn State is English. English proficiency test scores (TOEFL/IELTS) may be required for international applicants. See GCAC-305 Admission Requirements for International Students for more information.

**Degree Requirements**

**MASTER OF ARTS (M.A.)**

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements.

A candidate for the M.A. degree must take a minimum of 30 credits at the 400, 500, or 800 level, with at least 18 credits in 500-level courses. Required courses for the M.A. degree are SPAN 502 (1 credit) and PORT 123 (2 credits). Students are required to take PORT 123 in order to achieve basic proficiency in Portuguese; however, as a 100-level undergraduate course, PORT 123 will not count towards the 30 minimum credits required for the degree and will not count in the cumulative GPA required for the degree.

The culminating experience for the M.A. degree is a scholarly essay. A cumulative examination is also required, which serves as the doctoral qualifying examination for students continuing in the Ph.D. program. The M.A. degree (or equivalent) is normally a prerequisite for entrance to the Ph.D. program.

**DOCTOR OF PHILOSOPHY (PH.D.)**

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements.
For the Ph.D. degree, a student must complete at least 51 credits (including M.A. credits) of course work at the 400, 500, 600, or 800-level. Other requirements include reading knowledge of a language other than English and Spanish and submission of an essay to a peer-reviewed journal. Doctoral students must pass a qualifying examination, a comprehensive written and oral examination, and a final oral examination (the dissertation defense). To earn the Ph.D. degree, doctoral students must also write a dissertation that is accepted by the doctoral committee, the head of the graduate program, and the Graduate School.

DUAL-TITLES

Dual-Title Ph.D. in Spanish and Language Science

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Graduate students with research and educational interests in Spanish may apply to the Spanish and Language Science dual-title degree program. The goal of the dual-title in Spanish and Language Science is to enable graduate students from Spanish to acquire the knowledge and skills of their major area of specialization in Linguistics while at the same time gaining depth and methodological expertise in the areas associated with the language sciences.

Admission Requirements

Students must apply and be admitted to the graduate program in Spanish and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Language Science dual-title program. Refer to the Admission Requirements section of the Language Science Bulletin page. Doctoral students must be admitted into the dual-title degree program in Language Science prior to taking the qualifying candidacy examination in their primary graduate program.

Degree requirements

To qualify for the dual-title degree, students must satisfy the degree requirements for the Ph.D. in Spanish, listed on the Degree Requirements tab above. In addition, students must complete the degree requirements for the dual-title in Language Science, listed on the Language Science Bulletin page.

Particular courses may satisfy both the Spanish requirements and those in the Language Science dual-title program. Final course selection is determined by the student after consultation in advance with their advisers. A student’s doctoral committee can require additional course work depending on the student’s background and research plans.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Spanish and must include at least one Graduate Faculty member from the Language Science program. Faculty members who hold appointments in both programs’
Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Spanish and Language Science. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for doctoral committees, the doctoral committee of a Spanish and Language Science dual-title Ph.D. student must include at least one member of the Language Science Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the doctoral committee is not also a member of the Graduate Faculty in Language Science, the member of the committee representing Language Science must be appointed as co-chair. The Language Science representative on the student’s doctoral committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their doctoral committee and reflects their original research and education in Spanish and Language Science. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the doctoral committee, the head of the graduate program, and the Graduate School.

**Dual-Title Ph.D. in Spanish and Visual Studies**

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Graduate students with interests in Spanish and/or Latin American literature and visual media may apply to the dual-title Ph.D. in Spanish and Visual Studies. The goal of the dual-title Ph.D. in Spanish and Visual Studies is to enable graduate students from Spanish to acquire the knowledge and skills of their major area of specialization in Spanish and/or Latin American literature, while at the same time gaining the theories and methods of Visual Studies.

**Admission Requirements**

To pursue a dual-title degree under this program, the student must first apply to the Graduate School and be admitted through the Department of Spanish, Italian, and Portuguese (see the Admission Requirements tab). After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Visual Studies dual-title program. Refer to the Admission Requirements section of the Visual Studies Bulletin page. Students must receive approval from the Director of Graduate Studies in Spanish, and must submit a recommendation from a member of the Spanish Graduate Faculty who is also a member of the Visual Studies Graduate Faculty. Doctoral students must be admitted into the dual-title degree program in Visual Studies prior to taking the qualifying examination in Spanish.

**Degree Requirements**
To qualify for the dual-title degree, students must satisfy all of the degree requirements listed on the Degree Requirements tab for the Ph.D. degree in Spanish. In addition, students must complete the degree requirements for the dual-title in Visual Studies, listed on the Visual Studies Bulletin page. At least 9 of the 24 credits required for the Visual Studies dual-title must be from Spanish courses dealing with questions of visuality. These courses must be chosen in consultation with the Director of Graduate Studies in Spanish.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Spanish and must include at least one Graduate Faculty member from the Visual Studies program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Spanish and Visual Studies. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for doctoral committees, the doctoral committee of a Spanish and Visual Studies dual-title Ph.D. student must include at least one member of the Visual Studies Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the doctoral committee is not also a member of the Graduate Faculty in Visual Studies, the member of the committee representing Visual Studies must be appointed as co-chair. The Visual Studies representative on the student’s doctoral committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their doctoral committee and reflects their original research and education in Spanish and Visual Studies. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the doctoral committee, the head of the graduate program, and the Graduate School.

**Student Aid**

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding section of The Graduate School’s website. Students on graduate assistantships must adhere to the course load limits set by The Graduate School.

The following awards typically have been available to graduate students in this program:

The department awards annually an Edwin Erle Sparks Fellowship in the Humanities. In the past several years, graduate students have received external NSF fellowships and awards such as Doctoral Dissertation Research Improvement grants.

**Courses**
Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

**Learning Outcomes**

1. Demonstrate competence in Spanish—and when appropriate Portuguese—for written and oral communication for academic research, presentations, and teaching.
2. Develop in-depth scholarly knowledge of the literary, cultural, and intellectual Luso-Hispanic traditions.
3. Articulate competence in a range of approaches to analyze, study, and write about texts and other cultural productions.
4. Establish mastery of the conventions of writing and delivering a paper at a professional conference.
5. Formulate and execute an independent research project that significantly furthers knowledge and theory in a specific field within Luso-Hispanic Studies.
6. Demonstrate ability to uphold standards of academic, professional, and ethical integrity in research and teaching.
7. Demonstrate ability to design course activities and assessments, and deliver instruction appropriate to undergraduate education.

**Contact**

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<thead>
<tr>
<th>Campus</th>
<th>University Park</th>
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<tr>
<td>Graduate Program Head</td>
<td>PAOLA EULALIA</td>
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<td>Director of Graduate Studies (DGS) or Professor-in-Charge (PIC)</td>
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<tr>
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<td>(814) 863-5417</td>
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**Program Contact**

**Program Website**

View

IV. Affected Departments and Programs

The dual-title Ph.D. Program in Visual Studies involves collaboration (current and proposed) between five graduate programs in the College of the Liberal Arts -- Comparative
Literature; English; French and Francophone Studies; German and Slavic Languages; and (as here proposed) Spanish. The Department of Art History submitted letters assuring their participation in administering the Visual Studies dual-title degree. The Ph.D. program in Art Education is also considering a partnership.
January 21, 2019

To the Graduate Council.

We are writing as the founding director and the acting director of the Visual Studies dual-title PhD program in order to endorse very enthusiastically the adoption of this dual-title by the Department of Spanish, Italian, and Portuguese.

With the addition of this department, we are delighted to have realized our initial vision of the Visual Studies dual-title program as a collaboration of the modern language departments with Art History and colleagues in other related departments across the university.

We strongly endorse this application to adopt the program.

Sincerely,

Daniel Purdy
Professor of German

Christopher Reed
Distinguished Professor of English
and Visual Culture
Graduate Council
Program, Option, or Minor Proposal Form

Submit 1 original, signed Graduate Council proposal form and 2 hardcopies of the graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Office of the Dean of the Graduate School, 211 Kern Building, University Park. For more information about the process, see the Overview of the Graduate Council Curricular Review Process.

The Program Proposal Procedures provide guidance for the development of a graduate program proposal. If you have questions regarding the preparation of a graduate program proposal or how to complete this Graduate Council proposal form, contact the Office of the Dean of the Graduate School.

College/School: Smeal College of Business
Department or Instructional Area: Strategic Management and Executive Leadership

New Graduate Program, Option, or Minor: Add

Designation of new graduate program: ____________________________________________
Classification of Instructional Programs (CIP) Code: ________________________________
Designation of new graduate option: _____________________________________________
Designation of new graduate minor: _____________________________________________

Indicate effective semester:
First semester following approval
Second semester following approval

Existing Graduate Program Option, or Minor: Change Drop

Current designation of graduate program: Master of Management in Strategic Management and Executive Leadership
Current designation of graduate option: _____________________________________________
Current designation of graduate minor: _____________________________________________

New designation of existing graduate program (if changing): _______________________
New designation of existing graduate option (if changing): __________________________
New designation of existing graduate minor (if changing): ___________________________

Brief description of the change (if not noted above): New concentration and change to Admission Requirements

Indicate effective semester:
First semester following approval
Second semester following approval

Submitted by Graduate Program Head
Vilmos Misangyi
Printed name
Signature

Date: 2/13/17

Noted by College/School Representative to Graduate Council/Subcommittee on New and Revised Programs and Courses:
Arvind Rangaswamy
Printed name
Signature

Date: 2/13/17

Approved by College/School Dean/Chancellor (or Designee):
Steven Huddart
Printed name
Signature

Date: 2/14/17
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PROGRAM CHANGE PROPOSAL —
MASTER OF MANAGEMENT IN STRATEGIC MANAGEMENT AND
EXECUTIVE LEADERSHIP

THE PENNSYLVANIA STATE UNIVERSITY — SMEAL COLLEGE OF BUSINESS
ALBERT A. VICERE, PROFESSOR OF BUSINESS ADMINISTRATION, SMEAL COLLEGE OF BUSINESS
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   - New Primary Concentrations ................................................................. 8
   - Old Admission Requirements .............................................................. 13
   - New Admission Requirements ............................................................. 14

D. Revised Bulletin ......................................................................................................................... 15
A. Program Change Justification

Justification for new primary concentration area:

We are adding a third primary concentration in Business Sustainability Strategy. This is a topic of great interest to the target market for this program and we now are able to offer courses in this area.

Justification for changing:

Two letters of recommendation that attest to your readiness for graduate study and document the requisite of about 10 years of work experience including five or more years of management experience.

To

Two letters of recommendation that attest to your readiness for graduate study.

The original language is confusing and most recommenders may not be able to verify 10 years of work experience given that people often change jobs today. Our program office will verify that candidates possess the required work experience.

B. Learning Goals and Objectives

The Master of Management in Strategic Management and Executive Leadership Goals and Objectives:

1. **Strategy Formulation**
   
   SMEXL graduates will master the tools, concepts, and perspectives necessary to develop and articulate organizational strategies to drive effectiveness and performance.
   
   Learning Objectives:
   
   - SMEXL graduates will demonstrate the competency to think strategically about organizational issues and challenges and develop effective strategies for changing, complex environments.
   - SMEXL graduates will be able to analyze social, political, technological, economic, and global factors; evaluate industry and market structure; and assess organizational strengths and weaknesses.

   Assessment Method: Course-embedded measure MBADM 571, BA 865

2. **Strategic Leadership**
   
   SMEXL graduates will acquire the ability to think strategically, recognize patterns in the organizational environment, and set organizational direction.
   
   Learning Objectives:
   
   - SMEXL graduates will develop the skills and knowledge to meet the demands of senior management and assume leadership roles within any organization.
   - SMEXL graduates will be able to facilitate change across the enterprise and identify and develop the talent necessary to sustain performance.
3. **Strategy Implementation**
SMEXL graduates will be skilled at aligning organizational elements and facilitating change.

Learning Objectives:
- SMEXL graduates will be able to align direction and goals of an organization with the structures, processes and systems necessary to execute strategy and generate organizational performance.
- SMEXL graduates will acquire the skills to create organizational cultures that facilitate the implementation of strategy and a collaborative mindset that facilitates meaningful and lasting action.

4. **Leadership and Identity**
SMEXL Graduates will demonstrate will develop the self-awareness and interpersonal skills needed to lead an organization.

Learning Objectives:
- SMEXL graduates will develop enhanced personal leadership style by discovering strengths, motivations and the conditions necessary to build and lead high-performing teams.
- SMEXL graduates will develop enhanced capabilities in leadership, team building, and the management of change.

5. **Ethical Responsibilities of Leaders**
SMEXL graduates will be attuned to the ethical and social responsibilities of leaders.

Learning Objectives:
- SMEXL graduates will learn to consider and evaluate the ethical and societal implications of managerial decisions.
- SMEXL graduates will cultivate a principled approach to leadership, valuing others’ perspectives and acting with integrity.

C. **Comparison of Changes**

**Old Primary Concentrations**

**Introduction**

The Smeal College of Business is proposing a Master of Management in Strategic Management and Executive Leadership (SMEXL) program. The SMEXL program is a 30 credit online graduate program.
targeted to those who typically have about 10 years of work experience including five or more years of management experience, though exceptional students that fall outside of these general guidelines may be considered. The SMEXL program is designed to be an engaging, practical and comprehensive program that helps seasoned professionals learn how to formulate compelling strategies, align organizational elements in the pursuit of those strategies, and build culture and commitment across an organization.

The program format enables busy professionals to balance work, education, and personal demands more effectively in pursuit of their degree. With core course work in Strategic Management, Strategic Leadership, Strategy Implementation and Organizational Change, Leadership and Identity, and Ethical Responsibilities of Leadership, mid-career, experienced professionals gain a solid foundation for advancing in leadership positions. In addition to the core curriculum, students may select from electives and earn concentrations in the fields of Negotiations and Influence or Corporate Innovation and Entrepreneurship.

Program Objectives

With core course work in Strategic Management, Strategic Leadership, Strategy Implementation and Organizational Change, Leadership, and Ethical Responsibilities of Leadership, mid-career, experienced professionals will gain a solid foundation for advancing their careers and leading an organization into the future. In addition to the core curriculum, students may select from electives and earn concentrations in the fields of Negotiations and Influence or Corporate Innovation and Entrepreneurship. Penn State Smeal SMEXL students will come from diverse disciplines and organizational backgrounds and already will have gained significant management experience in the workplace. They will possess a desire to advance in strategic management and leadership roles. SMEXL courses will be taught by professors from Smeal’s highly-regarded Department of Management & Organization.

Key features of the SMEXL program include:

- **Fluency in the “Language and Process of Strategy”**: Students will learn how to formulate compelling strategies, align organizational elements in the pursuit of those strategies, and build culture and commitment across an organization.
- **Ethical and societal implications of managerial decisions**: The program will emphasize principled approaches to leadership, managerial decision-making, valuing others’ perspectives, and acting with integrity.
- **Leadership development**: By exploring contemporary leadership styles and ongoing self-evaluation, students gain deep self-awareness and set goals for enhancing their own leadership skills.
- **The potential to explore multiple concentration areas en route to completing a master’s degree**: The program course list is organized in a way that allows students to explore concentration areas that are relevant to their interests.
• **Learning from peers with diverse backgrounds online:** Online programs become hotbed of social network activity as students with diverse business backgrounds, yet sharing common interests, gather to learn, work as teams, and share insights.

• **Experiential learning:** The program delivers core business knowledge through high-impact experiential learning, small-group interaction in class, and team-based projects focused on real-world application.

• **World class online learning environment:** Students engage in challenging course work that will prepare them to successfully deal with on-the-job demands in a wide range of organization environments.

• **World-class faculty:** Students in the program will take classes from Smeal’s world-class faculty, who research and understand best practices in the fields of strategy, leadership, organizational change, and business ethics. Our professors are respected experts in their fields, renowned for their cutting-edge research and passion for teaching.

### Program Statement

**Program Statement (to be included in the graduate student handbook)**

**D.1 Program Description**

The Master of Management in Strategic Management and Executive Leadership (PROGRAM/SME XL) program requires a minimum of 30 credits. All courses will be at the 500 or 800 level. The student will take 18 credits of required courses, will select a 6-credit primary concentration and select an additional 6 credits of elective coursework based on their interests. The courses will be delivered in an online format.

### Program Description

The Master of Management in Strategic Management and Executive Leadership requires 30 credits comprised of 18 required core credits, a 6-credit primary concentration and 6 credits of electives.

### CORE COURSES (18 credits)

The core SMEXL courses are designed to teach students to think more strategically, assess external trends, learn from exemplar organizations, enhance their ability to formulate, articulate and implement strategy, and lead in an ethical and responsible manner.

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PRIMARY CONCENTRATIONS (6 credits)
In addition to the core curriculum, students will select a 6-credit primary concentration in the fields of either Negotiations and Influence or Corporate Innovation and Entrepreneurship. The concentrations may change over time in response to market demand.

Negotiations and Influence

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Corporate Innovation and Entrepreneurship

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<tr>
<td>ENTR 502</td>
<td>Business Modeling and New Venture Creation</td>
<td>3</td>
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<tr>
<td>BAN 530</td>
<td>Business Strategies for Data Analytics</td>
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This course list may contain relevant select courses from other colleges such as:

WF ED 582 Assessing Data: Organizational Diagnosis (3)

Degree Requirements

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In addition to the core curriculum, students will select a 6-credit primary concentration in the fields of either Negotiations and Influence or Corporate Innovation and Entrepreneurship. The courses that satisfy the concentration requirements can be chosen from a list of approved courses maintained by the graduate program office.

New Primary Concentrations
Introduction

The Smeal College of Business is proposing a Master of Management in Strategic Management and Executive Leadership (SMEXL) program. The SMEXL program is a 30 credit online graduate program targeted to those who typically have about 10 years of work experience including five or more years of management experience, though exceptional students that fall outside of these general guidelines may be considered. The SMEXL program is designed to be an engaging, practical and comprehensive program that helps seasoned professionals learn how to formulate compelling strategies, align organizational elements in the pursuit of those strategies, and build culture and commitment across an organization.

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### Corporate Innovation and Entrepreneurship

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### Business Sustainability Strategy

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<tr>
<td>MGMT 811</td>
<td>Sustainability Strategy Development</td>
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### Degree Requirements

Requirements listed here are in addition to Graduate Council policies listed under [GCAC-700 Professional Degree Requirements](#). A minimum of 30 credits at the 400, 500, or 800 level is required, with a minimum of 18 credits at the 500 or 800 level, and at least 6 credits at the 500 level.

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#### PRIMARY CONCENTRATIONS (6 credits)

In addition to the core curriculum, students will select a 6-credit primary concentration in the fields of either Negotiations and Influence, Corporate Innovation and Entrepreneurship, or Business Sustainability Strategy. The courses that satisfy the concentration requirements can be chosen from a list of approved courses maintained by the graduate program office.
**Old Admission Requirements**

Admission Requirements

Admission requirements listed here are in addition to requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin. Applicants apply for admission to the program via the Graduate School application for admission.

The following are required:

- Baccalaureate degree with a 3.0 minimum undergraduate GPA (or equivalent).
- Submission of a completed online Graduate School Application for Admission, including a Statement of Purpose, resume, and two letters of recommendation.
- Official transcripts from all post-secondary institutions attended.
- A minimum of 5 years management experience.

The language of instruction at Penn State is English. English proficiency test scores (TOEFL/IELTS) may be required for international applicants. Consult the English Proficiency section of the Graduate Bulletin Application and Admission Procedures page for more information.

**Core Application Packet**

- Completed online Graduate School application and payment of nonrefundable application fee.
- Statement of purpose: a 2-3 page essay articulating career and educational goals that demonstrates your written communication skills.
- Vita or Résumé.
- Two letters of recommendation that attest to your readiness for graduate study and document the requisite of about 10 years of work experience including five or more years of management experience. Letters must be submitted through the online application. Within the online application you will be asked to enter the names and email addresses of two individuals who will be providing your recommendations. Those individuals will receive a note via email asking them to complete a brief form that will serve as your recommendation. Please inform all recommenders they must submit the form for your application to be complete.

- Official transcripts from all post-secondary institutions attended.
- Candidates may be asked to participate in a video interview as part of the admissions process.

---

**New Admission Requirements**
Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission. Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 General Admissions Standards.

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D. Revised Bulletin

Graduate Bulletin Copy

Strategic Management and Executive Leadership

Dr. Albert A. Vicere, Professor of Business Administration
The Smeal College of Business
220S Business Building
814-863-1460

The Graduate Faculty

Briscoe, Forrest, Associate Professor of Management and Organization
Dang, Carolyn, Assistant Professor of Management and Organization
Eury, Jennifer, Instructor of Management and Organization
Garud, Raghu, Professor of Management and Organization, Research Director of Farrell Center for Corporate Innovation and Entrepreneurship
Gioia, Denny, Professor of Management and Organization
Gustafson, D. Andy, Senior Lecturer of Management and Organization
Hambrick, Don, Professor of Management and Organization
Humphrey, Stephen, Professor of Management and Organization
Joshi, Aparna, Professor of Management and Organization
Kreiner, Glen, Professor of Management and Organization
Lungeanu, Razvan, Assistant Professor of Management and Organization
Misangyi, Vilmos, Professor of Management and Organization, Department Head of Management and Organization
O’Hara, Lisa, Senior Lecturer of Management and Organization
Paruchuri, Srikanth, Associate Professor of Management and Organization
The Master of Management in Strategic Management and Executive Leadership program will prepare graduates to stand out in a competitive job market by studying at a highly reputed business school with some of the world’s leading academic thinkers and industry experts. This program will provide students with the strategic management, leadership, and organizational capabilities essential for a senior-level leadership position. Students will learn the skills to formulate compelling strategies, align organizational elements in the pursuit of those strategies, and build culture and commitment across an organization. The program will be taught by the same world-class professors who teach our M.B.A. students. A solid foundation in strategy, leadership, organizational change, and ethics will make the target audience more attractive for positions of increasing leadership responsibility and prepare them to advance more rapidly into those positions. These learning outcomes will be achieved by a combination of lectures by faculty, invited guest lecturers, reading of key literature, individual and team projects, and practical involvement in a leadership culminating experience.

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### PRIMARY CONCENTRATIONS (6 credits)

In addition to the core curriculum, students will select a 6-credit primary concentration in the fields of either Negotiations and Influence, Corporate Innovation and Entrepreneurship, or Business Sustainability Strategy. The courses that satisfy the concentration requirements can be chosen from a list of approved courses maintained by the graduate program office.

### ELECTIVES (6 Credits)

Students will also complete 6 credits of elective courses. A list of elective courses approved to count towards the degree requirements will be maintained by the program office.

### Culminating Experience

The culminating experience for the degree is a capstone course, BA 865 (3 credits), that provides an opportunity for students to apply and integrate the knowledge and skills that were gained throughout the SMEXL program.

### Student Aid

Students in this program are not eligible for graduate assistantships. World Campus students in graduate degree programs may be eligible for other types of financial aid. Refer to the Tuition and Financial Aid section of the World Campus website for more information.

### Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.
Graduate Council
Program, Option, or Minor Proposal Form

Submit 1 original, signed Graduate Council proposal form and 2 hardcopies of the graduate program proposal document, with a copy of the signed proposal form attached to each proposal copy, to the Office of the Dean of the Graduate School, 211 Kern Building, University Park. For more information about the process, see the Overview of the Graduate Council Curricular Review Process.

The Program Proposal Procedures provide guidance for the development of a graduate program proposal. If you have questions regarding the preparation of a graduate program proposal or how to complete this Graduate Council proposal form, contact the Office of the Dean of the Graduate School.

College/School: School of Graduate Professional Studies
Department or Instructional Area: Engineering

New Graduate Program, Option, or Minor: Add

Designation of new graduate program:
Classification of Instructional Programs (CIP) Code: 
Designation of new graduate option:
Designation of new graduate minor:

Indicate effective semester:
First semester following approval
Second semester following approval

Existing Graduate Program Option, or Minor: Change Drop

Current designation of graduate program: Master of Engineering in Systems Engineering
Current designation of graduate option:
Current designation of graduate minor:

New designation of existing graduate program (if changing):
New designation of existing graduate option (if changing):
New designation of existing graduate minor (if changing):

Brief description of the change (if not noted above): Changed the required courses and updated admission requirements in accordance with Graduate School policy

Indicate effective semester: First semester following approval
Second semester following approval

Submitted by Graduate Program Head
Colin J. Neill
Printed name
Signature
Date: 4/17/18

Noted by College/School Representative to Graduate Council Subcommittee on New and Revised Programs and Courses:
Pornsit Jiraporn
Printed name
Signature
Date: 4/17/18

Approved by College/School Dean/Chancellor (or Designee):
James A. Nemes
Printed name
Signature
Date: 4/17/18
Recommended by Chair, Graduate Council Subcommittee on New and Revised Programs and Courses:

On Behalf of David Babb

Printed name

Signature

Date: 3/28/2019

Recommended by Chair, Graduate Council Committee on Programs and Courses:

On Behalf of C. Andrew Cole

Printed name

Signature

Date: 3/28/2019

Noted by Dean of the Graduate School:

On Behalf of Regina Vasilatos-Younken

Printed name

Signature

Date: 3/28/2019
Program Change Proposal

Master of Engineering in Systems Engineering

Contact:
Colin J. Neill,
Director of Engineering Programs,
School of Graduate Professional Studies,
Penn State Great Valley,
(cjn6@psu.edu)

March 30, 2018
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Description of Changes
The Master of Engineering in Systems Engineering degree program is offered in residential format at the Penn State Great Valley campus and online through Penn State World Campus. Since the most recent program update precedes Graduate School policies regarding Bulletin listing information, a program change proposal is necessary. In addition, the program faculty have been evaluating the program according to the Learning Outcomes Assessment process instituted across the University, and this has revealed several necessary curricula changes. Those changes are:

- Specifying the required courses in the Bulletin. Currently the Bulletin states that “candidates must take two required 9-credit core modules for a total core curriculum of 18 credits and two other 9-credit elective modules.”
- Specifying the culminating experience. Currently the Bulletin does not mention the capstone explicitly.

Justification for the proposed changes
The Master of Engineering in Systems Engineering is an interdisciplinary degree, and involves the identification, modeling, analysis, architecture, integration, and management of complex systems and processes. The purpose of the program is to prepare engineers to develop the next generation of engineering products, systems, and services for industry and government.

In comparison to traditional engineering disciplines Systems Engineering is a discipline driven by the needs of systems engineering practitioners. The current Systems Engineering program at Penn State was designed to meet industry needs of systems engineering practitioners for developing and improving their skills. As the discipline evolved, tools and methods to address complexity changed and the discipline established core knowledge areas. The first versions of the Systems Engineering Body of Knowledge (SEBoK) and the Graduate Reference Curriculum for Systems Engineering (GRCSE) were published in 2012. The Systems Engineering Program Assessment Committee at Penn State Great Valley identified program learning outcomes based upon the SEBoK and GRCSE. Several gaps have been identified in our current Systems Engineering Program based on the program assessment in 2016-2017 academic year:

- Use of integrated models and simulations for multi-level system analysis and practices: SEBoK emphasize the use of integrated models and simulations for complex system design and analysis. The proposed program ensures contemporary methods and tools for integrated models and simulations are introduced for multi-level system analysis.
- The ability to architect complex engineered systems or solutions is becoming more important as systems are becoming more networked and complex. Traditional systems engineering practices used ad hoc methods to address system architecting. As the discipline evolved, methods that integrate architectural concerns from multiple
stakeholders and technical disciplines are established. The proposed program ensures contemporary methods and tools for system architecture are introduced to our students.

The proposed program changes ensure effective delivery of systems engineering concepts in online and resident instruction format. The addition of new core courses capture advances in the systems engineering discipline and reflect the knowledge areas that are critical for today's system engineers.

Comparison of Changes
The following table indicates the changes in the proposed program in comparison to the current program as specified in the Bulletin.

<table>
<thead>
<tr>
<th>PROPOSED</th>
<th>CURRENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required courses</strong></td>
<td></td>
</tr>
<tr>
<td>SYSEN 520</td>
<td>Systems Engineering</td>
</tr>
<tr>
<td>SYSEN 522</td>
<td>Systems Verification Validation and Testing</td>
</tr>
<tr>
<td>SYSEN 532</td>
<td>Simulation in Systems Engineering: Discrete-Time Systems</td>
</tr>
<tr>
<td>SYSEN 534</td>
<td>Simulation in Systems Engineering: Continuous-Time Systems</td>
</tr>
<tr>
<td>SYSEN 880</td>
<td>Systems Architecture and Models</td>
</tr>
<tr>
<td>SWENG 586</td>
<td>Requirements Engineering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Culminating experience</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSEN 594</td>
<td>(GCAPSTONE – Prof Master's-Capstone Project)</td>
</tr>
</tbody>
</table>

In summary:

We are specifying the 18-credits of required courses and the 3 credit culminating experience. The required courses reflect the knowledge areas from the SEBoK and GRCSE that reflect the learning outcomes the program faculty identified as critical to the discipline.
Evidence of Consultation

Consultation on the proposed program change was sought from a wide range of units across the university as shown below. Responses received are included in Appendix A.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Respondent</th>
<th>Remarks</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>School of Graduate Professional Studies</td>
<td>James Nemes, Chancellor and Chief Academic Officer</td>
<td>Full support</td>
<td></td>
</tr>
<tr>
<td>Penn State World Campus</td>
<td>Karen Pollack, Assistant Vice Provost for Online and Blended Programs</td>
<td>Full support</td>
<td></td>
</tr>
<tr>
<td>College of Engineering</td>
<td>Peter Butler, Associate Dean</td>
<td>Full support</td>
<td>We agreed to review courses from the ELIM minor for inclusion as electives</td>
</tr>
<tr>
<td>Penn State Harrisburg</td>
<td>Peter Idowu, Assistant Dean for Graduate Studies</td>
<td>Full support</td>
<td></td>
</tr>
<tr>
<td>Penn State Erie, The Behrend College</td>
<td>Ivor Knight, Associate Dean for Research and Graduate Studies</td>
<td>Full support</td>
<td></td>
</tr>
</tbody>
</table>
Revised Graduate Bulletin Listing

GRADUATE BULLETIN STATEMENT

Program Home Page

JAMES A. NEMES, Professor and Director of Academic Affairs
School of Graduate Professional Studies
Penn State Great Valley
30 E. Swedesford Road
Malvern, PA 19355-1443
610-725-3335

COLIN J. NEILL, Associate Professor and Director of Engineering Programs
School of Graduate Professional Studies
Penn State Great Valley, Engineering Division
610-648-3277
www.sgps.psu.edu

Program Chair

Colin J. Neill
Associate Professor, Software Engineering and Systems Engineering
School of Graduate Professional Studies
Penn State Great Valley
30 E. Swedesford Road
Malvern, PA 19355-1443
610-648-3277

Professor-in-Charge

Nil Kilicay-Ergin
Associate Professor of Systems Engineering
School of Graduate Professional Studies
Penn State Great Valley
30 E. Swedesford Road
Malvern, PA 19355-1443
610-648-3288

Degree Conferred:

M.Eng. in Systems Engineering
The Graduate Faculty

- Mohamad Darayi, Ph.D. (Oklahoma) Assistant Professor of Systems Engineering
- Joanna Defranco, Ph.D. (New Jersey Institute of Technology) Assistant Professor of Software Engineering
- Nil H. Ergin, Ph.D. (University of Missouri-Rolla), Assistant Associate Professor of Systems Engineering
- Kathryn Jablokow, Ph.D. (Ohio State) Associate Professor of Mechanical Engineering; Professor of Engineering Design and Mechanical Engineering; Associate Chief Academic Officer
- Mohamad Kassab, Ph.D. (Concordia) Assistant Professor of Software Engineering
- Philip A. Laplante, Ph.D. (Stevens Institute of Tech) P.E. Professor of Software and Systems Engineering
- John I. McCool, Ph.D. (Temple) Distinguished Professor of Industrial and Manufacturing Engineering
- Allan Moser, Ph.D. (Purdue) Associate Professor of Systems Engineering
- Ashkan Negahban, Ph.D. (Auburn) Assistant Professor of Engineering Management
- Colin J. Neill, Ph.D. (Wales) Associate Professor of Software and Systems Engineering; Director of Engineering Programs
- James A. Nemes, D.Sc. (George Washington University) Professor and Director of Academic Affairs Chancellor
- Michael J. Piovoso, Ph.D. (Delaware) Professor of Electrical Engineering
- David W. Russell, Ph.D. (CNAA, London) Professor of Electrical Engineering
- Kailasam Satyamurthy, Ph.D. (Clemson) Assistant Professor of Engineering
- Pamela Vercellone Smith, Ph.D. (Penn State) Assistant Professor of Software Engineering

The Program

This professional master's degree program, available at Penn State Great Valley, deals with the various aspects of systems engineering. The Master of Engineering in Systems Engineering degree is a graduate degree program that provides students the skills required to model, analyze, architect, integrate, and manage complex systems and processes. The primary goal of the program is to prepare engineers to develop the next generation of engineering products, systems, and services for industry and government.

The curriculum integrates the traditional engineering disciplines in a synergistic manner. The curriculum consists of 36 credits, delivered both in residence at the School of Graduate Professional Studies (Great Valley) and online through the Penn State World Campus. The program provides in-depth coverage of core systems engineering topics such as requirements analysis, systems architecture, model-based systems engineering, systems testing, and integrated models and simulations for complex system analysis. Course work includes four 9-credit modules of study with each module designed for in-depth coverage of a specific area of study (e.g., systems and control, robotics). Two of the four modules, the Skill-Based module and the Systems Engineering module, are required and constitute an 18-credit core. To complete the program, students choose an additional 18 credits of electives in two modules of professional interest.
As part of the 18 credit core curriculum, students who are nearing the end of their program complete a capstone research experience. Graduate instruction is under the direction of an interdisciplinary faculty committee and the departments participating in the program. The graduate faculty consists of members who have teaching and research interests in the area of systems engineering. Maximum flexibility is maintained by the program in an effort to meet both the professional needs of the individual students and academic quality standards.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Admission requirements listed here are in addition to requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin. Applicants apply for admission to the program via the Graduate School application for admission.

The M.Eng. in Systems Engineering program is designed for students with backgrounds in science or engineering. Admission will be granted if the applicant has the necessary program prerequisites and a faculty member in the student’s interest area agrees to serve as advisor. Normal admission requirements include mathematics through differential equations. Scores from the Graduate Record Examinations (GRE) are not an entrance requirement unless the junior/senior grade-point average is below 3.00 (on a 4.00 scale). There is no foreign language requirement.

Students with a 3.00 junior/senior GPA in an appropriate technical degree program will be considered for admission. The best-qualified applicants will be accepted. Exceptions to the minimum 3.00 GPA may be made for students with special backgrounds, abilities, and interests. Entering graduate students for whom English is not their first language are required to have a score of at least 550 (paper) or 213 (computer) on the Test of English as a Foreign Language (TOEFL).

Admission to the M.Eng in Systems Engineering program will be based on baccalaureate academic records, applicable work experience, and one letter of recommendation from a previous professor or supervisor who can attest to the applicant’s academic potential. Applicants with an undergraduate degree in a quantitative discipline such as science or engineering may apply. Students from other disciplines will be considered based on prior course work and/or standardized test scores. Normal admission requirements include two semesters of calculus (Calculus 1 and Calculus 2). Applications must include a statement of professional goals and a curriculum vitae or resume. Test scores from the GMAT or GRE exams are not required. An undergraduate cumulative grade-point average of 3.0 or better on a 4.0 scale in the final two years of undergraduate studies is required.

The language of instruction at Penn State is English. English proficiency test scores (TOEFL/IELTS) may be required for international applicants. Consult the English Proficiency section of the Graduate Bulletin Application and Admission Procedures page for more information.
Degree Requirements

All candidates must take two required 9-credit core modules, a total core curriculum of 18 credits and two other 9-credit elective modules. At least 15 credits of selected courses must be at the 500 level.

Requirements listed here are in addition to requirements stated in the DEGREE REQUIREMENTS section of the Graduate Bulletin.

The M. Eng. in Systems Engineering degree is conferred upon students who earn a minimum of 36 credits of course work while maintaining an average grade-point average of 3.0 or better in all course work, including at least 18 credits at the 500 or 800 level (with at least 6 credits at the 500 level). The program curriculum includes 18 credits of core courses, 15 credits of electives, and 3 credits of capstone experience.

Required Courses:

Prescribed courses for the degree include the following 18 credits of core courses:

- SYSEN 520: Systems Engineering (3 credits)
- SYSEN 522: Systems Verification Validation and Testing (3 credits)
- SYSEN 532: Simulation in Systems Engineering: Discrete-Time Systems (3 credits)
- SYSEN 534: Simulation in Systems Engineering: Continuous-Time Systems (3 credits)
- SYSEN 880: Systems Architecture and Models (3 credits)
- SWENG 586: Requirements Engineering (3 credits)

Additional Courses:

An additional 15 credits of elective courses must be selected from a list of approved elective courses maintained by the graduate program office.

Culminating Experience:

All students will complete their program of study with a capstone project that provides students with an opportunity to apply their knowledge of the systems engineering theories, methods, processes, and tools learned throughout their program, in a culminating and summative experience. Students complete the capstone project while enrolled in SYSEN 894.

Student Aid

Graduate assistants available to students in this program and other forms of student aid are described in the STUDENT AID section of the Graduate Bulletin. Students on graduate assistantships must adhere to the course load limits set forth in the Graduate Bulletin.
Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.
New Graduate Bulletin Listing

GRADUATE BULLETIN STATEMENT

Program Chair

Colin J. Neill
Associate Professor, Software Engineering and Systems Engineering
School of Graduate Professional Studies
Penn State Great Valley
30 E. Swedesford Road
Malvern, PA 19355-1443
610-648-3277

Professor-in-Charge

Nil Kilicay-Ergin
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Additional Courses:

An additional 15 credits of elective courses must be selected from a list of approved elective courses maintained by the graduate program office.

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All students will complete their program of study with a capstone project that provides students with an opportunity to apply their knowledge of the systems engineering theories, methods, processes, and tools learned throughout their program, in a culminating and summative experience. Students complete the capstone project while enrolled in SYSEN 894.

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Appendix A
Consultation responses
Colin,

I fully support the proposed changes to the M.Eng. in Systems Engineering Program.

Jim

James A. Nemes, D.Sc.
Chancellor and Chief Academic Officer
Professor of Mechanical Engineering
School of Graduate Professional Studies
Penn State Great Valley
30 East Swedesford Road
Malvern, PA 19355-1443
Phone: 610-648-3206
jan16@psu.edu

Dear Colleagues:

I am seeking your consultation on the attached program change proposal for the M.Eng in Systems Engineering. With the transition of the University Bulletin to LionPath, the Graduate School requires we update the program’s listing through a program change proposal. Admittedly, our current listing is very vague and required updating. In the proposed revision, we are now specific about the degree requirements and we have added the necessary language for admission requirements.

If you have any questions, please don’t hesitate to ask.

Best Regards,
Colin

Dr. Colin J. Neill
Director of Engineering Programs
Associate Professor of Software & Systems Engineering
School of Graduate Professional Studies
Penn State University
Hi Colin,

Sorry! I had temporarily lost my access to the consultation system. It just got restored. I will go in and concur. We do plan to support it and will get a letter of support in.

Best,
Karen

Karen I. Pollack, Ph.D.
Assistant Vice Provost for Online and Blended Programs
Penn State Online, The World Campus
222M Outreach Building
University Park, PA 16802
(814) 863-6347 (w)
kiw1@psu.edu

On Apr 16, 2018, at 9:31 AM, Colin J. Neill <cjin6@psu.edu> wrote:

Dear Dr. Pollack:

I was wondering if I could answer any questions you might have about the program change proposal I sent you. The Graduate School is requesting that the proposal be submitted by the 19th. If you have specific questions or concerns I'd be happy to speak with you on the phone.

Regards,
Colin

Dr. Colin J. Neill
Director of Engineering Programs
Associate Professor of Software & Systems Engineering
School of Graduate Professional Studies
Penn State University
www.personal.psu.edu/cjin6

From: Colin J. Neill <cjin6@psu.edu>
Thanks Colin. Yes, we support the proposal.

Peter J. Butler, PhD
Associate Dean for Education and Graduate Professional Programs, College of Engineering, Penn State University
pbutler@psu.edu

From: "Colin J. Neill" <cjn6@psu.edu>
Date: Tuesday, April 10, 2018 at 1:26 PM
To: Peter Butler <pjbbio@engr.psu.edu>
Subject: RE: Consultation Request: Change Proposal for M.Eng in Systems Engineering

Hi Peter,

The program change only pertains to the make-up of the core courses in the Systems Engineering program, not to the approach we take with the online delivery of the program via World Campus, which will continue to be a continuous-enrollment cohort model. I will ask the Professor in Charge and the Systems Engineering Assessment Committee to review the ELIM courses for potential inclusion in the list of electives, however.

Can I say that the College of Engineering supports the program change proposal?

Cheers,
Colin

Dr. Colin J. Neill
Director of Engineering Programs
Associate Professor of Software & Systems Engineering
School of Graduate Professional Studies
Penn State University
www.personal.psu.edu/cjn6
Hi Colin,
We support your effort in updating your program information and found the changes proposed meaningful. Thanks for sharing the proposal with us for review.

Regards,
Peter

Peter Idowu, Ph.D., P.E.
Assistant Dean of Graduate Studies, Penn State Harrisburg
Professor of Electrical Engineering

Penn State Harrisburg
W-102 Olmsted Building
777 W. Harrisburg Pike, Middletown PA 17057
(717) 948-6315 - Phone
(717) 948-6737 - Fax
idowu@psu.edu
http://sites.psu.edu/microgridtestbedpsh/
http://harrisburg.psu.edu/graduate-studies

From: "Colin J. Neill" <cjn6@psu.edu>
To: "Peter Idowu" <pbi1@psu.edu>
Sent: Monday, April 16, 2018 9:28:41 AM
Subject: FW: Consultation Request: Change Proposal for M.Eng in Systems Engineering

Dear Peter:

I was wondering if I could answer any questions you might have about the program change proposal I sent you. The Graduate School is requesting that the proposal be submitted by the 19th. If you have specific questions or concerns I’d be happy to speak with you on the phone.

Regards,
Colin

Dr. Colin J. Neill
Director of Engineering Programs
Hi Colin
I forwarded your proposal to our Engineering School and we have no concerns or questions. Thanks,
Ivor

Ivor Knight
Associate Dean
Penn State Behrend

Sent from my iPhone

On Apr 16, 2018, at 9:29 AM, Colin J. Neill <cjn6@psu.edu> wrote:

Dear Ivor:

I was wondering if I could answer any questions you might have about the program change proposal I sent you. The Graduate School is requesting that the proposal be submitted by the 19th. If you have specific questions or concerns I’d be happy to speak with you on the phone.

Regards,
Colin

Dr. Colin J. Neill
Director of Engineering Programs
Associate Professor of Software & Systems Engineering
School of Graduate Professional Studies
Penn State University
www.personal.psu.edu/cjn6

From: Colin J. Neill <cjn6@psu.edu>
Sent: Friday, March 30, 2018 12:10 PM
To: JAMES A NEMES <jan16@psu.edu>; 'PETER IDOWU' <pbi1@psu.edu>; 'IVOR T KNIGHT' <itk2@psu.edu>; KAREN IRENE POLLACK <kiw1@psu.edu>; pjb28@psu.edu
Subject: Consultation Request: Change Proposal for M.Eng in Systems Engineering

Dear Colleagues:

I am seeking your consultation on the attached program change proposal for the M.Eng