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January 15, 2019

TO: Academic Policy Committee

FROM: Timothy K. Mackey, MAS, PhD, Director - Healthcare Research & Policy

RE: Proposal for new specialized certificate program in **Digital Health**

Following, please find a proposal for a new specialized certificate in **Digital Health.** The University of California San Diego (UCSD), UC San Diego School of Medicine, and the Qualcomm Institute at UC San Diego are introducing a new specialization in Digital Health. Healthcare worldwide is shifting towards a Digital Health ecosystem and is increasingly requiring individuals with knowledge of the complexities of healthcare, management and information technology. Digital Health encompasses several distinct academic disciplines and technologies including data science (including skills in data mining, machine learning, and database management), software engineering for health applications, mobile health apps, biometric sensors, and connected health. The specialization content represents a collaboration of several UC San Diego departments and incorporates expertise in data science, eHealth, precision medicine, regulatory, commercialization, and ethical aspects related to the acceleration of Digital Health. The program will empower learners to understand the intricacies of the Digital Health landscape and to identify meaningful opportunities to generate new value for both consumers and organizations.

The specialized certificate program examines the ongoing technological Digital Health revolution and the structural changes it is bringing to medicine and healthcare. Stakeholders in healthcare are re-examining their roles and working to find a balance between using new technologies and maintaining the human touch in patient care in a new era of precision medicine and connected health. Current healthcare practices continue to be dominated by paper-based processes and are often times fragmented and inaccessible across systems. Disruptive technologies are transforming the current healthcare system, but still in many cases are awaiting the digitization of care delivery. This digitization empowers patients and can democratize healthcare to make care more affordable, accessible and augmented.

The Digital Health movement is concentrated on patient centric designs, which can lead to increased satisfaction and benefits. Digital health technologies continue to evolve, supporting patient insights into healthcare processes and decisions related to technology to improve customer satisfaction. Patients can have vital insights into healthcare processes that can accelerate innovation, care performance and sponsor lasting lifestyle changes. Concomitantly, new advances in Internet of Medical Things (IoMT), biosensors, nano devices, data analytics and wearable devices are opening up new possibilities in medicine. Data scientists can now make inferences and predictions for personalized care based on characteristics from populations of patients. UC San Diego and Qualcomm Institute faculty propose developing an innovative curriculum through leveraging expertise in Digital Health for scientific applications, genomic medicine, data science, behavioral medicine, and global health.

By incorporating academic expertise, and connecting with industry experts, this new specialization will offer an opportune educational offering. The collaboration between distinguished UC San Diego, Qualcomm Institute faculty and other healthcare and technology leaders provides a depth of knowledge in this emerging field of study. The specialized course content and case studies are innovative and address a variety of Digital Health topics which can be integrated into future verticalized courses. Our proposed specialization is a first-mover in the Digital Health space and will open the possibility for an impactful educational experience for future cohorts of students.

Best Regards,

Tim K. Mackey, MAS, PhD

Associate Professor

UC San Diego, School of Medicine

Director - Healthcare Research & Policy

UC San Diego - Extension

Director, Global Health Policy Institute

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**PROPOSAL FOR SPECIALIZED CERTIFICATE IN DIGITAL HEALTH**

**PROGRAM DESCRIPTION:**

This new specialized certificate program will provide an overview of Digital Health and data science principles as they relate to healthcare. Leading innovators from academia and industry will explore the implementation of e-health, m-health (mobile health), connected health, big data in medicine, and machine learning and artificial intelligence approaches to healthcare. Digital Health’s impact integrating disruptive medical innovations to can change healthcare outcomes, at both the patient and population health level, will be examined. Telemedicine, smart algorithms and wearable health trackers now make it possible to stream medical data from any location, allowing patients access to care nearly instantly. Studies have shown that medical outcomes can improve and costs can be reduced when technology like artificial intelligence is combined with the human touch of physicians. The UCSD Extension Digital Health certificate offers a unique educational experience for those working in healthcare technology roles, research, and regulatory entities in the healthcare space.

**PROGRAM DESIGN:**

The certificate program is designed to focus on data science, disruptive innovations, advanced medical technologies and regulatory aspects associated with the increased use of new technologies in delivering healthcare. Digital Health includes solutions, products, or concepts related to the use of technologies in the health management of patients or the practice of physicians, but also expands beyond the clinical setting to consumer health and population health areas. This program will explore several areas covering social media, mobile health, artificial intelligence (AI), and regulatory aspects. Current trends will be addressed including the use of artificial intelligence in medical decision making, augmented reality and the gamification of wellness. This program empowers learners to understand the intricacies of the Digital Health landscape and to identify meaningful opportunities to generate new value for both consumers and organizations.

Digital Health can provide increased transparency, from diagnosis to treatment with greater patient empowerment. Wearable technology and mobile health apps are increasingly promoted as a means of facilitating patient engagement helping patients self-monitor, improve comprehension of diagnoses and facilitate dynamic interactions between patients, their healthcare data, and clinicians. Mobile health technology is increasingly becoming embedded into tools focused on patient engagement, compliance, and clinical trials. Additionally, the ethical, legal and social implications of integrating new digital assets into medicine and healthcare will also be examined. Learners will explore readiness levels for organizational digital health innovation and develop Digital Health strategies to meet specific business needs. This specialization is designed to provide a certificate of completion and build fundamental skills and knowledge necessary to enter the Digital Health industry.

The specialization will comprise of five core courses offering an overview of Digital Health, unique case studies, and an examination of emerging technologies and new business models. The first two courses “Introduction to Digital Health” and “Case Studies in Digital Health” engage in both theoretical and applied activities to provide the background knowledge necessary to effectively understand and manage the changing and emerging landscape of digital health. The third course “Data Science for Digital Health” explores how data can be an enabling resource for deriving insights for improving care delivery, healthcare innovation, and product development for a host of healthcare technologies. In the final two courses, learners will explore the various business, regulatory and ethical issues specific to the digital health ecosystem in the “Business, Regulatory, and Ethics for Digital Health Innovation” and “Digital Health Business and Commercialization Strategies” course material. The discussion of trends and issues related to these new technologies, will provide a fundamental understanding of the impact of Digital Health initiatives on patients and healthcare consumers. Learners will apply their knowledge and skills to critically compare digital health solutions, and reflect on case studies to prepare a business plan for a theoretical digital health solution. The principal learning outcomes are:

* Apply critical thinking to understand the evolving Digital Health industry;
* Recognize and apply innovative solutions in Digital Health design principles, and processes;
* Build a strong foundational knowledge of the Digital Health and healthcare ecosystem;
* Interpret and develop investment goals of health, healthcare, and digital health strategies;
* Demonstrate an aptitude of data science fundamentals related to digital health projects;
* Define different types of stakeholder user requirements and required functionality necessary for successful commercialization;
* Identify appropriate data, network requirements, and capacity dependencies from existing eHealth initiatives;
* Explain the business, regulatory, and ethical aspects related to the acceleration of Digital Health;

**SPECIALIZED CERTIFICATE IN DIGITAL HEALTH COURSE MATRIX**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course Title** | **Course Number** | **Credits/ Units** | **SuQ** | **FaQ** | **WiQ** | **SpQ** |
| **Required Courses** |  |  |  |  |  |  |
| **Introduction to Digital Health** | **xxxx** | **3** |  | **X** |  | **X** |
| **Case Studies in Digital Health** | **xxxx** | **3** | **X** |  | **X** |  |
| **Data Science for Digital Health** | **xxxx** | **3** |  | **X** |  | **X** |
| **Regulatory and Ethics for Digital Health Innovation** | **xxxx** | **3** | **X** |  | **X** |  |
| **Digital Health Business and Commercialization Strategies** | **xxxx** | **2** |  | **X** |  | **X** |
| **Electives (3 units minimum):** |  |  |  |  |  |  |
| **Overview of Regulatory Affairs for Medical Devices** | **BIOL-40322** | **3** |  | **X** |  | **X** |
| **Project Management Essentials in Science and Technology** | **BUSA-40862** | **3** | **X** |  | **X** |  |
|  | **TOTAL:** | **17 UNITS** |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Optional Capstone (3 units):** |  |  |  |  |  |  |
| **Digital Health Capstone Project** |  |  | **X** |  | **X** |  |

**DESCRIPTION OF CORE COURSES:**

**Introduction to Digital Health (3 units)**

The Introduction to Digital Health course explores the fundamental concepts and components that make up the Digital Health ecosystem. Students will gain a basic understanding of structured data, privacy, information standards, and security. Content examines Digital Health components, product areas, application in clinical and non-clinical settings, software applications, decision support systems, databases, mobile health applications and basic architectures within the Digital Health ecosystem.

**Case Studies in Digital Health (3 units)**

This course allows students to develop a critical perspective on some key areas of contemporary digital health use. A series of case studies in digital health will be highlighted that link to the discussion of the Digital Health ecosystem in the Introduction course. Through an in-depth assessment of case studies, students are encouraged to apply various theoretical perspectives to the 'real world' so as to understand the potential and limitations of digital health solutions and systems.

**Data Science for Digital Health (3 units)**

The Data Science for Digital Health course focuses on understanding innovative methods, tools and processes to transform data to knowledge and provide a foundation for measurable action. Data Science is being used for a variety of healthcare applications including predicting population health trends, utilization in medical products and solutions, and integration of data with healthcare systems. This course will additionally examine how data is utilized from the perspective of the patient to inform lifestyle choices and promote well-being and active consumer engagement in their own care.

**Regulatory and Ethics for Digital Health Innovation (3 units)**

This course will examine various regulatory, ethical and privacy issues specific to the Digital Health ecosystem and how they impact digital health commercialization. Content will examine key issues and challenges facing the rapidly unfolding digital health paradigm and reflect on the impact of big data in medical research and clinical practice. Practical topics including discussion about patient data privacy frameworks (HIPAA, GDPR) and regulatory processes (e.g. FDA regulation of digital health) will also be addressed. All these topics will intersect to explore the relationship between ethics, privacy and the design and use of digital health technologies that impact decision making.

**Digital Health Business and Commercialization Strategies (2 units)**

This course will examine Digital Health strategies, products, and how companies can navigate the path to commercialization. Understand the mechanics of commercialization strategies, through exploring the role of investors and customer feedback during the development of Digital Health products. Course content will help students identify new digital and commercial capabilities required within their organization and identify challenges in developing Digital Health products that will be adopted by health and social care systems.

**DESCRIPTION OF ELECTIVE COURSES**

**Overview of Regulatory Affairs for Medical Devices (BIOL-40322– 3 units)**

This course is designed for individuals new to the medical device and biotechnology industries or who are considering a career in Quality, Regulatory Affairs or Project Management. Professionals employed in research and development, bioengineering, quality, regulatory, law, sales and marketing who are seeking a more comprehensive understanding of the medical device regulatory process will also benefit.

**Project Management Essentials in Science and Technology (BUSA-40862– 3 units)**

This course is designed for students interested or working in the life sciences, engineering, and technology fields. Students will learn how to define, plan, and execute project by gaining the tools and knowledge for delivering projects on time and on budget, while meeting performance specifications in the project life cycle. This course will also help you determine the correct project through strategic portfolio analysis; create a successful charter; assemble and manage a team; analyze and control risk; monitor project milestones; and close out the project.

**DESCRIPTION OF CAPSTONE COURSE (OPTIONAL):**

**Digital Health Capstone Project (TBDxxxx - 3 units)**

This faculty mentor-lead, 9-week capstone course provides students with an opportunity to apply their cumulative subject knowledge of Digital Health. Students will apply the skills gained in the certificate to explore a Digital Health project with greater and complexity and learn about the broader framework in which their project operates, and integrates within the larger health delivery ecosystem. The Capstones allows students to demonstrate proficiency in applying Digital Health academic theory into pragmatic and applied problem solving.

**Faculty:**

**Natasha Balac**, PhD is the director of the UC San Diego Interdisciplinary Center for Data Science and has also led multiple collaborations across a wide range of organizations in industry, government and academia. Dr. Balac founded the Predictive Analytics Center of Excellence at the Supercomputer Center, lead the data science program at Calit2/Qualcomm institute and lectures in the computer science department at UC San Diego Extension.

**Hobson Lane,** MS, has 20 years of experience working in Data Science, Machine Learning and building autonomous systems that contribute to the common good. Hobson is a prolific lecturer in autonomous systems, machine learning and has a talent for building state of the art systems.

**Timothy Mackey**, MAS, PhD. Assistant Professor, Department of Anesthesiology, UCSD School of Medicine; Associate Program Director, Joint MAS Program in Health Policy & Law, UCSD-CWSL; Director, Global Health Policy Institute.

**Special Requirements or Features**

No special admissions requirements to the certificate are envisioned at this time, though prior academic or professional experience in health or policy is preferred.

**Justification:**

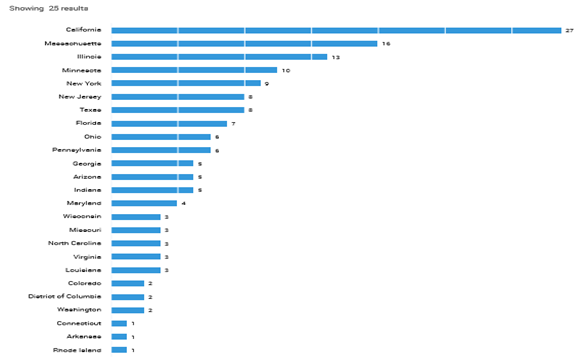
Digital Health is a rapidly expanding field premised on the availability of an ever-increasing amount of data about people’s lifestyles, habits, and clinical histories. Broad in scope, it includes mobile health (mHealth), health information technology (IT), wearable devices, genomics, telemedicine, and personalized medicine all of which rely heavily on human health data. Digital Health is a part of an evolving health data ecosystem including data gathered by healthcare services, such as electronic health records, genetic or genomic data, diagnostic and claims data. As more data sources become available advanced analytics can be applied for various purposes, protecting privacy will become an increasingly complex challenge.

The specialization’s course content will explore how Digital Health and data science capabilities can simplify and streamline the health care experience and ultimately improve lifestyles through enhancing healthcare quality. The ability to collect, structure and process a high volume of data and to gain a deeper understanding of the human body is a key objective of thousands of data scientists and machine learning experts worldwide. Data science is a valuable tool which can create the foundation for intelligent user engagement and improved business performance. Healthcare data scientists require an in-depth understanding of the healthcare industry in addition to statistical, programming, visualization, and experimental design skills. From predicting treatment outcomes, to making patient care more effective, course content will examine how data science in healthcare has proven to be an invaluable contribution to the future of the industry.

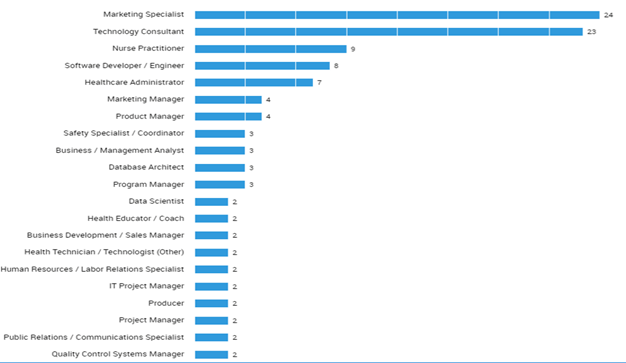
Courses are designed to develop a deep understanding of how Digital Health technology can be used to change and enhance healthcare delivery and patient outcomes. By developing and presenting this new course content aligned with data science, and specific to the health regulatory landscape, UCSD Extension will offer an educational offering that is also aligned with other educational cluster areas such as data science and regulatory affairs. Course content will be grounded in the understanding we will continue to witness the convergence of technologies and blending of ideas and innovations across organizations, therapeutic categories, and geographic regions. Incorporating these elements students will be prepared for positions in hospitals, biotechnology companies, and in the regulatory compliance industry.

**WORKFORCE DATA AND JOB MARKET LANDSCAPE**

**TOP HIRING AREAS:**

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**TOP INDUSTRIES (NATIONWIDE)**



**TARGET AUDIENCE AND ADMISSION REQUIREMENTS**

The specialization is targeted towards a wide audience of healthcare practitioners, data scientists, medical device providers, IT professionals, engineers, entrepreneurs, researchers, consultants, and regulatory entities. Learners will be those on the cutting-edge of the rapidly evolving technology curve, who desire the exploration and evaluation of new and emerging Digital Health technologies. There are no special requirements for admissions.

**EXTERNAL INVOLVEMENT OF PROGRAM DEVELOPMENT**

The certificate will involve participation in the design, development, and delivery of content from faculty from UC San Diego, UC San Diego Extension, UC San Diego School of Medicine and external stakeholders. The multidisciplinary group of advisers will ensure the certificate content remains up to date and valuable to the intended target audience.

**Ex-Officio Advisors:**

**Natasha Balac**, PhD is the director of the UC San Diego Interdisciplinary Center for Data Science and has also led multiple collaborations across a wide range of organizations in industry, government and academia. Dr. Balac founded the Predictive Analytics Center of Excellence at the Supercomputer Center, lead the data science program at Calit2/Qualcomm institute and lectures in the computer science department at UC San Diego Extension.

**Hobson Lane,** MS, has 20 years of experience working in data science and building autonomous systems that contribute to the common good. Hobson is a prolific lecturer in autonomous systems and machine learning and has a talent for building state of the art systems.

**Timothy Mackey**, MAS, PhD. is an Assistant Professor, Department of Anesthesiology, UCSD School of Medicine; Associate and Director UC San Diego Extension, Director of Global Health Policy Institute. Dr. Mackey’s work focuses on a broad array of multidisciplinary topics in domestic and global public health. This includes cross-cutting research in disciplines of public health, medicine, international relations, public policy, law, innovation, substance abuse, eHealth, crime, and global governance.

**Advisors:**

**Cinnamon Bloss,** PhD is an Associate Professor in the Departments of Psychiatry and Family Medicine and Public Health, Division of Health Policy at the UC San Diego. Dr. Bloss has conducted both candidate gene and genome-wide association studies of neurocognitive phenotypes, as well as empirical work on biomedical ethics topics in the area of genetic testing, genome sequencing, and wireless sensors.

**Daniel Haders II,** Ph.D. has 20 years of experience as a scientist, entrepreneur, advisor & investor developing patented technologies, managing innovation teams, and advising/investing in startups. Dr. Haders is currently the Managing Director, Healthcare Tech at Nex Cubed a Frontier Technology Venture Studio and Seed Investor based in San Francisco, San Diego & Washington, D.C.

**Camille Nebeker,** EdD is an assistant professor in the UC San Diego Department of Family Medicine and Public Health with a primary appointment in Behavioral Medicine and a secondary appointment in Global Health. Dr. Nebeker’s expertise is in human research ethics applied to emerging technologies and capacity building to support community research and citizen science.

**Gina Merchant**,MA, PhD is a behavioral scientist whose research is at the intersection of psychology, public health informatics, and data science. Dr. Merchant’s work broadly examines how online and offline social networks influence our health behaviors and healthcare decision-making. Currently she is conducting large-scale content analysis of unstructured text data exchanged in online networks to form a better understanding of how to intervene in virtual spaces to promote health-enhancing behaviors.

**END GOALS**

The program’ core knowledge and skills include gaining a fundamental understanding of the applications and practice of Digital Health and increasing specialized knowledge in associated technologies and regulatory aspects as it relates to healthcare. Students will apply skills by participating in group exercises and examination of the latest industry trends. Graduates are expected to be competitive for placement in healthcare organizations, government agencies, and academic institutions, to improve innovation and health outcomes through a new understanding of Digital Health’s potential.

**SPECIAL CONSIDERATIONS**

Students will require access to UCSD Extension e-learning environments via Blackboard or Canvas LMS.

**EVALUATION OF FISCAL VIABILITY**

Offering the program in a completely on-line format and will enhance opportunities for expansion. The financial success of the program will be established by its ability to market content to diverse cohorts of students from the San Diego region and the greater United States. Core courses can be offered more than once per year. We expect a minimum of 10 students per course for enrollment with a total enrollment projection of 25 during the first six months of the program, 60-80 total students within the first and second year. Gross revenue targets for the first six months are $20,000, with total gross revenue estimated at $22,000. For the first year, total gross revenue we would estimate a higher target of $40,000. UCSD Extension will market the program to current and prospective healthcare students and together with the advisory board will update content to ensure relevancy, and continued success of the certificate.