PHARMACY, DOCTOR OF (PHARM.D.) WITH A CONCENTRATION IN DIGITAL HEALTH

The purpose of the digital health concentration is to prepare VCU Pharm.D. graduates to assess and deploy digital health solutions effectively, meeting the healthcare industry's move towards a technology-centric approach. Moreover, this program enhances their critical thinking, leadership and communication skills, crucial for navigating the complexities of the digital health landscape. Consequently, this creates a workforce that is not just skilled in clinical and scientific areas but also proficient in utilizing and developing digital technologies, fostering innovation and efficiency in diverse roles within the pharmaceutical industry.

Student learning outcomes

- Graduates will demonstrate competencies in the following areas:
- Foundational knowledge: The graduate is able to develop, integrate and apply knowledge from the foundational sciences (i.e. biomedical, pharmaceutical, social/behavioral/administrative and clinical sciences) to evaluate scientific literature, explain drug action, solve therapeutic problems and advance population health and patient-centered care.
- Patient-centered care: The graduate is able to provide patient-centered care as the medication expert (collect and interpret patient information; prioritize and formulate assessments and recommendations into a plan; implement, monitor and adjust plans; and document activities) to optimize health outcomes.
- Medication use systems management: The graduate is able to apply professional standards to manage patient health care needs using human, financial, technological and physical resources to optimize the safety and efficacy of medication use systems.
- Health and wellness: The graduate is able to implement evidence-based prevention, intervention and educational strategies for individuals and communities to improve health and wellness and manage disease.
- Population-based care: The graduate is able to use population-based health data to interpret practice guidelines and evidence-based best practices to provide patient-centered care.
- Problem solving: The graduate is able to identify problems; explore and prioritize potential strategies; and design, implement and evaluate a viable solution.
- Education: The graduate is able to educate all audiences by determining the most effective and enduring ways to impart information and assess learning.
- Patient advocacy: The graduate is able to represent the patient's best interests by considering individual differences, values, preferences and needs when providing patient-centered care.
- Interprofessional collaboration: The graduate is able to engage and actively participate in shared decision-making as a health care team member by demonstrating mutual respect, understanding and values to meet patient care needs.
- Cultural sensitivity: The graduate recognizes social determinants of health care disparities in access to and delivery of quality care.
- Communication: The graduate is able to effectively communicate verbally and nonverbally when interacting with individuals, groups and organizations.
- Self-awareness: The graduate is able to enhance personal and professional growth through reflection on personal knowledge, skills, abilities, beliefs, biases, motivation and emotions.
- Leadership: The graduate is able to demonstrate responsibility for creating and achieving shared goals, regardless of position.
- Innovation and entrepreneurship: The graduate is able to engage in innovative activities by using creative thinking to envision better ways of accomplishing professional goals.
- Professionalism: The graduate is able to exhibit professional behaviors, ethics and values consistent with the VCU School of Pharmacy attributes of professionalism that are consistent with the trust given to the profession by patients, other health care providers and society.

Concentration-specific learning outcomes

Upon completion of the Digital Health in Pharmacy Practice program, students will be able to:

- Explain the integration and significance of digital health technologies within the healthcare system, including their impact on pharmacy practice.
- Articulate the role of emerging digital health technologies like telehealth, electronic health records, and data analytics in healthcare delivery.
- Identify and analyze key areas in digital health relevant to pharmacy, including:
    - Telemedicine and remote patient care
    - Electronic health records management
    - Data analytics and its application in patient care
    - Artificial Intelligence and machine learning in drug development and patient monitoring
    - Blockchain technology in pharmaceutical supply chain management
    - Digital approaches in medication adherence and personalized medicine
- Demonstration the ability to accurately use terminology related to digital health technologies and applications in pharmacy and healthcare.
- Explore and evaluate career opportunities in digital health within pharmacy, including roles that intersect with technology and patient care.
- Develop informed decisions about pursuing a career in digital health within pharmacy, considering personal interests and evolving landscape of healthcare technology.

Admission

https://pharmacy.vcu.edu/admissions/pharmd/

The School of Pharmacy participates in the Pharmacy College Application Service (PharmCAS). The electronic application is available on the PharmCAS website (https://www.pharmcas.org/). Application for the Doctor of Pharmacy program opens in mid-July of each year preceding the enrollment date. To view a list of current admission deadlines, visit the School of Pharmacy's website. Applicants who do not meet the PharmCAS deadlines will be ineligible for admission to the Doctor of Pharmacy degree program.

Students are admitted only at the start of the academic year (Fall semester). The admissions committee begins reviewing applications during August of the year preceding admission, and operates on a rolling admissions basis. It is to the applicant's advantage to apply during the fall of the year before expected enrollment.

Admission requirements

The admission requirements for the Doctor of Pharmacy program are listed below. Meeting these requirements does not, however, guarantee acceptance into VCU School of Pharmacy:

1. Official application submitted online through PharmCAS, including personal statement.
2. Official transcripts supplied to PharmCAS from all colleges and universities attended. Applications are considered by the admissions committee only after transcripts on file show completion of no fewer than 30 semester hours (45 quarter hours) of college work.
3. Three letters of reference supplied directly to PharmCAS. These include a reference from a professor or faculty member (science-focused preferred), a health professional (pharmacist preferred) and an employer.
4. Prerequisites completed for admissions, including a minimum 52 semester hours (78 quarter hours) of course work taken at a U.S.-accredited college or university. Applicants must have earned a C or better in the courses specified to meet minimum academic requirements for admission. When offered, an acceptance is contingent upon satisfactory completion of all prerequisite courses listed below.

Credits earned through Advanced Placement (AP) tests, International Baccalaureate (IB) or Cambridge examinations may be accepted for prerequisite completion, but the credits must be made up through additional electives / coursework to ensure the minimum 52 semester hour requirement. Refer to the VCU bulletin (https://bulletin.vcu.edu/undergraduate/undergraduate-study/admission-university/additional-sources-of-credit/#text) for a list of course equivalents based on exam scores.

Dual-enrollment credit earned during high school will be evaluated on an individual basis for prerequisite completion. Official transcripts from the college or university that awarded dual-enrollment credit must be provided to PharmCAS as part of the submitted application.

Course Title	Hours
General biology (lecture and laboratory	8
College chemistry (lecture and laboratory)	8
Organic chemistry (lecture and laboratory)	8
Physics (lecture and laboratory)	4
Human anatomy [1,2]	3
Human physiology	3
Microbiology [1]	3
Biochemistry	3
English [3]	6
Calculus	3
Statistics	3
Minimum	**52**

[1]

One hour of lab in these subjects is also preferred.

[2]

If Human Anatomy and Physiology are taken together, both sections should be taken (i.e., Human Anatomy and Physiology I and II) to satisfy the 6-credit requirement.

[3]

At least three semester hours of composition and rhetoric is required. Up to three semester hours can be fulfilled with documentation of a writing-intensive course.

> Due to the importance of a strong biomedical science foundation for success in the Doctor of Pharmacy program, some or all of the courses listed below are highly recommended:

Course Title	Hours
Genetics	3
Molecular biology	3
Immunology	3
Cell biology	3

1. Completion of an individual interview is mandatory for admission consideration.
2. Applicants who have resided fewer than 10 years in the United States and who have English as a second language should submit scores from the Test of English as a Foreign Language (TOEFL) exam, or other proof that their command of English is sufficient to allow successful completion of all requirements of the program. The TOEFL does not need to be taken if an applicant completes a bachelor's degree at an accredited U.S. college or university. TOEFL scores should be submitted directly to PharmCAS as part of the overall application.
3. Prior to enrolling, successful matriculants must meet the immunization requirements set forth in the *Professional Study* section of this bulletin. Prior to entering the fourth professional year, students must satisfy all university and APPE site immunization requirements.

International applicants

International students are eligible to apply to the Doctor of Pharmacy program provided that they meet all established admission requirements, and the following:

1. Provide all transcripts for coursework completed at foreign colleges or universities for translation and course-by-course evaluation to a certified agency. The School of Pharmacy will only accept evaluations from the World Education Services (WES). WES electronic evaluations must be ordered directly through the PharmCAS application. If you do not order through the application, your evluation will not be accepted. Instructions related to foreign transcript evaluations can be found on the PharmCAS website.
2. Score a minimum total score of 80 on the Test of English as a Foreign Language (TOEFL). Scores are based on the TOEFL Internet-Based Test (iBT) Score Comparison Tables, published by Educational Testing Services (ETS). Official scores are valid for two years and must be submitted in PharmCAS (Code 8246) by the application deadline.

The TOEFL does not need to be taken if an applicant completes a bachelor's degree in a native English-speaking country. Such degree must be awarded by the time of application. Native English-speaking coutnries include only the following: U.S., Canada, United Kingdom, Ireland, Australia and New Zealand.

Selection factors

The following criteria are considered when judging applicants:

- College attended
- Academic workload carried
- Overall college GPA
- Chemistry, biology and math proficiency
- Outside activities, extracurriculars, employment and achievements in high school and college
- Written and oral communication skills
- Extent of exposure to pharmacy practice
- Extent of exposure to other health disciplines
- Assessment provided from three (3) references
- Personal interview performance

Time demands for this full-time program are rigorous. In general, the first three years require a Monday to Friday (8 a.m.-6 p.m.) commitment for lectures, conferences, laboratories and off-campus visits to area pharmacy practice sites. The fourth year is devoted to experiential learning at sites located throughout Virginia. Students enrolling in the four-year professional degree program must agree to the possibility of being assigned to sites beyond the Richmond metropolitan area (e.g., eastern, northern or western Virginia). Candidates must assess personal obligations prior to seeking application.

Transfer in advanced standing

VCU School of Pharmacy does not typically consider applications for transfer admission, as the curriculum across colleges and schools of pharmacy can differ significantly. Students who are interested in transferring into the Doctor of Pharmacy program should first meet with the Associate Dean of Admissions to discuss their individual situation and prior completed coursework. Such meetings can be requested by emailing pharmacy@vcu.edu.

Any applications for transfer must be submitted to PharmCAS during a normal application cycle. The decision to transfer in advanced standing is at the discretion of the admissions committee.

Disability support services

VCU does not discriminate against qualified applicants for admission who have disabilities, and seeks to provide reasonable accommodation to applicants and admitted students who identify themselves as having disabilities. All accommodation requests are handled on an individual basis. Examples of accommodations include; extended test taking time, note takers, readers, scribes, quiet testing area, and assistive technology. Academic requirements essential to the program or directly related to licensing requirements will not be substituted.

Upon acceptance into the program, students in need of accommodation may contact the Division for Academic Success at (804) 828-9782 or das.vcu.edu (https://das.vcu.edu/) to discuss their needs. All disclosures are confidential and released only with your permission.

Admission to concentration

Students enrolled in the Doctor of Pharmacy program will be admitted to the Doctor of Pharmacy with a concentration in digital health as early as the spring of P1 year by completing an interest application. Students are encouraged to meet with the digital health faculty champion, Dr. Shanaka Wijesinghe (wijesinghed@vcu.edu) to discuss the expectations of the concentration.

Curriculum requirements

Course	Title	Hours
IPEC 501	Foundations of Interprofessional Practice	1
IPEC 502	Interprofessional Quality Improvement and Patient Safety	1
IPEC 560	Interprofessional Collaborative Care for Older Adults	1
MEDC 527	Basic Pharmaceutical Principles for the Practicing Pharmacist	3
MEDC 533	Pharmacognosy	1
MEDC 542	Biotechnology-derived Therapeutic Agents	1
MEDC 553	Concepts in the Medicinal Chemistry of Therapeutics Agents	1
PCEU 507	Pharmaceutics and Biopharmaceutics I	2.5
PCEU 508	Pharmacokinetics	3
PCEU 509	Pharmaceutics and Biopharmaceutics II	3
PCEU 601	Applied Pharmacokinetics and Pharmacogenomics	2.5
PHAR 501	Pharmaceutical Calculations	1
PHAR 502	Introduction to Pharmacoeconomics	1
PHAR 503	Ethics and Equity	1.5
PHAR 505	Pathophysiology and Patient Assessment Skills	3
PHAR 506	Nonprescription Medications and Self-care	2
PHAR 507	Introduction to Health Informatics	1
PHAR 508	Evidence-based Pharmacy I	2
PHAR 511	Evidence-based Pharmacy II	2
PHAR 515	Continuous Professional Development I	1
PHAR 523	Foundations I	2
PHAR 524	Foundations II	1.5
PHAR 530	Introductory Pharmacy Practice Experience: Community Practice	4
PHAR 532	Introductory Pharmacy Practice Experience: Hospital Practice	3
PHAR 533	Introductory Pharmacy Practice Experience: Patient Care	.5
PHAR 534	Foundations III	1.5
PHAR 535	Foundations IV	1.5
PHAR 544	Clinical Therapeutics Module: Cardiovascular	4.5
PHAR 545	The U.S. Health Care System	1.5
PHAR 546	Pharmacy-based Immunization Delivery	1.5
PHAR 551	Pharmacy-based Point of Care Testing	1.5

PHAR 555	Clinical Therapeutics Module: Endocrinology	2.5
PHAR 556	Clinical Therapeutics Module: Neurology	3.5
PHAR 602	Clinical Therapeutics Module: Psychiatry	3
PHAR 603	Clinical Therapeutics Module: Respiratory/Immunology	2.5
PHAR 604	Clinical Therapeutics Module: Infectious Diseases	4
PHAR 605	Clinical Therapeutics Module: Hematology/Oncology	2.5
PHAR 606	Clinical Therapeutics Module: Nephrology/Urology	2
PHAR 609	Clinical Therapeutics Module: Reproductive Health, Dermatology, EENT, Bone and Joint	3.5
PHAR 615	Continuous Professional Development II	1
PHAR 618	Clinical Therapeutics Module: Gastrointestinal/Nutrition	2.5
PHAR 640	Foundations V	1.5
PHAR 645	Foundations VI	1.5
PHAR 652	Health Promotion and Communication in Pharmacy Practice	2
PHAR 702	Pharmacy Practice Management	2.5
PHAR 703	Clinical Therapeutics Module: Complex Patient Cases and Critical Care	3.5
PHAR 715	Continuous Professional Development III	1
PHAR 724	Pharmacy Law	2.5
PHAR 730	Continuous Professional Development IV	.5
PHAR 760	Acute Care Pharmacy Practice I	5
PHAR 761	Advanced Hospital Pharmacy Practice	5
PHAR 763	Ambulatory Care Pharmacy Practice	5
PHAR 765	Elective I	5
PHAR 766	Elective II	5
PHAR 767	Clinical Selective I	5
PHAR 768	Advanced Community Pharmacy Practice	5
PHAR 773	Acute Care Pharmacy Practice II	5
PHTX 606	Introduction to Pharmacology of Therapeutic Agents	1
Electives [1]		8
Total Hours		**148.5**

[1]

Select electives from the list of approved concentration courses in the table below.

The minimum number of credit hours required for this degree is 148.5.

List of Digital Health concentration courses are included below. A total of 8 credits must be included to successfully complete the concentration.

Course	Title	Hours
INNO 610	Innovation, Design Thinking and Change Management	3
PHAR 678	Health Informatics and Excel: A Practical Partnership	1
PHAR 680	Introduction to Data Science and Rapid Prototyping	2
PHAR 691	Special Topics in Pharmacy	1-5
PHAR 765	Elective I	5

PHAR 765 will be focused on Digital Health and PHAR 680 is a highly encouraged prerequisite.

Students who complete the requirements for this concentration will receive a Doctor of Pharmacy.

Recommended course sequence/plan of study

P1 year

Fall semester		Hours
IPEC 501	Foundations of Interprofessional Practice	1
MEDC 527	Basic Pharmaceutical Principles for the Practicing Pharmacist	3
MEDC 533	Pharmacognosy	1
PCEU 507	Pharmaceutics and Biopharmaceutics I	2.5
PHAR 501	Pharmaceutical Calculations	1
PHAR 505	Pathophysiology and Patient Assessment Skills	3
PHAR 515	Continuous Professional Development I (continues)	-
PHAR 523	Foundations I	2
PHAR 545	The U.S. Health Care System	1.5
PHAR 652	Health Promotion and Communication in Pharmacy Practice	2
	Term Hours:	**17**
Spring semester		
MEDC 553	Concepts in the Medicinal Chemistry of Therapeutics Agents [1]	1
PCEU 508	Pharmacokinetics	3
PCEU 509	Pharmaceutics and Biopharmaceutics II	3
PHAR 506	Nonprescription Medications and Self-care	2
PHAR 515	Continuous Professional Development I	1
PHAR 524	Foundations II	1.5
PHAR 530	Introductory Pharmacy Practice Experience: Community Practice	4
PHAR 544	Clinical Therapeutics Module: Cardiovascular [1]	4.5
PHTX 606	Introduction to Pharmacology of Therapeutic Agents [1]	1
	Term Hours:	**21**

P2 year

Fall semester		
MEDC 542	Biotechnology-derived Therapeutic Agents [1]	1
PCEU 601	Applied Pharmacokinetics and Pharmacogenomics	2.5

PHAR 508	Evidence-based Pharmacy I	2
PHAR 534	Foundations III	1.5
PHAR 546	Pharmacy-based Immunization Delivery [1]	1.5
PHAR 555	Clinical Therapeutics Module: Endocrinology [1]	2.5
PHAR 603	Clinical Therapeutics Module: Respiratory/Immunology [1]	2.5
PHAR 615	Continuous Professional Development II (continues)	-
PHAR 618	Clinical Therapeutics Module: Gastrointestinal/Nutrition [1]	2.5
PHAR 680	Introduction to Data Science and Rapid Prototyping	2
	Term Hours:	**18**
Spring semester		
IPEC 502	Interprofessional Quality Improvement and Patient Safety	1
PHAR 502	Introduction to Pharmacoeconomics	1
PHAR 503	Ethics and Equity	1.5
PHAR 511	Evidence-based Pharmacy II	2
PHAR 532	Introductory Pharmacy Practice Experience: Hospital Practice	3
PHAR 535	Foundations IV	1.5
PHAR 604	Clinical Therapeutics Module: Infectious Diseases [1]	4
PHAR 606	Clinical Therapeutics Module: Nephrology/Urology [1]	2
PHAR 615	Continuous Professional Development II	1
PHAR 691	Special Topics in Pharmacy	1-5
	Term Hours:	**18-22**
P3 year		
Fall semester		
PHAR 507	Introduction to Health Informatics	1
PHAR 551	Pharmacy-based Point of Care Testing [1]	1.5
PHAR 556	Clinical Therapeutics Module: Neurology [1]	3.5
PHAR 602	Clinical Therapeutics Module: Psychiatry [1]	3
PHAR 605	Clinical Therapeutics Module: Hematology/Oncology [1]	2.5
PHAR 640	Foundations V	1.5
PHAR 715	Continuous Professional Development III (continues)	-
PHAR 678	Health Informatics and Excel: A Practical Partnership	1
	Term Hours:	**14**
Spring semester		
IPEC 560	Interprofessional Collaborative Care for Older Adults	1
PHAR 533	Introductory Pharmacy Practice Experience: Patient Care	.5
PHAR 609	Clinical Therapeutics Module: Reproductive Health, Dermatology, EENT, Bone and Joint [1]	3.5
PHAR 645	Foundations VI	1.5
PHAR 702	Pharmacy Practice Management	2.5

PHAR 703	Clinical Therapeutics Module: Complex Patient Cases and Critical Care [1]	3.5
PHAR 715	Continuous Professional Development III	1
PHAR 724	Pharmacy Law	2.5
INNO 610	Innovation, Design Thinking and Change Management	3
	Term Hours:	**19**
P4 year (over 45 weeks)		
Fall semester		
PHAR 730	Continuous Professional Development IV	.5
PHAR 760	Acute Care Pharmacy Practice I	5
PHAR 761	Advanced Hospital Pharmacy Practice	5
PHAR 763	Ambulatory Care Pharmacy Practice	5
PHAR 765	Elective I	5
PHAR 766	Elective II	5
PHAR 767	Clinical Selective I	5
PHAR 768	Advanced Community Pharmacy Practice	5
PHAR 773	Acute Care Pharmacy Practice II	5
	Term Hours:	**40.5**
	Total Hours:	**147.5-151.5**

[1]

Course will be taught as a module.

[2]

Students will complete four total credits of electives over the course of the year.

The minimum number of credit hours required for this degree is 148.5.