

# M.S. IN SKIN BIOLOGY AND DERMATOLOGICAL SCIENCES

## Curriculum Requirements Non-Thesis Track

Code	Title	Credit Hours
<b>Core Requirements</b>		
DER 601	Introduction to Dermatology	1
DER 603	Skin Biology and Pathophysiology	3
DER 605	Microbiology and Immunology of the Skin	3
DER 606	Dermato-epidemiology	2
DER 607	Dermatopharmacology	2
DER 608	Photobiology and Photomedicine	1
DER 609	Skin Carcinogenesis	2
DER 610	Clinical Skin Diseases	2
DER 611	Visualizing the Skin	2
DER 612	Grant Writing	1
DER 613	Techniques in Skin Research	1
DER 614	Innovation in Dermatology	1
DER 615	Dermatology Health Care Delivery	1
DER 622	Introduction to Dermatopathology	1
DER 623	Techniques in Skin Research- II	1
DER 631	Advances in Dermatology	1
DER 632	Advances in Dermatology	1
DER 633	Advances in Dermatology	1
DER 641	Frontiers in Sciences	1
DER 642	Frontiers in Sciences	1
DER 643	Frontiers in Sciences	1
<b>Total Credit Hours</b>		<b>30</b>

## Curriculum Requirements Thesis Track

Code	Title	Credit Hours
<b>Core Requirements</b>		
DER 601	Introduction to Dermatology	1
DER 603	Skin Biology and Pathophysiology	3
DER 605	Microbiology and Immunology of the Skin	3
DER 606	Dermato-epidemiology	2
DER 607	Dermatopharmacology	2
DER 608	Photobiology and Photomedicine	1
DER 609	Skin Carcinogenesis	2
DER 610	Clinical Skin Diseases	2
DER 611	Visualizing the Skin	2
DER 612	Grant Writing	1
DER 613	Techniques in Skin Research	1
DER 614	Innovation in Dermatology	1
DER 615	Dermatology Health Care Delivery	1
DER 622	Introduction to Dermatopathology	1
DER 623	Techniques in Skin Research- II	1
DER 631	Advances in Dermatology	1
DER 632	Advances in Dermatology	1
DER 633	Advances in Dermatology	1
DER 641	Frontiers in Sciences	1
DER 642	Frontiers in Sciences	1

DER 643	Frontiers in Sciences	1
<b>Research Rotation</b>		<b>1</b>
Take 1 credit of Research Rotation - course depends upon the semester taken:		
Fall - DER 661		
Spring DER 662		
Summer - DER 663		
<b>Research Thesis</b>		
DER 808	Research Thesis	6
<b>Total Credit Hours</b>		<b>37</b>

## Plan of Study (Non-Thesis Track)

Year One		Credit Hours
<b>Fall</b>		
DER 601	Introduction to Dermatology	1
DER 603	Skin Biology and Pathophysiology	3
DER 605	Microbiology and Immunology of the Skin	3
DER 606	Dermato-epidemiology	2
DER 631	Advances in Dermatology	1
DER 641	Frontiers in Sciences	1
<b>Credit Hours</b>		<b>11</b>
<b>Spring</b>		
DER 607	Dermatopharmacology	2
DER 608	Photobiology and Photomedicine	1
DER 609	Skin Carcinogenesis	2
DER 610	Clinical Skin Diseases	2
DER 613	Techniques in Skin Research	1
DER 622	Introduction to Dermatopathology	1
DER 632	Advances in Dermatology	1
DER 642	Frontiers in Sciences	1
<b>Credit Hours</b>		<b>11</b>
<b>Summer</b>		
DER 611	Visualizing the Skin	2
DER 612	Grant Writing	1
DER 614	Innovation in Dermatology	1
DER 615	Dermatology Health Care Delivery	1
DER 623	Techniques in Skin Research- II	1
DER 633	Advances in Dermatology	1
DER 643	Frontiers in Sciences	1
<b>Credit Hours</b>		<b>8</b>
<b>Total Credit Hours</b>		<b>30</b>

## Plan of Study (Thesis Track)

Year One		Credit Hours
<b>Fall</b>		
DER 601	Introduction to Dermatology	1
DER 603	Skin Biology and Pathophysiology	3
DER 605	Microbiology and Immunology of the Skin	3
DER 606	Dermato-epidemiology	2
DER 631	Advances in Dermatology	1
DER 641	Frontiers in Sciences	1
<b>Credit Hours</b>		<b>11</b>

<b>Spring</b>		
DER 607	Dermatopharmacology	2
DER 608	Photobiology and Photomedicine	1
DER 609	Skin Carcinogenesis	2
DER 610	Clinical Skin Diseases	2
DER 613	Techniques in Skin Research	1
DER 622	Introduction to Dermatopathology	1
DER 632	Advances in Dermatology	1
DER 642	Frontiers in Sciences	1
	<b>Credit Hours</b>	<b>11</b>
<b>Summer</b>		
DER 611	Visualizing the Skin	2
DER 612	Grant Writing	1
DER 614	Innovation in Dermatology	1
DER 615	Dermatology Health Care Delivery	1
DER 623	Techniques in Skin Research- II	1
DER 633	Advances in Dermatology	1
DER 643	Frontiers in Sciences	1
DER 663	Research Rotation	1
	*Can be taken as DER 661 in the Fall Semester or DER 662 in the Spring Semester	
	<b>Credit Hours</b>	<b>9</b>
<b>Year Two</b>		
<b>Fall</b>		
DER 808	Research Thesis <sup>1</sup>	6
	<b>Credit Hours</b>	<b>6</b>
	<b>Total Credit Hours</b>	<b>37</b>

<sup>1</sup> DER 808 may be taken for 1-6 credits per semester in any semester for a required total of 6 credits.

## Mission

Our mission is to foster future generations of skin scientists, physician scientists and industrial leaders in skin sciences, skin care as well as skin related drug and device development.

## Goals

In alignment with the university's strategic vision, the Goals of the programs are:

- Train Master's students in a focused knowledge area of Skin Biology and Dermatological Science; and
- Train Master's students in requisite research and research management skills,

## Student Learning Outcomes

- Students will demonstrate advanced knowledge of the fundamentals of skin biology.
- Students will demonstrate advanced knowledge of dermatological science and disorders.
- Students will demonstrate advanced knowledge of innovation, technology and regulations in the field of Skin Biology.

**DER 600. Cutaneous Biochemistry, Cell Biology and Genetics. 3 Credit Hours.**

This course will bring students to basic, fundamental and integrated sciences of human skin in biochemistry, cellular and molecular biology, and genetics. The course will cover various topics from skin cellular and molecular structure, function and biology, to their genes, DNA, RNA and protein, biochemical reactions, metabolism, and genetic processes that transmit biological information and regulation. This course will help students to understand the fundamental concepts on and connection between genes, structure and functions of human skin. The course is specifically designed and required for students who do not have strong background in human biochemistry and/or cell biology. Other students may elect this course to prepare for the subsequent vigorous studies in the MS degree program in Skin Biology and Dermatological Sciences. This is a hybrid course therefore students are required to attend campus-based classroom lectures 24 hours and online sessions of live lectures or pre-recorded presentations 24 hours.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 601. Introduction to Dermatology. 1 Credit Hour.**

The aim of the course is to familiarize participants with the basic subject of dermatology and the most common terminology. Students will be introduced to the subject of dermatology, subspecialties in dermatology, structure of the skin (basic anatomy and physiology), terminology (primary and secondary cutaneous lesions), and examples of the most common dermatological conditions.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**DER 603. Skin Biology and Pathophysiology. 3 Credit Hours.**

This course helps students to understand the fundamental concepts on and connection between structure and function of the skin. The course will include biology of major skin cell types of keratinocytes, fibroblasts, endothelial cells, melanocytes and Langerhans cells. It will cover biology of skin metabolism, skin appendages, skin matrix, cutaneous vasculature, neuroendocrine system and major processes required for cutaneous barrier function during normal and pathophysiological states. Molecular and cellular mechanisms of cutaneous wound healing, matrix remodeling, tissue regeneration and skin ageing will be also included into coursework.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**DER 605. Microbiology and Immunology of the Skin. 3 Credit Hours.**

This course covers skin microbiota and immune components of the skin in healthy and disordered states. The microbiology will cover bacterial species that cause most common skin infections such as *Staphylococcus aureus* (folliculitis, impetigo, abscesses, pyoderma, toxic-shock syndrome, staphylococcal scalded skin syndrome, wound infections); *Streptococcus pyogenes* (impetigo, erysipelas, cellulitis, necrotizing fasciitis, rheumatic fever, scarlet fever, wound infections), and *Corynebacterium* spp. (wound infections), etc. The bacterial biofilms and their importance in skin infections will also be addressed. The skin hosts the same immunocompetent cell types found throughout the body -T cells, B cells, macrophages, eosinophils, neutrophils, etc. -as well as its own skin-specific subpopulations-Langerhans cells, keratinocytes, and dermal dendrocytes. The second part of the course will cover the biology of immunology of the skin in normal functioning and underlying both intradermal allergic reactions and skin-specific autoimmune disorders ( alopecia areata, vitiligo, psoriasis), as well as the standard treatments for each. Further, this course addresses unique immune environments within the skin, such as the immune privilege of the hair follicle, and wound infection.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**DER 606. Dermato-epidemiology. 2 Credit Hours.**

Students will be introduced to the emerging discipline in skin epidemiology or Dermatoepidemiology, to obtain an overview of incidence rates and time trends of skin disorders in the US and in the world, learn biostatistical tools in data analysis including descriptive statistics, hypothesis testing, analysis of variance, and regression analysis. Students gain an appreciation for disparity in the disease outcomes among populations and various barriers contributing to current disparity. Students will also learn about various state and national registries for skin cancer and some other skin disorders available for database research.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**DER 607. Dermatopharmacology. 2 Credit Hours.**

This course familiarizes students with the mechanisms of drug action, FDA-indications, off-label uses, safety and efficacy, side effects and necessary monitoring and important drug interactions relevant to topical and systemic medications used in dermatology. The course covers skin barrier and transdermal drug delivery (structure of the skin barrier, factors affecting the skin barrier, strategies to enhance transdermal drug delivery), major drugs used in dermatology including glucocorticosteroids, retinoids, antimicrobials, immunomodulators, agents used in oncology, hormonal therapy, other systemic medications (antimalarials, colchicine, dapsone, leukotriene inhibitors, antihistamines, thalidomide) and topic medications.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 608. Photobiology and Photomedicine. 1 Credit Hour.**

This course discusses fundamental concepts on photobiology and phototherapy with Ultraviolet light (UV) B, Excimer Laser, UV A, PUV A (psoralen + UV A), Photopheresis, and Photodynamic therapy. The course will cover photobiology, photochemistry and mechanisms of actions. Treatment protocols with clearing phase and maintenance phase, indications, adverse effects and complications, practice and techniques and future directions will be also included into coursework.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 609. Skin Carcinogenesis. 2 Credit Hours.**

This course considers the etiology, pathophysiology, epidemiology, types, prognosis and various treatment of the most common types of skin cancers will be covered. Skin cancer is by far the most common type of cancer affecting the humans. More than 50% of all the cancers combined are skin cancers. The most common skin cancer is Basal Cell Carcinoma (BCC). The second most common type is Squamous Cell Carcinoma. One of the most serious form of skin cancer is Melanoma. There are other types of skin cancers that affect us. One in 5 Americans develop skin cancer during their lifetime.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 610. Clinical Skin Diseases. 2 Credit Hours.**

This course gives students a clinical overview of the common skin disorders encountered by society. It discusses the most common skin diseases such as acne, seborrheic dermatitis, and xerosis, with an emphasis on pathogenesis, and current research in these conditions. Older treatments will be compared to newer treatments with respect to efficacy as well as cost to patients.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 611. Visualizing the Skin. 2 Credit Hours.**

This course covers basic and advanced techniques of visual examination and digital photography of the skin and hair. Topics include macrophotography of the skin and scalp, dermatoscopy, processing of biopsies for histology, routine and special histological staining, microscopy with regular and special lights, immunohistochemistry and immunofluorescence, and recent advances of non-invasive methods of visualizing the skin in depth such as optical coherence tomography and in vivo confocal microscopy.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 612. Grant Writing. 1 Credit Hour.**

The course presents approaches and important aspects of preparation of some major grant applications to including government funding from National Institute of Health (NIH) such as Research grants (R formats) for academia and Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants for industries and grants from Department of Defense. Major sources, tools and policies for grant application and management will be discussed.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 613. Techniques in Skin Research. 1 Credit Hour.**

This course will cover different areas of research techniques employed in studying skin biology/ pathophysiology that span from in vitro cell based assays, ex vivo skin or reconstructed skin equivalents to in vivo animal models to study skin biology and skin diseases, and will integrate various molecular, cellular and tissue based methods. The course will balance multiple teaching methods from traditional didactics to individual and group "hands-on" laboratory experience and training. Its main approach will be using skin specimen (human or animal) as a major source and starting point. It will follow progression from simple methods (cell-based) to more complex (organotypic and tissue-based techniques) to in vivo animal models in pre-clinical trials. The course will also cover high throughput approaches in skin genomics, genetics and proteomics, and use and analysis of big data as well.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 614. Innovation in Dermatology. 1 Credit Hour.**

The aim of this course is to familiarize the participants with the tools of innovation. It will cover the strategic processes of how to ideate, formulate, innovate and push through new ideas-from concept to implementation. This course will also cover the issues related to patent and how to protect the intellectual property.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 615. Dermatology Health Care Delivery. 1 Credit Hour.**

This course prepares students for positions of leadership in skin care and skin health-related industrials and organizations. The course focuses on the educational needs of professionals already fully employed in the health care industry, as well as those aspiring to careers in the field. The course considers practical administrative skills as well as broad strategic and theoretical perspectives to students who wish to expand their knowledge of management and administration as applied to the skin care industry, with emphasizes in the development of business; technical, administrative, and leadership concepts as they apply to the clinical practice and skin care industry. TeleHealth, TeleDermatology and Clinical Outreach will also be discussed. This course considers the topics on the development of business, technical, administrative, and leadership concepts as they apply to the health care industry. Students will consider issues pertaining to animal use and protection and human subject in research, regulatory requirements and allied issues.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 622. Introduction to Dermatopathology. 1 Credit Hour.**

This course is the continuation of the course DER 602 Skin Anatomy and Histology and or DER 603 Skin Biology and Pathophysiology. The aim of the course is to give students a general introduction to clinical histopathology in common skin disorders. The course will familiarize students with basic terms of histopathological changes in skin tissue, basic characteristic pattern recognitions, clinic-pathologic correlations, and histopathologic features of common skin diseases.

Prerequisite: DER 602 or DER 603.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 623. Techniques in Skin Research- II. 1 Credit Hour.**

This course is the continuation of the course DER 613 Techniques in Skin Research-I. It will teach students how to approach and solve research problems with different strategies and methods. Various research models specific to skin research will be discussed including angiogenesis, aging, cancer, endocrinology, hair, itching and sensation, wound repair and tissue regeneration, therapeutic research in drug transdermal and systemic deliveries, and clinical skin disease research and therapeutic trials as well. Students will also consider issues pertaining to animal use and protection and human subject in research and allied issues.

Prerequisite: DER 613.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 631. Advances in Dermatology. 1 Credit Hour.**

This hour-long seminar course is held in conjunction with Dermatology Grand Rounds, which will be the basis of this course. The purpose is to help students to keep up with advances in investigative dermatological research and patient care. The lectures are delivered by Dermatology full time faculty, voluntary faculty, visiting dermatologists/investigators, and physicians and investigators from related disciplines at the University of Miami. This series covers various aspects of skin biology, dermatology, and related disciplines.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**DER 632. Advances in Dermatology. 1 Credit Hour.**

This hour-long seminar course is held in conjunction with Dermatology Grand Rounds, which will be the basis of this course. The purpose is to help students to keep up to date in advances in investigative dermatological research and patient care. The lectures are delivered by Dermatology full time faculty, voluntary faculty, visiting dermatologists/investigators, and physicians and investigators from related disciplines at the University of Miami. This series covers various aspects of skin biology, dermatology, and related disciplines.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 633. Advances in Dermatology. 1 Credit Hour.**

This hour-long seminar course is held in conjunction with Dermatology Grand Rounds, which will be the basis of this course. The purpose is to help students to keep up to date in advances in investigative dermatological research and patient care. The lectures are delivered by Dermatology full time faculty, voluntary faculty, visiting dermatologists/investigators, and physicians and investigators from related disciplines at the University of Miami. This series covers various aspects of skin biology, dermatology, and related disciplines.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 641. Frontiers in Sciences. 1 Credit Hour.**

This course will be in conjunction with Dermatology Journal Clubs. Students will participate in the presentation, discussion and critiques of the publications in peer-reviewed journals in both basic sciences and clinical aspects, not limited to the field of dermatology, with emphasis in translational research and research applications. In addition, this course will be run in conjunction with Dermatology Research Conferences. It will provide the most recent updates on various aspects of dermatological sciences ranging from molecular mechanisms of normal skin regeneration and repair to pathologies such as impaired healing disorders and skin cancer. Faculty, fellows and students from each research laboratory will present their research discoveries. Each MS thesis track student will be required to present their own research projects during their thesis period.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**DER 642. Frontiers in Sciences. 1 Credit Hour.**

This course will be in conjunction with Dermatology Journal Clubs. Students will participate in the presentation, discussion and critiques of the publications in peer-reviewed journals in both basic sciences and clinical aspects, not limited to the field of dermatology, with emphasis in translational research and research applications. In addition, this course will be run in conjunction with Dermatology Research Conferences. It will provide the most recent updates on various aspects of dermatological sciences ranging from molecular mechanisms of normal skin regeneration and repair to pathologies such as impaired healing disorders and skin cancer. Faculty, fellows and students from each research laboratory will present their research discoveries. Each MS thesis track student will be required to present their own research projects during their thesis period.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 643. Frontiers in Sciences. 1 Credit Hour.**

This course will be in conjunction with Dermatology Journal Clubs. Students will participate in the presentation, discussion and critiques of the publications in peer-reviewed journals in both basic sciences and clinical aspects, not limited to the field of dermatology, with emphasis in translational research and research applications. In addition, this course will be run in conjunction with Dermatology Research Conferences. It will provide the most recent updates on various aspects of dermatological sciences ranging from molecular mechanisms of normal skin regeneration and repair to pathologies such as impaired healing disorders and skin cancer. Faculty, fellows, and students from each research laboratory will present their research discoveries. Each MS thesis track student will be required to present their own research projects during their thesis period.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 661. Research Rotation. 1 Credit Hour.**

This elective course will be offered in all three semesters in the first year. Thesis Path students will elect to take this course during the first year. Students will rotate through 1-3 research labs to explore a variety of potential topics for thesis. Thesis path students are required to take at least 1 lab rotation (1 credit) prior to their lab selection for thesis by the end of 3rd semester. Non-thesis path students will have the option to take this elective course as an opportunity to get hands-on experience in laboratory research and learn research techniques.

**Components:** LAB.

**Grading:** GRD.

**Typically Offered:** Fall.

**DER 662. Research Rotation. 1 Credit Hour.**

This elective course will be offered in all three semesters in the first year. Thesis Path students will elect to take this course during the first year. Students will rotate through 1-3 research labs to explore a variety of potential topics for thesis. Thesis path students are required to take at least 1 lab rotation (1 credit) prior to their lab selection for thesis by the end of their 3rd semester. Non-thesis path students will have the option to take this elective course as an opportunity to get hands-on experience in laboratory research and learn research techniques.

**Components:** LAB.

**Grading:** GRD.

**Typically Offered:** Spring.

**DER 663. Research Rotation. 1 Credit Hour.**

This elective course will be offered in all three semesters in the first year. Thesis Path students will elect to take this course during their first year. Students will rotate through 1-3 research labs to explore a variety of potential topics for thesis. Thesis path students are required to take at least 1 lab rotation (1 credit) prior to their lab selection for thesis by the end of 3rd semester. Non-thesis path students will have the option to take this elective course as an opportunity to get hands-on experience in laboratory research and learn research techniques.

**Components:** LAB.

**Grading:** GRD.

**Typically Offered:** Summer.

**DER 670. Dermatology Clinical Shadowing. 1-3 Credit Hours.**

This course will consist of shadowing with a clinical faculty dermatologist in clinics in the Department of Dermatology and Cutaneous Surgery at the University of Miami (minimum 2-3 hours per week for each credit hour). This course is for students who are interested in clinical dermatology or medicine. It will give students firsthand experience in clinical dermatology. Students will be rigorously monitored for progress by clinical faculty mentors. Student will be required to write a case report or present a case report at the end of the semester.

Prerequisite: DER 601.

**Components:** CLN.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**DER 808. Research Thesis. 1-6 Credit Hours.**

A 6-credit research thesis will be required for students who choose the Thesis Path. For timing reasons, students will choose a mentor's lab by the end of the first year and select a thesis proposal after rotation through 1-3 research labs (DER 661, DER 662, or DER 663). Students are required to conduct campus-based thesis research in their second year in the research laboratories with faculty mentors in the Department of Dermatology and Cutaneous Surgery. A thesis requires an oral defense and a written paper evaluated and approved by the thesis committee convened for that purpose. The oral defense is open to the university community and the public. The student should distribute the thesis paper to the thesis committee for preliminary approval at least 10 days prior to the oral defense. The written paper should be of quality to be submitted for publication as first author or a co-author. The length of completion of the thesis research, including written thesis paper and oral defense, usually takes 12 months. Students need to discuss with their thesis mentor about research topic, thesis committee, duration and expectation.

Prerequisite: DER 661 or DER 662 or DER 663.

**Components:** THE.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.