

COURSE CONTENT

Course Code	DT2005
Course Title	Lighting and Rendering Pipeline
Pre-requisites	NIL
No of AUs	3
Contact Hours	39 hours studio contact

Course Aims

This course will introduce you to the fundamental processes and techniques of lighting and rendering in 3D, which you will then apply in the creation of original computer-generated imagery to become familiar with the effect that lighting and rendering have upon the emotional ambience of a scene. This learning forms the foundation for further studies in Visual Effects and 3D animation.

Intended Learning Outcomes (ILO)

By the end of the course, you should be able to:

1. Describe techniques used in the lighting and rendering practice
2. Demonstrate fundamental techniques required to create computer graphic renderings
3. Apply techniques and aesthetic considerations to create original computer graphic creative rendering.
4. Present and discuss the application of lighting and rendering to personal computer graphic work.
5. Critique lighting and rendering techniques employed by peers in a constructive manner.

Course Content

The role of Lighting and Rendering

As in photography or film, lighting is a key factor in creating a successful image. Lighting determines not only brightness and darkness but also tone, mood and the atmosphere. In computer graphic (CG) animation, lighting and rendering are the technical and artistic tools used to design the atmosphere and to render the final 2D output of a 3D scene. In this course you will experience a practice-based introduction to the basic techniques of lighting and rendering and its place within the production process.

The Fundamentals of Lighting Design

What makes a good lighting design? Through analysis of a variety of examples from photography, film and animation, you will develop a sense of creative considerations and their role in creating a successful lighting design. Through lectures, practice-based exercises and project assignments, you will learn the fundamentals of lighting techniques, the role of colour, shadows and the creation of atmospheric lighting.

Shading and Rendering

In the context of lighting and rendering of a 3D scene, the materiality of its 3D objects and the

type of rendering algorithm applied are equally important in creating a particular aesthetic. This course will cover the various types of materials, shader formats and rendering terminology. You will learn to understand vocabularies such as diffuse, glossy, specular, raytracing, global illumination and PBR (physically based rendering and shading) and apply such concept to your projects.

Class assignments

Creative projects, which explore fundamental lighting and rendering related techniques. Lectures, tutorials, class exercises and peer/instructor feedback sessions.

Assessment (includes both continuous and summative assessment)

Component	ILO Tested	Programme LO	Weighting	Team/ Individual
Continuous Assessment Mid-semester assignment	1,2,3	N.A	40	Individual
Final Project: Final rendering, still or sequential	1,2,3,4	N.A	40	Individual
Continuous Assessment: Participation	5	N.A	20	Individual
Total			100%	

Reading and References

1. Birn, Jeremy. *Digital lighting & rendering*. Pearson Education, 2014.
2. Biver, Steven, Paul Fuqua, and Fil Hunter. *Light science and magic: An introduction to photographic lighting*. Routledge, 2012.
3. Katatikarn, Jasmine, and Michael Tanzillo. *Lighting for Animation: The Art of Visual Storytelling*. Routledge, 2016.
4. Pharr, Matt, Wenzel Jakob, and Greg Humphreys. *Physically based rendering: From theory to implementation*. Morgan Kaufmann, 2016. free online at www.pbr-book.org
5. Wright, Steve. *Compositing visual effects: Essentials for the aspiring artist*. Routledge, 2013.

Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned readings, activities, assignments, attend all classes punctually and complete all scheduled assignments by due dates. You are expected to take responsibility to follow up with assignments and course related announcements. You are expected to participate in all project critiques, class discussions and activities.

(2) Punctuality

You are expected to be punctual for all classes. If you are more than 30 minutes late, you will be deemed as absent and will not be able to sign on the attendance register.

(3) Absenteeism

In-class activities make up a significant portion of your course grade. Absence from class without a valid reason will affect your participation grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for in-class activities.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Planned Weekly Schedule*

*Subjected to adjustment by instructor according to students' progress, public holidays and unforeseeable circumstances.

Week	Topic	Course LO	Readings/ Activities
1	<ul style="list-style-type: none">Introduction and First Steps Overview of key concepts of a CG pipeline and the place of lighting and rendering in the process in creating CG animation or VFX.	1, 2, 5	Introductory lecture In-class discussion and analysis of examples. In-class exercise: A first lighting setup in Maya.
2-4	<ul style="list-style-type: none">Fundamentals of Lighting Design Introduction to fundamental artistic, theoretical and technical concepts of lighting design. Students will learn basic techniques to design and create lighting setups. <ul style="list-style-type: none">Aesthetic considerations Through analysis of examples, students will develop a sense, which attributes contribute to successful	1, 2, 5	Lectures on: Concept of Lighting Design In-class discussion and analysis of lighting design examples. In-class exercises: Introduction to lighting concepts. Assigned project: Conceptualisation of the mid-semester assignment.

	lighting designs.		
5-7	<ul style="list-style-type: none"> • Basic Practices Exploration of core concepts of rendering, shading and texturing such as material types and shading theory. Students will learn techniques to create materials and render final images. 	1,2, 4, 5	<p>Lectures on: Shading, Texturing and Rendering Basics</p> <p>In-class exercises: Exploring and practising of basic shading, texturing and rendering techniques.</p> <p>Project critique and feedback on in-class exercises and assigned projects.</p> <p>Assigned project: Continue with mid-semester assignment.</p>
8-9	<ul style="list-style-type: none"> • Exploring Advanced Techniques An in-depth exploration of strategies to create realistic images utilising advanced techniques such as image-based lighting (IBL) and rendering. • Comparison of Render Engines In-depth investigation and comparison of the characteristics and advantages of various render engines. 	1,2, 3, 4, 5	<p>Project critique and feedback on mid-semester project assignments.</p> <p>Lectures on: Advanced Lighting and Rendering Techniques. Comparison of Render Engines</p> <p>In-class exercises: Exploring and practising of advanced lighting and rendering.</p> <p>Assigned project: Continue with mid-semester assignment.</p>
10	<ul style="list-style-type: none"> • Presentation and discussion of mid-semester assignment • Start of final project. 	1,2,3,4,5	<p>Completion of mid-semester assignment. Project presentation and critique. Class discussion.</p> <p>Start of final project. Final project: Still frame or sequence demonstrating core competencies, technical skills and aesthetic considerations.</p> <p>Discussion of requirements. Demonstration of examples. Q and A.</p>
11-12	<ul style="list-style-type: none"> • Exploring Advanced Techniques Exploration of advanced postprocessing strategies such as utilising render passes in compositing to advance the realism of and control over the final image. • Continuous review of final 	1, 2, 3, 4, 5	<p>Lectures on: Advanced Render Passes and Postprocessing Techniques</p> <p>In-class exercises: Investigating advanced use of render passes in compositing.</p> <p>Project critique and feedback on in-class exercises and assigned projects.</p> <p>Project consultation and continuous</p>

	<p>assignment through various stages of completion</p> <p>Throughout the last weeks of the semester, the final project will be subject to review through its various stages of completion. This will be carried out in class presentations by students and will allow for a peer-review-based examination of the works in progress. In this highly interactive process, you will learn through and from the work of your peers and the advice offered by the lecturer.</p>		<p>review, assessment and feedback throughout the production of the final project.</p>
13	<ul style="list-style-type: none"> • Review of Final Project <p>Presentation, review and discussion of final project as a peer-review-based examination of the final work. In this highly interactive process, you will learn through and from the work of your peers and the advice offered by the lecturer.</p>	4, 5	<p>Student Presentations of final project with discussion, critique and feedback session.</p>