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Computer Graphics

By Prof. Samit Bhattacharya | IIT Guwahati

Learners enrolled: 11646

Computer graphics is one of the fundamental aspects of any computing system. Its primary role is to render the digital content (0's and 1's) in a human-comprehensible form on the computer screen. The rendering follows a series of stages, collectively known as the graphics pipeline. In this course, we will introduce the pipeline and its stages. The topics covered include various object representation techniques followed by the pipeline stages of modeling transformation, 3D to 2D viewing transformation, clipping and hidden surface removal and scan conversion (rendering). We shall follow the stages of the 3D graphics pipeline. In order to complete the coverage, we shall also briefly introduce the present day graphics hardware (I/O devices, GPU) and the widely popular OpenGL graphics library.


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INTENDED AUDIENCE : UG students of Computer Science and Engineering/IT

PREREQUISITES : Knowledge of data structures and algorithm is preferable
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INDUSTRIES SUPPORT :

- (1) Gaming and entertainment industry
- (2) Industry dealing with display technology
- (3) Interactive consumer electronic industry
- (4) Any other industry dealing with display and content rendering

Summary

Course Status :	Completed
Course Type :	Core
Duration :	8 weeks
Category :	<ul style="list-style-type: none"> ◦ Computer Science and Engineering ◦ Foundations of Computing
Credit Points :	2
Level :	Undergraduate
Start Date :	14 Sep 2020
End Date :	06 Nov 2020
Enrollment Ends :	25 Sep 2020
Exam Date :	19 Dec 2020 IST

Note: This exam date is subjected to change based on seat availability. You can check final exam date on your hall ticket.



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Course layout

Week 1: Introduction – historical evolution, issues and challenges, graphics pipeline, hardware and software basics

Week 2: Object representation – boundary representation, splines, space partitioning

Week 3: M Transformations – matrix representation, homogeneous coordinate system, composition, 3D transformation  (<https://swayam.gov.in/>)  (https://swayam.gov.in/nc_details/NPTEL)

Week 4: Illumination and shading – background, simple lighting model, shading models, intensity representation, color models, texture synthesis [About Swayam \(https://swayam.gov.in/about\)](https://swayam.gov.in/about) | [All Courses](#) | [\(\)](#)

Week 5: 3D viewing – viewing pipeline, view coordinate system, viewing transformation, projection, window-viewport transformation

Week 6: Clipping and hidden surface removal – clipping in 2D. 3D clipping algorithms, hidden surface removal

Week 7: Rendering – scan conversion of line, circle, fill-area and characters, anti-aliasing

Week 8: Graphics hardware and software – generic architecture, I/O, GPU, Shader programming, graphics software (OpenGL)

Books and references

1. Samit Bhattacharya. (2015). Computer Graphics. Oxford University Press.
2. Hearn, D. & Baker, M. P. (2003). Computer Graphics with OpenGL, (3rd ed), Pearson.

Instructor bio



Prof. Samit Bhattacharya

IIT Guwahati

Dr Samit Bhattacharya is an associate professor in the Dept of Computer Science and Engineering, IIT Guwahati, with nearly 12 years of teaching and research experience. He has taught numerous courses including those related to the proposed course, to both the PG and UG level students of Computer Science and Engineering. He also has more than four dozen publications as books, book chapters, patents, peer-reviewed journals and conference proceedings under his credit. He has already graduated two PhD students (with another eight at various stages of their research) and guided more than a dozen MTech projects and two dozen BTech projects in this area.

Course certificate

- The course is free to enroll and learn from. But if you want a certificate, you have to register and write the proctored exam conducted by us in person at any of the designated exam centres.
- The exam is optional for a fee of Rs 1000/- (Rupees one thousand only).
- **Date and Time of Exams: 19 December 2020**, Morning session 9am to 12 noon; Afternoon Session 2pm to 5pm.
- Registration url: Announcements will be made when the registration form is open for registrations.
- The online registration form has to be filled and the certification exam fee needs to be paid. More details will be made available when the exam registration form is published. If there are any changes, it will be mentioned then.

•Please check 1 details on the cities where the exams will be held, the conditions you agree to when you fill the form etc. (https://swayam.gov.in/) (https://swayam.gov.in/nc_details/NPTEL)



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- Average assignment score = 25% of average of best 6 assignments out of the total 8 assignments given in the course.
- Exam score = 75% of the proctored certification exam score out of 100
- Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75.

- If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.
- Certificate will have your name, photograph and the score in the final exam with the breakup. It will have the logos of NPTEL and IIT Guwahati. It will be e-verifiable at npTEL.ac.in/noc. (http://npTEL.ac.in/noc)
- Only the e-certificate will be made available. Hard copies will not be dispatched.



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Initiative by : Ministry of Education (Govt of India)



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This certificate is awarded to
DEVADHARSHINI P
for successfully completing the course

Computer Graphics

with a consolidated score of **52** %

Online Assignments	17.75/25	Proctored Exam	33.75/75
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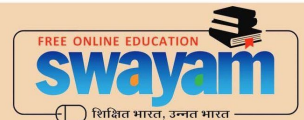
Total number of candidates certified in this course: **311**

Jul-Sep 2022
(8 week course)

Prof. T. V. Bharat
Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati



Roll No: NPTEL22CS111S23280992

To validate the certificate



No. of credits recommended: 2 or 3



NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to
DHARINI A
for successfully completing the course

Computer Graphics

with a consolidated score of **53** %

Online Assignments	23.33/25	Proctored Exam	30/75
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Total number of candidates certified in this course: **311**

Jul-Sep 2022
(8 week course)

Prof. T. V. Bharat
Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati



Roll No: NPTEL22CS111S13510344

To validate the certificate



No. of credits recommended: 2 or 3



Elite

NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to
GAYATHIREEN M
for successfully completing the course

Computer Graphics

with a consolidated score of **60** %

Online Assignments	19.17/25	Proctored Exam	40.75/75
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Total number of candidates certified in this course: **311**

Jul-Sep 2022
(8 week course)

Prof. T. V. Bharat
Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati



Roll No: NPTEL22CS111S23281021

To validate the certificate



No. of credits recommended: 2 or 3



NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to
GERALD MANJU J
for successfully completing the course

Computer Graphics

with a consolidated score of **54** %

Online Assignments	24.17/25	Proctored Exam	30/75
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Total number of candidates certified in this course: **311**

Jul-Sep 2022
(8 week course)

Prof. T. V. Bharat
Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati



Roll No: NPTEL22CS111S23280235

To validate the certificate



No. of credits recommended: 2 or 3



Elite

NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to
KAVYAA S M
for successfully completing the course

Computer Graphics

with a consolidated score of **60** %

Online Assignments	24.17/25	Proctored Exam	35.5/75
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Total number of candidates certified in this course: **311**

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Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



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Roll No: NPTEL22CS111S23280335

To validate the certificate



No. of credits recommended: 2 or 3



NPTEL Online Certification

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This certificate is awarded to
MAHALAKSHMI P P
for successfully completing the course

Computer Graphics

with a consolidated score of **54** %

Online Assignments	23.75/25	Proctored Exam	30/75
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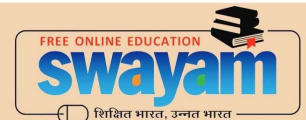
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Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati



Roll No: NPTEL22CS111S13280491

To validate the certificate



No. of credits recommended: 2 or 3



NPTEL Online Certification

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This certificate is awarded to
L SRI SAKTHI
for successfully completing the course

Computer Graphics

with a consolidated score of **57** %

Online Assignments	25/25	Proctored Exam	31.5/75
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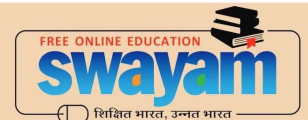
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Prof. T. V. Bharat
Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati



Roll No: NPTEL22CS111S13280631

To validate the certificate



No. of credits recommended: 2 or 3



Elite

NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to
SUBBULAKSHMI P
for successfully completing the course

Computer Graphics

with a consolidated score of **60** %

Online Assignments	24.58/25	Proctored Exam	35.25/75
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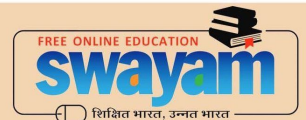
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Jul-Sep 2022
(8 week course)

Prof. T. V. Bharat
Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



Indian Institute of Technology Guwahati



Roll No: NPTEL22CS111S13280659

To validate the certificate



No. of credits recommended: 2 or 3



NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to
UMAYAL C
for successfully completing the course

Computer Graphics

with a consolidated score of **54** %

Online Assignments	24.17/25	Proctored Exam	30/75
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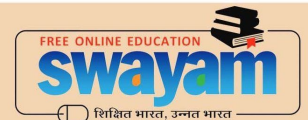
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Jul-Sep 2022
(8 week course)

Prof. T. V. Bharat
Head, Centre for Educational Technology
NPTEL Coordinator, IIT Guwahati



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Roll No: NPTEL22CS111S13280745

To validate the certificate



No. of credits recommended: 2 or 3