



NUMERICAL METHODS : FINITE DIFFERENCE APPROACH

PROF. AMEEYA KUMAR NAYAK

Department of Mathematics

IIT Roorkee

PRE-REQUISITES : Numerical Methods Basic Knowledge

INTENDED AUDIENCE : UG students of technical universities/colleges

INDUSTRIES APPLICABLE TO : TCS, Intel, General Electric, General Motors, ABB, Nuclear Industries, etc

COURSE OUTLINE :

This course is an advanced course offered to UG/PG student of Engineering/Science background. It contains solution methods for different class of partial differential equations. The convergence and stability analysis of the solution methods is also included. It plays an important role for solving various engineering and sciences problems. Therefore, it has tremendous applications in diverse fields in engineering sciences.

ABOUT INSTRUCTOR :

Prof. Ameeya Kumar Nayak is Associate Professor in Department of Mathematics at IIT Roorkee and actively involved in teaching and research in the direction of numerical modeling of fluid flow problems for last ten years. His research interests are in the fundamental understanding of species transport in macro and micro-scale confinements with applications in biomedical devices and micro electro mechanical systems. He has authored and co-authored more than 32 peer-reviewed journal papers, which includes publications in Springer, ASME, American Chemical Society and Elsevier journals. He is also active in writing book chapter with reputed international publication house.

COURSE PLAN :

Week 1: Introduction to Numerical methods, Initial and Boundary value problems, Numerical solution of ODE, Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method.

Week 2 : Introduction of PDE, Classification of PDE: parabolic, elliptic and hyperbolic. Boundary and initial conditions, Taylor series expansion, analysis of truncation error, Finite difference method: FD, BD & CD, Higher order approximation, Order of Approximation, Polynomial fitting, One-sided approximation.

Week 3 : Parabolic equation in 2D, Explicit & Crank-Nicolson method, Alternating direction Implicit method (ADI), Elliptic equations, Solution of Poisson equation with Example, Successive over Relaxation (SOR) method, Solution of Elliptic equation by using ADI method, Example.

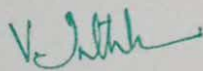
Week 4 : Hyperbolic equations, solution using Explicit method, Stability analysis of Explicit and Implicit scheme, Example, Characteristics of PDE, Solution of Hyperbolic equation by using methods of Characteristics, Hyperbolic equation of first order, Lax-Wendroff's method, Wendroff's method, stability analysis of method, Example.

PG AND RESEARCH DEPARTMENT OF MATHEMATICS

NPTEL ONLINE COURSE

STUDENT LIST

S. No.	Roll No.	Name	Course Name
1.	21-PM-01	E. Guruprasath	Numerical Methods: Finite Difference Approach
2.	21-PM-03	K. Ponraj	Numerical Methods: Finite Difference Approach
3.	21-PM-04	S. Praveenkumar	Numerical Methods: Finite Difference Approach
4.	21-PM-09	S. Akila	Numerical Methods: Finite Difference Approach
5.	21-PM-10	M. Anudharunya	Numerical Methods: Finite Difference Approach
6.	21-PM-17	M. Geethanjali	Numerical Methods: Finite Difference Approach
7.	21-PM-18	M. Gokulavani	Numerical Methods: Finite Difference Approach



HOD

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.



PRINCIPAL

PRINCIPAL
N. G. M. COLLEGE, POLLACHI

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Roll No: NPTEL22MA21S33323855

To
PRAVEENKUMAR S
2/40A, ANNA NAGAR,
ELAYAMUTHUR
TIRUPPUR
TAMIL NADU - 642154
PH. NO :9360596205



Score	Type of Certificate
≥ 90	Elite+Gold
75-89	Elite+Silver
≥ 60	Elite
40-59	Successfully Completed
< 40	No Certificate

No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



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This certificate is awarded to

PRAVEENKUMAR S

for successfully completing the course

Numerical Methods: Finite Difference Approach

with a consolidated score of **56** %

Online Assignments	18.25/25	Proctored Exam	37.5/75
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Total number of candidates certified in this course: **20**

Prof. Sanjeev Manhas
Coordinator, Continuing Education Centre
IIT Roorkee

Jan-Feb 2022
(4 week course)

Prof. Priti Maheshwari
NPTEL Coordinator
IIT Roorkee



Indian Institute of Technology Roorkee



Roll No:NPTEL22MA21S33323855

To validate and check scores: <https://npTEL.ac.in/noc>

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Roll No: NPTEL22MA21S33322559

To
PONRAJ K
681, AVANALINGAM PILLAI STREET
KANIYUR, TIRUPPUR
KANIYUR
TAMILNADU - 642203
PH. NO : 8838954387



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



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This certificate is awarded to

PONRAJ K

for successfully completing the course

Numerical Methods: Finite Difference Approach

with a consolidated score of **46** %

Online Assignments	14.92/25	Proctored Exam	31.5/75
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Total number of candidates certified in this course: 20

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Coordinator, Continuing Education Centre
IIT Roorkee

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This certificate is computer generated and can be verified by scanning the QR code given below.

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AKILA S
3/49, KALLIPALAYAM
SENGATUPALAYAM(POST),DHARAPURAM(TALUK)
TIRUPPUR
TAMILNADU - 642206
PH. NO :8754221978



Score	Type of Certificate
≥ 90	Elite+Gold
75-89	Elite+Silver
≥ 60	Elite
40-59	Successfully Completed
< 40	No Certificate

No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



TOPPER

Elite

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This certificate is awarded to

AKILA S

for successfully completing the course

Numerical Methods: Finite Difference Approach

with a consolidated score of **72** %

Online Assignments	19.5/25	Proctored Exam	52.5/75
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Total number of candidates certified in this course: 20

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This certificate is awarded to

ANUDHARUNYA M

for successfully completing the course

Numerical Methods: Finite Difference Approach

with a consolidated score of **56** %

Online Assignments	19.5/25	Proctored Exam	36/75
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ANAIMALAI TALUK, POLLACHI, COIMBATORE
POLLACHI
TAMIL NADU - 642103
PH. NO : 6385333491



Score	Type of Certificate
≥ 90	Elite+Gold
75-89	Elite+Silver
≥ 60	Elite
40-59	Successfully Completed
< 40	No Certificate

No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



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This certificate is awarded to

GURUPRASATH ESWARAN

for successfully completing the course

Numerical Methods: Finite Difference Approach

with a consolidated score of **49** %

Online Assignments	14.92/25	Proctored Exam	34.5/75
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Total number of candidates certified in this course: 20

Prof. Sanjeev Manhas
Coordinator, Continuing Education Centre
IIT Roorkee

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Prof. Priti Maheshwari
NPTEL Coordinator
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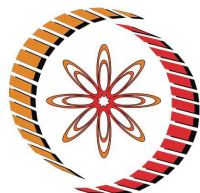
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GEETHANJALI M
15/128 NANJAPPAGOUNDANPUTHUR
JALLIPATTI (POST), DHARAPURAM (TALUK)
TIRUPPUR
TAMILNADU - 641671
PH. NO :9500687834



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



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This certificate is awarded to

GEETHANJALI M

for successfully completing the course

Numerical Methods: Finite Difference Approach

with a consolidated score of **60** %

Online Assignments	19.5/25	Proctored Exam	40.01/75
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Total number of candidates certified in this course: **20**

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IIT Roorkee

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(4 week course)

Prof. Priti Maheshwari
NPTEL Coordinator
IIT Roorkee



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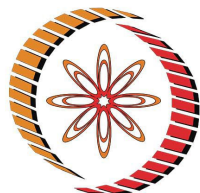
To
GOKULAVANI M
2/X16,SUNDARAGOUNDANUR,POOSARIPATTI(PO)
POLLACHI(TK)
POLLACHI
TAMILNADU - 642205
PH. NO :9750042566



Score	Type of Certificate
>=90	Elite+Gold
75-89	Elite+Silver
>=60	Elite
40-59	Successfully Completed
<40	No Certificate

No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



Elite

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TOPPER

This certificate is awarded to

GOKULAVANI M

for successfully completing the course

Numerical Methods: Finite Difference Approach

with a consolidated score of **66** %

Online Assignments	19.5/25	Proctored Exam	46.5/75
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Total number of candidates certified in this course: **20**

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Coordinator, Continuing Education Centre
IIT Roorkee

Jan-Feb 2022
(4 week course)

Prof. Priti Maheshwari
NPTEL Coordinator
IIT Roorkee



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