



SARANATHAN COLLEGE OF ENGINEERING

An Autonomous Institution

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)

Venkateswara Nagar, Panjappur, Tiruchirappalli-620012

(Accredited by NAAC A+ Grade in the first cycle)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(Accredited by NBA)

Report on the Compact Course

Numerical Iterative Methods (10-03-2025 to 12-03-2025)

Sponsored by Professor R. Balakrishnan Endowment Trust (RBET) and The Indian Mathematics Consortium (TMC)

A three-day compact course on Numerical Iterative Methods, sponsored by Professor R. Balakrishnan Endowment Trust (RBET) and The Indian Mathematics Consortium (TMC) was conducted from 10.03.2025 to 12.03.2025 at Saranathan College of Engineering. The course was aimed to provide participants with a comprehensive understanding of numerical iterative methods and their applications in solving mathematical and engineering problems. Dr. Lavanya Selvaganesh, Associate Professor, Department of Mathematical Sciences, IIT (BHU) Varanasi was invited as a resource person to the compact course for delivering the lecture to 74 first year Computer Science and Engineering students. The students were from Saranathan College of Engineering (62), JJ College of Engineering (2), MIET College of Engineering (3), Ramakrishna College of Engineering (3), and Ramakrishna College of Technology (4).

DAY-1

The inaugural session featured a captivating prayer song, setting a vibrant beginning for the program. Dr. R. Natarajan Head, R&D, Saranathan College of Engineering extended a warm welcome and Dr. K. Somasundaram, Chairperson, Dept of Mathematics, Amrita Vishwa Vidyapeetham Coimbatore (Regional Coordinator, RB Endowment Trust) introduced the RB Endowment Trust. Dr. R. Balakrishnan and Dr. C. Durairajan, Dept. of Mathematics, Bharathidasan University (Treasurer, RB Endowment Trust) offered felicitation. Dr. V. Punitha, Head, Department of CSE, Saranathan College of Engineering introduced the resource person and the compact course. Following the inauguration the resource person Dr. Lavanya Selvaganesh started the lecture with the introduction of numerical techniques and the concepts of error, significant loss and the stability of algorithms. Following the introduction session, the solution of algebraic and transcendental equations, fixed point iteration-method and Newton-Raphson methods were discussed. During the hands-on session the participants gained clear understanding of applications of algebraic and transcendental equations.



Inaugural Session



Day 1: Lecture delivered by Dr. Lavanya Selvaganesh

DAY-2

The second day of the compact course delved into the solution of linear simultaneous equations and non-linear simultaneous method. During the second day lecture, the participants gained knowledge in solving systems of linear equations by transforming the system into an upper triangular form, reducing the matrix to the reduced row echelon form, and decomposing a given matrix into simpler matrices to facilitate solving linear equations. Use cases of each numerical method and their efficiencies and computational complexities were analyzed.



DAY-3

On day 3, Dr. Lavanya's discussions encompassed matrix eigenvalue problems, Gerschgorin's theorem, Perron's theorem, special matrices, and determination of eigenvalues of matrices by iteration. Participants understood that eigenvalue problems are fundamental in numerical linear algebra, and engineering, theorems such as Gerschgorin's and Perron's provide insights into eigenvalue properties, while numerical techniques like the QR algorithm aid in practical computation.



Day 3: Lecture delivered by Dr. Lavanya Selvaganesh

As a concluding remark, a simple valediction ceremony was organized at the end of third day lecture. Participants were encouraged to give their sincere feedback. Almost all those who spoke invariably appreciated the content delivery by Dr. Lavanya Selvaganesh and the organization of the compact course. As the event's organizers, the CSE department believes that a real effort is made to give the students a comprehensive grasp of numerical and iterative techniques.



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Compact Course titled “Numerical Iterative Methods”

Programme Schedule

**Sponsored by Professor R. Balakrishnan Endowment Trust (RBET) and
The Indian Mathematics Consortium (TMC)**

Resource Person: Dr. Lavanya Selvaganesh, Associate Professor, Department of Mathematical Sciences, IIT (BHU) Varanasi.

Overview: A 3-day workshop titled “Numerical Iterative Methods” for all undergraduate students at the college. The workshop aims to provide participants with comprehensive knowledge and hands-on experience in both the theoretical foundations and practical applications of numerical techniques to solve systems of equations and various matrix-based problems, including eigenvalue problems and relevant programming techniques.

Topics Covered: SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS

Solution of algebraic and transcendental equations– Fixed point iteration method–Newton Raphson method– Solution of a linear system of equations – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss-Seidel – Eigenvalues of a matrix by Power method.

Lecture Timing: 11:15AM- 12:45 PM & 1:45 PM-2:45 PM

Tutorial(Hands-on session) Timing: 3:00 PM- 4:30 PM

Venue: Smart Classroom: JS Block Seminar Hall

Lecture Plan:

Day-1:

- Introduction to Numerical Techniques, Understanding the concepts of error, round-off, significant loss, and the stability of algorithms.
- Solution of Algebraic and Transcendental equations: Fixed point iteration-Method and Convergence, Newton’s and Newton-Raphson methods- algorithm and convergence.

Day-2:

- Solution of Linear Simultaneous equations- Gauss elimination, Gauss Jordan and Factorization method-inverse of a matrix, Jacobi’s iteration, Gauss-Siedel’s iteration.
- Solution of non-linear simultaneous method- Newton-Raphson method.

Day-3:

- Matrix Eigenvalue Problems –Gerschgorin's theorem, Perron's theorem, special matrices, Determination of Eigenvalues of matrices by iteration, power method, dominant eigenvalues, and Rayleigh quotient.



Signature and Name of the applicant
Dr V. PUNITHA