

**DEPARTMENT OF MATHEMATICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

No.: IITR/Math's/116/ Ph.D. Admission (SS/24-25)

Dated: November 14, 2024

Shortlisting Criteria: -

| Minimum Eligibility | Shortlisting Criteria | | |
|--|--------------------------|-----------------------|-----------------------|
| | Cutoff General | Cutoff EWS/OBC | Cutoff SC/ST/PWD |
| Masters in Mathematics with GATE | 452 (GATE Marks) | 406.8 (GATE Marks) | 301.33 (GATE Marks) |
| Masters in Mathematics with JRF/NET | 110.50 (JRF/NET Marks) | 99.45 (JRF/NET Marks) | 73.67 (JRF/NET Marks) |
| Bachelors or Masters from IITs/CFTI with CGPA \geq 8.0 | Minimum CGPA \geq 8.75 | | |

- The below mentioned candidates are shortlisted for appearing in a written examination to be held on **November 26, 2024 from 9:00 am to 10:30 am.**

| Sl.No | Application Sequence Number | Dept. Application No. | NAME |
|-------|-----------------------------|-----------------------|--------------------|
| 1 | PHDS24003930 | MATS24003930 | A SRICHANDANA |
| 2 | PHDS24004173 | MATS24004173 | AARJU SRIVASTAVA |
| 3 | PHDS24004835 | MATS24004835 | AARTI KUMARI |
| 4 | PHDS24000525 | MATS24000525 | AASTHA |
| 5 | PHDS24001477 | MATS24001477 | ABHIJIT JANA |
| 6 | PHDS24001059 | MATS24001059 | ABHINO B DOWARAH |
| 7 | PHDS24000805 | MATS24000805 | ABHISHEK KAIN TURA |
| 8 | PHDS24003865 | MATS24003865 | ABHISHEK LATWAL |
| 9 | PHDS24001180 | MATS24001180 | ADARSH VISHWAKARMA |
| 10 | PHDS24000998 | MATS24000998 | ADITI JHA |
| 11 | PHDS24001878 | MATS24001878 | ADURI PAVAN KUMAR |
| 12 | PHDS24000114 | MATS24000114 | AJAY KUMAR |
| 13 | PHDS24000172 | MATS24000172 | AJAY KUMAR |
| 14 | PHDS24000706 | MATS24000706 | AKRAM KHAN |
| 15 | PHDS24001582 | MATS24001582 | ANAMIKA |
| 16 | PHDS24000600 | MATS24000600 | ANAMITRO BISWAS |
| 17 | PHDS24001194 | MATS24001194 | ANDAN DHIBAR |
| 18 | PHDS24004769 | MATS24004769 | ANJALI YADAV |
| 19 | PHDS24003001 | MATS24003001 | ANKIT DHARA |
| 20 | PHDS24003336 | MATS24003336 | ANKUR KUMAR |
| 21 | PHDS24000590 | MATS24000590 | ANSHIKA GAUTAM |
| 22 | PHDS24000860 | MATS24000860 | ANUJ KUMAR |
| 23 | PHDS24003575 | MATS24003575 | ANUP KUMAR BARMAN |

Aditi Gangopadhyay

Chairperson D.R.C

H. K. S.

Head of the Department

| Sl.No | Application Sequence Number | Dept. Application No. | NAME |
|-------|-----------------------------|-----------------------|------------------------|
| 24 | PHDS24001314 | MATS24001314 | ANUPAM SAMANTA |
| 25 | PHDS24002618 | MATS24002618 | ANUPAMA PATIL |
| 26 | PHDS24002008 | MATS24002008 | ANUREET KAUR |
| 27 | PHDS24001959 | MATS24001959 | ANVESHAA TOMAR |
| 28 | PHDS24001220 | MATS24001220 | ARJU |
| 29 | PHDS24002109 | MATS24002109 | ASHIKA SINGH |
| 30 | PHDS24001257 | MATS24001257 | ASHISH KUMAR |
| 31 | PHDS24002666 | MATS24002666 | ATRAJIT SARKAR |
| 32 | PHDS24001531 | MATS24001531 | AVINASH KUMAR CHAUHAN |
| 33 | PHDS24003980 | MATS24003980 | BALRAM CHAUHAN |
| 34 | PHDS24003947 | MATS24003947 | BANUMATHI P |
| 35 | PHDS24001858 | MATS24001858 | BHARTI |
| 36 | PHDS24000830 | MATS24000830 | BHARTI |
| 37 | PHDS24000391 | MATS24000391 | BHASKAR |
| 38 | PHDS24002150 | MATS24002150 | BHUMIKA VARSHNEY |
| 39 | PHDS24003645 | MATS24003645 | BHUPINDER SINGH SADDAL |
| 40 | PHDS24000631 | MATS24000631 | BINTU |
| 41 | PHDS24002413 | MATS24002413 | BISHYAY MAJUMDAR |
| 42 | PHDS24004222 | MATS24004222 | BISWAJIT SAHOO |
| 43 | PHDS24000757 | MATS24000757 | CHUDAMANI SATNAMI |
| 44 | PHDS24002086 | MATS24002086 | DARSHIKA PANDEY |
| 45 | PHDS24002238 | MATS24002238 | DAYANAND DEEGWAL |
| 46 | PHDS24002495 | MATS24002495 | DEEPAK SHARMA |
| 47 | PHDS24002477 | MATS24002477 | DEEPIKA GARG |
| 48 | PHDS24003262 | MATS24003262 | DEEPTI KUMARI |
| 49 | PHDS24003172 | MATS24003172 | DEEPU YADAV |
| 50 | PHDS24000284 | MATS24000284 | DIKSHA BISHT |
| 51 | PHDS24003137 | MATS24003137 | DILIP KUMAR |
| 52 | PHDS24001864 | MATS24001864 | DIVYANSHU PANDEY |
| 53 | PHDS24000844 | MATS24000844 | DRISHTI GARG |
| 54 | PHDS24001127 | MATS24001127 | EKTA YADAV |
| 55 | PHDS24002615 | MATS24002615 | GAGAN SONI |
| 56 | PHDS24001600 | MATS24001600 | GANESH KUMAWAT |
| 57 | PHDS24001329 | MATS24001329 | GARIMA KHETAWAT |
| 58 | PHDS24001414 | MATS24001414 | GAURAV KUMAR |
| 59 | PHDS24002759 | MATS24002759 | GAURAV SINGH |
| 60 | PHDS24002979 | MATS24002979 | GURUDEV KUMAR |
| 61 | PHDS24000527 | MATS24000527 | GURVACHAN SINGH |
| 62 | PHDS24003347 | MATS24003347 | HARDYAL SATTAWAN |
| 63 | PHDS24002844 | MATS24002844 | HARSH MISHRA |
| 64 | PHDS24002487 | MATS24002487 | HARSH TIWARI |

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Chairperson D.R.C

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Head of the Department

| Sl.No | Application Sequence Number | Dept. Application No. | NAME |
|-------|-----------------------------|-----------------------|------------------------------|
| 65 | PHDS24003145 | MATS24003145 | HEMANT KUMAR |
| 66 | PHDS24000974 | MATS24000974 | ISHIKA SAGWAL |
| 67 | PHDS24000257 | MATS24000257 | JASWANT |
| 68 | PHDS24001105 | MATS24001105 | JATIN SHARMA |
| 69 | PHDS24001010 | MATS24001010 | JAYANT KUMAR GUPTA |
| 70 | PHDS24003279 | MATS24003279 | JAYANT SHARMA |
| 71 | PHDS24003231 | MATS24003231 | JAYAPRATHAP N |
| 72 | PHDS24001960 | MATS24001960 | JAYESHBHAI RAJASIBHAI GAGIYA |
| 73 | PHDS24002014 | MATS24002014 | JEENEE |
| 74 | PHDS24002657 | MATS24002657 | JYOTI |
| 75 | PHDS24002118 | MATS24002118 | JYOTI KUMARI |
| 76 | PHDS24000134 | MATS24000134 | KANCHAN KUNWAR CHAUHAN |
| 77 | PHDS24003180 | MATS24003180 | KARAN JAISWAL |
| 78 | PHDS24003078 | MATS24003078 | KARTIK SHIT |
| 79 | PHDS24002731 | MATS24002731 | KASHISH AGARWAL |
| 80 | PHDS24001994 | MATS24001994 | KAUSHAL KISHOR PAL |
| 81 | PHDS24002408 | MATS24002408 | KAVITA KUMARI |
| 82 | PHDS24002453 | MATS24002453 | KELASH DAS SWAMI |
| 83 | PHDS24004752 | MATS24004752 | KEYA GUCHHAIT |
| 84 | PHDS24002791 | MATS24002791 | KISHAN MEHER |
| 85 | PHDS24003681 | MATS24003681 | KM VIJAY LAXMI |
| 86 | PHDS24001150 | MATS24001150 | KRIKA MISHRA |
| 87 | PHDS24000084 | MATS24000084 | KULDEEP PAL |
| 88 | PHDS24000252 | MATS24000252 | KUMBHANI SMIT BHIMJIBHAI |
| 89 | PHDS24001138 | MATS24001138 | KUMKUM KUMARI |
| 90 | PHDS24000803 | MATS24000803 | KUNIKA |
| 91 | PHDS24000565 | MATS24000565 | MADHANA PRAKASAM S T |
| 92 | PHDS24000435 | MATS24000435 | MANISH PRASAD |
| 93 | PHDS24001674 | MATS24001674 | MANOJ KUMAR |
| 94 | PHDS24003697 | MATS24003697 | MANPREET KAUR |
| 95 | PHDS24003929 | MATS24003929 | MEENAKSHI SUNDARAM N |
| 96 | PHDS24002873 | MATS24002873 | MUSAROF HOSSAIN |
| 97 | PHDS24003748 | MATS24003748 | MUSKAN GUPTA |
| 98 | PHDS24002257 | MATS24002257 | MUSKAN GUPTA |
| 99 | PHDS24003644 | MATS24003644 | NAMITA BHOWMICK |
| 100 | PHDS24000705 | MATS24000705 | NAMITA SINGH |
| 101 | PHDS24003858 | MATS24003858 | NARESH BENDE |
| 102 | PHDS24003757 | MATS24003757 | NARGISH |
| 103 | PHDS24001786 | MATS24001786 | NAVDEEP KAUR |
| 104 | PHDS24004074 | MATS24004074 | NAVEEN |
| 105 | PHDS24002846 | MATS24002846 | NEELAM RAWAT |

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Head of the Department

| Sl.No | Application Sequence Number | Dept. Application No. | NAME |
|-------|-----------------------------|-----------------------|-------------------------|
| 106 | PHDS24002158 | MATS24002158 | NEHA KUMAWAT |
| 107 | PHDS24000246 | MATS24000246 | NEHA TIWARI |
| 108 | PHDS24001250 | MATS24001250 | NILEEMA MAHATO |
| 109 | PHDS24004185 | MATS24004185 | NITESH |
| 110 | PHDS24002786 | MATS24002786 | NITIN VERMA |
| 111 | PHDS24001067 | MATS24001067 | OMPRAKASH RATHORE |
| 112 | PHDS24003006 | MATS24003006 | PARITOSH MAURYA |
| 113 | PHDS24000633 | MATS24000633 | PARNADITYA CHAKRAVARTTY |
| 114 | PHDS24004247 | MATS24004247 | PAWAN KUMAR YADAV |
| 115 | PHDS24000144 | MATS24000144 | PHAVISHNU K |
| 116 | PHDS24001308 | MATS24001308 | PIJUSH KANTI SARKAR |
| 117 | PHDS24003928 | MATS24003928 | POOJA MAHESH |
| 118 | PHDS24003808 | MATS24003808 | PRANSHU KOTHARI |
| 119 | PHDS24004403 | MATS24004403 | PRIYAJIT DEBNATH |
| 120 | PHDS24000461 | MATS24000461 | PRIYANKA |
| 121 | PHDS24000477 | MATS24000477 | PRIYANSHU SAROJ |
| 122 | PHDS24001076 | MATS24001076 | PROLAY MONDAL |
| 123 | PHDS24001322 | MATS24001322 | PUJA SAMANTARAY |
| 124 | PHDS24001139 | MATS24001139 | PURVA JANGIR |
| 125 | PHDS24002458 | MATS24002458 | RAHUL PAL |
| 126 | PHDS24003690 | MATS24003690 | RAJAN SINGH |
| 127 | PHDS24002348 | MATS24002348 | RAJNI |
| 128 | PHDS24000378 | MATS24000378 | RAKESH BISWAS |
| 129 | PHDS24004817 | MATS24004817 | RAKESH PRADHAN |
| 130 | PHDS24001144 | MATS24001144 | RASHIKA |
| 131 | PHDS24003872 | MATS24003872 | RAVI |
| 132 | PHDS24001685 | MATS24001685 | RAVI RAJ |
| 133 | PHDS24003139 | MATS24003139 | RAVINA |
| 134 | PHDS24001605 | MATS24001605 | RENU |
| 135 | PHDS24003954 | MATS24003954 | RIJU PATRA |
| 136 | PHDS24001198 | MATS24001198 | RITIKESH DIMRI |
| 137 | PHDS24002571 | MATS24002571 | RITUL DUTTA |
| 138 | PHDS24000025 | MATS24000025 | RITUPARNA NATH |
| 139 | PHDS24004329 | MATS24004329 | RIYA KARMAKAR |
| 140 | PHDS24003503 | MATS24003503 | RUDRA PRATAP SHARMA |
| 141 | PHDS24001826 | MATS24001826 | RUPAM KUMAR DAS |
| 142 | PHDS24003629 | MATS24003629 | SAANVI |
| 143 | PHDS24001237 | MATS24001237 | SACHIN YADAV |
| 144 | PHDS24002047 | MATS24002047 | SAHIN SK |
| 145 | PHDS24001670 | MATS24001670 | SAIBUR ALOM |
| 146 | PHDS24003425 | MATS24003425 | SAKSHI GUPTA |

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Chairperson D.R.C

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Head of the Department

| Sl.No | Application Sequence Number | Dept. Application No. | NAME |
|-------|-----------------------------|-----------------------|----------------------------|
| 147 | PHDS24000979 | MATS24000979 | SAMIR SARKAR |
| 148 | PHDS24002224 | MATS24002224 | SANDEEP KUMAR |
| 149 | PHDS24002379 | MATS24002379 | SANU SARKAR |
| 150 | PHDS24003086 | MATS24003086 | SATISH KUMAR |
| 151 | PHDS24000215 | MATS24000215 | SATISH KUMAR |
| 152 | PHDS24000421 | MATS24000421 | SATYA PRAKASH |
| 153 | PHDS24001058 | MATS24001058 | SATYENDRA SINGH |
| 154 | PHDS24001796 | MATS24001796 | SATYESH PRAKASH |
| 155 | PHDS24002517 | MATS24002517 | SHAHBAZ ALI |
| 156 | PHDS24001962 | MATS24001962 | SHARMISTHA KAR |
| 157 | PHDS24004125 | MATS24004125 | SHEETAL PRASAD THAWAIT |
| 158 | PHDS24000035 | MATS24000035 | SHIVAM KUMAR |
| 159 | PHDS24000218 | MATS24000218 | SHIVANI CHAUHAN |
| 160 | PHDS24002500 | MATS24002500 | SHOBHA BHARTI |
| 161 | PHDS24001228 | MATS24001228 | SHWETA WADHWANI |
| 162 | PHDS24005060 | MATS24005060 | SIDDHARTH VASISHTH |
| 163 | PHDS24003448 | MATS24003448 | SONALI PRIYADARSINI BEHARA |
| 164 | PHDS24000081 | MATS24000081 | SONIKA |
| 165 | PHDS24001789 | MATS24001789 | SONU |
| 166 | PHDS24002483 | MATS24002483 | SOUMAN MANNA |
| 167 | PHDS24000929 | MATS24000929 | SOUMYA KANTA BHOI |
| 168 | PHDS24004025 | MATS24004025 | SOUMYA SINGH |
| 169 | PHDS24003226 | MATS24003226 | SREERAG SATHYAN |
| 170 | PHDS24003709 | MATS24003709 | SRISHTI MAURYA |
| 171 | PHDS24001821 | MATS24001821 | SUBHADIP CHOWDHURY |
| 172 | PHDS24004046 | MATS24004046 | SUBHAM MAITY |
| 173 | PHDS24003828 | MATS24003828 | SUBIKSHA KANNAN |
| 174 | PHDS24001292 | MATS24001292 | SUBIR DAKSHI |
| 175 | PHDS24004195 | MATS24004195 | SUDIPTA PATRA |
| 176 | PHDS24002945 | MATS24002945 | SUMAN GHOSH |
| 177 | PHDS24004049 | MATS24004049 | SUNIL KUMAR MEENA |
| 178 | PHDS24002102 | MATS24002102 | SUNNY PAHAL |
| 179 | PHDS24002607 | MATS24002607 | SURAJ KUMAR |
| 180 | PHDS24002048 | MATS24002048 | SURYANSHU SINGH |
| 181 | PHDS24000799 | MATS24000799 | SUSHMITA |
| 182 | PHDS24001019 | MATS24001019 | SWADHIN MAITI |
| 183 | PHDS24000348 | MATS24000348 | TARUN GAUTAM |
| 184 | PHDS24000060 | MATS24000060 | TEMJENSANGBA |
| 185 | PHDS24000841 | MATS24000841 | UJJAL HAZRA |
| 186 | PHDS24000613 | MATS24000613 | UMESH KUMAR |
| 187 | PHDS24000106 | MATS24000106 | UMESH KUMAR VERMA |

Aditi Gangopadhyay

Chairperson D.R.C

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Head of the Department

| Sl.No | Application Sequence Number | Dept. Application No. | NAME |
|-------|-----------------------------|-----------------------|--------------------|
| 188 | PHDS24003698 | MATS24003698 | VAISHALI |
| 189 | PHDS24001022 | MATS24001022 | VIDHI YADAV |
| 190 | PHDS24002862 | MATS24002862 | VIJAY KUMAR SHARMA |
| 191 | PHDS24003902 | MATS24003902 | VIPIN KUMAR |
| 192 | PHDS24001096 | MATS24001096 | VISHAL SONI |
| 193 | PHDS24003577 | MATS24003577 | VIVEK SINGH |
| 194 | PHDS24000307 | MATS24000307 | VIVEK GOSWAMI |

- Venue for the written examination will be informed later.
- Shared hostel accommodation shall be provided to the candidates for two/three nights on payment basis.

Contact details of Hostel Supervisors

| S. No. | Bhawan Name | Tel. & email id | For Male/Female Candidates |
|--------|----------------------|---|----------------------------|
| 1 | Cautley Bhawan | Office No. 01332-281368 Email id- cautleybhawan@iitr.ac.in | For Male candidates |
| 2 | Ganga Bhawan | Office No. 01332-281369 Email id- gangabhawan@iitr.ac.in | For Male candidates |
| 3 | Radhakrishnan Bhawan | Office No. 01332-281561 Email id- radhakbhawan@iitr.ac.in | For Male candidates |
| 4 | Sarojini Bhawan | Office No. 01332-281355 Email id- sarojinibhawan@iitr.ac.in | For Female candidates |
| 5 | Kasturba Bhawan | Office No. 01332-281220 Email id- kasturbabhawan@iitr.ac.in | For Female candidates |

- Any sort of query to be addressed to the DRC Chairperson, Department of Mathematics, IIT Roorkee, Email – drc@ma.iitr.ac.in

Instructions

- Link for Information Brochure:
<https://iitr.ac.in/Academics/static/Admission/PhD/Spring%202024/Ph.D. IB S 2024.pdf>
- Information filled by candidates in the application form is treated as final. No further change is possible in the information provided by the candidate while filling the Application form.

Aditi Gangopadhyay

Chairperson D.R.C

Head

Head of the Department

- **The syllabus for written examination is attached as Appendix.**
- **The written examination will be held on Tuesday, November 26, 2024, from 9:00 AM to 10:30 AM, comprising both objective and subjective questions. Interview for shortlisted candidates are scheduled for November 27-28, 2024.**
- Please bring the following documents at the time of Interview failing which your candidature will not be considered:
 1. If you are having your own valid fellowship i.e. CSIR/UGC JRF/DBT/ICMR etc., please produce document at the time of interview and bring the self-attested copy of the same.
 2. Also bring your Master's degree certificate and Mark sheet at the time of interview.
 3. Original certificate of SC/ST category (If applicable). In its absence you will be treated in General Category.
 4. Candidates belonging to OBC/(NCL)/GEN-EWS category must produce certificate issued **after March 31, 2024.**
- Further, no request for change of date(s) and /or time for Written Test/ Interview will be entertained under any circumstances.

Aditi Gangopadhyay

Chairperson D.R.C

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Head of the Department

DEPARTMENT OF MTHEMATICS, IIT ROORKEE

Ph.D. Admission, Spring 2024-2025

SYLLABUS FOR SHORTLISTING TEST

Calculus: Functions of two or more variables, continuity, directional derivatives, partial derivatives, total derivative, maxima and minima, saddle point, method of Lagrange's multipliers; Double and Triple integrals and their applications to area, volume and surface area; Vector Calculus: gradient, divergence and curl, Line integrals and Surface integrals, Green's theorem, Stokes' theorem, and Gauss divergence theorem.

Linear Algebra: Finite dimensional vector spaces over real or complex fields; Linear transformations and their matrix representations, rank and nullity; systems of linear equations, characteristic polynomial, eigenvalues and eigenvectors, diagonalization, minimal polynomial, Cayley-Hamilton Theorem, Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process, symmetric, skew-symmetric, Hermitian, skew-Hermitian, normal, orthogonal and unitary matrices; diagonalization by a unitary matrix, Jordan canonical form; bilinear and quadratic forms.

Real Analysis: Metric spaces, connectedness, compactness, completeness; Sequences and series of functions, uniform convergence, Ascoli-Arzelà theorem; Weierstrass approximation theorem; contraction mapping principle, Power series; Differentiation of functions of several variables, Inverse and Implicit function theorems; Lebesgue measure on the real line, measurable functions; Lebesgue integral, Fatou's lemma, monotone convergence theorem, dominated convergence theorem.

Complex Analysis: Functions of a complex variable: continuity, differentiability, analytic functions, harmonic functions; Complex integration: Cauchy's integral theorem and formula; Liouville's theorem, maximum modulus principle, Morera's theorem; zeros and singularities; Power series, radius of convergence, Taylor's series and Laurent's series; Residue theorem and applications for evaluating real integrals; Rouche's theorem, Argument principle, Schwarz lemma; Conformal mappings, Möbius transformations.

Ordinary Differential equations: First order ordinary differential equations, existence and uniqueness theorems for initial value problems, linear ordinary differential equations of higher order with constant coefficients; Second order linear ordinary differential equations with variable coefficients; Cauchy-Euler equation, method of Laplace transforms for solving ordinary differential equations, series solutions (power series, Frobenius method); Legendre and Bessel functions and their orthogonal properties; Systems of linear first order ordinary differential equations, Sturm's oscillation and separation theorems, Sturm-Liouville eigenvalue problems, Planar autonomous systems of ordinary differential equations: Stability of stationary points for linear systems with constant coefficients, Linearized stability, Lyapunov functions.

Algebra: Groups, subgroups, normal subgroups, quotient groups, homomorphisms, automorphisms; cyclic groups, permutation groups, Group action, Sylow's theorems and their applications; Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domains, Principle ideal domains, Euclidean domains, polynomial rings, Eisenstein's irreducibility criterion; Fields, finite fields, field extensions, algebraic extensions, algebraically closed fields

Functional Analysis: Normed linear spaces, Banach spaces, Hahn-Banach theorem, open mapping and closed graph theorems, principle of uniform boundedness; Inner-product spaces, Hilbert spaces, orthonormal bases, projection theorem, Riesz representation theorem, spectral theorem for compact self-adjoint operators.

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Numerical Analysis: Systems of linear equations: Direct methods (Gaussian elimination, LU decomposition, Cholesky factorization), Iterative methods (Gauss-Seidel and Jacobi) and their convergence for diagonally dominant coefficient matrices; Numerical solutions of nonlinear equations: bisection method, secant method, Newton-Raphson method, fixed point iteration; Interpolation: Lagrange and Newton forms of interpolating polynomial, Error in polynomial interpolation of a function; Numerical differentiation and error, Numerical integration: Trapezoidal and Simpson rules, Newton-Cotes integration formulas, composite rules, mathematical errors involved in numerical integration formulae; Numerical solution of initial value problems for ordinary differential equations: Methods of Euler, Runge-Kutta method of order 2.

Partial Differential Equations: Method of characteristics for first order linear and quasilinear partial differential equations; Second order partial differential equations in two independent variables: classification and canonical forms, method of separation of variables for Laplace equation in Cartesian and polar coordinates, heat and wave equations in one space variable; Wave equation: Cauchy problem and d'Alembert formula, domains of dependence and influence, non-homogeneous wave equation; Heat equation: Cauchy problem; Laplace and Fourier transform methods.

Topology: Basic concepts of topology, bases, subbases, subspace topology, order topology, product topology, quotient topology, metric topology, connectedness, compactness, countability and separation axioms, Urysohn's Lemma.

Linear Programming: Linear programming models, convex sets, extreme points; Basic feasible solution, graphical method, simplex method, two phase methods, revised simplex method ; Infeasible and unbounded linear programming models, alternate optima; Duality theory, weak duality and strong duality; Balanced and unbalanced transportation problems, Initial basic feasible solution of balanced transportation problems (least cost method, north-west corner rule, Vogel's approximation method); Optimal solution, modified distribution method; Solving assignment problems, Hungarian method.

Probability and Statistics: Probability space, Bayes theorem, conditional probability, independence, joint and conditional distributions, Random variables, standard probability distributions and their properties, conditional expectation, expectation, moments; Chebyshev, Markov and Jensen inequalities, Borel-Cantelli lemma; strong and weak law of large numbers, Sampling distributions, central limit theorem, UMVU estimators, maximum likelihood estimators, standard parametric tests based on normal, Testing of hypotheses, Chi Square, t, F – distributions; Linear regression; Interval estimation.

Aditi Gangopadhyay

Chairperson D.R.C

hdmw 14/11/2024

Head of the Department