

Academic Programmes

Scope, Eligibility and Selection Procedure

Eligibility conditions, as mentioned below for each of the academic programmes, reflect only minimum requirements to apply for a particular programme. Merely satisfying the eligibility conditions does not guarantee selection into the programme.

For all the programmes described below, those who have completed or are due to complete the qualifying examinations for which results are not yet published, may also apply for admission. If selected, their admission to an academic programme will be provisional pending the announcement of results. In such cases, however, their applications may be cancelled if the final examinations are not completed before **July 31, 2020**. The institute may decide to relax this date at its discretion.

1.1 Bachelor of Statistics (Honours) [B Stat (Hons)]

Scope This **three-year** degree programme offers comprehensive instruction in the theory, methods and application of Statistics, in addition to several areas of Mathematics and some basic areas of Computer Science. It also offers optional courses in some other subjects. It is so designed that, on successful completion, the students will be able to pursue higher studies in areas of Statistics and Mathematics, as well as Computer Science, Economics and allied fields, or take up careers as Statisticians in research institutions and scientific laboratories, government departments or industries. This programme is offered only at **Kolkata**.

Eligibility In order to be eligible for admission to this programme, an applicant must have successfully completed 10+2 years of Higher Secondary Education (or its equivalent) with Mathematics and English as subjects.

Selection Procedure All applicants for this programme, except the INMO AWARDEES (see next paragraph), will have to appear for two written tests comprising multiple-choice type and descriptive questions in Mathematics at the 10+2 level. Based on performance in the written tests, a number of candidates will be called for interviews.

Written Test Waiver The written test is **waived** for applicants who have been selected as **INMO AWARDEES** to participate in the International Mathematics Olympiad Training Camp (IMOTC) in the current year or in any previous year, based on their performance in the Indian National Mathematics Olympiad (INMO) conducted by the National Board of Higher Mathematics, Department of Atomic Energy, Government of India. Such candidates will be directly called for interviews. However, like

all other candidates, such candidates are also required to apply in the prescribed application form for admission to the programme. **Merely holding an INMO Certificate of Merit from Homi Bhabha Centre for Science Education (HBCSE) or clearing any Math Olympiad organised by any other organisation will not suffice for waiver of written tests for selection to the programme.**

The final selection of candidates for admission to the programme is based on performance in the two written tests (unless waived) as well as the interviews. The final list of candidates selected for admission is announced after completion of all the interviews.

1.2 Bachelor of Mathematics (Honours) [B Math (Hons)]

Scope This **three-year** degree programme offers comprehensive instruction in basic Mathematics along with basic courses in Probability, Statistics, Computing and Physics. It is so designed that, on successful completion, the students will be able to pursue higher studies in the areas of Mathematics, Statistics, Computer Science, Mathematical Physics, etc., or take up a career in applications of Mathematics. This programme is offered only at **Bengaluru**.

Eligibility Same as for the B Stat (Hons) programme.

Selection Procedure Same as for the B Stat (Hons) programme.

Written Test Waiver Same as for the B Stat (Hons) programme.

1.3 Master of Statistics [M Stat]

Scope This **two-year** programme offers advanced-level training in the theory, methods and applications of Statistics along with specialised training in selected areas of Statistics and allied fields. On successful completion of this programme, students will be able to pursue an academic/research career in Statistics, Mathematics, Economics, Computer Science and allied fields, depending on their chosen area of specialization. They will also be able to work competently as Statisticians and specialists in research institutions and scientific laboratories, government departments or industries. This programme is being offered this year at **Kolkata** and **Delhi**.

Eligibility In order to be eligible for admission to this programme, an applicant must have

- a three-year Bachelor's degree or a BE/B Tech degree with Statistics as a subject, or
- a B Math degree from ISI, or

- a Post-Graduate Diploma in Statistical Methods and Analytics from ISI.

Selection Procedure Students with B Stat (Hons) degree from ISI are offered direct admission to this programme without any selection test or interview. For all other eligible candidates, including students with a B Stat (Pass) degree from ISI, selection for admission to this programme is based on performance in written admission tests and subsequent interview.

The written admission test is designed to assess competence in the theory and methods of Statistics and comprehension in Mathematics, and has two parts:

- multiple-choice questions in Statistics and Mathematics at the undergraduate level in the first part, and
- short-answer questions in Statistics and Mathematics at the undergraduate level in the second part.

Students with B Stat (Hons) degree from ISI who are directly admitted to this programme complete the first year in Kolkata. Other selected candidates complete the first year in either Delhi or Chennai as decided by the institute. The second year of the programme is conducted in Kolkata for all students.

1.4 Master of Mathematics [M Math]

Scope This **two-year** programme offers advanced-level training in Mathematics. On successful completion of the programme, students will be able to pursue a research/ academic career in Mathematics. Depending on the choice of the optional subjects, the students will also be able to work in the fields of Probability Theory and Theoretical Computer Science. This programme is offered in alternate year at Bengaluru or Kolkata. This year it is being offered at **Kolkata**.

Eligibility In order to be eligible for admission to this programme, an applicant must have

- a three-year Bachelor's degree or a BE/B Tech Degree with Mathematics as a subject, or
- a B Stat degree from ISI.

Selection Procedure Students with B Math (Hons) degree from ISI are offered direct admission to this programme without any selection test or interview. For all other eligible candidates, including students with B Math (Pass) degree from ISI, selection for admission to the programme is based on performance in written admission tests and subsequent interview.

The admission tests will comprise multiple-choice questions in Mathematics in the first part and short-answer type questions in Mathematics in the second part. The questions will be on Mathematics at a level corresponding roughly to the Mathematics Honours/Major of Indian universities.

1.5 Master of Science in Quantitative Economics [MS (QE)]

Scope This is a **two-year** advanced programme in Economics and its applications, with special emphasis on quantitative methods. On successful completion of the programme, a student will be able to pursue an academic career in Economics or take up responsible positions in various private and public sector organisations. It is offered simultaneously at **Kolkata** and **Delhi**.

Eligibility In order to be eligible for admission to this programme, an applicant must have

- a 3-year Bachelor's degree in any discipline with Mathematics as a subject at the intermediate (10+2) level.
- a BE/B Tech degree or any other qualification considered equivalent (such as AMIE).

Selection Procedure Selection of candidates to this programme will be based on performance in written tests and subsequent interview. The written admission tests will comprise multiple-choice and short answer type questions in both Economics and Mathematics at the undergraduate level.

1.6 Master of Science in Quality Management Science [MS (QMS)]

Scope This is a **two-year** programme in Quality Management and its applications with a special emphasis on Quantitative Methods. It also includes Dissertation in the third semester and a live Project work in the fourth semester under the direct guidance of the faculty. The programme offers a flexible format for those who want to meet specific educational and career objectives. Students aspiring to undertake this programme will enhance their career options by gaining the contemporary knowledge and perspective required of Quality Analysts, Quality Managers and those who are responsible for one or more aspects of quality improvement.

The first two semesters will be offered at **Bengaluru** whereas the third semester will be at **Hyderabad**. The Project work in the fourth semester will be at a centre of the institute depending on the location of the project assigned to the student.

Eligibility In order to be eligible for admission to this programme, an applicant must have

- a three-year Bachelor's degree with Mathematics as a subject, or

- a BE/ B Tech degree in any discipline.

Selection Procedure Selection of candidates to this programme, including the sponsored ones, will be based on performance in written tests and subsequent interview. The written admission tests will comprise multiple-choice and/or descriptive questions in Mathematics at the undergraduate level.

Sponsorship of Candidates There is a provision for **sponsorship** by government, semi-government, public sector undertakings. General eligibility criteria, qualifying degree for the sponsored candidates remain the same as that of the non-sponsored candidates. Moreover, the following **clauses** are applicable:

1. A sponsored candidate must be from government/ semi-government/ government-aided, both national and international. Self-sponsored candidates are not eligible to apply.
2. Sponsored candidates will have to pay a tuition fee of Rs. 50,000 per semester. They are not eligible for any scholarship/financial support from the Institute.
3. A sponsored candidate must have been in service of the sponsoring organization for at least two years as on the date of admission to the programme. This two years of service experience must have been gained by the candidate after acquiring the requisite qualifying degree of the programme into which the candidate is seeking admission.
4. The sponsoring organization must specifically undertake to pay the necessary tuition fees to the Institute and to relieve the candidate to pursue the programme for its full duration.
5. A certificate from the sponsoring organization, to the effects of points 3 and 4 above, must be provided by the candidate at the time of applying for admission to the corresponding programme.

1.7 Master of Science in Library and Information Science [MS (LIS)]

Scope This is a **two-year** advanced programme in Library and Information Science, with special emphasis on applications of information technology. On successful completion of this programme, a student will be able to pursue an academic career or take up responsible positions in various private and public sector organisations in the Library and Information fields. The objectives of this programme are to develop manpower capable of

- effectively and efficiently working as information professionals at higher levels in libraries and information centres;
- design and development of information systems;
- contributing to the discipline of Library and Information Science in terms of research and teaching.

This programme is offered only at **Bengaluru**.

Eligibility In order to be eligible for admission to this programme, an applicant must have a three-year Bachelor's degree in any discipline.

Selection Procedure Selection of candidates will be based on performance in written tests and subsequent interview.

1.8 Master of Technology in Computer Science [M Tech (CS)]

Scope This **two-year** programme is designed to provide a balance of theoretical and professional training in Computer Science and Technology so that the students, on successful completion of the programme, may take up

- a professional career in the technology of software for computer systems or specialised application areas, or
- an academic career for further study and research in the fundamental and applied aspects of Computer Science and Technology and related disciplines.

This programme is offered only at **Kolkata**.

Eligibility In order to be eligible for admission to this programme, an applicant must have

- a four-year B-Tech/B.E. (or equivalent) degree in any stream or,
- a master's degree in any subject and have passed Mathematics at the 10+2 level.

Selection Procedure A candidate is admitted to this programme through written tests and interview.

The written test consists of two tests:

- (i.) a multiple choice type test on Mathematics at the B.Sc. (pass) level
- (ii.) a subjective test consisting of two parts, the candidate having to answer any one part:

Group A: Mathematics at the B.Sc. (pass) level

Group B: Computer Science at B.E./B. Tech. level

Written Test Waiver The written test is to be waived for candidates with a valid GATE score above a threshold, to be decided by the admission committee each year. A student who applies for admission and meets the announced threshold for GATE score will be called directly for the interview. Candidates who obtain a waiver in the written tests will be assigned a score in the written test based on the GATE score. **These candidates are required to apply, like all other candidates, in the prescribed application form.**

Sponsorship of candidates There is a provision for **sponsorship** by government, semi-government, public sector undertakings. General eligibility criteria, qualifying degree for the sponsored candidates remain the same as that of the non-sponsored candidates. Other eligibility requirements remain the same as that for sponsored candidates for the MSQMS programme (refer to clauses (1) - (5) under Section 6.6, page no. ??).

1.9 Master of Technology in Cryptology and Security [M Tech (CrS)]

Scope This is a **two year** programme offered at **Kolkata**. The programme is designed to impart in-depth theoretical and practical knowledge in the area of cryptology and information security. It is designed to provide the basic background in mathematics, statistics and computer science followed by specialized instructions on various theoretical and practical aspects of the field. The students on successful completion of the programme, may take up

- a professional career in a industry/government organization which specializes in information security.
- an academic career to further study and research in theoretical and practical aspects of cryptology, information security and related disciplines.

Eligibility Same as for the M Tech programme in Computer Science.

Selection Procedure Same as for the M Tech programme in Computer Science.

Written Test Waiver Same as for the M Tech programme in Computer Science.

Sponsorship of candidates Same as for the M Tech programme in Computer Science.

1.10 Master of Technology in Quality, Reliability & Operations Research [M Tech (QROR)]

Scope This is a full-time **two-year** programme and is offered only at **Kolkata**. It is intended to produce specialists in Statistical Quality Control, Reliability, Operations Research, and Quality Management Systems. Enough background on computing technologies is provided to enable the students to use technology effectively.

The programme is designed to offer adequate instruction in the theory and practice of the above disciplines. The objective is to equip students with the basic practical skills and sufficient theory to understand the principles involved in the application and to inculcate in them the power of systematic thinking and reasoning, practical approach and exposition. Every student, besides undergoing classroom instruction, shall do practical work by way of case studies, dissertation or project work on live problems under the guidance of the expert faculty members of ISI. On successful completion of this programme, the students may take up either

- a professional career in the field of quality engineering and management in departments of government, semi-government, public/ private sector undertakings, industrial organizations, financial sector, consultancy agencies, or
- an academic career for further study and research in theoretical and applied aspects of Quality, Reliability and Operations research in organizations of higher learning and research institutions.

Eligibility In order to be eligible for admission to this programme, an applicant must have

- (i) a Master's Degree in Statistics with Physics and Chemistry at the (10+2) level; or
- (ii) a Master's Degree in Mathematics with Statistics as a subject at undergraduate or post-graduate level, and Physics and Chemistry at the (10+2) level; or
- (iii) a BE/B Tech degree or any other qualification considered equivalent (such as AMIE).

The programme is offered in two streams:

- **Statistics Stream** for candidates with qualifications (i) or (ii) mentioned above;
- **Engineering Stream** for candidates with an undergraduate degree in Engineering or Technology as in (iii) above.

Selection Procedure All candidates, including sponsored ones, are admitted through written tests and interview. For admission to this programme, valid GATE score is not necessary, and candidates with valid GATE scores also must take the written tests.

Sponsorship of candidates There is a provision for **sponsorship** by government, semi-government, public sector undertakings. General eligibility criteria, qualifying degree for the sponsored candidates remain the same as that of the non-sponsored candidates. Other eligibility requirements remain the same as that for sponsored candidates in MSQMS programme (refer to clauses (1) - (5) under Section 6.6, page no. ??).

The Admission Test is conducted in two sessions (forenoon and afternoon):

Session 1: a multiple-choice type of test in Mathematics at the undergraduate level;

Session 2: a descriptive test for the two streams as follows:

Part I (for Statistics Stream): A test divided into two sections carrying equal marks, in Statistics and Probability. Candidates must answer questions from both the sections.

Part II (for Engineering Stream): A test divided into two sections carrying different marks, in Mathematics and Engineering. The Engineering section will have questions on Thermodynamics, Engineering Mechanics, Electrical and Electronics Engineering and Engineering Drawing. Candidates must answer questions from both the sections.

1.11 Postgraduate Diploma in Statistical Methods and Analytics [PGDSMA]

Scope The programme is intended to provide students with a comprehensive training in basic theory and applications of Statistical Methods and Analytics, in addition to some exposure to Mathematics and Computer Science. It is so designed that on successful completion, the students will be able to take up jobs as statisticians in such departments of government and industries where application of Statistics and Analytics is required.

The total duration of this programme is **one year**. This year it is offered at **Chennai** and the **ISI North-East Centre, Tezpur**.

This programme is open to candidates from all over India. However, **Fifty percent (50%) of the total number of seats at ISI North East (Tezpur) centre is reserved for the students domiciled in the North-Eastern states** of India.

A prestigious multinational IT consultation and services company has signed a Memorandum of Understanding with ISI that gives placement opportunities to successful students who are domicile of North-Eastern states of India.

Eligibility In order to be eligible for this program one must have one of the following:

- a three-year Bachelor's Degree in any discipline with Mathematics as a subject;

- a BE/B Tech degree or any other qualification considered equivalent (such as AMIE).

In order to be considered for admission to this programme at the ISI North-East Centre (Tezpur) as a domiciled candidate, it is mandatory to have a valid certificate of domicile in one of the North-Eastern states of India from a competent authority.

Selection Procedure Selection is based on the performance in written test and interview. The admission test will comprise multiple-choice questions on Basic Mathematics.

1.12 Postgraduate Diploma in Agricultural and Rural Management with Statistical Methods and Analytics [PGDARSMA]

Scope The programme is intended to provide students with comprehensive training in agricultural farm management, statistical methods and applications using R, computer operation and programming, agricultural production and operations management, agribusiness and rural management. This unique program is so designed that on successful completion, the students will be able to take up jobs in rural development organizations under Central and State governments, national and multinational companies involved in agro-processing and agricultural business operation or supply chain management, international and national level NGOs, development projects funded by government and non-government organizations, agricultural and livelihood related projects, and rural banking sector amongst others.

The total duration of this programme is **one year**, and it is offered at the **ISI Girdih** Branch. There is no stipend or tuition fee for the programme.

Eligibility In order to be eligible for admission to this programme, an applicant must have

- a three/four-year Bachelor's Degree in any discipline with Mathematics/Statistics as a subject studied at least at the intermediate (10+2) level as a subject.

Selection Procedure Selection is based on the performance in written test and interview. The admission test will comprise multiple-choice questions on Mathematics (up to 12th standard), Logical Reasoning, as well as English Grammar and Comprehension.

1.13 Postgraduate Diploma in Business Analytics [PGDBA]

Scope The Post Graduate Diploma in Business Analytics (PGDBA) – jointly offered by ISI, IIT Kharagpur and IIM Calcutta – aims to help shape the emerging profession of business analytics by delivering a cutting edge interdisciplinary educational experience to graduate applicants with an aspiration of building

a career in this field. PGDBA is a two year full time diploma programme, specially designed to create business analytics professionals employable by leading Indian and foreign firms. Students successfully graduating from this programme will have options to join organizations working in the area of analytics, or pursue doctoral or other advanced studies in this area.

See <http://www.isical.ac.in/~pgdba/> for further details.

1.14 Junior Research Fellowships (JRF)

1.14.1 JRF in Statistics, Mathematics, Quantitative Economics, Computer Science, and Quality, Reliability & Operations Research (QROR)

Scope The Institute offers Junior Research Fellowships in Statistics, Mathematics, Quantitative Economics, Computer Science (CS) (see also <http://www.isical.ac.in/~deanweb/phdcs/>), and Quality, Reliability and Operations Research (QROR). A candidate admitted as a Junior Research Fellow, and applying for registration for Ph D in the relevant discipline, will generally be required to successfully complete mandatory course-work involving at least five courses from the list of courses for that discipline. He/she is expected to engage in original research work in one of the above areas under the guidance of a supervisor appointed by the Institute, culminating in a doctoral thesis to be submitted for the Ph D degree of the Institute. Candidates making satisfactory progress towards the above goal are eligible to register for the Ph D degree of ISI. At the end of the second year, the Junior Research Fellows are assessed for the award of Senior Research Fellowships. The total duration of Junior and Senior Research Fellowships shall not exceed 6+1 years.

Subjects The subjects in which research fellowships are being offered this year, along with the names of the respective centres are given below.

SUBJECT	CENTRE
Statistics	Kolkata, Delhi, Bengaluru, Chennai
Mathematics	Kolkata, Delhi, Bengaluru
Quantitative Economics	Kolkata, Delhi
Computer Science ¹	Kolkata, Bengaluru, Chennai
Quality, Reliability & Operations Research (QROR)	Kolkata, Bengaluru, Delhi, Chennai

Eligibility

Statistics In order to be eligible for admission to this programme, an applicant must have

- an M Stat degree from ISI, or
- an MA/M Sc or equivalent degree in Statistics.

Mathematics In order to be eligible for admission to this programme, an applicant must have

- an M Stat/ M Math degree from ISI, or
- an MA/ M Sc or equivalent degree in Mathematics, or
- an ME/ M Tech degree or equivalent with Mathematics as a subject.

Quantitative Economics In order to be eligible for admission to this programme, an applicant must have

- a Master's degree in any discipline with Economics/ Mathematics/ Statistics as a subject at the undergraduate or postgraduate level.

Computer Science In order to be eligible for admission to this programme, an applicant must have

- an ME/ M Tech or equivalent Master's degree in Electronics/ Telecommunication/ Radio Physics/ Computer Science/ Electrical Engineering/ Microwave Communications/ Information Technology/ Bioinformatics/ Biotechnology with Mathematics as a subject at the undergraduate or postgraduate level, or
- an M Stat/ M Sc/ MCA/ MA or equivalent Master's degree in Physics/ Mathematics/ Applied Mathematics/ Statistics/ Electronic Sciences/ Computer Science/ Atmospheric Science/ Information Technology/ Bioinformatics/ Biotechnology with Mathematics as a subject at the undergraduate or postgraduate level.

Quality, Reliability & Operations Research (QROR) In order to be eligible for admission to this programme, an applicant must have

- an M Tech/ ME/ MS/ M Phil or equivalent degree in Quality/ Reliability/ Operations Research, or

¹JRF(CS) selected at Bengaluru or Chennai Centres may have to come to ISI Kolkata for completing the necessary coursework.

- an M Stat/ M Sc/ MA or equivalent degree in Mathematics/ Statistics/Physics with Mathematics as a subject at the undergraduate or postgraduate level.

Selection Procedure Subject to the eligibility criteria being satisfied, the selection of candidates for this programme is strictly based on merit as judged by performance in Written Test and interview.

Written Test Waiver For an applicant who has obtained a Master's degree in the relevant discipline from ISI with at least 75% in the aggregate without any backpaper or compensatory examination in any course during the entire programme, and is applying within two years of graduating, the written test will be waived, and he/ she will be called directly for interview by the corresponding JRF selection committee. However, such candidates are also required to apply, like all other candidates, in the prescribed application form.

Note: Candidates who have been awarded a Junior Research Fellowship in the aforementioned research areas by NBHM/ CSIR/ UGC/ ICMR/ DST/ DBT based on a nationally conducted written Admission Test, are also required to clear the JRF admission test or an equivalent separate test conducted by the relevant JRF selection committee of the institute, if they wish to obtain a Ph D degree from ISI. The institute may conduct a separate equivalent test in December 2020 - January 2021. If any such test is held, it will be advertised in the website of the Institute.

Current Research Interests at Different Centres**KOLKATA**

Statistics: Asymptotic Theory in Statistics, Decision Theory, Statistical Inference: parametric, non-parametric and semi-parametric, Bayesian Analysis, Model Selection, Resampling Plans, Sequential Analysis, Sequential Plan, Multivariate Analysis, Parametric/ Non-parametric Regression Analysis, Robustness, Minimum Distance Methods, Discrete and Categorical Data Analysis, Linear Models, Parametric/ Non-parametric Discriminant Analysis, Biostatistics, Environmental Data Analysis, Survival Analysis, Reliability, Directional Data Analysis, Growth Curve Modelling, Exploratory Data Analysis, Ranking and Selection, Constructional and Combinatorial Aspects of Designs, Optimal Designs, Sampling Theory and Surveys, Small Area Estimation, Inference in High Dimensional Models. Applications of Statistics in Geology, Agriculture, Social Sciences and Industrial (Quality) Engineering; GIS Applications, Statistical Computation, Cryptology, Statistical Pattern Recognition, Image Analysis, HIV/AIDS Modelling. Clinical Trial, Majorisation, Brain Mapping.

Mathematics: Algebraic Topology, Differential Topology, Dynamical systems, Algebraic Geometry, Commutative Algebra and Affine Algebraic Geometry, Functional Analysis, Geometry of Banach Spaces, Spectral Theory of Differential Operators, Non-commutative Geometry, Harmonic Analysis, Wavelet Analysis, Number theory. Stochastic Processes, Probability Inequality, Large Deviations, Stochastic Calculus, Financial Mathematics, Markov Chains, Diffusion, Limit Theorems, Stochastic Approximations, Random Matrices, Extreme Value Theory, Heavy Tails and Long Range Dependence.

Quantitative Economics: Microeconomics, Macroeconomics, International Trade, Development Economics, Welfare Economics, Game Theory, Voting Theory, Contract Theory, Industrial Organisation, Financial Economics, Finance, Convergence, Social Choice, Political Economy, Public Economics, Economic Growth, Indian Economic Problems, Agricultural Economics, Environmental Economics, Time Series Econometrics, Financial Econometrics, Empirical/Applied Econometrics, Poverty and Inequality, Polarisation, Experimental Economics, Economics of Conflict, Public Choice, Social Economics, Analytical Marxism, Theories of Distributive Justice.

Computer Science: Computer Networks – ad hoc, Wireless Sensor, Wireless Mesh, UMTS Network Design; Parallel and Distributed Computing, Mobile Computing, Cluster Computing, Parallel/Distributed Architectures and Algorithms; Nanotechnology and Giga-scale Integration, Electronic Design Automation Algorithms and Testing, Biochips and Nano-biosystems, Intellectual Property Protection of SoCs, Quantum Computing, Fault Tolerance; Computational Geometry, Graph Theory, Combinatorial Optimisation, Algorithms and Computational Complexity; Computational Molecular and Systems Biology, Bioinformatics; Pattern Recognition, Machine Learning, Artificial Intelligence, Web Intelligence and Web Mining, Social Network Analysis, Text Mining, Data Mining, Information Retrieval, Natural Language Processing, Computational Linguistics; Computer Vision, Cognitive Vision, Digital Document Process-

ing, Image and Video Processing, Content-based Image Retrieval, Computer Graphics, Biomedical Image Processing, Video Surveillance; Speech and Signal Processing; Artificial Neural Nets, Case Based Reasoning, Evolutionary Computing, Fuzzy Sets and Systems, Fuzzy Control, Granular Computing, Soft Computing, Computing with Words, Rough Sets, Swarm Intelligence, DNA-Computing; Mathematical Morphology, Fractals, Wavelets; Artificial Immune System, Neurodynamics; Digital Watermarking; Atmospheric Science, Remote Sensing; Theory and Applications of Cellular Automata; Cryptology, Coding Theory, Information Theory, Perception Engineering, Computational Neuroscience.

Quality, Reliability & Operations Research (QROR): Business Analytics and Data Mining, Six Sigma and Lean Six Sigma, Mathematical Programming, Reliability Models, Process Control, Process Optimisation.

DELHI

Mathematics: Quantum groups, non-commutative geometry, operator algebras, KK-theory. Analysis and geometry of matrices and linear operators. Generalised inverse of a matrix. Matrices and graphs. Number theory, Diophantine equations, irreducibility of polynomials, prime numbers. Cryptography. Combinatorial optimisation problems. Extreme value theory. Interacting particle systems. Markov chains. Markov processes and martingale problems. Percolation theory. Random graphs, probability on trees. Random walks in random environments. Stochastic differential equations. Stochastic filtering theory. Stochastic control. Urn models.

Statistics: Computational biology. High-dimensional data. Penalised regression. Resampling methods. Reliability. Non-linear regression. Non-parametric inference. Statistical computing. Statistical graphics. Statistical signal processing. Surrogate data. Survival analysis.

Quantitative Economics: Optimisation Theory, Game Theory and Applications, Mechanism Design, Auction Theory, Choice Theory, Industrial Organisation, International Trade and Finance, Macroeconomic Theory, Growth Theory and Empirics, Applied Econometrics, Political Economy, Empirical and Theoretical Development Economics, Economics of Education, Health Economics, Agricultural Economics, Environmental and Natural Resource Economics, Experimental Economics, Economics of Terrorism and Conflict.

Quality, Reliability & Operations Research (QROR): Complementarity Problems, Game Theory, Design of Experiments.

BENGALURU

Mathematics: Algebraic Geometry, Algebraic Groups, Coding Theory, Ring theory, Operands, Finite Geometry, Finite Groups, Buildings, Number Theory, Topology, Combinatorial Topology, Complex geometry, Differential geometry. Probability Theory, Stochastic Processes, Diffusion Processes, Reflected

Diffusion, Martingale problems, Interacting particle systems, Probability measures on groups. Functional Analysis, Geometry of Banach spaces, Operator Theory, Operator Algebras, Quantum Probability, Hilbert Modules.

Statistics: Bayesian Statistics, Design of Experiments, Survey sampling.

Computer Science: Mathematical Morphology, Digital Geometry, Earth Systems Science, Spatial Informatics, Theoretical GISci and Geocomputation, Satellite Remote Sensing Data Analysis, Digital Image Processing, Digital Geographics, Modeling the behavior Complex Terrestrial Systems via Chaos and Bifurcation Theories, Fractals and Multifractals. Neuroinformatics: Interface between brain science and computer science from signal processing, information theory and coding theory point of view with realistic applications in experimental and clinical sciences. Equal emphasis is on quantitative science and medical science. Information Granulation, Granular Computing, Pattern Recognition, Machine Learning, Image and Video Processing, Soft Intelligence Computing, Computational Intelligence.

Quantitative Economics: Development economics, Agricultural economics.

Quality, Reliability & Operations Research (QROR): Statistical Process Control, Reliability and Six sigma.

CHENNAI

Statistics: Quantitative Finance, Reliability, Survival Analysis.

Mathematics: Mathematical Logic, Game theory.

Quality, Reliability & Operations Research (QROR): Semidefinite Linear Complementarity Problems, Stochastic Games, Optimisation, Cooperative games, Reliability and Operations Research.

Theoretical Computer Science: Cryptography, Graph theory, Algorithms, Logic and Games, Formal epistemology.

1.14.2 Research Fellowships (JRF) in Other Subjects

Scope The Institute also offers Junior Research Fellowships in several areas of the Natural Sciences and the Social Sciences. However, candidates working for Ph D in any area other than the five mentioned in page no. ??, need to register with other Universities/Institutes for their Ph D degree. A student is initially admitted as a Junior Research Fellow. After two years of satisfactory progress including successful completion of mandatory course work, Junior Research Fellows are assessed for the award of Senior Research Fellowships. The combined duration of the Junior and Senior Research Fellowships is

6+1 years. The areas in which the Institute wants to recruit JRFs this year and the respective eligibility conditions for applying for admission are as follows:

(a) Physics and Applied Mathematics

Areas: **Physics and Applied Mathematics**

Eligibility: an M Sc degree in Physics or an M Sc degree in Mathematics or equivalent.

(b) Biological Science

Area: **Agricultural and Ecological Research**

Eligibility: M.Sc. or equivalent degree in Botany / Biochemistry / Microbiology / Biotechnology / Life Sciences

Area: **Human Genetics**

Eligibility: M.Sc. or equivalent degree in Biochemistry / Biotechnology / Genetics / Molecular Biology / Life Sciences / Zoology.

(c) Development Studies

Areas: Agriculture and Rural development, labour studies, village studies, gender studies, statistical databases

Eligibility: A good academic record with Masters or M.Phil degree in Development Studies, Economics, Agricultural Economics, or any equivalent degree.

(d) Library and Information Science

Area: **Library and Information Science**

Eligibility: MS (LIS) awarded by ISI or Associateship in Documentation and Information Science (=ADIS, awarded by ISI or NISCAIR/INSDOC) or its equivalent degree (such as Master's degree in Library and Information Science from any Indian/Foreign University).

Subjects The other subjects in which research fellowships are being offered this year along with the respective centres are given below.

SUBJECT	CENTRE
Physics and Applied Mathematics	Kolkata, Bengaluru
Development Studies	Bengaluru
Biological Science	Kolkata
Library & Information Science	Bengaluru

Selection Procedure Subject to satisfying the eligibility criteria, the selection of candidates for JRF is strictly based on merit as judged by their performance in Written Tests and interview. Past academic records may also be taken into consideration².

Note: Candidates who have been awarded a Junior Research Fellowship by NBHM/ CSIR/ UGC/ ICMR/ DST/ DBT based on a nationally conducted written Admission Test, are also required to clear the ISI JRF admission test or an equivalent test conducted by the relevant JRF selection committee of the institute for submitting the doctoral thesis in ISI for a PhD degree. **No equivalent test will be conducted for such awardees in the academic session 2020-21.**

²For an applicant receiving education outside of India, whether the applicant satisfies the eligibility criteria for a programme will be decided on a case-by-case basis.