

# RESEARCH ADMISSION BROCHURE



**INDIAN INSTITUTE OF TECHNOLOGY MADRAS**  
**CHENNAI - 600 036**

Updated up to September 21, 2013

## 1. THE INSTITUTE

The Indian Institute of Technology Madras (IITM) is established as an autonomous institute of national importance in 1959 by the Government of India with an initial technical and financial support from Germany. IIT Madras with a number of well equipped laboratories, advanced research facilities, sophisticated services and computing and networking capabilities, is recognized to have done exceedingly well in the fields of higher technical education, research and industrial consultancy.

IIT Madras conducts academic programmes of B.Tech., Dual Degree (B.Tech. and M.Tech.), Integrated M.A, M.Tech., M.B.A, M.Sc., M.S. and Ph.D. in various disciplines. Located in about 225 hectares of natural flora and fauna, with 17 student's hostels and about 1000 faculty/staff quarters, IIT Madras is one of the greenest residential campuses in the country. Faculties of international repute, a brilliant student community, excellent technical and supporting staff and an effective administration have all contributed to the pre-eminent status of IITM.

## 2. ABOUT RESEARCH PROGRAMMES

The IITM is internationally renowned for the quality and diversity of its research, with over 350 academic staff and 2800 post-graduate students. Ample opportunities are provided for research-minded students to hone their research skills and participate actively in pioneering research studies through Ph.D and M.S (by research) programmes. The faculties of engineering, science, Humanities and Management departments, along with their scholars do active research in frontier areas, which often results in highly acclaimed publications in International and National Journals and patents. Most of the research work is also presented in International and National conferences. A large number of sponsored research projects are funded by agencies such as the Department of Science & Technology, Aeronautical Research & Development Board, Indian Space Research Organisation, Ministry of Non-Conventional Energy Sources and Defence

Research & Development Organisation, Naval Research Board, Department of Electronics, IGCAR, Atomic energy agencies and other Organisations for tackling the challenging research issues of national interest. Our faculty also undertakes several application-oriented industrial consultancy projects with industries in India and abroad and collaborative research projects with foreign universities. Opportunities are available for interested students to participate in such sponsored research, industrial consultancy or collaborative research projects. The Engineering, Science, Humanities and Management Departments of our Institute are equipped with excellent laboratories, facilities with state-of-the-art equipment. Research is being carried out on many areas of topical interest world wide. For example, research is carried out in areas such as Laser diagnostic applications, Non-destructive techniques, NMR spectroscopy, solid state physics and micro-electronic devices, Nano-materials technology, Bio-technology, Bio-medical research, Bio-chemistry, Wireless Local Loop technology, Alternative Energy sources and Emission Control, Composite materials, Finite Element modeling, Photo elasticity, Structural Analysis, Computational Fluid Dynamics, Ocean Engineering, Vibration & Acoustics, Rarefied Gas Dynamics, to name a few. The details of areas of research in the departments and research centres are given in this brochure. More detailed description of the research work undertaken in each department is available in the Institute website [www.iitm.ac.in](http://www.iitm.ac.in) Strong expertise exists among the faculty on both theoretical and experimental methods of research.

Opportunities exist for candidates to do Joint Ph.D in Engineering & Sciences offered by IIT Madras & National University of Singapore. Joint Ph.D programme is also offered by IIT Madras, Sree Chitra Tirunal Institute for Medical Sciences & Technology, Trivandrum and Christian Medical College, Vellore in the area of Biomedical Devices and Technology.

Research works are carried out in the interdisciplinary areas among the Departments which may be pursued by the research scholars for the Ph.D degree. A list of interdisciplinary areas is given in section 8.18.

While the Office of the Dean, Academic Research administers the academic research activities, the Industrial Consultancy & Sponsored Research (IC & SR) wing of the Institute coordinates the sponsored research and consultancy activities.

### 3. PH.D AND M.S ADMISSIONS

#### 3.1 Financial Assistance:

Scholars admitted to Ph.D. and M.S. programmes under regular scheme (fulltime) are eligible for the following Half-time Teaching/Research Assistantship (HTRA) for which:

- (a) They should work for 8 hours per week in the Departments to earn this assistantship.
- (b) Renewal of assistantship every semester will be contingent on enrolment, satisfactory progress in research work and good performance during the preceding semester in the discharge of responsibility as teaching/ research assistant.

#### Ph.D

a)	In Engineering and Management for those with Masters Degree in Engineering	Rs.18,000/- p.m. for first 2 years & Rs.20,000/- p.m. for next 2 years
b)	In Engineering for those admitted directly with B.E / B.Tech degrees	Rs.16,000/- p.m. for first 2 years & Rs.18,000/- p.m. for next 3 years
c)	In Sciences / Humanities & Social Sciences Management	Rs.16,000/- p.m. for first 2 years & Rs.18,000/- p.m. for next 3 years

#### M.S.

In Engineering / Management	Rs.8,000/- p.m. for first 3 years
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Other scholarships like UGC-JRF, CSIR-JRF, ICMR, ICAR, DAE-JEST & AICTE etc. may also be available for those who had qualified for these schemes and get admission and the amount of fellowship will be as per the norms of the funding agency.

#### 3.2 Admission without Assistantship:

A few candidates may also be considered for admission to the Ph.D./M.S. programme without assistantship also (Non-HTRA) under full time (regular) category.

The eligible qualifications are the same as for the Regular (fulltime) HTRA candidates.

Such candidates have to enclose a letter along with the Application Form stating that they may be considered for admission even without assistantship (Non-HTRA).

(Students selected from HTRA list can move to N-HTRA and revert back to HTRA later. Students selected from N-HTRA list cannot move to HTRA category)

#### 3.3 Selection Procedure:

Eligible candidates possessing the minimum educational qualifications (as given in section 5, eligible degree as given in section 6) and satisfying additional and stiffer criteria set by the departments from time to time, will be called for an interview and/or test by the Selection Committees of the respective departments.

For candidates who have obtained PG degree 10 years earlier as on the last date prescribed for receipt of the completed application, a departmental test will be conducted.

The applications of foreign nationals may be considered without a personal interview / test (details vide section 8).

Based on the academic record and the performance of the candidates in the interview and/or test, the Departmental Selection Committee will recommend to the Chairman, Senate the names of candidates found suitable for admission to the Ph.D. programme.

#### 3.4 Reservation of Seats

Reservations are applicable to SC/ST/OBC/Persons with Disability (PD) candidates as per Govt. of India rules.

### 3.5 Fees and Deposits:

Fees for the Indian students/scholars to be admitted in the academic year 2013-14 (for Jul - Nov 2013)			
S.No	Items of Fees & Deposits	M.S.	Ph.D.
I. Institute Fees			
A. One time Fees:			
1.	Admission fee	150	150
2.	Grade card/Thesis fee	450	950
3.	Provisional certificate	100	100
4.	Medical Exam fee	100	100
5.	Student welfare fund	500	500
6.	Modernisation fee	500	500
7.	Alumni Life Membership Fee (NS)	500	500
8..	Publication fee (NS)	250	250
		-	-
	Total A	2550	3050
B. Semester Fees:			
1.	Tuition fee #`	2500	2500
2.	Examination fee	300	300
3.	Registration-Enrolment fee	300	300
4.	Gymkhana	1000	1000
5.	Medical fee	300	300
6.	*Hostel Seat Rent	2250	2250
7.	*Fan, Elec. & Water Charges	750	750
8.	Student Wellness fee	100	100
9.	Medical Insurance Premium (p.a.) (subject to revision)	927	927
	Total B	8427	8427
C. Deposits (Refundable):			
	Institute Deposit and Library Deposit (each Rs 1000)	2000	2000
	Institute fees payable at the time of admission through DD drawn in favour of "Registrar, IIT Madras" payable at "Chennai"	Hostellers (A+B+C)	12977
		Day scholars [A+(B-* ) +C+ II(3)]	14977
II. Hostel Fees & Mess Charges per semester			
1.	Hostel Admission fee	100	100
2.	Hostel Deposit (NS)- (refundable)	2000	2000
3.	Estt.'A' charges	5000	5000
4.	Estt 'B' charges	1000	1000
5.	Advance Dining charges	12000	12000
6.	SWD charges	50	50
Hostel Fees payable through DD drawn in favour of "Chairman, Council of Wardens. IIT Madras" pavaible at "Chennai"		20150	20150

NS – Non-Statutory fees

\* For Hostellers only.

# SC/ST students/ scholars are exempted from payment of tuition fee.

+ (for one year )Subject to Change

Hostel rooms are allotted depending on availability on sharing basis. **If you wish to be a day scholar, you should register your name in the Office of the Dean Students and obtain day scholar certificate immediately after admission.**

### **3.6 TA for attending Interview for Ph.D programme:**

Candidates called for Ph.D. interview under the regular (full time) category will be paid second class single to & fro rail fare from their place of residence to Chennai by the shortest route. A candidate is entitled for a single TA as above even as he/she may attend interview in more than one department in the same trip.

### **3.7 Completing the Qualifying Degree and production of Provisional Certificate:**

Candidates joining Ph.D/M.S programme in July-December/January-June session have to submit their original mark/grade sheets along with provisional certificates at the time of admission. They should also produce their required degree certificate for having passed the qualifying examination within three months from the date of registration i.e. **on or before 30<sup>th</sup> September for July admission / 31<sup>st</sup> March for January admission.**

### **3.8 Documents to be submitted at the time of interview/Admission**

#### **At the time of Interview:**

- (a) Printed copy of application mailed to the candidates after online registration.
- (b) Copies of all Mark sheets / grade cards, degree certificates beginning from first degree towards proof of qualification with Original certificates.
- (c) Copy of Community Certificate in the case of SC/ST/OBC candidates issued by the respective State Government.
- (d) Authorised Doctor's Certificate with disability descriptions in the case of Person with Disabled (PD) candidates.
- (e) Copy of GATE score or NET (UGC-JRF/Lectureship/CSIR/ DAE-JEST) or other fellowship award.
- (f) Project Co-ordinator's certificate in the prescribed format and a copy of project appointment letter from Dean IC & SR of IITM in the case of Project Associate if already appointed.

#### **At the time of Admission:**

- a) Attested copy of the first page of your SSLC/SSC/Matriculation certificate (if not already sent) along with application form.
- b. Original GATE Score Card/NET (UGC-JRF/Lectureship/CSIR/DAE-JEST) award letter for admission to Ph.D and M.S. programme as the case may be.
- c. One set of Photostat copies of Degree certificate, if available and Grade Cards/Mark sheets of all the semesters of degree programme (if not already sent) with originals.
- d. SC/ST/OBC community certificate original with an attested copy, if the candidate belongs to SC/ST/OBC category. OBC candidates should submit the community certificate (Non creamy layer certificate )in the prescribed format.
- e. External candidates should bring the attested copy of degree certificate of the Guide if not already sent together with relieving order from the employer in the enclosed proforma.
- f. Relieving order/Resignation acceptance letter from the employer in the case of regular candidates (HTRA / NHTRA / PROJECT / CSIR / UGC), if employed except candidates selected under IITM Staff scheme as per enclosed format.

## 4. CATEGORIES OF ADMISSION

### 4.1 Categories of admission in Ph.D programme:

- a) **Regular** full-time scholars with or without Institute fellowship or with project support.

Students selected from HTRA list can move to N-HTRA and revert back to HTRA later. Students selected from N-HTRA list cannot move to HTRA category

- b) Research scholars sponsored under the **Quality Improvement Programme (QIP)**.

- c) Research scholars who are **staff members** of the Institute

- d) Research scholars under the **external registration** programme sponsored by and employed in industry/organisation having R & D facilities and recognised by DST or IIT Madras, national laboratories, reputed universities/colleges or employed in research/analysis jobs in public sector/private sector/government in the case of management area.

*(A research scholar under the external registration programme will normally carry out part or all of his / her research work in the industry/organization/national laboratories/universities **employing** the scholar under the supervision of a co-guide also employed in the same organization and a guide at IIT Madras.)*

*The candidate must have at least **two years** experience in the case of registration in Engineering/Sciences/Social Sciences/ Management.*

- e) Research scholars working on a **part-time** basis from a reputed University/Institution/ Organisation. They should have **two years** experience for registration in Engineering, Sciences and Humanities & Social Sciences Depts./Department.

*(A research scholar working on a part time basis shall normally carry out the research work at IIT Madras under the supervision of a guide at IIT Madras. The feasibility of doing this with sufficient intensity will be an important consideration in admitting the scholar in this category).*

- f) Candidates applying for admission in the External/Part-time categories:

- i) Should submit a relief certificate at the time of admission
- ii) Should submit one page write-up about the research topic.
- iii) Must belong to any one of the following category:

- a) Industry/organization having R& D facilities and recognized by DST, GoI or IIT Madras
- b) National Laboratories
- c) Reputed Universities / Colleges
- d) Public sector / Private sector / Government Departments engaged in research/analysis jobs of their executives in the case of management area.

- g) The minimum residential requirement for the Ph.D scholar under external registration and Ph.D. research scholars working on part-time basis not employed in the Institute is one semester.

- h) Scholars will be permitted to do course work without the residential requirement with the permission of their institution subject to fulfilling the course requirement.

- i) Part time scholar residing within the commutable distance from IIT Madras may use this option.

- ii) The scholar to complete the course and comprehensive requirement within the time limit.
- iii) Leave not required for attending the courses.

## 4.2 Categories of admission in M.S programme:

- a) **Regular** full time scholars with or without Institute fellowship or with project support.

*(Person employed on a project can apply for admission to M.S. programme with a minimum project experience of six months without valid GATE score subject to qualifying in selection procedure (interview / written examination) of the concerned department. They will not be eligible for HTRA until they qualify in the GATE examination. The scholars may seek conversion from project to HTRA provided they qualify in GATE with the minimum cut-off prescribed for the selection of scholars admitted in his/her batches.)*

- b) Research scholars who are **staff members** of the Institute.

- c) Research scholars under the **external registration** programme sponsored by and employed in industry/organisation having R & D facilities and recognized by DST or IIT Madras, national laboratories, reputed universities/colleges or employed in research/analysis jobs in public sector/private sector/government in the case of Management area.

*(A research scholar under the external registration programme will normally carry out part or all of his/her research work in the industry/organization/national laboratories/ universities employing the scholar under the supervision of a co-guide employed in the same organization and a guide at IIT Madras. The candidate must have at least **two years** experience).*

- d) Research scholars working on a **part-time** basis from a reputed University/ Institution/Organization. They should have **two years** experience.

*(A research scholar working on a part-time basis shall normally carry out research work at IIT Madras under the supervision of a guide at IIT Madras. The feasibility of doing this with sufficient intensity will be an important consideration in admitting the scholar in this category).*

- e) Candidates applying for admission in the External/Part-time categories:

1. Should submit a relief certificate at the time of admission
2. Should submit one page write-up about the research topic.
3. Must belong to any one of the following category:

- Industry/organization having R& D facilities and recognized by DST, GoI or IIT Madras
- National Laboratories
- Reputed Universities / Colleges
- Public sector / Private sector / Government Departments engaged in research/analysis jobs of their executives in the case of management area.

- f) The minimum residential requirement for the MS scholar under external registration and MS research scholars working on part-time basis not employed in the Institute is one semester.

## 5. MINIMUM EDUCATIONAL QUALIFICATIONS FOR ADMISSION

### 5.1 Minimum Educational Qualifications for Ph.D:

#### 5.1.1 For Regular (full time) Research Scholars:

##### Ph.D. in Engineering:

- a) Candidates with a Master's degree in Engineering/Technology with a good academic record or a Master's degree by Research in Engineering/Technology with a good academic record.
- b) Candidates with Master's degree in Sciences with a good academic record and of exceptional merit where eligible, for the relevant Engineering discipline and with a valid GATE score or UGC/CSIR NET/NBHM or equivalent qualification in the relevant area tenable for the year of registration.

In the case of candidates with more than 5 years relevant experience after the Master's degree, the requirement of a test score may be waived by the Selection Committee.

- c) Candidates who have qualified for the award of Bachelor's degree in Engineering/Technology with exceptionally good academic record in an eligible discipline will be considered for **direct admission to Ph.D. Programme** as a regular full time scholar subject to the following conditions:
  - a B.Tech. degree holder of Centrally Funded Technical Institute with a minimum CGPA of 8.0 on a 10.0 point scale or with a valid GATE score
  - a Bachelor's degree holder in Engineering/Technology with 8 CGPA or equivalent from any other University and having a valid GATE score.
  - a Bachelor's degree holder in Engineering/Technology from a reputed R & D organization and having a proven research record.

##### Ph.D. in Sciences:

1. Master's degree in Sciences with a good academic record and having a valid GATE score or UGC/CSIR NET/NBHM or equivalent qualification tenable for the current year in the relevant area.
2. Master's degree in Engineering/Technology are eligible with a good academic record.
3. B.Tech degree holder of an IIT are eligible with a minimum of CGPA of 8.0 on a 10.0 point scale or with a valid GATE Score.
4. B.Tech / B.E degree of any recognized University in India with a minimum CGPA of 8.0 on a 10.0 point scale or equivalent with valid GATE score.
5. Students who get more than 8.0 CGPA in M.Sc. in Science Departments of IIT Madras can be admitted directly to their Ph.D programme in Sciences with interview at departmental level; sanction of HTRA to these candidates is subject to the clearance of MHRD.

##### Ph.D. in Humanities and Social Sciences:

Master's degree in an eligible discipline with a good academic record or equivalent and having a valid GATE score or UGC/CSIR NET/NBHM or equivalent qualification tenable for the current year in the relevant area.

### **Ph.D in Management:**

Masters degree or equivalent PG Diploma or Associateship in a relevant discipline, and a Bachelor's degree with a good academic record OR Five year integrated masters degree / dual degree or equivalent in a relevant discipline with a good academic record

AND

Qualifying in national level examinations such as CAT /XAT /MAT /ATMA /GATE /UGC or CSIR / NET / JRF or Lectureship or equivalent or international level post graduate admission examination such as GMAT / GRE or equivalent.

OR

At least **5 years** of managerial experience in lieu of the above examination. (This clause is only for Non-HTRA candidates)

Master's degree in Engineering / Technology with a good academic record or a Master's degree by Research in Engineering / Technology in a relevant discipline are exempted from qualifying in National level examinations.

#### **5.1.2 For Institute staff members / Research Scholars under QIP / Research Scholars under External Registration / Research Scholars working on part-time basis:**

For Research Scholars in the above categories, the minimum educational qualifications are the same as prescribed for Regular (full time) Research Scholars in 5.1.1 for admission to the Ph.D. Programme in the respective categories.

However, valid GATE score or CSIR/UGC NET/NBHM/CAT/AIMA/JRF or Lectureship or equivalent qualification as applicable for regular (full time) research scholars **may not be required** in these cases.

Further the residential requirement is treated as fulfilled for MS/PhD scholars admitted from among the employees of the organizations posted to IITM Research Park.

### **5.2 Minimum Educational Qualifications for M.S:**

#### **5.2.1 For Regular (full time) Research Scholars:**

##### **M.S. in Engineering :**

- a) Candidates with a Bachelor's degree in Engineering / Technology with valid GATE score or a Master's degree in appropriate Sciences Management/Humanities and Social Sciences where eligible with a good academic record and a valid GATE score or CSIR/UGC NET/NBHM/CAT/AIMA or equivalent qualification tenable for the current year in the relevant areas.
- b) Candidates having Associate Membership of the following professional bodies will also be eligible for admission to the M.S. programme of their parent discipline provided they have a valid GATE score and have passed both part A and part B of the Membership examinations with a good academic record.

The Institution of Engineers (India) (Civil, Mechanical, Electrical and Electronics, Electronics and Communications), the Aeronautical society of India, the Indian Institute of Metals, the Indian Institute of Chemical Engineers, the Institute of Electronics and Telecommunication Engineering and other professional bodies approved by the Senate from time to time.
- c) Candidates having qualified in MFT (Major Field Test) will also be eligible for admission to the M.S. programme if the concerned department opt for it.
- d) IIT B.Tech candidates with a CGPA score of 8.0 or above on a scale of 10 [SC/ST: 7.5 CGPA] are eligible to apply for M.S. Programme

### 5.2.2. M.S. in Entrepreneurship/Management

- A) Bachelors degree or equivalent in any professional discipline of minimum four years duration or Masters degree or equivalent in a relevant discipline, with a good academic record,

**AND**

- B) A good score or pass in:
- a) national level post graduate admission qualifying examinations such as CAT/XAT/MAT/ATMA/GATE/ UGC or CSIR NET JRF or Lectureship or equivalent, or
  - b) International level post graduate admission qualifying examination such as GMAT/GRE or equivalent
  - c) at least 3 years of managerial experience in lieu of the qualifying test. (This clause is only for non-HTRA candidates)
- C) Candidates having qualified in MFT (Major Field Test) will also be eligible for admission to the M.S. programme if the concerned department opt for it.

### 5.2.3. For Institute staff members/Research Scholars under External Registration / Research scholars working on part-time basis:

Bachelor's degree in Engineering/Technology or a Master's degree in appropriate Sciences/Management/Humanities and Social Sciences where eligible with a good academic record.

However, valid GATE score or CSIR/UGC NET/NBHM/CAT/AIMA or equivalent qualification as applicable for regular (full time) research scholars **may not be required** in these cases.

#### **General:**

A list of eligible discipline in which the minimum educational qualifications have to be obtained by the candidate is given in section 6.

***Additional and stiffer criteria than the minimum educational qualifications given in 5.1(Ph.D) and 5.2 (M.S) may be set by the Department/Selection Committee from time to time for short listing candidates to be called for interview and or test.***

*The Department Selection Committee may find fit to consider meritorious candidates from disciplines other than listed in the Research Admission Brochure if there is a good match between the educational/ research background of the candidate and the proposed area of research.*

*Research works are carried out in the interdisciplinary areas among the Departments which may be pursued by the research scholars for the Ph.D degree. A list of interdisciplinary areas is given in section 8.18*

## 6. ELIGIBLE DEGREES FOR ADMISSION TO Ph.D AND M.S PROGRAMMES

### 6.1 Eligible Degrees for Admission to Ph.D. programme

Sl.No.	Department	Eligible Degree for Ph.D
1.	Aerospace Engineering	<p>Master's degree or its equivalent in Aerospace / Civil / Applied Mechanics / Mechanical / Electrical Engg. or Master's degree in Mathematics / Physics and aptitude for research.</p> <p>Science Post-graduates should have exceptional merit and research or industrial experience in the appropriate field.</p> <p>Candidates with Master's degree in other allied engineering specialisations can also be considered provided they have either basic degree in Aerospace Engineering OR at least five years experience in Aerospace industry/Research Organisation.</p>
2.	Applied Mechanics	<p><b>Engineering Mechanics and Solid Mechanics areas:</b> Master's degree in Civil/Aerospace/Mechanical/Naval Architecture Engineering with an aptitude for research in Solid Mechanics.</p> <p><b>Fluid Mechanics area:</b> Master's degree in Engineering Mechanics/Civil Engineering/Mechanical Engineering/Aerospace Engineering/Chemical Engineering.</p> <p><b>Biomedical Engineering area:</b> Master's degree in Civil/Mechanical/Electrical/Biomedical Engineering/ Computer Science.</p>
3.	Biotechnology	Masters Degree in Engineering / Pharmacy / Science
4.	Chemical Engineering	<p>Master's degree in Chemical Engineering or any other discipline of Engg. or Technology or equivalent.</p> <p>Science/Mathematics postgraduates to be considered should have exceptional merit and/or Research / Industrial experience in the appropriate field.</p> <p>BTech/BE in Chemical Engineering, allied disciplines (eg. petroleum, petrochemical, pharmaceutical, environmental, polymer, biochemical, biotechnology, electrochemical, instrumentation) and other disciplines of engineering/technology with exceptional merit can also be considered for direct PhD admissions.</p>
5.	Chemistry	<p>Master's degree in Sciences (in areas such as chemistry, applied chemistry, biochemistry, chemical physics, physics, material sciences, mathematics, pharmacy, or similar such area) with a good academic record and having a valid GATE score or UGC/CSIR-NET-JRF</p> <p><i>[DST-INSPIRE Fellowship is treated as eligible criteria for admission to PhD programme in all the departments wherever applicable.]</i></p> <p>Master's degree in Engineering/Technology (in areas such as electrical engineering, computer sciences, chemical engineering, materials engineering, biotechnology or similar such area) with a good academic record.</p> <p>B.Tech degree holder of an IIT with a minimum of CGPA of 8.0 on a 10.0 point scale or with a valid GATE score.</p>
6.	Civil Engineering	<p>Master's degree in Civil Engineering or Ocean Engineering (including integrated M.Tech / M.E. degree) with First Class or equivalent grade for specialisation in Civil Engineering.</p> <p>In addition, the following non-Civil Engineering degrees qualification are also eligible for different specializations:</p>

**Building Technology and Construction Management:** Master's degree in Industrial Engineering / Industrial Management / MBA after obtaining a basic degree in Civil Engineering with first class. First class Bachelor's and Master's degree in Architecture, Town and Country Planning.

**Geotechnical Engineering:** Master's degree in Engineering Mechanics/Master's degree in Mining Engineering with 2 years relevant experience.

Environmental and Water Resources Engineering: M.Tech or M.S. or equivalent degree in Engineering Mechanics/Aerospace Engineering / Agricultural Engineering / Environmental Engineering

or

M.Tech or M.S. or equivalent degree in Environmental Science & Engineering/Chemical Engineering/Biotechnology/Applied Geology.

Environmental and Water Resources Engineering: M.Tech or M.S. or equivalent degree in Engineering Mechanics/Aerospace Engineering / Agricultural Engineering / Environmental Engineering

or

M.Tech or M.S. or equivalent degree in Environmental Science & Engineering/Chemical Engineering/Biotechnology/Applied Geology.

Structural Engineering: Master's degree in Engineering Mechanics / Aerospace Engineering / Naval Architecture / Mechanical/Architectural/Ocean Engineering/Master's degree in Computer Science & Engineering with basic degree in Civil Engineering.

Transportation Engineering: Master's degree in Architecture/ Master's degree in Town and Country Planning/Regional Planning/City Planning/Urban Engineering or 2 years full time Postgraduate Diploma in Town and Country Planning with specialization in Traffic and Transportation Planning of the School of Planning and Architecture, New Delhi / MBA after obtaining a basic degree in Civil Engineering with first class.

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|-----|----------------------------------|--|
| 7.  | Computer Science and Engineering | Master's degree in Engineering/Technology. Preference will be given to those with M.Tech/M.S degree in Computer Science & Engineering.   |
| 8.  | Electrical Engineering           | Master's degree in Electrical Engineering (Electrical and Electronics Engineering)/ Electronics Engineering (Electronics and Communication Engineering) / Instrumentation Engineering or Master's degree in Physics followed by a Master's degree in Engineering in an area of relevance to the area of research. Candidates not having Master's degree in Electrical/Electronics Engineering should qualify in a written test to be eligible for interview. |
| 9.  | Engineering Design               | Master's degree in Aerospace, Automobile, Biomedical, Civil, Computer Science, Electrical, Electronics, Engineering Physics, Instrumentation, Mechanical, Metallurgical, Naval Architecture, Production / Manufacturing Engineering, or Master's degree in Design (M.Des.) or M.Tech (Industrial Mathematics.)   |
| 10. | Humanities & Social Sciences     | Master's degree or equivalent with a First Class or a minimum of 6.5 CGPA on a 10-point scale or 60% aggregate marks in Commerce or a minimum of 55% aggregate marks in Humanities and Social Sciences and allied areas.   |
| 11. | Management Studies               | Masters degree or equivalent PG Diploma or Associateship in a relevant discipline, and a Bachelor's degree with a good academic record OR Five year integrated masters degree / dual degree or equivalent in a relevant discipline with a good academic record<br>AND<br>Qualifying in national level examinations such as CAT /XAT /MAT /ATMA /GATE /UGC or CSIR / NET / JRF or Lectureship or equivalent or  |

international level post graduate admission examination such as GMAT / GRE or equivalent.

OR

At least 5 years of managerial experience in lieu of the above examination. (This clause is only for Non-HTRA candidates)

Master's degree in Engineering / Technology with a good academic record or a Master's degree by Research in Engineering / Technology in a relevant discipline are exempted from qualifying in National level examinations.

- |   |   |
|---|---|
| 12. Mathematics                           | Master's Degree in Mathematics/Statistics/Physics/Computer Science with GATE/UGC/CSIR/NBHM or M.Tech (Industrial Mathematics & Scientific Computing) or any M.Tech degree with Master's degree in Mathematics/Physics/Statistics/ Computer Science.   |
| 13. Mechanical Engineering                | Master's degree in Mechanical Engineering, Aerospace Engineering, Automobile Engineering, Automotive Engine Tech, Bio-Medical Engineering, Chemical Engineering, Computer Science, Electrical Engineering, Electronics, Energy Engineering, Industrial Engineering, Instrumentation, Maintenance Management, Metallurgical Engineering, Production/ Manufacturing Engineering/Agricultural Engineering and in related areas depending on the research topics. |
| 14. Metallurgical & Materials Engineering | Master's degree or equivalent in Metallurgical Engineering or other appropriate branch of Engineering/Technology. Science postgraduates to be considered should have exceptional merit and research or industrial experience in the appropriate field.  |
| 15. Ocean Engineering                     | Master's degree in Engineering/Technology and preference to those with Master's degree in Ocean Engineering.<br>M.Sc degree in Physics, Mathematics, Oceanography, Geology and / or Geophysics and Statistics and having valid GATE score.  |
| For Petroleum Engineering                 | Master's degree in Engineering / Technology in any area relevant to research in Petroleum Engineering."<br>M.Sc degree in Physics, Mathematics, Oceanography, Geology and / or Geophysics and Statistics and having valid GATE score.   |
| 16. Physics                               | M.Sc/M.Sc (Tech) in Physics, Applied Physics, Materials Science/M.Tech (Solid State Technology)/M.Tech (Materials Science) or equivalent.<br><br>Students who get CGPA of 8.0 and above in M.Sc degree from IIT Madras are also eligible for admission to Ph.D programme in Sciences  |

**Note:**

*DST-INSPIRE Fellowship is treated as eligible criteria for admission to PhD programme in all the departments wherever applicable.*

## 6.2 Eligible Degrees for Admission to M.S programme

Sl.No.	Department	Eligible Degree
1.	Aerospace Engineering	Bachelor's degree in Aerospace/Civil/Chemical/Computer Science/Electrical/Mechanical/Metallurgical/Naval Architecture OR Master's degree in Physics/Mathematics/Chemistry and aptitude for research. Candidates with degree in other branches of Engineering can also be considered if they have three years relevant experience in Aerospace industry/Research Organisation.
2.	Applied Mechanics	<p><b>Engineering Mechanics and Solid Mechanics areas:</b> Bachelor's degree in Civil/Aerospace/ Mechanical/Naval Architecture Engineering.</p> <p><b>Fluid Mechanics area:</b> Bachelor's degree in Civil / Mechanical / Aerospace / Chemical Engineering.</p> <p><b>Biomedical Engineering area:</b> Bachelor's degree in Engineering or Master's degree in Science with Mathematics as optional subject and aptitude for research. MBBS candidates with Mathematics in +2 and having 2 years research/teaching experience may also apply for M.S sponsored programme in the area of Biomedical Engineering.</p>
3.	Biotechnology	<p>Bachelors Degree in Engineering or Pharmacy or M.B.B.S or B.D.S</p> <p>Selection Process: The candidate should have a valid GATE score or qualified for JRF through CSIR or ICMR exams or all India PG admission test or equivalent in order to be called for the interview.</p> <p>The final selection process will be based on performance in the Departmental written test and interview.</p>
4.	Chemical Engineering	<p>Bachelor's degree in Chemical Engineering, allied disciplines such as polymer, petroleum, petrochemical, pharmaceutical, environmental, biochemical, biotechnology, electrochemical, instrumentation etc and other disciplines of engineering/technology</p> <p>M.Sc.(Mathematics/Physics/Chemistry/Env. Science/Biochemistry/Biology etc.) with aptitude for research.</p>
5.	Civil Engineering	<p>Bachelor's degree in Civil Engineering from any recognised University for all specialisations in Civil Engineering.</p> <p>In addition, the following non-Civil Engineering Degree Qualifications are also eligible for different specialisations but M.Sc. degree holders in Science with two years experience admitted to the M.S. programme should take additional Engineering Courses to acquire enough engineering background.</p> <p>Building Technology and Construction Management: Bachelor's degree in Architecture or First Class M.Sc degree in Physics/ Applied Science/Material Science with 2 years experience in Civil Engineering area.</p> <p>Geotechnical Engineering: M.Sc. degree in Mathematics/ Physics/Chemistry/Applied Geology with 2 years experience in Civil Engineering area. Bachelor's degree in Mining Engineering with one year relevant experience.</p> <p>Environmental and Water Resources Engineering: Bachelor's degree in Agricultural Engineering or Master's degree in Applied Mathematics/Applied Geology/ Geophysics with 2 years experience in Civil Engineering area.</p> <p>or</p> <p>Bachelor's degree in Environmental Engineering/ Chemical Engineering/Biotechnology or Master's degree in Environmental</p>

Science/Microbiology/Bio-Chemistry with 2 years experience in Civil Engineering.

Structural Engineering: Bachelor's degree in Aerospace Engineering/Naval Architecture/Mechanical/ Architectural Engineering or First Class M.Sc. degree in Applied Mathematics/ Chemistry/Materials Science/ Physics with 2 years experience in Civil Engineering area.

Transportation Engineering: Bachelor's degree in Architecture or First Class B.E/B.Tech (Mechanical) working in Transportation Field

- |    |                                  |   |
|----|----------------------------------|---|
| 6. | Computer Science and Engineering | Bachelor's degree or equivalent in any branch of Engineering / Technology or Master's Degree in Mathematics/ Statistics/ Physics/Computer Science/MCA with Mathematics/ Physics/ Statistics basic degree  |
| 7. | Electrical Engineering           | Bachelor's degree in Electrical Engineering (Electrical and Electronics Engineering)/ Electronics Engineering (Electronics and Communication Engineering) / Instrumentation Engineering or Master's degree in Physics.  |
| 8. | Engineering Design               | Bachelor's degree in Aerospace, Automobile, Biomedical, Civil, Computer Science, Electrical, Electronics, Engineering Physics, Instrumentation, Mechanical, Metallurgical, Naval Architecture, Production / Manufacturing Engineering, or Bachelor's degree in Design (B.Des.) or Master's degree in Physics. |
| 9. | Management Studies               | Qualifying Test : National-level entrance/eligibility test such as CAT/XAT/MAT/ATMA/GATE/ UGC or CSIR NET JRF or Lectureship or equivalent  |

International level post graduate admission qualifying examination such as GMAT/GRE or equivalent

Candidates having qualified in MFT (Major Field Test) will also be eligible for admission to the M.S. programme

Minimum Educational Qualifications : B.E./B.Tech or equivalent with First class or 60% marks in aggregate or Four-year professional degree (like AMIE) or equivalent programmes in a relevant discipline with First class or 60% marks in aggregate.

or

A Master's degree in any discipline with 55% marks in aggregate from a recognized Institution or University.

Minimum Work Experience :

1. NIL for those fulfilling the above conditions for Qualifying Test and Minimum Educational Qualifications.
2. THREE years' managerial experience for those who fulfill the Minimum Educational Qualifications condition but have not taken or are ineligible to take the Qualifying Test. Such applicants will be administered by a Departmental test to evaluate their eligibility. These candidates are not eligible for HTRA.

Candidates with MBA or equivalent from universities/institutions other than IIMs, XLRI, IRMA, IITs should have either a UGC/CSIR NET JRF or Lecturership or a GATE score for admission to Ph.D or M.S programmes in Management with HTRA.

Sl.No.	Department	Eligible Degree
10.	Mechanical Engineering	Bachelor's degree in Mechanical Engineering, Aerospace Engineering, Agricultural Engineering, Architectural Engineering, Automobile Engineering, Chemical Engineering, Computer Science, Electrical Engineering, Electronics, Energy Engineering, Industrial Engineering, Instrumentation, Metallurgical Engineering, Mining Engineering, Naval Architecture, Marine Engineering, Production/ Manufacturing Engineering and in related areas depending on the research topics.
11.	Metallurgical & Materials Engineering	Bachelor's degree or equivalent in Metallurgical Engineering or other appropriate branch of Engineering/ Technology or Master's degree in Physics/Chemistry/Materials Science or allied fields with GATE with 'XE'. Master's Degree in Mathematics with GATE with Metallurgy.
12.	Ocean Engineering	Bachelor's degree or its equivalent in Civil/Mechanical/ Aerospace/Naval Architecture or Master's degree in Oceanography/Applied Mathematics/Physics.
	For Petroleum Engineering	Bachelor's degree in Civil / Mechanical / Chemical / Naval Architecture / Ocean / Aerospace / Metallurgical / Materials / Electrical and Electronics / Marine / Mining / Aerospace or its equivalent. Master's degree in Oceanography / Earth Sciences / Applied Physics / Applied Mathematics / Geology / Geophysics / Remote Sensing or its equivalent.

### 17. Interdisciplinary research MS/PhD

Sl.No	Areas of Research	Eligible Degree
1.	<b>Combustion</b>	B.Tech./ M.Tech. in AE, AM, CH, ME, EE, IE or M.Sc. in Phys., Chem. and allied disciplines
2.	<b>Earth sciences</b> (a) Atmospheric and oceanic sciences and technology (ii) Climate science and climate change (iii) Ocean optics, imaging and satellite oceanography (b) Environmental science and engineering (i) Air and water quality (ii) Nuclear waste management (iii) Carbon dioxide sequestration (iv) Aerosol science	Undergraduate and post graduate degrees in all branches of science/engineering
3.	<b>Science of the small</b> (a) Nanoscience and nanotechnology: Materials, biology and devices (b) MEMS and NEMS a. Lab on a chip b. Microfluidics and applications c. Novel methods to understand physics, chemistry and biology	B.Tech./ M.Tech. in all disciplines or M.Sc. in Phys., Chem., BT or B.Pharm./M.Pharm. or M.B.B.S./M.D.

4.	<b>Sustainability</b> (a) Energy technologies including new and renewable (b) Water: Resources, distribution and purification (c) Transportation technologies including guidance, control and safety (d) Materials and technology for sustainable living (biopolymers, green technologies)	B.Tech./ M.Tech. in all disciplines or B.Arch/M.Arch. or M.Sc. in Phys., Chem., Math, Stat., Bio., Instrumentation, Psychology and allied disciplines
5.	<b>Soft matter</b>	B.Tech./ M.Tech. in AE, CH, ME, EE or M.Sc. in Phys., Chem., Math and allied disciplines
6.	<b>Technology and policy</b> (a) Education and ICT (b) Energy policy and sustainability (c) Technology and ethics (d) Technology management (e) Equity	Same as 4 and MA in sociology, development studies, economics or BL/ML
7.	<b>Computational science</b> (a) Understanding physical, chemical and biological systems and associated phenomena (b) Quantum computing (c) Analytics, simulation and optimization	Undergraduate and post graduate degrees in all branches of science/engineering/medicine
8.	<b>Systems science</b>	Undergraduate and post graduate degrees in all branches of science/engineering and MA in sociology, development studies and economics
9.	<b>Bio-engineering</b> (a) Biomechanics (b) Rehabilitation (c) Instrumentation and devices (d) Tissue engineering	Undergraduate and post graduate degrees in all branches of science/engineering/medicine or post graduate degree in physiotherapy
10	<b>Sensors</b> (a) Sensors for: (i) National security (ii) Personal health (b) New methods of imaging	Undergraduate and post graduate degrees in all branches of science/engineering/medicine

Minimum educational qualifications as given in Section 5 will apply. Eligibility norms refer also to equivalent degrees. MS degree will be preferred for PhD admission. GATE in appropriate discipline or CSIR/UGC JRF is necessary for fellowship as per MHRD norms.

## 7. INTERNATIONAL STUDENTS - ADMISSION (MS/Ph.D)

Foreign nationals can only register as regular full-time scholars. Foreign nationals with degree from Indian Universities will be treated on par with Indian nationals for admission purposes. Foreign nationals with foreign degrees must meet the minimum educational requirements as given in **R.2.1** equivalent to a Indian Master's degree in the relevant disciplines. In addition, they should have a valid GRE/ GMAT / GATE /CAT/XAT/MAT/ATMA/UGC or CSIR /NET /JRF or an equivalent examination in the relevant discipline and should have cleared TOEFL score. International students are expected to have a working knowledge of English. Once admitted, IIT Madras will apply for necessary clearance from the Government of India for study in India.

### Fees:

Sl.No.	Institute fees	Ph.D.	M.S.
1.	One time fee (at the time of admission)	US \$ 100	US \$ 100
2a	Semester fees: a) Tuition Fees (for SAARC Countries US \$ 1000)	US \$ 2000	US \$ 2000
2b	Other fees	US \$ 65	US \$ 65
4	Hostel Fees	Rs. 17594	Rs. 17594
5	Institute/Library caution Deposit	Rs. 2000	Rs. 2000

## 8. RESEARCH AREAS

### 8.1 Aerospace Engineering Department :

Aerodynamics: Subsonic, Transonic, Supersonic, Hypersonic, Rarefied Gas flows (Theoretical and Experimental), Boundary Layers and Stability of Flows, Turbulent Flows, Shock Tubes and Related Problems, Development of Algorithms and Code for Numerical Methods in Gas Dynamics and Computational Fluid Dynamics, Vortex Dynamics, Supersonic Mixing and Combustion, Optical Flow Diagnostics.

Aircraft Structures: Finite Element Methods, Numerical Methods, Photo Elasticity, Moire and Holographic Methods of Structural Analysis. Composite Structures, Fatigue and Fracture Mechanics, Contact Mechanics, Vibrations and Impact Mechanics.

Aerospace Propulsion: Rocket Propulsion and Solid Propellant Combustion, Airbreathing Propulsion and Combustion, Cascade Flows, Multiphase Flow Simulation, Combustion Instability, Optical Flow/Combustion Diagnostics.

Dynamics and Control : Nonlinear Dynamics in Aerospace Applications, Computational Methods in Nonlinear Dynamics, Nonlinear Control Theory and Applications, Flight Simulations and Controller Development, Design Development of Autonomous Flying Vehicles.

### 8.2 Applied Mechanics Department :

Plates and Shells, Finite and Boundary Element Techniques, Experimental Stress Analysis including Holography, Image processing techniques, Digital Photo Mechanics, Fatigue of Materials, Fracture Mechanics, Reliability of Structures, High Temperature Design, Composite Structures, Plasticity, Smart Materials and Structures, Constitutive Modelling, Granular Materials, Biomaterials, Fluid Mechanics, Aerodynamics, Stability, Transition, Turbulence, Turbulence Modelling, Turbulent Convection, Computational Fluid Dynamics (CFD), Bluff body and Industrial Aerodynamics, Fluid Structure interaction, Cardiovascular System studies, Image and Signal Processing, Speech Signal Processing, Ultrasound and Laser instrumentation in Medicine, Biomechanics, Rehabilitation Engineering, Evoked Response and Functional Electrical Stimulation.

### 8.3 Biotechnology Department :

Cellular, Molecular and Structural Biology relating to Signal transduction, Lipid Trafficking, Stem cell proliferation etc., Protein crystallography and structure prediction; Drug design and QSAR. Bioorganic Chemistry; Biotransformations; Enzymes in Organic synthesis; Biosensors; Environmental Biotechnology Bioremediation; Green Chemistry;

Biochemical Engineering, Bioreactor Modelling; Reactive Oxygen species in Bioreactors; Recombinant Systems Cloning of Therapeutic Proteins and Large scale Production;

Industrial Microbial Processes; Plant tissue and Animal cell Culture; Downstream Processing; Protein Refolding.

Bioinformatics and Computational Biology; Biomedical Engineering Biomechanics; Biomaterials; Computational Neuroscience; Molecular Genetics of Plant Development.

#### **8.4 Chemical Engineering Department:**

Chemical reaction engineering and thermodynamics, transport processes, process design and control, environmental engineering, polymer science and technology, semi-conductor materials processing, and particle technology.

Fundamental studies: Mathematical modeling of physico-chemical phenomena. Applied statistical mechanics, thermodynamic property estimation, phase equilibria. Flow visualisation using lasers, Microwave assisted thawing. Drying, multicomponent boiling and condensation. Simultaneous heat and mass transfer processes.

Modeling of processes and equipments: Hydrodynamic and kinetic studies of turbulent bed contactors, trickle beds, slurry reactors, fast and inverse bed fluidized beds. CFD analysis of process equipments. Advanced separation processes such as reactive and azeotropic distillation, membrane processes. Modeling of rotary kilns, crushing and grinding equipments, fluid energy mills of Microelectronic fabrication techniques.

Development, characterization and processing of materials: Development of polymer blends and composites, polymer based nano-composites. Rheology of polymers and colloids; damping and vibration isolation using polymers. Enzyme design and engineering, protein engineering and production of recombinant proteins.

Process design and control, systems engineering: Advanced control design such as adaptive control, intelligent control, non-linear control, fault diagnosis and fault tolerant control. Synthesis and optimization of process systems; statistical data processing. Simulation and optimization of crushing and grinding circuits.

Environmental engineering and waste reduction: Liquid and solid waste treatment, air pollution monitoring and control, toxic and hazardous waste management, environmental risk assessment, colour removal from waste water. Recycling of mixed plastic waste.

#### **8.5 Chemistry Department:**

Analytical Chemistry, Bioinorganic Chemistry, Chemistry of Main Group Elements, Inorganic Heterocycles, Materials Science, Synthetic and Structural Solid State Chemistry, Nanomaterials, Cage and Cluster Chemistry, Synthetic Organometallic Chemistry, Metalloboranes and Metallocarboranes, Supramolecular Chemistry

Organic Synthesis, Natural Product Synthesis, Organometallics, Asymmetric Catalysis, Synthetic and Structural Carbohydrate Chemistry, Bioorganic Chemistry, Enzymes in Organic Synthesis, Medicinal Chemistry, Physical Organic Chemistry, Organic Photochemistry

Homogeneous and Heterogeneous Catalysis, Surface Chemistry, Theoretical and Experimental Electrochemistry, Photochemistry, Polymer Chemistry and Applications, Gas-phase Kinetics, Monolayers and Clusters, Green Chemistry, Host-Guest Chemistry, Reaction Mechanisms, Excited State Photophysics, Energy Systems, Superconductors, Nanoclusters and Nanophases, Colloid and Interface Science Chemical Physics, Quantum and Theoretical Chemistry, Chemical Reaction Dynamics, Theoretical and Experimental Spectroscopy, Magnetic Resonance Spectroscopy and Imaging (especially NMR based), Fluorescence Spectroscopy, Nuclear Spectroscopy, Statistical Mechanics, Molecular Dynamics.

## **8.6 Civil Engineering Department :**

**Building Technology & Construction Management Division:** Technology of Construction Materials, High Performance Concrete, Repair and Rehabilitation of Constructed Facilities, Accelerated and unreinforced / reinforced Masonry, Disaster-Resistant Construction. Functional Performance of Buildings, Energy Efficiency of Buildings, Noise Control in Buildings, Acoustical Modelling, Environmental Noise Control. Construction Project Management, Project Scheduling and Control, Resource Management, Quality Management, Contracts, Productivity, Constructability, Schedule Compression, Risk Modelling in Projects, PPP for Infrastructure Development, Computer Applications in Construction, Geographic Information Systems.

**Geotechnical Engineering Division:** Strength and Deformation Behaviour of Soils, Expansive Soils, Soil Dynamics and Earthquake Engineering, Pile Foundations, Soil Stabilization, Stone Columns, Reinforced Earth, Geosynthetics, Environmental

Geotechnics and Waste Disposal, Computer Methods in Geotechnical Engineering, Soil Structure Interaction, Reliability Methods.

**Environmental and Water Resources Engineering Division:** Water Resources Systems Analysis, Design and Management for Water Supply, Irrigation, Drainage, Hydropower, Flood Control, Droughts. Surface and Ground Water Hydrology, Stochastic Hydrology, Physical and Numerical Modelling. Use of Finite Difference, Finite Element and Boundary Element Methods. Instrumentation and Monitoring of Hydraulic Systems, Computer Simulation and Optimization of Hydrosystems. Evolutionary Computing Applications, CAD, Decision Support and Expert Systems in Water Resources Engineering. Environmental Hydraulics, Water Quality Modelling, Industrial Waste Water Treatment, Hazardous Waste Management, Environmental Systems Analysis, Environmental Micro-

Biology, Bioremediation, Air quality and Solid Waste Management, Environmental Biotechnology, Water and Wastewater Treatment.

**Structural Engineering Division:** Experimental and Theoretical Study of Reinforced Concrete, Prestressed Concrete and Metal Structures, Plates & Shells, Thin Walled Members, Advanced Fibre Composite Members, Structural Dynamics and Impact Behaviour, Structural Stability, Structural Reliability, Smart Structures, Earthquake Resistant Design and Retrofit of Reinforced Concrete Structures, Bridges, Tall Structures, Structures for Power Plants, Finite Element Analysis of Linear and Non-Linear Structural Systems, Structural Optimization, Computer Aided Structural Analysis and Design, Expert Systems and Artificial Intelligence Applications in Structural Engineering.

**Transportation Engineering Division:** Inter-City and Regional Transportation, Urban Transportation Planning, Travel Demand Analysis, Traffic Management, Operations and Safety; Public Transportation Planning, Operations and Management; Planning of Pedestrian and Bicycle Facilities, Intelligent Transportation Systems (ITS), Applications of GIS, Simulation Tools, Advanced Techniques and Decision Support System, Optimization, Transportation Economics; Constitutive Modelling of Asphalt, Modified Asphalt and Asphalt Mixtures; New and Innovating Materials in Pavement Construction; Analysis of Layered Structures, Design of Flexible and Rigid Pavements; Geo-synthetics in Pavements and Pavement Overlays; Pavement Management Systems; Rural Roads Planning, Design, Performance Evaluation and Maintenance Management; Low Cost Road Construction, Socio-economic Benefits Evaluation of Rural Road Projects.

#### **8.7 Computer Science and Engineering Department :**

Automata theory and Formal languages, Analysis of algorithms, Graph theory, Unconventional Methods of Computing, Cryptography.

Software Engineering, Object Oriented Systems, Parallel and Distributed systems, Mobile Computing, Programming languages, Performance evaluation.

Software for VLSI design, Computer architecture, Computer graphics and Visualization.

Computer Communication and networks, Network Protocols and security, Real-time systems, Wireless Sensor Networks.

Data bases, Knowledge based systems, Data mining, Artificial intelligence, Machine learning, Indian language systems, Speech and vision systems, Artificial neural networks.

#### **8.8 Electrical Engineering Department :**

**Communication Systems:** Multi-access Wireless Communication Networks, Modulation and Coding, Digital Signal Processing, Audio and Video Signal Compression, Image Processing and Computer Vision, Speech Processing, Computer Networks, Optical Communication, Optical Networks, Optical Sensors and Components, Optical metrology Computational Electromagnetics.

**Control:** Control Theory - Linear and Nonlinear, Robotics, Vision, Sensing, Digital Control of Systems, Simulation of Systems, Control Systems Design, Servomechanisms and Micromachines, Electronic and Control Instrumentation.

**Electrical Drives and Power Electronics:** Power Electronic Converters, Vector Control/Direct control /Torque Control of Motors, Simulation of PE systems, DSP Applications, Permanent Magnet Machines and Special Machines.

**Instrumentation:** Power Systems Instrumentation - Partial discharge measurements - Modeling and Simulation-Transducers-Signal conditioning-Optical methods for Bio-Medical Instrumentation - Virtual Instrumentation. Signal Processing applications in Instrumentation - Telemetry.

**Microelectronics:** Modeling, Simulation, Fabrication and Characterization of Silicon-on-Insulator (SOI) based Devices, Power MOSFETS, HEMTS, Compound semiconductor Devices, Polysilicon and Amorphous Silicon Thin Film Transistors: ultra-thin and high-k gate dielectric and small geometry devices. MEMS based sensors and actuators, BioSensors, photonics.

**Power Systems and High Voltage:** Power System Optimization and Economics, Energy Management Systems, Power system automation, Flexible AC Transmission Systems (FACTS), Restructured Power System Operation, Power Quality.

High Voltage Engineering, Insulation Coordination, Treeing and Tracking Phenomena in insulation material, Condition Monitoring of Power Apparatus Using Multi-Fusion Sensors, Production of Nanoparticles, Sterilization of Liquid Foods.

**VLSI Design:** Analog and RF circuit design, Digital Systems including Architectures for Image Processing and Vision, CAD for Digital and Analog Circuits, Reconfigurable Computing.

## **8.9 Engineering Design:**

Automotive Engineering : Vehicle Dynamics, Tyre Mechanics, Automotive Systems and Control & Fault Diagnosis

Robotics: Parallel manipulators, Underwater Robots, Path Planning, System Dynamics and Control

- CAD/CAM: Geometric and Solid Modeling, Computational Geometry, Shape Search, Shape Optimization, Reverse Engineering and Image based Reconstruction, Solid Free Form Fabrication

- Finite Element Analysis • Biomedical Design: Medical Imaging, Biomechanical Modeling, Soft tissue Mechanics, Biofluid Mechanics, Prosthetic and Scaffold Design

- Ergonomics

- Design Theory, Reliability, Fatigue and Fracture

#### **8.10 Humanities & Social Sciences Department : Ph.D**

British, American, Common Wealth Literatures; New Literatures in English; Linguistics; Socio-linguistics; Philosophy of Language and Continental Philosophy; English Language Teaching (ELT); German Studies; German Language and Literature, German and European Studies, Comparative Studies, Political Philosophy; Modern Indian History (History of Science, Religion & Modern Science, Socio-Economic and Cultural Developments); Economics (Macro-monetary Economics, International Trade and Finance, Applied Economics/Econometrics, Development Economics, Health Care Economics, Environment and Health); Sociology; Science and Technology Policy Studies; Environment and Natural Resources Policy; Development Studies.

#### **8.11 Department of Management Studies :**

Production and Operations Management; Supply Chain Management; Logistics Management; Financial Management; Financial Engineering; Business Policy/Strategic Management; Marketing Management; Organisational Behaviour; Personnel Management and Industrial Relations; Public Systems Management; Information Systems and Interdisciplinary Research.

#### **8.12 Mathematics Department:**

Functional Analysis, Operator Equations, Inverse problems, Fixed Point Theory, Differential Equations, Special Functions, Complex Analysis, Non-linear Analysis, Harmonic Analysis and Wavelets, Fractals. Fuzzy sets Theory and Applications, Summability Theory, Algebra, Communication and Coding Theory, Numerical Analysis, Numerical Linear Algebra, Fluid Mechanics, Computational Fluid Dynamics, Mathematical Physics, Mathematical Modelling, Applied Probability and Stochastic Processes, Queuing Theory, Inventory Control, Reliability, Computer Modelling and Simulation, Theoretical Computer Science Complex Theory, Algorithms, Database, Theory of Programming.

#### **8.13 Mechanical Engineering Department:**

##### **(i) Design Engineering:**

Machine Elements: design development, analysis and performance improvements; New materials and design: composites, nano composites, bio materials, surface engineering, contact mechanics, tribology, tyre mechanics, biomechanics, fatigue and failure analysis: computational and experimental fracture mechanics, fatigue crack closure - environment interaction studies, alternate/small specimen test methods, small crack propagation under biaxial/multiaxial loading, multi crack interaction studies, fatigue damage in composites, failure mechanics of biomaterials. Non linear finite element analysis, design process, design optimization, finite element applications including coupled problems, Non destructive evaluation, structural health monitoring, Materials constitutive modeling and Characterisation, Measurements of Material Properties and Behaviour, NVH, machinery signal processing,

Condition monitoring of structures/ machines, machinery diagnosis, combustion/flame noise, Acoustics and Noise Control.

**(ii) Manufacturing Engineering :**

Manufacturing Processes, Conventional and Unconventional Processes, CAD/CAM, Robotics, CNC Machining, Metrology, Surface Engineering, Computer Integrated Manufacturing, Manufacturing Methods in Precision Engineering; Microsystems technology: Micro-sensors and actuators, Embedded systems, Vehicle controls; Robotics: Series and parallel configuration, Networked robots, Under water, space and medical applications; Fluid power technology: Electro-hydraulic servo-valves, Hybrid hydraulics, System Simulation and Modeling; Precision manufacturing; Design, Development, Modeling and Simulation of Unconventional, Micro and Nano Machining Systems.

**(iii) Thermal Engineering:**

Heat Transfer in Nano-fluids, Heat Transfer in Multi-Phase Flows, Heat Exchangers, transition to turbulence, Heat and Mass Transfer in Fuel Cells, Biomass combustion, Fluidized Bed Combustion, Advanced Coal Power Plants, Solar Power Systems, Optimization of Solar ICs Systems, Concentrating Solar Power, Thermal Photovoltaic systems The Heat Transfer in Phase Change Material Based Composite Heat Sinks, Experimental and Numerical Methods in Porous Media, Bio-thermo fluids, numerical modeling of heat transfer in biological systems, Conjugate heat transfer in low and high speed flows, Optimization of heat transfer systems, Inverse heat transfer, Satellite Meteorology, Numerical weather prediction, Radiance Assimilation in Mesoscale Weather Models; Pico, micro and mini hydropower ; Economic choice and use of pumps; Two phase flow in pumps and turbines; Cavitation in pumps, turbines and flow devices ; Pumps using solar power; Control of hydrodynamic cavitation, and Design and development of micropumps; Flow Structure Interaction in High Speed Turbo machinery Seals,; Turbine rotor stator interaction, Performance improvement of centrifugal compressor by tip modification, subsonic cascade studies, Investigations on counter rotating turbines, volute casing and mixed flow compressors, active and passive control of turbomachinery flows, Gas turbine blade cooling; IC Engine Combustion and Emissions; Alternative fuels; Multi-component Fuels; Phenomenology and CFD of IC Engines and Gas Turbine Processes, Engine Flow and Combustion Diagnostics; engine management, Advanced IC Engine Technologies; Vapour compression refrigerators operating with new generation HFO, refrigerants and refrigerant mixtures, mixed refrigerant cascade, refrigerators, Simulation and optimization of mixed refrigerant processes, liquefaction of natural gas/bio gas, magnetic and acoustic refrigeration systems, high effectiveness compact heat exchangers used in refrigerators, air conditioners, and liquefiers, vapour absorption refrigerators operating with ionic fluids. desalination systems, solar cooling systems, IAQ (indoor air quality), jet refrigeration systems, heat pipes, heat pumps, micro-miniature and small cryogenic refrigerators, Simulation and optimization of air separation cycles, solid state hydrogen storage, sorption heating and cooling systems, Desiccant / evaporative cooling, air-conditioning and Ventilation , CFD for air distribution; Acoustics of

Supersonic Jets, Active and Passive Control of High speed flows, Combustion noise, Emissions, Combustion of solid, liquid and gaseous fuel, Propulsion, CFD of high speed reacting flows, Microfluidics, Bio-MEMS, Micro-scale flows.

**8.14 Metallurgical & Materials Engineering Department:**

Metal casting, Metal forming, Metal joining, Materials Technology, Physical and Structural Metallurgy, Mechanical Metallurgy, Chemical Metallurgy, Thermodynamics of Metallurgical Systems, Powder Metallurgy, Ceramics and Composites, Corrosion, Surface Engineering, Biomaterials, Simulation and Modelling of Materials Processing, Nanostructured Materials, Magnetic Materials, Amorphous Alloys, Non-equilibrium Processing, Hydrogen Storage Materials, Smart Materials, Fuel Cells, Metallic Foams, Chemical Sensors, Carbon Nanotubes, Special Steels, Superalloys, Intermetallics, Materials for Optoelectronic Applications, Shape Memory Alloys, Fatigues and Fracture Mechanics, High Temperature Behaviour of Materials and Creep, Superplasticity and Superplastic Forming.

**8.15 Ocean Engineering Department :**

Petroleum Engineering , Ocean Hydrodynamics, Ship hydrodynamics, Dynamics of Floating systems, Ocean Structures, Coastal processes, Marine Geotechnical Engineering, Materials for marine Environment, Ocean Energy.

**8.16 Physics Department :**

Applied Optics, Quantum Optics, Photonics and nonlinear optics, Atomic and Molecular Physics, Complex fluids, Dynamical systems, Statistical physics and field theory, Low temperature physics and superconductivity, Magnetism and Magnetic materials, Hydrogen Storage Materials, Microwaves and Dielectrics, Semiconductor Physics, Photovoltaics, Solid State Ionics and molecular electronics, Thin film phenomena, X-ray diffraction and Amorphous systems, Spintronics and Diluted Magnetic Semiconductors, Condensed Matter Physics/Magnetism in Oxides/Magnetic Materials, Electronic structure of solids/Computational material science, Nonlinear Dynamics, Quantum Chaos, Quantum Information, Metal-oxide Thin films, Nanostructured thin films and heterostructures by PLD.

## Centres:

### 8.17 Sophisticated Analytical Instrument Facility (SAIF) :

Nanomaterials, Clusters, Self Assembled Monolayers, Chemistry of Ions, Surface Chemistry, and Chemistry of ice surfaces. Bioactive ceramics, Surface science aspects of biomaterials host interface, nano composites, Crystal Twinning, Molecular structure of natural products and biomolecules. Photophysical Chemistry, Fluorescence Spectroscopy.

### 8.18 Interdisciplinary Research Areas:

Biotechnology, Chemical Physics and Molecular Biology, Communication Technology, Complex Systems, Computational Engineering, Development Studies, Energy Technology, Environmental Technology, Infrastructure Technology, Instrumentation and Control, Materials Technology, Measurement, Testing and Diagnostics

## 9. AMENITIES IN THE CAMPUS

### 9.1 Accommodation:

IIT Madras is a residential institute and provides on-campus accommodation to all students, faculty and staff. For the students, there are 17 Hostels. Accommodation in the Hostels is provided by the Chairman, Council of Wardens. The hostel rooms are furnished with a cot, a chair and a writing table. Students are expected to bring their own bedding. Establishment fees covers the rent for hostel accommodation. (vide section 3.5 for fees and deposits)

Students residing in the hostels are provided with exclusive dining facility. This covers, breakfast, lunch, evening coffee/tea and dinner. The menu for these is decided by an elected student body.

Each hostel has

- (i) A small library for the exclusive use of the students of that hostel. The hostel library is normally stacked with books for general reading and story books. The hostel library is maintained by the student body of the hostel.
- (ii) A common room for recreation. The common room is provided with a Television, News papers and selected magazines (decided by the student body)
- (iii) Limited sports facility such as table tennis, volley ball / ball-batmiton courts etc.,

A Guest House provides accommodation for visitors to the Institute faculty, staff and students.

### **9.2 Transport:**

Campus wide transport is provided by battery operated mini-buses.

### **9.3 Shopping:**

The campus has two shopping centres catering to the needs of the students, faculty and staff. The shopping centre in the hostel zone hosts a xerox shop, a stationery shop, patisserie shop, gift articles shop and a telecom centre. The shopping centre in the residential zone hosts grocery shops, vegetable / fruit stalls, stationery shop and a bookshop.

### **9.4 Sports Facility:**

The Institute has play fields for football, hockey, cricket, volleyball, tennis and a skating ring. A modern Gymnasium, indoor courts for shuttle and volleyball and a beautiful swimming pool are the pride of Institute sports facility.

### **9.5 Medical Facility:**

A full-fledged hospital with 20 beds takes care of the medical needs of the students, faculty and staff. All students of Institute are registered with the hospital and are also covered by a Medical Insurance scheme. Apart from general practitioners, services of leading specialists (on part-time basis) are provided by the hospital.

### **9.6 Banks:**

Two banks, namely State Bank of India and Canara Bank operate branches within the campus. ATM's of SBI and ICICI are housed near the hostels.

### **9.7 Other Amenities:**

A post office and a BSNL telecom centre are also available on campus.

There are four restaurants, two in the Institute zone and two in the hostel zone, catering to the needs of all iitians.

## Important Dates

- Registration of Application forms ... 22.09.2013  
will be open on
- Last date for Registration of .. 20.10.2013  
application through on-line
- Interview and or Test [on or .. 18.11.2013 to  
before]\* 25.11.2013
- Date of Joining will be announced  
later

*\* Intimation on interview and/or test indicating the date of interview will be given by the respective Departments.*

**[To be submitted at the time of the Interview]**

**DATA SHEET FOR Ph.D / M.S ADMISSION**

(TO BE FILLED BY CANDIDATES)

**Ph.D**

**M.S**

(Please put a tick (✓) mark)

1. Name

(If the boxes provided are not sufficient,  
Shorten your name)


2. Category Applied for

HTRA	Non-HTRA	External	Project	Staff	Sponsored	CSIR	Part-Time
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3. Department

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4. Age as of last date of the receipt  
of Application form in IITM

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5. Date of Birth

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6. Email ID

: \_\_\_\_\_

7. B.Tech./B.E./B.Sc.(Engg)/M.A./ M.Com./ M.Sc./AMIE. Etc.,

(a) University  
(Shorten the name if boxes  
are not sufficient)

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(b) Year of passing

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(c) Aggregate Marks  
(Provide one Box also for point)

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(d) GATE Score  
(Provide one Box also for point)

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(e) UGC-JRF-Lectureship/CSIR Fellowship  
holder (state validity date)

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8. Category SC / ST/ GN / PH

SC ☐ ST ☐ GN ☐ PH ☐

9. M.Tech/M.Sc.(Engg.)/M.E/M.Sc./M.S./M.A./M.Com./M.B.A

(a) University  
(Shorten the name if boxes  
are not sufficient)

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(b) Year of passing

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(c) Aggregate Marks  
(Provide one Box also for point)

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(d) If result awaited fill up the boxes as R A

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10. Experience in years as of April /Oct.

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11. No. of Publications

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To be filled in by office :

Reg. No: .....

Ph.D

☐

M.S

☐

[To be submitted at the time of Interview]

**Admission to Ph.D/M.S programme under  
External / Part – time Registration Scheme at IIT Madras**

**Proforma for Relief Certificate**

**Shri/mt/Kumari .....**  
*employed as ..... is granted  
leave for 20 weeks (140 days) commencing from ..... to  
..... and is relieved of his/her duties with effect from .....  
to ..... to enable him/her to pursue M.S/Ph.D. Research programme  
under External / Part – time Registration Scheme in July / Jan..... semester  
at the Indian Institute of Technology Madras, Chennai - 600036 as per their offer  
of admission letter No..... dated .....*

Date :

Signature of the Officer with name  
and address of the Organisation

Office Seal

**[To be submitted at the time of Interview]***Certificate from the Employing Organisation***For external registration of their employees in Ph.D / M.S programme of IIT Madras**

The application of ..... working as .....  
 ..... in ..... since ..... is  
 herewith recommended and forwarded for admission under External Registration  
 Scheme of the Indian Institute of Technology Madras for Ph.D/M.S Research  
 programme in the Department of .....

1. This organization has adequate facilities for carrying out the research indicated by the applicant and if he/she is selected, these will be made available to him/her during regular working hours till the completion of the programme.
2. The applicant will be deputed/given leave for duration of his/her residence period at IIT Madras. The applicant is working with in the commutable distance from IIT madras and he/she will be given permission to attend the required class for completing course work. *(strike out what ever not applicable)*
3. Facilities will be made available to the Co-guide to supervise the work of the applicant and to attend the meetings at IIT Madras when necessary.
4. Till the completion of his/her research programme, the applicant will not ordinarily be transferred to another unit or place which may impede his/her work under the scheme. If such a transfer is necessary, IIT Madras will be informed within a month of such transfer. We understand that continuing of registration will depend on IIT's decision in this regard, taking into account all relevant factors.
5. We note that the facilities of the Institute will be made available to him/her for carrying out the work and that there will be no separate charge (other than tuition fees payable by the candidate) for the use of laboratory, library and other facilities.
6. No part of the work carried out in fulfillment of the Research programme will be utilized commercially or for applying for a Patent without the approval of Indian Institute of Technology Madras and other than on terms mutually agreed to by IIT Madras and this organization.

Date:

Signature of the Officer :

Seal of the organization/  
Institution

Name and Designation :

Postal address of the Organisation :

Certificate from the reputed University / Institution/ Organization sponsoring their employees For Ph.D / M.S programme of IIT Madras-Part-time scheme

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The application of ..... working as .....  
..... in ..... since ..... is  
herewith recommended and forwarded for admission under External Registration  
Scheme of the Indian Institute of Technology Madras for Ph.D/M.S Research programme  
in the Department of .....

1. The applicant has 2 year / 5 year(in the case of management area) experience in the organization.
2. We note that facilities of the IITM will be made available to him/ her for carrying out the research work under the supervision of a guide and he/ she has to pay full fees every semester for the use of laboratory, library and other facilities of the Institute.
3. This organization facility will also be made available to him/ her in the case of selection.
4. The applicant will be deputed/given leave for duration of his/her residence period at IIT Madras. The applicant is working with in the commutable distance from IIT madras and he/she will be given permission to attend the required class for completing course work. *(strike out what ever not applicable)*
5. Till the completion of his/her research programme, the applicant will not ordinarily be transferred to another unit or place which may impede his/her work under the scheme. If such a transfer is necessary, IIT Madras will be informed within a month of such transfer. We understand that continuing of registration will depend on IITM's decision in this regard, taking into account all relevant factors.
6. No part of the work carried out fulfillment of the Research programme will be utilized commercially or for applying for a Patent without the approval of Indian Institute of Technology Madras and other than on terms mutually agreed to by IIT Madras and this organization.

Date:

Signature of the Officer :

Seal of the organization/  
Institution

Name and Designation :

*Postal address of the Organisation*

[To be submitted at the time of Interview]

### Particulars of Co-guide for external Registration Scheme

In addition to being in a position to ensure technical and logistic support to the scholar in his/her research work in the organization, the Co-guide must have a minimum academic qualification of a Master's degree in Engineering/Management or Ph.D. in Science and adequate professional experience in the relevant field. The Co-guide should not himself be a scholar working for any higher degree of any university. He will be an invitee to the Doctoral Committee/General Test Committee meetings at IIT Madras.

(1) Name of proposed Co-guide :  
(in block letters)

(2) Academic qualifications of Co-guide :

(3) Membership of Professional Societies of :  
Co-guide

(4) Designation of Co-guide :

### Certificate of Co-guide

This is to state that in the event of  
Mr/Ms. \_\_\_\_\_ of this organization being  
selected for Ph.D / M.S programme in the Department of  
\_\_\_\_\_ under the External Registration  
Scheme of IIT Madras, I agree to be his/her Co-guide and shall extend all possible  
facilities to enable him to carry out his research programme towards the submission of  
thesis.

Date:

Signature of Co-guide

**Admission to Ph.D / M.S programme under Project Scheme at IIT Madras**

**Certificate from the Project Co-ordinator**

I have noted the conditions stated below concerning the registration of project staff for Ph.D / M.S programme.

This is to certify that Sri/Smt/Kum \_\_\_\_\_ is working in the project title \_\_\_\_\_ since \_\_\_\_\_ as \_\_\_\_\_. The candidate is eligible to continue in the project for a minimum period of one more year from the date of his/her joining the research programme (Ph.D / M.S) even though his/her appointment is upto \_\_\_\_\_ as per his/her appointment order. The actual duration of the project is upto \_\_\_\_\_.

**Conditions:**

1. For a person employed on a project to be eligible for Ph.D/M.S registration, there should be a minimum residual period of one year's service in the project from the date of registration.
2. Where qualification in an All-India Examination like CSIR/UGC/GATE is also a requirement for registration, persons who are employed on projects and who do not satisfy this requirement on the date of application, can be considered for provisional registration for Ph.D / M.S programme provided, they have at least 2 years residual service on the project and to get qualified in the national level examination within a year securing common cutoff score.
3. Person employed on a project can apply for admission to M.S. programme with a minimum project experience of six months without valid GATE score subject to qualifying in selection procedure (interview / written examination) of the concerned department. They will not be eligible for HTRA until they qualify in the GATE examination. The scholars may seek conversion from project to HTRA provided they qualify in GATE with the minimum cut-off prescribed for the selection of scholars admitted in his/her batches.

Date:

Signature and name of the Project Coordinator

Department of \_\_\_\_\_

Countersigned:

Date:

Head of the Department of \_\_\_\_\_