

Indian  
Institute of  
Technology  
Bombay

**Information Brochure**

**M.Tech.**

**2009-2010**

## Important Information:

1. Please read the instructions given in the brochure carefully before you start filling up the application form. (please refer to page no. 17 to 22 of this brochure)
2. Online application form is available on the Institute website [www.iitb.ac.in/ admissions](http://www.iitb.ac.in/admissions). Candidates are advised to submit their application ONLINE.
3. Application form & Information Brochure is also available on the Institute website. You may download the same from the Institute website.
4. Application form & Information Brochure can also be obtained in person/sending a DD of the required amount from/to the Academic Office, IIT Bombay.
5. Along with the Application form, candidates are provided with the following.
  - i. Information Brochure, ii. Statement of Purpose (SoP) (to be submitted only if you are applying for Aerospace Engineering Department / CTARA )
6. The cost of the application is Rs. 300/- for GN/OBC-NC/PC category(150/- for SC/ST) candidates, which is to be paid in the form of Online Payment System/Demand Draft.
7. Each applicant should submit only One Application Form. If more than one applications forms are submitted then only one application form will be considered and in that case Institutes' choice will be final and binding on the applicant.
8. If you want to apply for more than one Department / Centre / School / ID group then you must submit the corresponding number of sets of photocopies of the completed application form along with the all the enclosures properly arranged and stapled.
9. Please note that, if you do not provide sufficient number of copies then you will be considered only for the Department / Centre / School / ID group for which the copies are provided.
10. The duly filled application form along with the necessary enclosures and the demand draft (of the required amount) is to be sent in a big size envelope (27 cm X 20 cm), without folding superscribing on the top 'Application form for M.Tech. Programme', to the following address: **Deputy Registrar (Academic), Indian Institute of Technology Bombay, Powai, Mumbai – 400 076.**
11. The application without payment of the cost of the application form (Online payment/ Demand Draft) will not be entertained.
12. Candidates are instructed to check the Institute website [www.iitb.ac.in/ admissions](http://www.iitb.ac.in/admissions) for result/important announcements.
13. Candidates are also instructed to check their email address (provided in the application form) for all important communications and announcements.
14. OBC candidates must note that the limit of annual income of Rs. 2.5 lakhs has been raised to Rs. 4.5 lakhs for determining the creamy layer among Other Backward Classes (OBCs) candidates.
15. All candidate must note that utilizing and maintaining of any motorized vehicle on the Institute campus is strictly prohibited.
16. For information and communication please refer/contact, Website: [www.iitb.ac.in/admissions](http://www.iitb.ac.in/admissions)  
E-Mail address: [pgadm@iitb.ac.in](mailto:pgadm@iitb.ac.in), Telephone: 022 - 2576 4008/7066/7042,  
Fax : 022 – 2576 4041.

### IMPORTANT NOTE :

As per the directives received from the Hon'ble Supreme Court, if any incident of ragging comes to the notice of the authority, the concerned student shall be given liberty to explain and if his explanation is not found satisfactory, the authority would expel him from the institution.

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## IMPORTANT DATES (TENTATIVE)

	Online	Offline
01. Issue of Application forms begins	March 16, 2009	March 30, 2009
02. Last date for issue of application forms	April 15, 2009	April 6, 2009
03. Last date for submission of completed application forms :	April 15, 2009	April 15, 2009
04. Declaration of result of short listed candidates called for written test and or/ interview	May 05, 2009	
05. Direct Admissions on the basis of only GATE score for <u>TA/RA category</u> (GN, OBC & PC candidates) (AE, CL, CE, CS, EE, ME & IEOB) (No Test/Interviews)	Result Announcement	Last date for payment of fees
	1 <sup>st</sup> offer	May 05, 2009
	2 <sup>nd</sup> offer	May 25, 2009
	Final offer	June 15, 2009

### 05 Tentative Dates for Written Test and or /Interview

#### (i) Dates for the Written Test followed by Interview for all categories

( i.e TA/TAP/RA/PA/PS/IS/SF/SW etc.)

Energy Science & Engg.	May 12, 2009
Industrial Engineering & Operations Research (IO)	May 11, 2009
School of Biosciences & Bioengineering (Biomedical Engg.) (SBB)	May 12, 2009
Systems & Control Engg.	May 12, 2009
Center for Technology Alternative for Rural Areas (CTARA)	May 13 & 14, 2009

#### (ii) Dates for the written Test followed by Interview for sponsored categories

(SW, IS, PS, etc)

For all Departments/ Schools/ Centres/ID except IO, SBB,CTARA for which dates are same as fixed )for TA/RA etc. categories as mention against (i) above.	May 12, 2009
Energy Science & Engg. (EN)	May 13, 2009
Computer Science & Engg. (CS)	May 25, 2009

#### (iii) Admissions on the basis of Interview for Non-sponsored categories (ie. TA/RA etc.)

Aerospace Engg.	May 12 & 13, 2009
Civil Engg.	May 12 & 13, 2009
Earth Sciences	May 12 & 13, 2009
Electrical Engg.	May 12 & 13, 2009
Mechanical Engg.	May 12 & 13, 2009
Met. Engg. & Mat. Sci. ( including CO)	May 13, 2009

Energy Science & Engg.	May 13, 2009
Industrial Engineering & Operations Research (IO)	May 12 & 13, 2009
Systems & Control	May 13 & 14, 2009
CESE	May 13 & 14, 2009
CSRE	May 13 & 14, 2009
CTARA	May 13 & 14, 2009
School of Biosciences & Bioengineering (SBB) (Biomedical Engg.)	May 12 & 13, 2009

### 6. Declaration of Result for Written Test/Interview and last date for payment of fees

	Result Announcement	Last date for payment of fees
1 <sup>st</sup> offer	May 26, 2009	June 9, 2009
2 <sup>nd</sup> offer	June 11, 2009	June 23, 2009
Final offer	June 26, 2009	July 7, 2009

- Results will be declared on IIT [website:www.iitb.ac.in](http://www.iitb.ac.in) admissions on the tentative date as mentioned above. Candidates are instructed to check the web site regularly for all updates. Candidates are also instructed to check their email address (provided in the application form) for all important communications and announcements.
  - All applicants appeared for interviews are requested to check the result on Institute website on above date.
  - Intimation will be sent through courier/speed post. However, the Institute will not be responsible for postal delays, if any.
  - Payment of fees through Demand Draft only drawn in favour of Registrar, IIT Bombay, payable at State Bank of India, IIT Powai OR Canara Bank, IIT Powai branch. You must write your Name, Department and Email ID on reverse side of the Demand Draft. The Draft may be submitted in person to Academic Office or sent by post / courier to The Deputy Registrar (Academic), IIT Bombay, Powai, Mumbai –400 076.
7. **Registration and Orientation Programme July 16, 2009 to July 17, 2009**
8. **Instructions begins July 22, 2009**

***Ps: Interviews for candidates having University Examination on above dates may be conducted only on Sunday, the 17<sup>th</sup> May 2009, with prior permission of concerned Head of the Departments. Such candidates are advised to directly contact respective Head of the department with certificate from the Director/ Principal/ equivalent competent authority of their College/Institute last attended for the same.***

Seats are reserved for Other Backward class- Non-Creamy layer(OBC-NC)/Scheduled Caste (SC) / Scheduled Tribe (ST) /Physically Challenged (PC) category, as per Government of India rules.

IIT B.Tech. students getting a (CGPA / CPI) score of 8.00 and above (on a scale of 10) are exempted from requirement of GATE clearance. They are admitted to M.Tech. Programme through normal procedure for selection of candidates for TA positions, as per rules.

### Important Dates for SC/ST Candidates

Candidates under Reserved Categories (Scheduled Caste/Scheduled Tribe) do not have Written Test or Interview. They are admitted directly solely on the basis of their GATE score.

<u>Declaration of Result for Direct Admission</u>	<u>Result Announcement</u>	<u>Last date for payment of fees</u>
1 <sup>st</sup> Offer	May 08, 2009	May 20, 2009
2 <sup>nd</sup> Offer	May 22, 2009	May 27, 2009
3 <sup>rd</sup> Offer	May 29, 2009	June 10, 2009
4 <sup>th</sup> Offer (If required)	June 12, 2009	June 24, 2009
5 <sup>th</sup> & Final Offer (If required)	June 26, 2009	July 08, 2009

### **A) GENERAL**

#### **1) THE INSTITUTE**

The Indian Institute of Technology Bombay (IIT Bombay) is one of the seven higher Institutes of Technology in the country set up with the objectives of making available facilities for higher education, research and training in various fields of Science and Technology. IIT Bombay established in 1958.

The Institute is located at Powai in a campus extending over 220 hectares amidst picturesque surroundings with Vihar and Powai lakes on either side.

At present, Undergraduate, Postgraduate and Doctoral programmes are offered by Aerospace Engineering, Chemical Engineering, Civil Engg., Computer Science and Engineering, Earth Sciences, Energy Science & Engineering, Electrical Engg., Mechanical and Metallurgical Engineering and Materials Science Departments and by certain Interdisciplinary groups. The Industrial Design Centre of the Institute offers a 2-year M.Des. Programme in Industrial Design, Visual Communication, Animation and Interaction Design and Ph.D. Programme in Design. M.Sc. and Ph.D. programmes in Applied Geology, Chemistry, Mathematics, Physics, M.Sc. Programme in Applied Statistics and Informatics are offered by the respective Departments. The Department of Physics also offers 4-Year B.Tech. Programme in Engineering Physics. The Institute has a Humanities and Social Sciences Department, which offers doctoral programmes and 2-years M.Phil programme. The Centre for Studies in Resources Engineering (CSRE) offers two year M.Tech. Programme in Natural Resources Engineering. The Department of Physics and Energy Science and Engineering are also offering M.Sc.-Ph.D Dual degree programmes and their admissions are through JAM.

The Institute has started following new programmes from the following academic year

#### 2007-08

1. M.Tech. in Technology and Development – offered by CTARA
2. M.Tech. in Petroleum Geoscience – offered by the Department of Earth Sciences.
3. Ph.D. in Natural Resources Engineering – offered by CSRE

#### 2008-09

4. M.Tech in Steel Technology – offered by the Department of Met. Engg. & Mat. Sci.

Interdisciplinary Programmes in Industrial Engineering & Operations Research and Systems & Control Engineering offer Ph.D. & M.Tech. Programmes. The ID group of Corrosion Science & Engineering which offers M.Tech. & Ph.D. Programmes runs under Department of Metallurgical Engineering & Materials Science.

The Shailesh J. Mehta, School of Management offers a 2-year Master of Management programme and also a doctoral programme. The School of Management also conducts a wide range of courses for the Undergraduate and Postgraduate Programmes. The School of Biosciences and Bioengineering offers M.Sc. in Biotechnology, Ph.D. and M.Tech. programme in Interdisciplinary group : Biomedical Engineering.

The DIIT Programme (Post Graduate Diploma of IIT) is offered through Distance Education mode.

The Institute on an average admits 650 candidates for the Undergraduate programmes and 1050 candidates for different Ph.D / Postgraduate programmes every year. Students from Bangladesh, Egypt, Ethiopia, Fiji, Iran, Iraq, Jordan, Mauritius, Malaysia, Nepal, Palestine, Sri Lanka, Vietnam and Yemen are also undergoing training in various programmes. In addition to these academic programmes, the Continuing Education Programme (CEP Cell) organizes short, intensive courses in specialized topics both for practicing engineers as well as for teachers from engineering colleges; and also conduct seminar and conferences on current scientific and technological developments. Further, under Quality Improvement programme (QIP), teachers from various engineering colleges also join Institute for the postgraduate and doctoral programmes.

## **2) RESEARCH FACILITIES**

All the departments of the Institute have well equipped research laboratories and workshop facilities. In addition, there are a number of central facilities, which include Computer Centre, Central Library, Workshop, Xerox and Photography Sections. The Central Library has a very large collection of books, back volumes of periodicals, standard specifications and other literature. The Library now has more than 3 lakhs books and volumes and subscribes to over 1500 current journals in Science, Engineering, Humanities and Social Sciences.

The Centre for Studies in Resources Engineering (CSRE) established in 1976 by the then Ministry of Education and Social Welfare, has the facilities and infrastructure for research in the area of Natural Resources exploration and management using modern tools of Remote Sensing and Geographic Information Systems.

The Centre for Research in Nano-Technology & Science (CRNTS), is well equipped one for pursuing research in nanotechnology. Almost all sophisticated tools required for Nanotechnology research are housed here.

The Center for Environmental Science and Engineering (CESE) funded by the Department of Education, Govt. of India, is concerned with air and water quality management, computer aided design for waste water engineering systems, low waste techniques, etc.

The Department of Science and Technology (DST), Defense Research & Development Organization (DRDO) and Ministry of Human Resources Development (MHRD) of Government of India, has sponsored the setting of a National Geotechnical Centrifuge Facility (NGCF) to facilitate research in frontier areas.

The Centre for Technology Alternatives for Rural Areas (CTARA) is concerned with development, transfer and impact-assessment of technology in the context of socio-economic development of a small region. To this end, the centre offers courses (coupled with field work) to impart necessary perspectives and quantitative skills

The Industrial Design Centre (IDC), established in 1969, has followed an integrated and interdisciplinary approach towards design education. The Centre over the past years has experimented with different methods in design education to develop a flexible structure to suit the needs of students.

Schools in Cryogenics, Lasers and Laser Systems, Offshore Engineering and Management have also been established. New facilities under the Thrust Area Programmes in the fields like Microelectronics, Microprocessor Applications, Intelligent Systems, Robotics, CAD/CAM, Remote Sensing, Telematics, etc. have been created.

Centre for Aerospace Systems Design & Engineering (CASDE) and Centre for Formal Design and Verification of Software (CFDVS) have been established recently. The Institute has many research collaborations with leading universities in USA, Europe, Japan, and other East countries. As part of these collaborations, the post graduate students get opportunities to carry out joint research projects with faculty and students from these universities.

Approximately 7 to 10 M.Tech. projects will be taken up every year in collaboration with German Academic Exchange Service (DAAD) wherein students work on their projects in reputed German Universities like Aachen, Berlin, Darmstadt, Karlsruhe, Stuttgart and Dresden.

The location of IIT Bombay in close proximity to several leading R&D Centers and major industrial establishments offers excellent opportunities to interact with them and plan some of research programmes in collaboration with them. The Industrial Research and Consultancy Centre (IRCC) coordinates collaborative projects with industry and other research organizations such as BARC, TIFR and CSIR. The Institute is actively collaborating with several organizations of other countries on a bilateral basis.

The Computer Centre of IIT Bombay provides high end computing facilities to the Institute. It has several high performance computing machines, which include a 4 CPU Digital machine, HP's K-class machine, SGI Octane and several SUN servers. Students are provided email access through a cluster of 10 J class HP computers. The Computer Centre is a level 3 Centre for the national computing facilities under the ICOSER project of the Department of Science and Technology's TIFAC.

The entire academic area of the Institute as well as its hostels are connected to the Institute's backbone by a 10 Mbps optical fiber link connected to an ATM switch through several fast ethernet switches. The Institute backbone is linked to a 2 Mbps Internet link through a radio modem. In addition, there are two lower capacity Internet links, each of 64 kbps. Each student hostel has a computer room with several PCs, which can directly access any server in the Institute through the Internet link.

## **3) STUDENTS AMENITIES**

Institute is fully residential and has 13 hostels for students. Each hostel is an independent entity with its own mess facilities, recreation areas, etc. However students may be permitted to have their own arrangements for accommodation outside campus.

Extra curricular activities are provided by the Students' Gymkhana. These activities include Sports, Cultural programmes and Social Service. Various clubs of the Gymkhana encourage individual talents of students in hobbies such as painting, modeling, music, photography, aeromodelling and fabrication of electronic devices. A swimming pool is an additional facility. A well-planned Student Activities Centre (SAC) is functioning.

## **4) M.TECH. PROGRAMME**

The Institute offers a postgraduate Master of Technology programme in various disciplines.

The aim of the programme is to train the students in high level theoretical knowledge which enables them to tackle practical complex problems of design and development in the industrial fields as well as pursue further academic achievements through research. Enough flexibility is provided in the structure of the programme in respect of lecture courses, laboratory and project work to help the students to achieve the above mentioned aim. The departments are equipped with sufficient facilities for this purpose. The salient features of the programme are given below,

- i) The Institute offers a full time programme of 2-year and a part time programme of 3-year duration.
- ii) The part time programme is available to sponsored and self-finance students. However, the working hours for the part time programme will include the normal working hours of 8.30 a.m. to 5.00 p.m. and also evening slots.

## 5) ADMISSIONS

Some of the departments and interdisciplinary groups, offer **direct admission** to the limited number of candidates solely based on higher GATE score. Candidates, who are offered direct admission, have to confirm the admission by paying the fees **on the dates mentioned under Important Dates on Page No 4 to 6** of this brochure. However, such candidate will have option for not accepting the direct admission offer in given specialization, but to appear for written test / interview in discipline of his/her higher choice(s).

Seats remaining vacant after Direct Admissions, will be filled up through written test / interview.

### OBC-NC/SC / ST /PC Candidates:

Seats are reserved for Other Backward Class- Non-Creamy layer(OBC-NC)/Scheduled Caste (SC), Scheduled Tribe (ST) and Physically challenged(PC) categories as per Government of India rules.

*Scheduled Caste and Scheduled Tribe candidates are offered direct admission solely based on their GATE Score and their choices.*

### Other Backward Class Non-Creamy layer(OBC-NC)/ PC Candidates (Physically Challenged):

Seats are reserved for Other Backward Class Non-Creamy layer(OBC-NC)/ PC (Physically Challenged) category, as per Govt.of India rules. The admission will be through Written Test / Interview along with General candidates.

### Admission for IIT B.Tech. degree holders

IIT B.Tech. students getting a (CGPA/CPI) score of 8.00 and above (on a scale of 10) are exempted from requirement of GATE clearance. They are admitted to M.Tech. Programme through normal procedure for selection of candidates for admission with Teaching Assistantship.

## 5.1 APPLICATION CATEGORIES AND FINANCIAL SUPPORT

*(Admissions to all categories are subject to availability of seats)*

**The continuation of the financial support and the registration for your selected programme will be subject to satisfactory performance of the duties assigned by the Department / Centre/ Schools/ IDPs as well as satisfactory academic performance (i.e.**

**maintain SPI / CPI of 6.00 and above at the end of each semester) and fulfillment of the other academic and non-academic requirements, as per rules.**

## INSTITUTE TEACHING ASSISTANTSHIP (TA)

*(On roll employees of any organizations with or without pay are not eligible for admission under this category).*

5.2.1 Candidates are selected through the following modes.

- (i) Direct Admissions based on valid GATE score.
- (ii) Valid GATE score and Performance in Test / Interview.

5.2.2 **As per MHRD directives fellow holding TA ship shall not accept or hold any appointment paid or otherwise or receive any emoluments, salary, stipend from any source during the tenure of the award (TA ship).**

5.2.3 The students joining the programme under this category will be considered for Teaching Assistantships of Rs. 8,000/- per month , based on the following norms:

- (a) Students getting assistantship will be required to assist / work for courses, laboratory, or any other related academic / administrative work to the extent of 8 hours per week.
- (b) The assistantship will be available for a maximum period of 24 months and students with TA have to complete M.Tech. in two years.
- (c) Assistantship will be paid on the basis of monthly attendance.

## 5.3 TEACHING ASSISTANTSHIP THROUGH PROJECT (TAP)

*(On roll employees of any organizations with or without pay are not eligible for admission under this category).*

Candidate to this category will be admitted subject to:

- (i) Valid GATE score.
- (ii) Performance in Written Test / Interview.

The students joining the programme under this category will be considered for Assistantships based on the following norms:

- a) The TAP holders are required to work in a sponsored R&D project being carried out at the institute.
- b) They will also do their M. Tech. dissertation work under same faculty group in same area as the sponsored project.
- c) They have to complete M.Tech. programme in 2 years.

Fellowships are also available from agencies such as Aeronautics Research & Development Board (ARDB), Dept. of Science and Technology (DST), Forbes Marshall, Pune, Textile Machinery Manufacturers' Association (TMMA), Atomic Energy Regulatory Board (AERB), International Energy Initiative, Department of Atomic Energy (DAE) and Larsen & Toubro, etc.

#### 5.4 RESEARCH ASSISTANTSHIP

*(On roll employees of any organizations with or without pay are not eligible for admission under this category).*

##### 5.4.1. Institute Research Assistantship (RA)

Candidate to this category will be admitted subject to:

- (i) Valid GATE score.
- (ii) Performance in Written Test / Interview.

The students joining the programme under this category will be considered for Research Assistantships of Rs. 9,000/- per month , based on the following norms:

- a) Research Assistants have to look after the Undergraduate laboratories and also assist in Teaching or Research or other work assigned by the Head of the department.
- b) They are required to work for about 20 hours a week. They have to complete the M.Tech. Programme in three years.

##### 5.4.2 Project Research Assistantship (PA)

Candidate to this category will be admitted subject to:

- (i) Valid GATE score and
- (ii) Performance in Written Test / Interview.

The students joining the programme under this category will be considered for Assistantships supported under Sponsored Research Project being carried out at the Institute based on the following norms:

- a) Research Assistants have to work in Sponsored R&D project. They will do their thesis / dissertation in same project area.
- b) They are required to work for about 20 hours a week on the Sponsored Research Project. They have to complete M.Tech. programme in 3 years.

#### 5.5 PROJECT STAFF (PS)

*(only for project staff members of IIT Bombay)*

This category is for Employees working in Sponsored Research Project at the Institute.

Candidate to this category will be admitted subject to:

- (i) 6 months service in project.
- (ii) Valid GATE score OR 2 years total experience of which 6 months in the Project of the Institute (the option of 2-years of relevant professional experience is not applicable to candidates applying to M.Tech. Programme in Computer Science & Engineering.)
- (iii) Performance in Written Test / Interview.

The students joining the programme under this category require to satisfy following norms:

- a) The candidate under this category will be required to assist as assigned by the principal investigator of the concerned project.
- b) They are required to work for up to 20 hours a week.
- c) They have to complete M.Tech. programme in 3 years.

#### 5.6 INSTITUTE STAFF (IS)

*(only for permanent staff members of IIT Bombay)*

Candidate to this category will be admitted subject to:

- a) Being permanent employee of the Institute and must have 2-years service left.
- b) Valid GATE score OR more than 2 years relevant experience (the option of 2-years of relevant professional experience is not applicable to candidates applying to M.Tech. Programme in Computer Science & Engineering.)
- c) Performance in Written Test / Interview.
- d) They have to complete M.Tech. Programme in 3 years.

#### 5.7 SELF FINANCED STUDENTS (SF)

*(Non-Residential student)*

The Institute may admit few students under self-financed category . Eligibility criteria will be the same to that of TA category.

If admitted, these students have to complete their programme without any financial support from the Institute. **The SF category students are non-residential students hence the Institute will not provide hostel accommodation on campus.**

#### 5.8 SPONSORED CANDIDATES (SW):

With a view to encourage persons working in Industries, the Institute admits a limited number of sponsored candidates to the M.Tech. Programme. It is expected that such candidates after successfully completing the programme, are better equipped to work in organizations sponsoring them. The admission procedure for sponsored candidates will be as follows:

- a) They must be from recognized Industrial Organization/Academic Institutions.
- b) Valid GATE score OR 2 years of relevant professional experience after obtaining FIRST class in qualifying degree. However, candidates applying to M.Tech. in Computer Science & Engineering Department must have valid GATE score in CS / IT.
- c) Performance in Written Test/Interview. The written test will be conducted to examine their knowledge in the discipline of their qualifying degree, which forms the prerequisite for admission to the corresponding specialization of the M.Tech. Programme.

**All Sponsored candidates (SW, PS, IS, etc) should have obtained 60% marks (55% for SC/ST candidates) or equivalent grade in the qualifying examination.**

Sponsored candidates who are admitted to the programme should have full financial support

from the concerned sponsoring agency for the entire duration of the programme. They can complete the programme on full-time (duration 2-year) or part-time (duration 3-year) basis, depending on the nature of sponsorship. **Sponsored candidates are not eligible for any financial assistance from the Institute.**

### SPONSORSHIP CERTIFICATE

(for full-time candidates)

(On the letterhead of the Sponsoring Organization).

To,  
The Director,  
Indian Institute of Technology,  
Mumbai - 400 076.

#### Sub : Sponsoring of an employee for M.Tech. Programme

Dear Sir,

We hereby Sponsor the candidature of Shri / Smt. / Kum \_\_\_\_\_, an employee in our organization, for joining his / her M.Tech. Programme in \_\_\_\_\_ at your Institute as a full-time candidate.

He / She is employee of our organization for \_\_\_\_\_ years. We shall bear the total expenses of his / her studies. We shall fully relieve him / her of his / her duties in the organization during the entire period of the M.Tech. programme, to enable him / her to devote full time to his / her studies in the Institute.

Date: \_\_\_\_\_ Signature and seal of the Sponsoring Authority.

### SPONSORSHIP CERTIFICATE

(for part-time candidates)

(On the letterhead of the Sponsoring Organization).

To,  
The Director,  
Indian Institute of Technology,  
Mumbai - 400 076.

Dear Sir,

We hereby sponsor the candidature of Shri / Smt. / Kum. \_\_\_\_\_ for joining M.Tech programme at your Institute on Part-time basis.

Shri / Smt./ Kum. \_\_\_\_\_ is employed in our organization since \_\_\_\_\_. We are ready to release him / her during working hours to undergo the programme as per IIT Bombay, time-table. We understand that the duration for part time M.Tech. is expected to be 3 years.

It is noted that normal Instructional hours are from 8.30 a.m to 5.00 p.m. and also some courses are in evening slots. We shall bear the total expenses of his / her studies.

Date: \_\_\_\_\_ Signature and Seal of the Sponsoring Authority

### Certificate for Project-RA, Project-TA & Project Staff

This is to certify that Shri / Smt / Kum. \_\_\_\_\_ has been working in Project \_\_\_\_\_ from dt. \_\_\_\_\_.

The duration of the project is \_\_\_\_\_ years. Appointment of Shri / Smt / Kum \_\_\_\_\_ is for the period of \_\_\_\_\_ years. His / Her appointment is likely to be extended for the further period.

I have no objection if he / she register for M.Tech. Programme in \_\_\_\_\_ Department under \_\_\_\_\_ category.

Signature  
Prof. \_\_\_\_\_

Project Investigator:  
Project Code:  
Project Title:

### UNDERTAKING

I, Shri / Smt / Kum \_\_\_\_\_ hereby declare state that in the event termination of my appointment in the project, I shall continue my studies as Self-financed student for the remaining period.

Date: \_\_\_\_\_ Signature:  
Name of Student:

### 6) FEES AND DEPOSITS

Various fees, deposits and Hostel Rent are listed in Appendix-C (Table I, page nos. 43 & 44).

### 7) GENERAL ELIGIBILITY FOR M.TECH PROGRAMMES IN ALL DEPARTMENTS / CENTRES / SCHOOLS / I D GROUPS.

**7.1:** Candidates with FIRST class or 60% marks in B.E. / B.Tech / B.Sc. (Engg.) / M.Sc. / MCA / MBBS / M.Pharm. or equivalent in appropriate branches (55% for SC / ST) and a high GATE score are eligible to apply for various M.Tech. programmes as shown in Appendix- C (Table III). The FIRST class (60%) in qualifying degrees (55% for SC / ST) is essential general eligibility criteria, however, applicant **should fulfill the specified qualifying degree criteria**

as mentioned against the concerned Department / ID groups / Centre / School, which he/she has applied for.

**7.2: Candidates with Associate Membership Examinations (A.M.I.E, etc.)**

Candidates who have passed the Associate Membership Examinations conducted by recognized professional bodies (like Institution of Engrs. (India), Institute of Chemical Engrs., Aeronautical Society of India, Institute of Electronics & Telecommunication Engrs., Indian Institute of Metals etc., are also eligible to apply for the appropriate M.Tech programmes, provided they fulfill the following requirements:

- a) the above examinations are recognized as equivalent to B.E. / B.Tech Degree.
- b) candidates MUST have obtained a **FIRST CLASS or 60% marks** (55% for SC / ST candidates) in the above examinations.
- c) the candidates have a minimum of two years professional experience after passing the final examinations of his qualifying degree.
- d) candidates have a valid GATE score.

**8) APPLICATION FORM & INFORMATION BROCHURE:**

**8.1**

- i) Online Application Form & Information Brochure are available on the Institute website [www.iitb.ac.in/admissions](http://www.iitb.ac.in/admissions). Candidates are advised to submit their application **ONLINE**.

**However, he / she has to send adequate number of sets of application form duly signed considering the number of Departments applied for, along with the necessary documents and a Demand Draft (if not paid on line) to the Deputy Registrar, (Academic), IIT Bombay, Powai, Mumbai – 400 076 before last date for submission of application forms, failing which, his / her candidature will not be considered.**

- ii) Application Form & Information Brochure may be obtained in person or by sending a Demand Draft (of the required amount) to **Deputy Registrar, (Academic), IIT Bombay, Powai, Mumbai – 400 076**.
- iii) Cost of Application form is Rs. 300/- for General category (GN)/ Other Backward Class Non-Creamy layer (OBC-NC) & Physically Challenged (PC) & Rs. 150/- for SC / ST candidates. The cost of application form is to be paid only in the form of **Demand Draft** drawn in favour of **'REGISTRAR, IIT BOMBAY'** payable at **SBI/ Canara Bank Powai Branch**.

**The details of Demand Draft are to be written in the application form.**

- iv) You are provided with the following:
  - 1. Application Form
  - 2. Information Brochure
  - 3. Statement of Purpose (SoP) to be submitted only if you are applying for the Department of Aerospace Engineering and CTARA.

**8.2 Guidelines for filling up the Application form**

**ALL ENTRIES SHOULD BE MADE IN CAPITAL LETTERS**

- 1. Name in full: Write your name in capital letters as it appears in the qualifying degree certificate.

*Paste (do not pin) passport size photograph in the space provided and get it attested by Principal / Head of College / University last attended or a Gazetted Officer.*

- 2. (a) *GATE Details: (Attach copy of the GATE Score Card) Write your GATE registration no., GATE year, GATE Score and All India Rank (AIR).*

*(b) Competitive (All India) Exam Score, if any (Like AIIMS / MCI / GIPMER / PGI-Chandigarh / AFMC-Pune / DNB-Part-I)—Write Name of examination, Year of passing & Score*

- 3. *Write your address for postal communication at (a) and permanent address at (b).*

*It is the responsibility of the candidate to inform change of address, if any, to the Deputy Registrar (Academic), IIT Bombay, Powai, Mumbai – 400 076.*

- 4. *Write your telephone number with STD code, Mobile number and e-mail address(s) for contact.*

***Candidate must provide E-mail address or Mobile number or both. Notifications will be sent by email and /or SMS. Candidates are instructed to check their emails regularly for all important communication and results announcements.***

- 5. *Write your Date of Birth :*

D	D	M	M	Y	Y	Y	Y

- 6. Sex- M for Male, F for Female.

- 7. (a) Fill in

- for General Candidates - G N
- for Other Backward Class Non-Creamy layer - OBC-NC
- for Scheduled Caste\* - S C
- for Scheduled Tribe\* - S T
- Physically Challenged\* - P C
- please mention yes or no

- 7. (b) **\*attach caste / tribe / disabilities/non creamy layer (for OBC) certificate.**

- 8. Nationality: \_\_\_\_\_ (write your Nationality)

- 9. Indicate your qualifying degree as follows:

- B.Tech. B T
- B.E. B E

- |       |  |     |
|-------|--|-----|
|       | B.Sc.(Engg.)   | B S |
|       | M.Sc.  | M S |
|       | Professional<br>(AMIE, MBBS, etc.)   | P F |
| 9 (a) | Mode of Programme - Regular or Correspondance  |     |
| 9 (b) | Write Duration of Programme in years.  |     |
| 10.   | Indicate the qualifying discipline in which you have pursued your degree programme by writing the appropriate code form the following table. |     |

**Engineering / Technology**

Aeronautical/Aerospace Engg.	AE
Agriculture Engg.	AG
Applied Mechanics	AM
Architecture & Planning	AR
Automobile Engg.	AU
Biochemical Engg.	BI
Biomedical Engg.	BM
Biotechnology	BT
Ceramic & Glass Tech	CG
Chemical Engg. / Chemical Tech.	CH
Civil Engg. / Civil & Environmental / Structural Engg.	CE
Computer Sc. & Engg.	CS
Electrical Engg.	EE
Electronics & Comm. Engg.	EC
Energy Engg.	EN
Environmental Engg.	EV
Food Technology	FT
Industrial Engg.	IE
Instrumentation Engg. / Instrumentation Tech./Instrumentation Information Technology	IN I T
Manufacturing Engg.	MF
Mechanical Engg.	ME
Metallurgical Engg.	MT

Mineral Engg.	MR
Mineral Dressing	MD
Mining Engg. / Tech. / Mining & Machinery	MN
Naval Architecture/Marine Engg.	NA
Oil Technology	OL
Paint Technology	PT
Petroleum Engg.	PE
Petroleum Technology	PC
Planning	PN
Plastic Technology	PL
Polymer Technology	PO
Production Engg. / Production Engg. & Management	PR
Production & Industrial Engg.	PI
Rubber Technology	RT
Textile Engg. & Fibre Science	TF
<b>All other disciplines in Engg./Tech.</b>	<b>ZE</b>

**Sciences**

Applied Physics	AP
Agriculture Science	AS
Biochemistry	BY
Bio-Sciences	BS
Computer Applications	CA
Chemistry	CY
Industrial Chemistry	CI
Engineering Physics	EP
Earth Sciences	ES
Geology/ Geophysics	GG
Life Sciences	LS
Life Sciences (Veterinary / Animal Sciences)	LV
Life Sciences (Botany)	LB
Life Science (Zoology)	LZ

Material Sciences	MS
Mathematics / Applied Mathematics	MA
Microbiology	MB
Operations Research	OR
Physics	PH
Pharmaceutical Sc./Pharmacy	PY
Radio Physics	RP
Statistics	ST
Textile Chemistry	TC
<b>All other disciplines in Science</b>	<b>ZS</b>

11. Indicate the status of your qualifying degree examination by writing

For examination pending	1
For result pending	2
For result out	3

12. No. of years of experience – Indicate years in the boxes provided against (attach certified copies).

a) Teaching \_\_\_\_\_ b) Industry/Others \_\_\_\_\_

13. Details of Academic Record “most recent exams”: please fill various columns of the table given here.

Examination	Institute / University	Passing Year	% of marks / CPI / CGPA / out of	Class / Division

14. **Departments / Centres / Schools / Interdisciplinary groups applied for** (Before applying please see the eligibility criteria of each Dept / Centre / School / Interdisciplinary group):

**Note 1: Only one application form is to be submitted per candidate.**

**Note 2: If you want to apply for specializations from more than one Department / Centre / School / ID group, then you must submit the corresponding number of sets of photocopies of the completed application form along with the enclosures properly arranged and stapled. If you do not provide sufficient number of sets then you will be considered only for the departments for which the sets are provided.**

**Specializations : Applicant can give his/her options (in order of preference - upto TEN) from the specializations listed below :**

**valid specialisation codes : Table II: Summary of M.Tech Programmes in the Information Brochure.**

AE1	AE3	AE4	CH	CE1	CE2	CE3	CE4	CE6	CS	GS	PG	EE1	EE2	EE3
EE4	EE5	ME1	ME2	ME3	MM1	MM2	CO	EN	IO	SC	EV	NR	TD	BM

Preference-wise Specialisations : please refer Information Brochure Table IV: GATE & Other Requirement of Different Discipline to check your eligibility.

01	02	03	04	05	06	07	08	09	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. **Select categories to seek admission:** (  mark in box)

TA/TAP #       RA#/PA       SW       PS/IS (only for permant/Project employees of IIT Bombay)

2 Yr. M.Tech  
Programme

3 Yr. M.Tech  
Programme

(3 yr. M.Tech Programme)

Employee Code

**(Categories: #TA–Institute Teaching Assistantship, #TAP–Teaching Assistantship through Project,# RA– Institute Research Assistantship, PA–Project Research Assistantship, SW–Sponsored candidates. PS–Project Staff of IIT Bombay , IS–Institute Staff of IIT Bombay. For more details, please refer to page no.10 to 13 of this Information Brochure ).**

**#As per MHRD directives, candidates selected under TA/TAP/RA categories cannot accept or hold any appointment paid or otherwise or receive any emoluments, salary, stipend from any source during the tenure of TA/TAP/RA. Hence, candidates selected for TA/TAP/RA and having employment with or without pay with any organisation/ Institution/ Establishment/ Project etc. must leave the job and submit relieving certificate before joining the M.Tech programme under TA/TAP/RA category.**

16. **Publications, if any:** No. of Papers published — (please attach copy of the paper)

17. **Employment details:** Give details of your present employment viz. on leave(with or without pay) etc. Please note that by retaining your employment you cannot join the programme under TA,RA,TAP categories.

18. **Present status :** Employed/Not Employed

19. If you have applied for IIT Bombay Research Fellowship then you must write application number. If you have not applied then write ‘not applicable’.

20. **Declaration:** Must be signed.

**Applicant must provide Demand Draft details at the end of the form.**

Candidates applying for Chemical (CH), Biomedical (BM), Electrical (EE1, EE2, EE3, EE4, EE5) may provide following information on the backside of the application form or on separate sheet.

- i) Title of the final year project.
- ii) List of four courses, which you think, are relevant to the M.Tech. programme.
- iii) Short-term courses attended.

### 8. Submission of Application Form

Please fill in the application form completely, sign it and then take as many Xerox copies of the application form along with the necessary documents, as per the number of Department choices mentioned by you against Sr. No. 14 of the application form.

Enclose the attested photocopies of the following documents.

1. the GATE score card
2. the Mark Sheet of qualifying examination
3. the Degree Certificate
4. the Birth Certificate/School Leaving Certificate
5. OBC-NC certificate (if applicable).
6. The Caste/Tribe/Disabilities certificate (if applicable)

The application form is to be sent in a big size envelope (27cms x 20cms) superscribing on the top 'Application form for M.Tech. programme', without folding the application and attached documents to,

**Deputy Registrar (Academic),**

**Indian Institute of Technology Bombay**

**Powai, Mumbai – 400 076**

The form can be submitted in person at Academic Office, IIT Bombay, on all working days (Monday to Friday) between 9:15 a.m. To 5:45 p.m. or may be sent by post . However, the institute will not be responsible for any postal delay or loss in transit.

**Candidates who are submitting on-line forms, are also required to submit printed copy(s) of their application form with enclosures and Demand Draft for required amount on or before the last date . The online application forms will not be entertained if the hard copy with Demand Draft (of required amount) is not received on or before the last date.**

### **(B) M.TECH. PROGRAMMES:**

#### **1) AEROSPACE ENGINEERING**

#### **AE**

The Master's degree programme in Aerospace Engineering provides education in multi-disciplinary areas involving Aerodynamics, Dynamics & Control, Aerospace Propulsion and Aerospace Structures.

### **Eligibility Criterion for Admission**

Candidates having First class or 60% marks (55% for SC/ST) in Bachelor's degree ( B.E. / B.Tech. or equivalent) are eligible. Candidates with degree in Aeronautical or Aerospace and valid GATE score in any discipline are eligible for admission to any of the four specializations (AE1, AE2, AE3 & AE4) .

Candidates with degree in other branches of Engineering (i.e. Mechanical, Civil, Electrical, Electronics, Instrumentation or allied branches) are eligible for admission to specific specializations of Aerospace Engineering, if they have valid GATE score in disciplines as shown in the table below:

<b>Specialization</b>	<b>Eligibility</b>
Aerodynamics (AE1)	Bachelor's degree in Mechanical Engg./ Civil Engg. with valid GATE score in ME/CE
Dynamics & Control (AE2)	Bachelor's degree in Mechanical Engg./ Electrical / Electronics/ Instrumentation Engg. with valid GATE score in ME / EE/ EC / IN
Aerospace Propulsion (AE3)	Bachelor's degree in Mechanical Engg. with valid GATE score in ME.
Aerospace Structure (AE4)	Bachelor's degree in Mechanical Engg./ Civil Engg. with valid GATE score in ME/CE.

Candidates having two years of relevant work experience are exempted from requirement of GATE score, provided their candidature is sponsored by the employer. However, they are not eligible for award of Teaching/Research Assistantship.

Four scholarships on behalf of the Aeronautical Research and Development Board are available at the department. The interested candidates may visit the departmental web page for additional information on these scholarships (<http://www.aero.iitb.ac.in>).

### **Areas of Research**

**Aerodynamics:** Boundary layers stability and control, Separated flows; Bluff body wakes; Drag, Jet flow interactions with obstacles; Shockwave boundary layer interactions, CFD for compressible and incompressible with flow with heat transfer, Fluid-structure interaction, Hypersonic Flows; Particle methods for computational simulation of unsteady fluid flow problems; Finite volume time domain techniques in computational electromagnetics; Optimization in aircraft design; Aerospace vehicle stability and control analysis.

**Dynamics & Control:** Autonomous mini aerial vehicle, Cooperative control, HILS, Dynamics & Control of flexible Aerospace Vehicles, Spacecraft attitude control and non-linear Dynamics.

**Aerospace Propulsion:** Aero thermodynamic analysis and engine sizing, Axial Flow compressor design and performance analysis; cascade flow analysis; Combustion; CFD of internal flows; Microchannel cooling of gas turbine blades; Thermal signature analysis of aerospace powerplant; Aerothermal studies in hypersonics; Active and passive flow control in turbomachines.

**Aerospace Structures:** Mechanics of composite materials and structures; Vibration and Stability; Finite element methods of structural analysis; Aeroelasticity and Aeroservoelasticity; Structural optimization; Smart structures.

## 2) CHEMICAL ENGINEERING

CH

A wide variety of courses are offered to enable a student to obtain proficiency in various facets of the Chemical Engineering Profession—Design, Production, Research and Development, and Academics.

### Fields of Study

The programme provides strong core courses together with a set of elective courses in the following areas:

Colloid and interfacial science, Process engineering related to Petroleum, Polymers, Food and Biochemical Engg., Electrochemical Engg., Process Modeling, Simulation and Control, Computer Aided Design.

### Eligibility for Admission

Candidates with FIRST class or 60% marks (55% for SC/ST) in Bachelors degree in Chemical Engineering or equivalent and with a valid GATE score in Chemical Engineering (CH) are eligible to the M.Tech. programme in Chemical Engineering.

### Areas of Research

The research activities of the department encompass Process Modelling, Simulation, Computer Aided Design, Optimization and Control, Particulate Systems, Fluid Mechanics, Separation Processes, Petrochemicals, Electrochemical Processes, Thermodynamics, Colloid and Interfacial Science, Microstructure Engineering, Supercritical Fluid Extraction, Membrane Processes, Polymers and Advanced Materials, Reaction Engineering, Catalysis, Environmental Engineering, Bioprocess Engineering and Food Engineering.

## 3) CIVIL ENGINEERING

CE

This programme is particularly geared to meet the growing demand in the country for designers, consultants, development engineers, research-scientists and faculty.

### Areas of Specialization

A student entering the M.Tech. programme in Civil Engineering can follow one of the following streams :

- |                                       |      |
|---------------------------------------|------|
| 1. Transportation Systems Engineering | CE 1 |
| 2. Geotechnical Engineering           | CE 2 |
| 3. Water Resources Engineering        | CE 3 |
| 4. Structural Engineering             | CE 4 |
| 5. Remote Sensing                     | CE 6 |

### Eligibility for Admission

Candidates with FIRST class or 60% marks (55% for SC/ST) in Bachelor's degree in Civil Engineering or equivalent with valid GATE score in any discipline are eligible to apply for any of the five specializations.

## Areas of Research

### Transportation Systems Engineering:

Modelling traffic flow, Urban regional transport network design, Transport planning models, Urban public transport operation and management; Economic evaluation, analysis and impact assessment; Land-use transport planning, Pavement analysis and design, Pavement maintenance management. FS, ANN, AI, GA, ES, GIS applications to transport modelling.

### Geotechnical Engineering:

Geotechnical properties of soils, Soil-structure interaction, Foundation for offshore structures, Earth dam problems, Stability and Seepage, Mechanics of Swelling Soils, Rock Mechanics and tunneling, Soil dynamics, Pile foundations, Soil stabilization, Anchored geosynthetics, Reinforced soil structures and geosynthetics, Geotechnical centrifuge study, Optimization techniques and environmental geotechniques; Landslides.

### Water Resources Engineering:

Real fluid flow, Dispersion in surface and ground water, Jets, Stratified flow, Fluid transients, Sediment transport in pipes and open channels, Mathematical and analogue models for ground water flows, Hydraulic structures, Hydrology, Optimization techniques in water resources Engineering, Water balance studies; Conveyance network; Urban water management; Urban water supply, Storm water and wastewater treatment and disposal.

### Structural Engineering:

Earthquake engineering, Structural dynamics; Finite element techniques; Composite materials and mechanics; Earthquake disaster management; Reinforced and prestressed concrete; Computational mechanics; Wind effects on structures; Concrete technology; Steel structures; Strength, stability and dynamics of thin membranes; Plates and shells; Structural optimization; Structural response to impact and shock loading; Pressure vessels; Reliability analysis; Probabilistic design methods; Curved grid; Cable networks, Plastic analysis techniques; Inverse problems and artificial intelligence applications; Offshore Structures; Shell foundation.

### Remote Sensing:

Development of methods and algorithms for digital analysis of remotely sensed data; Digital analysis of thermal and microwave SAR data; Digital terrain modelling; Remote sensing and spatial information analysis systems in hydrological modelling; Land degradation and soil erosion assessment; Spectral studies of crops and soils. Fuzzy, ANN and other approaches in remotely sensed data Analysis; Statistical analysis of geodetic and remote sensing data; Geodesy and geodetic techniques; Global positioning systems and its applications.

## 4) COMPUTER SCIENCE AND ENGINEERING

(CS)

The M.Tech. programme in Computer Science is a flexible, second level programme offering students wide choice of electives from areas such as algorithms, programming languages, databases, machine intelligence, computer graphics and vision, networks, architecture, distributed computing and formal methods. The programme is aimed at generation of high quality technical manpower for Research, Design and Development in Computer Science and Computer Applications by exposing the students to courses in theory as well as application areas. The department has strong ties with the computer industry and many M.Tech. students work on sponsored projects. Exposed to the department's rich and stimulating environment for study

and research, M.Tech. students of the Department are much sought after by leading Indian as well as multinational companies.

#### **Industry Sponsored fellowships:**

Some Industry-sponsored fellowship covering tuition fees and providing monthly stipend of Rs.7000/- and project-related expenses are available to meritorious M.Tech. students. Fellows are expected to produce high quality research leading to Conference and Journal publications.

#### **Eligibility for Admission:**

First class or 60% marks (55% for SC/ST) in Bachelor's degree in Engineering/Master's degree in Science /MCA (with Physics and Mathematics at B.Sc. level) or equivalent degree with a valid GATE (CS / IT) discipline.

Valid GATE score in (CS / IT) is required for all applicants (including Project Staff (PS) / Institute Staff (IS) and Sponsored candidates).

#### **Areas of Research**

##### **(i) Computer Graphics, Computer Vision and Image Understanding**

Computer-aided graphics design; Multimedia; High Performance computing; Visualization; Rendering; Graphics design and Animation; Computer vision; Image retrieval.

##### **(ii) Database and Information Systems**

Object oriented, temporal, parallel databases; Query optimization and transaction management; Information systems; Hypertext mining and information retrieval; Data dissemination networks.

##### **(iii) Programming languages and Compilers**

Theory of code optimization; Optimising and parallelizing compilers; Analysis and implementation of functional and logic programming languages; Theory of programming languages.

##### **(iv) Computer Networks and Distributed Systems**

Performance modeling of networks & distributed systems; Quality of service in distributed systems; Wireless LANs: analysis and design; Design, implementation and verification of network security protocols; Distributed control algorithms and operating systems.

##### **(v) Algorithms**

Algorithms and complexity; Combinatorics and graph theory; Geometric Algorithms.

##### **(vi) Artificial Intelligence**

Image Processing, Pattern Recognition and Computer Vision; Intelligent systems and their applications—tutoring systems, Natural language understanding; Machine learning and neural networks.

##### **(vii) Software Engineering**

Object oriented software development; Component architectures. Re-engineering of software.

##### **(viii) Formal Methods**

Formal specification, design and verification of hardware and software systems including distributed systems; Logic, automata theory and their applications in reasoning about systems; Automated theorem proving; Model checking.

##### **(ix) Real-Time and Embedded Systems**

Functional Programming Applications, reconfigurable computing, Automobile Telematics, Embedded control units.

##### **(x) Computer Networks**

Mobile Computing, Voice Routing, Voice over IP, QoS in Networks, Network Security, Wireless networks, RFID networks.

##### **(xi) Data Bases and Data Mining**

Transaction processing in database systems, and real-time databases systems, integrating mining with relational DBMS, temporal mining, integrating mining with OLAP, indexing multidimensional data, precomputation techniques, mining extensions and Extending relational DBMS for e-commerce, Wide-area distributed database systems, forecasting and smart e-business.

##### **(xii) Distributed Systems**

System Performance Evaluation, Distributed Client Server Information Systems, Scalable Services, Fault Tolerance, Distributed Object Based Systems, Autonomic / Adaptive Distributed Applications, Programming Models and Runtimes for Generic Agents, Information Appliances, Parallel Computing, Java Security, high performance cluster computing.

##### **(xiii) Software Engineering**

Systems Analysis and Design, MIS systems, Project Management, Quality Assurance, object-oriented software.

#### **5) EARTH SCIENCES**

**(ES)**

The M.Tech programme of the department lays special emphasis on developing skills for exploration of mineral, petroleum and groundwater. The students of this programme have good placement opportunities in leading national and international mineral & oil exploration companies, Geological survey of India, National Mineral Development Corporation, Atomic Mineral Division, Mineral Exploration Corporation and Software Companies.

#### **Eligibility for Admission**

**a. Geoexploration (GS) :** Candidates having First class or 60% marks (55% for SC/ST) in Master's degree or equivalent in Geology / Applied Geology / Geophysics / Geochemistry with valid GATE score in Geology & Geophysics are eligible for admission.

**b. Petroleum Geoscience (PG) :** Candidates having First class or 60% marks (55% for SC/ST) in Master's degree or equivalent in Geology / Applied Geology / Geophysics / Applied Geophysics with valid GATE score in Geology & Geophysics are eligible for admission.

**Specialization : a. Geoexploration (GS)**

**b. Petroleum Geoscience (PG)**

**a. Geoexploration : GS**

The programme is structured such that the students can learn various aspects of mineral, petroleum and groundwater explorations. It offers wide ranging courses in exploration Well Logging, Basin Analysis, Marine Mineral Resources, Groundwater Hydrology, Environmental Geology and Hydrogeochemistry.

**b. Petroleum Geoscience : PG**

This Specialization is introduced from July 2007. It prepares graduates for a career in petroleum exploration and development. The course provides advanced skills in seismic interpretation, basin analysis and applied micropaleontology, sequence stratigraphy, reservoir sedimentology, petrophysics, wireline logging tools and data interpretation using workstations and software as used in the industry.

**Areas of Research**

Geochemistry, Structural Geology, Petrology, Hydrogeology, Sedimentology, Micropaleontology, Stratigraphy, Ore Petrology, Geostatistics and Ore Deposit Modeling Rock magnetism, Seismology, Seismology, Geothermics, Rock Physics, Well-logging and Electromagnetism.

**6) ELECTRICAL ENGINEERING**

**EE**

**Areas of Specialization**

- |  |     |
|--|-----|
| 1. Communication Engineering           | EE1 |
| 2. Control and Computing               | EE2 |
| 3. Power Electronics and Power Systems | EE3 |
| 4. Microelectronics                    | EE4 |
| 5. Electronic Systems                  | EE5 |

**Eligibility for Admission**

**“For admission under TA category, students are required to have valid GATE score in GATE subjects EC/EE/IN/PH/CS”.**

**EE1 (Communication Engineering):** First class or 60% marks (55% for SC/ST) in Bachelor's degree in Computer Science and Engineering, Electrical Engineering, Electronics Engineering, Telecommunications Engineering, Engineering Physics OR First class or 60% marks (55% for SC/ST) in Master's degree in Physics (with specialization in Electronics) or Electronic Sciences with valid GATE score in CS, EC, EE or PH.

**EE2 (Control and Computing):** First class or 60% marks (55% for SC/ST) in Bachelor's degree in Aeronautical/Aerospace Engineering, Chemical Engineering, Computer Science and Engineering, Electrical Engineering, Electronics Engineering, Telecommunication Engineering, Instrumentation Engineering, Mechanical Engineering, Metallurgical Engineering, Engineering Physics OR First class or 60% marks (55% for SC/ST) in Master's degree in Physics, Mathematics with valid GATE score in CH, CS, EC, EE, IN, ME, MT, PH, MA, XE.

**EE3 (Power Electronics & Power Systems):** First class or 60% marks (55% for SC/ST) in Bachelor's degree in Computer Science and Engineering, Electrical Engineering, Electronics Engineering, Telecommunication Engineering, Instrumentation Engineering with valid GATE score in CS, EC, EE or IN.

**EE4 (Microelectronics):** First class or 60% marks (55% for SC/ST) in Bachelor's degree in Computer Science, Electrical Engineering, Electronics Engineering, Telecommunication Engineering, Engineering Physics, Instrumentation Engineering OR First class or 60% marks (55% for SC/ST) in Master's degree in Physics or Electronic Sciences with valid GATE score in CS, EC, EE, IN or PH.

**EE5 (Electronic Systems) :** First class or 60% marks (55% for SC/ST) in Bachelor's degree in Biomedical Engineering, Electrical Engineering, Electronics Engineering, Instrumentation Engineering, Telecommunication Engineering, Engineering Physics OR First class or 60% marks (55% for SC/ST) in Master's degree in Electronics/Physics (with specialization in Electronics) with valid GATE score in EC, EE, IN or PH.

**Communication Engineering (EE 1)**

- Communication System
- Communications Network and Internet
- Computational Electromagnetics
- Image Processing and Computer Vision
- Microwaves, RF and Antennas
- Multimedia Systems
- Optical Communication and Photonics
- Signal Processing.
- Speech Processing
- Wireless and Mobile Communication

**Control and Computing (EE 2)**

- Linear Systems Theory.
- Optimal Control & Optimization.
- Systems Modeling & Identification.
- Control of Distributed Parameter Systems.
- Nonlinear Systems.

- Modern Filter & Network Theory.
- Behavioral System Theory.
- Computational Methods in Electrical Engineering.

#### **Power Electronics & Power Systems (EE 3)**

- Power System Analysis and Computation
- Power System Protection and Switchgear
- FACTS, HVDC and Power Quality
- EMI, EMC and EM field computations
- Electrical machines: modeling, analysis, design and control
- Power Electronics Converters

#### **Microelectronics (EE 4)**

- Devices & IC Technology.
- Reliability Studies in Devices
- Semiconductor Device Simulation & Modeling.
- Organic Semiconductor Devices.
- VLSI and System Hardware Design.
- CAD Tools
- MEMS Design and Technology (Including Bio-MEMS).
- Flash Memory Devices.

#### **Electronics Systems (EE 5)**

- Signal Processing Applications
- Speech Processing
- Electronic Instrumentation
- Biomedical Electronics

### **7) DEPARTMENT OF ENERGY SCIENCE & ENGINEERING                      EN**

Energy is a critical input required for development. Fossil fuel reserves in the country are limited and there is a need to develop viable cost effective alternatives. Renewable and Nuclear Energy can provide possible longterm solutions for the energy problems. There are problems in the large-scale development and deployment of these alternatives that need to be addressed. In the short run India has to aggressively pursue energy efficiency and Demand Side Management to Improve the efficiency of supply and utilization devices and systems. The development of new energy technologies provides a technological challenges as well as significant business opportunity. In order to help meet these challenge, the Department of Energy Science and Engineering (DESE) has been established with a mission to develop sustainable energy systems and solutions for the future. There is a requirement for high quality trained

manpower in the energy sector. This also provides scope for engineering innovators/ entrepreneurs. The DESE programme has two laboratories (Solar Energy and Energy Systems Laboratory) and a computational facility. In addition to this, DESE students are actively involved in the research and development activities of the Thermal Hydraulics facility, Gasification Laboratory, Heat Pump Laboratory (Mechanical Engineering), Power Electronics and Power Systems Laboratory (Electrical Engineering). DESE faculty have been organizing several Continuing Education Programme on a continuous basis on Renewable Energy, Energy Management, Process Integration, Solar Passive Architecture and have initiated a series of programmes for the Nuclear Power Corporation. DESE has established linkages with industries like Thermax, Forbes Marshall, BSES, Mahindra & Mahindra, BHEL and organization like Atomic Energy Regulatory Board, Ministry of New and Renewable Energy,, International Energy Initiative and The Energy and Resource Institute which have sponsored M.Tech/Ph.D Projects. This has ensured the relevance of the DESE research output.

The Department of Energy Science & Engineering M.Tech. programme offers a mix of compulsory courses and elective courses that can be chosen according to the specialization and interest of the students.

#### **Eligibility for Admission**

Candidates with First class or 60% marks (55% marks for SC/ST) in Bachelor's degree in Mechanical, Electrical, Chemical, Energy Systems, Thermal Power, Automobile, Aerospace, Aeronautical, Metallurgical or Civil Engineering **or equivalent** with valid GATE score in any discipline are eligible for admission.

#### **Areas of Research**

##### **Energy Efficiency / Improvements in conventional Energy Systems.**

Heat pumps, Energy integration, Process integration for resource optimization, Pinch Analysis Development of techniques for optimization of Utility systems, Demand Side Management/ Load Management in the Power Sector, Variable Speed Drives, Power Generation and Systems Planning, Energy Management and Auditing, Efficient Motor Drive Systems, Electronics Ballasts, Static VAR compensators, Illumination control, Power Electronics in Energy Efficient Systems, Electric Vehicles, Boilers and Fluidised Bed Combustion, Exhaust Heat Recovery, Cogeneration, Building Energy Management, Efficient Air Conditioning Systems, Hydrogen Generation and Storage, Fuel Cells.

##### **• Renewables**

Biomass Gasifier Design, Development and Testing, Pyrolysis for liquid fuels and chemical, CNG Kit development, Testing of Solar Collectors and systems, Passive Solar Architecture, Development of Carbon PV cell, Decentralized Power Systems Grid Integration Issues, Hybrid Systems for Rural Electrification, Wind Energy, Low Cost Solar Drier, Fuel Cells, Thin film solar cells, Carbon nano tubes for hydrogen storage, Solar photovoltaic concentrator, Development of Engines of SVO, Biodiesel, Dual fuelling etc., Biodiesel manufacturing process.

##### **• Nuclear**

Nuclear Safety, Nuclear Waste management, Thermal Hydraulics Research, Computer Simulation Models for Analysis of Transients in Pressurized Heavy Water Reactor.

#### *Fellowships*

Several fellowships are normally available to **DESE** students ranging from Rs.5000 to Rs. 15,000 per month – Industry Fellowship Forbes Marshall, Pune (**Rs.9000 per month**), and support candidates from the energy sector to carry out M.Tech. in Energy Systems Engineering. Atomic Energy Regulatory Board (AERB) fellowships up to five students will be sponsored for M.Tech in Energy Systems Engineering with specialization in Nuclear Engineering. They will be offered a stipend of **Rs. 15,000** on successful completion of the M.Tech. These students will be absorbed by AERB as Scientific Officer (C) in the scale **Rs.15600-39100**. Total emoluments at the time of joining will be approximately **Rs.34,000**. The candidates may be offered additional increments based on their performance in the programme. The students undergoing this programme will have to execute a bond to serve the AERB for a period of 3 years.

Most of the fellowships also include tuition fee waiver. Fellowship will be offered on the basis of separate interviews.

## 8) MECHANICAL ENGINEERING

ME

### Areas of Specialization

- |                                   |      |
|-----------------------------------|------|
| 1. Thermal and Fluids Engineering | ME 1 |
| 2. Design Engineering             | ME 2 |
| 3. Manufacturing Engineering      | ME 3 |

### Eligibility for Admission

The qualifications necessary for admission to the various specialization are as follows :

**All applicants must have First class or 60% marks (55% marks for SC/ST) in qualifying degrees in areas mentioned below:**

- a) **Thermal and Fluids Engineering:** Bachelor's degree in Mechanical Engineering or Aeronautical/ Aerospace Engineering or Automobile Engg. or Chemical Engg. with valid GATE score in any discipline.
- b) **Design Engineering:** Bachelor's degree in Aerospace Engineering, Mechanical Engineering or Production Engineering or Automobile Engg. or Machine Tool Engineering with valid GATE score in any discipline.
- c) **Manufacturing Engineering:** Bachelor's degree in Mechanical Engineering, Production Engineering or Machine Tool Engineering or Industrial Engineering with valid GATE score in any discipline.

### Areas of Research

#### Thermal and Fluids Engineering:

Fluid Mechanics, Fluid Machinery, Fluid Power Control and Fluidics, Analysis of Thermal Systems, Numerical prediction of convective and radiative heat transfer, Combustion, Fluidised bed combustion, Refrigeration and Airconditioning, Cryogenics, Miniature Cryorefrigerators, Food preservation, Performance Studies on IC Engines, Alternate Fuels, Nuclear Energy and Reactor Physics, Fuel Cells, Nuclear Reactor Thermal Hydraulics, Electronics Cooling, Microfluidics and Microscale Heat Transfer, Transport in porous media, Computational Fluid Flow and Heat Transfer, Analysis of Turbulent Flows, Low Temperature Plasma

Modelling, Molecular Gas Dynamics, Enhanced Oil Recovery.

### Design Engineering:

Stress and Vibration Analysis – Analytical, numerical (Finite Element and Boundary Element Methods) and experimental methods, Fatigue and Fracture-Linear elastic and elastic-plastic fracture mechanics, Fracture of composite materials, Fatigue-creep-corrosion interaction, Tribology and Machinery Maintenance, Pressure Vessel Design, Computer Aided Simulation and Design Optimization, Linear and non-linear vibrations, Chaos, Vehicle Dynamics, Rotor Dynamics, Acoustics and Noise, Active Vibration and Noise Control, Smart Structure, Robotics, Kinematics and control of Rigid and Flexible Manipulators, Microprocessor based control and automation, Mechatronics, Mobile Robots, Textile Machinery, MEMS.

### Manufacturing Engineering:

CAD / CAM / CIM, CNC, Computer Assisted Process Planning, Design for Manufacturing and Assembly, Manufacturing Automation & Control, Intelligent Manufacturing Systems, Rapid Prototyping and Tooling.

Design, Optimization and Modelling of Manufacturing Processes (Casting, Forming, Machining, and Welding), Precision and Micro-Manufacturing Processes, Computer Aided Tool Design.

Applications of IE & OR in Manufacturing, Logistics, Quality and Maintenance Systems.

## 9) METALLURGICAL ENGINEERING AND MATERIALS SCIENCE (MM)

### A) M.Tech. in Metallurgical Engineering & Materials Science

#### Areas of Specialization

- |                        |      |
|------------------------|------|
| 1. Materials Science   | MM 1 |
| 2. Process Engineering | MM 2 |
| 3. Steel Technology    | MM3  |

### Eligibility for Admission

#### Materials Science

Candidates having First class or 60% marks (55% marks for SC/ST) in Bachelor's Degree in Ceramic, Chemical, Electrical, Electronics, Electrochemical, Mechanical, Metallurgical Engineering, Engineering Physics with valid GATE score or First class or 60% marks (55% marks for SC/ST) in M.Sc. degree in Chemistry, Materials science, Physics with valid GATE score in any discipline are eligible for admission. AMIE/AMIIM are also eligible.

#### Process Engineering

Candidates having first class or 60% marks (55% for SC/ST) in Bachelor's degree in Chemical, Electrochemical, Mechanical, Metallurgical Engineering with valid GATE score OR First class or 60% marks (55% for SC/ST) in M.Sc. in Chemistry (General or Specialization in Physical or Inorganic Chemistry), Materials Science with valid GATE score in any discipline are eligible for admission. AMIE/AMIIM are also eligible.

**For above specializations, the applicants with M.Sc. qualifying degree, Mathematics as a subject at his / her B.Sc. degree level is an essential requirement.**

Faculty in the Metallurgical Engineering and Materials Science Dept. carry out research on a range of materials:

**Metals:** Process analysis, instrumentation and control, Iron and Steel making, deformation behavior and microstructure evolution during creep and superplasticity, mineral processing and extractive metallurgy, metal forming, mechanical behavior, welding, physical metallurgy, phase transformation, structure property relationship, thermomechanical processing and texture analysis.

**Ceramics:** Electronic ceramics, bio-ceramics, glass ceramics, ceramic foams, industrial ceramics, IR transmitting glasses, near net shape forming, gel casting, rheology of suspensions.

**Semiconductors and magnetic materials:** Devices of thin film elemental semiconductors and alloy systems, surface treatment and surface engineering, chemical vapor deposition, structure property correlation in nano-crystalline magnetic materials, magneto-resistor materials.

In addition, research into materials for sensors and batteries, superconductors, synthesis and processing of ion conductors, materials for energy generation and storage is going on in the Dept.

**Polymers and Composites:** Polymer blends, Polymer-carbon nanotube composites, metal-matrix composites, structure property relations.

**Wear and Corrosion:** Fracture and failure, non-destructive evaluation, aqueous corrosion, metallurgy of corrosion, oil and gas corrosion, and protective coatings (paints, high temperature coatings etc.).

**Modeling and Simulations:** Modeling of metallurgical processes, heat and mass transport, modeling of metal forming, Optimization, Monte Carlo simulations, Dislocation dynamics simulations.

#### **FACILITIES AVAILABLE**

Various facilities are available for research in the department:

Basic XRD with X-celerator and thin film attachment

1600 Degree Horizontal Single Sample Dilatometer with Accessories

Image Intensifier System and Ex-Ray Source

High Temp. Attachment and Texture and Stress Attachment Unit

Air Vacuum Induction Melting System

Hitachi Scanning Electron Microscope

Simultaneous Thermal Analysis System

R/S SST Plus with Coaxial Cylinder Rheometer

Atomic Absorption Unit AVANTAP

Carbon Sulphur Analyser

High Temp. Furnaces 1700 Deg.C.

UV Visible Spectrophotometer

Thin film processing units

MTS machines

Vibrating sample magnetometer

National facility on OIM and stress determination by XRD

#### **Steel Technology (MM3)**

##### **Area of Specialisation**

**MM3 : Steel Technology (Industry sponsored)**

##### **Eligibility for admission**

##### **Steel Technology**

Candidates having First class or 60% marks (55% for SC/ST) in Bachelor's degree in Chemical, Mechanical, Metallurgical Engg. With valid GATE score are eligible for admission.

Eligibility Criteria as mentioned for sponsored candidates in 5.8

##### **Corrosion Science & Engineering**

**(CO)**

**(under Metallurgical Engineering & Materials Science Department)**

Corrosion in Industry has traditionally been looked upon as stumbling block for regular productivity which people normally try to tackle based on previous "experience". With rapid industrialization the corrosion problems have become more severe and complex warranting investigation by experts. It is estimated that in India the loss due to corrosion alone is of the order of Rs. 10,000 crores per annum. A person trained in any of the standard disciplines cannot tackle these problems effectively because of the complex nature of the corrosion problems. The loss due to corrosion can be reduced to a large extent with the help of properly trained personnel. The present programme is intended to fill this gap. In this course, the students would be trained so that they would be a good asset to any organization where such problems are a matter of concern. Being a hive of chemical industries, a source of crude oil and proximity to the sea, these problems are quite prevalent in and around Mumbai. For this reason, IIT Bombay has taken the lead to offer this specialization course.

##### **Eligibility for admission**

First class or 60% marks (55% marks for SC/ST) in Bachelor's degree in Aeronautical / Aerospace, Chemical, Civil, Electrical, Electro-Chemical, Mechanical, Metallurgical Engineering with valid GATE score OR First class or 60% marks (55% marks for SC/ST) in Master's degree in Chemistry/ Material Science/Ceramics/Petrochemical with valid GATE score in any discipline. AMIE/AMIIM are also eligible.

##### **Areas of Research**

Localized Corrosion including Stress Corrosion Cracking; Corrosion Fatigue and Hydrogen embrittlement, High Temperature Corrosion, Hot Corrosion, Protective Coatings-Electroplating, Organic Coatings, and High Temperature Coatings, Corrosion Control and Monitoring, Corrosion of Steel in Concrete, Microbial Corrosion, Inhibitors, Cathodic Protection, Corrosion of Weldments, Biomaterials, Intermetallics/Aluminides, Light Metals

## Facilities Available

1. Electrochemical Measurement Systems-The State-of-the-art Model PAR 338.
2. Potentiostat model Wenking PSG 581
3. Automated 10 Ton/SCC systems.
4. Linseis Thermogravimetric Balance L81
5. Computer Facilities.
6. Optical & Stereo microscopes
7. Acoustic Emission Systems.
8. Wear Cornesme Wear Machines.
9. Facilities for testing Paint and Other Coatings.
10. Dynamics loop systems.
11. High temperature high pressure autoclaves

## 10) INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH IO

### Eligibility for Admission

Candidates having First class or 60% marks (55% marks for SC/ST) in Bachelor's degree in any branch of Engineering with valid GATE score in any discipline are eligible to apply.

### Areas of Research

The group is interested in research related to modeling, quantitative analysis and optimal resource allocation from decision problems in deterministic and stochastic contexts. Broad areas of application are in manufacturing systems, supply chains, logistics, transport including railways, finance, services, infrastructures and other industrial systems; application of quantitative methods in quality and maintenance management systems; development and application of decision support, intelligent and knowledge-based systems.

The specific problems of interest include: production planning, scheduling and control systems; management of inventories in production, distribution and service systems; industrial scheduling, facilities planning, project management, quality management, material management and productivity management; operation, planning and control related to CMS, MRP, flexible assembly, FMS, JIT, Supply Chains and ERP; reverse logistics and RFID applications, product variety management.

Operations Research applications in management of technology and resource allocation; optimal control in stochastic systems; applications of game theory, modeling and simulation of supply chains, manufacturing and service systems; theory and applications of distributed simulation, discrete event and system dynamics simulations; applied stochastic models; scheduling and control of railways and other transport operations; time tabling of services, crew and vehicle scheduling for transport operations; optimization and design problems arising from e-commerce, including auctions and mechanism design for electronic exchanges; risk analysis and contract design; revenue management; quantitative models for financial engineering. Theory and applications of neural nets and fuzzy systems in manufacturing and management; development

and applications of modern information systems for managing manufacturing, supply chain and service organizations.

The IEOR programme is unique in its contemporary flavour, with new courses in Financial Engineering, Services Management, Knowledge Based Systems, Neural Networks, Supply Chain Management, Engineering Economy, Manufacturing systems to name a few. The programme is equally strong in background building, with updated courses in Optimization Techniques, Stochastic Models and Simulation.

## 11) SYSTEMS AND CONTROL ENGINEERING SC

It provides a balanced choice of courses in theory and application of Systems and Control Engineering with the possibility of concentration in either theory or application.

It provides an interdisciplinary background to all the students by exposing them to other areas. The exercises, examples and projects are based on real world systems, so as to impart a deep understanding of the subjects and their applications.

### Eligibility For Admission

Candidates having First Class or 60% (55% for SC/ST) in Bachelor's Degree in Aeronautical / Aerospace / Chemical / Electrical / Electronics/ Instrumentation / Mechanical/ Metallurgical Engineering with a valid GATE score in one of these disciplines. **Candidate should have undergone a basic course in Control theory.**

### Areas of Research

Modeling and simulation of various types of dynamic systems, Linear and Nonlinear controls, Variable structure systems and sliding mode control, Control of large size nuclear reactor, System identification, Adaptive and learning systems, Robust and optimal control, Statistical dynamic of system, Aircraft control systems, Process control systems, Robotics control systems, Fuzzy logic systems and Neural network based control systems, Reliable computing, Quantitative feedback theory, Geometric mechanics and control, Underactuated systems.

## 12) CENTRE FOR ENVIRONMENTAL SCIENCE AND ENGINEERING EV

The interdisciplinary programme in Environmental Science and Engineering aims to offer a balanced training in scientific, engineering and social aspects of this field. The course has been designed to meet the requirements of industry, consultancy services, academic and R & D organizations related to Environmental Management, treatment of emission and effluents and remediation of contaminated environment. The programme provides ample choice of electives to enable students to delve deeper in to various aspects related to this discipline, i.e. Environmental Monitoring and Modeling, Environmental Impact Analysis, Environment Biotechnology, Industrial Air & Water Pollution Control, Industrial Ecology, Clean Technology and Hazardous Waste Management and Aerosol Science and Technology.

### Eligibility for Admission

Candidates having First class or 60% marks (55% marks for SC/ST) in Bachelor of Engineering degree in Aeronautical/Aerospace, Agricultural, Chemical, Civil, Energy , Biotechnology, Environmental, Mechanical, Metallurgical, Mining, Production, Petrochemical Engineering with valid GATE score, or First class or 60% marks (55% marks for SC/ST) in Master of Science degree (with Mathematics at the Higher Secondary / Intermediate level) in Atmospheric

Science, Biochemistry, Biotechnology, Chemistry, Earth Sciences, Environmental Toxicology, Environmental Sciences, Life Sciences, Meteorology, Microbiology and Physics with valid GATE score in any of these discipline are eligible for M.Tech admission.

### Areas of Research

The research and development activities of the CESE encompass a wide spectrum of areas in Environmental Science and Engineering with special emphasis on the solution of real life environmental problems such as environmental monitoring, industrial air and water pollution control, solid and hazardous waste management, air and water quality modelling, environmental systems optimization, environmental microbiology and biotechnology, bioremediation, indoor air quality, aerosol science and technology, environmental impact assessment and global issues. For further details visit [www.cese.iitb.ac.in](http://www.cese.iitb.ac.in)

### 13) CENTRE OF STUDIES IN RESOURCES ENGINEERING NR

#### (Natural Resources Engineering)

Centre of Studies in Resources Engineering at IIT Bombay offers an M.Tech programme in Natural Resources Engineering which is multidisciplinary in nature. The emphasis of the programme is on the use of modern techniques and tools such as Satellite Remote Sensing, Geographic Information Systems, Global Positioning Systems etc. for natural resources studies. The course provides a balanced coverage on natural resources exploration and management as well as on the topical areas of interest such as Agro-Informatics & Rural Development, Atmospheric Studies including Ozone Depletion, Coastal and Marine Environment, Digital Image Processing, Digital Photogrammetry, Natural Hazard Assessment and Disaster Mitigation, Snow, Avalanche and Glacial Studies, Terrain Evaluation, Water Resources (Surface and Ground water) Studies etc.

#### Eligibility for Admission

Candidates with first class or 60% marks (55% marks for SC/ST) in Bachelor degree in Engineering/ Masters degree in Science with valid GATE score in any of the following papers are eligible for admission to this programme.

#### Engineering & Science discipline

Agricultural Engg.	AG
Civil Engg.	CE
Computer Science & Engg.	CS
Electronics & Communication Engg.	EC
Electrical Engg.	EE
Environmental Engineering	EV
Geology & Geophysics	GG
Information Technology	IT
Mathematics	MA
Mining Engg.	MN
Physics	PH

Engineering Sciences (XE) with qualifying papers in (a) Computational Science (b) Electrical Sciences (c) Environmental Sciences

\* Mathematics at 10+2 level is essential.

### Courses Available

Due to multidisciplinary nature of the subject of Natural Resources Engineering, emphasis of this programme is to train the students with an integrated approach to various issues pertaining to natural resources exploration and scientific management using the most modern tools and techniques. The courses offered cover fundamentals to advanced topics in the use of Remote Sensing, GIS and GPS to natural resources of Land, Earth and Atmosphere as well as natural hazards and disasters.

### Areas of Research

Remote Sensing and GIS applications, Surface and ground water resources, Terrain evaluation, Land use planning, Sustainable rural development, Mineral and hydrocarbon exploration, Snow and avalanche studies, Hazards of landslide, Drought and desertification, Marine and coastal environmental studies, Atmospheric remote sensing, Development of tools and techniques of spatial data processing, Digital Image processing, Stereo image analysis and digital cartography, Microwave remote sensing etc.

### 14) CENTRE FOR TECHNOLOGY ALTERNATIVES FOR RURAL AREAS (CTARA) – TD

#### (TECHNOLOGY AND DEVELOPMENT)

The two year trans-disciplinary course is designed to prepare professionals in the area of “Technology and Development” to work in diverse fields and in different roles for managing / influencing / consulting/ innovating / choosing in different public, private and civil society organizations. The core courses will deal with important rural resource assessment (land, water, energy), techniques for choice of technology, development theory and policy, social science research methods and system dynamics models, and project management. Students will be able to choose electives based on their background and interest.

#### Facilities available :-

Metal and wood working workshop, Food Processing laboratory, contacts with active organization in the region for practical training and field-based project work.

#### Areas of Research :-

Appropriate technology development, Agro-based industries, Water-shed development, Public policy and impact of technology on development.

#### Eligibility for Admission :

- First Class or 60% marks (55% for SC/ST) in BE / B.Tech. in any branch with valid GATE score OR
- First Class or 60% marks (55% for SC/ST) in M.Sc. degree in any discipline with valid GATE score OR First Class or 60% marks (55% for SC/ST) in B.Arch / B.Tech. (Agri.) with valid GATE score.

## 15) SCHOOL OF BIOSCIENCES AND BIOENGINEERING (SBB) - BM

### (Biomedical Engineering)

#### 15.1 Introduction

The Biomedical Engineering Group (BME) at IIT Bombay was set up in 1988. It is now a part of School of Biosciences and Bioengineering (SBB). Biomedical Engineering is one of the youngest disciplines in engineering and has made tremendous progress in the last 4 decades. This has been aided by rapid advancements in Semiconductor Technology, Information Technology, and Biotechnology. In the field of Biomedical Engineering, researchers with expertise in diverse areas work towards the unified goal of creating products and techniques for better health care. The backgrounds of faculty in BME at IIT Bombay reflect the wide spectrum of expertise required to make better and more affordable health care a reality. Further, the students admitted to the programme have backgrounds in Engineering, Physical Sciences, Life Sciences and Medicine, making it the only program in the country to offer M.Tech. admissions to such a unique mix of candidates. The creation of a heterogeneous class composition promotes interaction between students and faculty of different backgrounds and provides opportunities for research in exciting interdisciplinary areas.

#### Course work & Project

Over the first two semesters, M.Tech. students are required to do substantial amount of course work to complement their undergraduate or masters level education. The third semester is devoted mostly to the M.Tech. projects although some courses may be taken during that period. The fourth semester is fully devoted to completion of the project. The curriculum has been designed to provide all students with a general background in Biomedical Engineering followed by more specific knowledge in the area of their choice. The former is achieved through core (for everyone) and compulsory (for students with a particular background) courses in the first semester. Electives taken during the second and third semester provide specialized knowledge in the area of the individual interest.

In the first semester, students with backgrounds in life sciences and medicine are required to take compulsory courses in mathematics, electronic circuits and instrumentation. Students with backgrounds in physical sciences and engineering take courses in physiology. Further, everyone is required to present a seminar on a topic related to Biomedical Engineering under the guidance of a faculty. There are other elective courses to be taken as well.

In the second semester, all students have to go through a core course on Biostatistics and Design of Experiments. Students with backgrounds in physical sciences and engineering undergo a compulsory course in Clinical Physiology. All students are required to undergo a course on quantitative and experimental methods in physiology. The rest of the courses are electives which the students choose after consultation with the faculty adviser.

Elective are offered in bioelectricity, biorheology, ergonomics, medical instrumentation, bioMEMS, medical physics, physiological systems modeling, signal processing, etc. All students are required to take a course designated as an Institute Elective offered by departments other than BME. In special cases electives other than the institute elective may be taken from other departments in IIT after obtaining necessary permissions from the School Post Graduate Committee.

#### 15.2 Eligibility for Admission : First Class or 60% marks (55% marks for SC/ST) in

- i) B.Tech/B.E. in Biomedical, Chemical, Computer Science, Electrical, Electronics, Instrumentation, Mechanical Engineering, Metallurgy and Materials Science, Telecommunications Engineering and Engineering Physics. OR
- ii) M.Sc. or equivalent in Biochemistry, Biophysics, Biotechnology, Ceramics, Chemistry, Electronics, Ergonomics, Materials Science, Mathematics, Molecular Biology, Physics and Physiology; OR \*
- iii) MBBS OR \*
- iv) M. Pharm OR\*
- v) B.V.Sc., B.D.S and B.Pharm degree (Duration 4 years or more)

and Valid GATE score in any discipline for engineering and science graduates, or AIIMS / All India MCI/JIPMER/PGI Chandigarh/AFMC-Pune/DNB Part I national level medical postgraduate entrance examinations or GATE Life Sciences examination for medical and biological sciences.

\* Candidate with qualifications mentioned against (iii), (iv) & (v) must submit a certificate for their having First class or 60% marks (55% for SC/ST) in qualifying degrees, failing which, they will not be eligible for admission to M.Tech in Biodmedical Engineering

All India level Pre-M.D.S / M.V.Sc. Selection examination for B.V.Sc., B.D.S and B.Pharm. Eligibility/rank certificates of all such entrance examinations are required.

#### Written test and Interview

Prospective candidates called for the interview will be required to appear in a written test in the morning of the first day of the interview. The written examination, of two hours duration, will be conducted in Mathematics (for candidates with a Medical / Pharmacy / Life Sciences background) and Biology (for candidates with a Engineering/Physical sciences background). The syllabi for the tests will be in accordance with the 12th std. syllabi of CBSE.

#### 15.3 RESEARCH AREAS

Currently fundamental and applied research is being conducted in the broad areas of:

- Bioinstrumentation for diagnostics and therapeutics
- Biomaterials and tissue engineering, prostheses and medical devices
- Bionanotechnology
- Controlled drug delivery systems
- Neurophysiology
- Physiological system modelling and analysis

Students can do their projects in, but not restricted to, the following areas:

- Bioinstrumentation for early detection of carcinoma and tropical diseases,
- Biointerfaces and Langmuir models of biological membranes,
- Biomaterials and tissue engineering,

- Biomedical transducers and sensors including biosensors and bioMEMS devices,
- Bionanotechnology,
- Biostatistics and mathematical modeling,
- Cardiac electrophysiology and muscle mechanics,
- Controlled drug delivery systems,
- Diagnostic tools based on spectroscopic and imaging techniques,
- Hemorheology, microcirculation and biorheology for diagnostic purposes,
- Neurophysiology,
- Prosthetic devices including aids for the handicapped,
- Pulmonary surfactant replacemens for therapeutics,
- Signal processing,
- Telemedicine and knowledge based systems

#### 15.4 REASERCH FACILITIES

Research in Biomedical Engineering is conducted in laboratories set up by core as well as associated faculty of the group. The various research labs and facilities available are as follows:

- Biointerfaces laboratory for evaluation of surface phenomena in biological systems well equipped with specialized Langmuir Blodgett systems and surfactometers
- Biomaterials Laboratory with facilities for the development and evaluation of novel materials for clinical applications
- Biomedical Instrumentation Laboratory with standard test and measurement instruments such as digital storage oscilloscopes, signal generators, etc.
- Biophotonics Laboratory to study the interaction of photons with tissues with a view to elicit information of tissue function and develop non-invasive diagnostic tools.
- Cardiac Electrophysiology Laboratory with high speed data acquisition and signal conditioning modules for research into electrophysiology of ischemia and fibrillation.
- Cellular Engineering Laboratory to conduct cellular and subcellular research. This Laboratory is equipped for cell and tissue culture as well as hybridoma research.
- Haemorheology Laboratory, with instruments like cone and plate viscometer, red cell platelet aggregaometer for the evaluation of viscosity and flow parameters of biological fluids
- Nerve and Muscle Physiology laboratory has facilities for experiments on skeletal, cardiac and smooth muscles
- Work on Ergonomics and Biomechanics is carried on in the Ergonomics Laboratory in Industrial Design Centre (IDC)

- Work on Medical Image Processing and Electrophysiological Signal Processing is carried on in Signal Processing and Artificial Neural Networks (SPANN Lab) Laboratory and the Instrumentation and Projects Laboratory in Electrical Engineering Department.

The computing facility of BME houses multiple workstations and servers. Fibreoptic local area network exists in the Institute. Students and faculty have access to the Institute facilities which include high end machines. The computing facilities are complimented by several PC-s with data acquisition cards. (National Instruments, USFA) and GUI development software (LabWindows, LabView)

#### (C) APPENDIX

**Table I: Fees, Deposits & Hostel Rent:**

##### GENERAL:

Particulars	Revised fee payable(Rs.)			
	GN/OBC		SC/ST	Institute Staff
	Non-spons. category#	Spons. Category@		

##### A) One time payment at the time of Admission

a.1. Admission fee	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>
2. Grade Card	<b>150</b>	<b>150</b>	<b>150</b>	<b>150</b>
3. Medical Examination	<b>100</b>	<b>100</b>	<b>100</b>	<b>00</b>
b.1. Provisional Certificate	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
2. Student Welfare Fund	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>
3. Modernisation	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>
4. Identity Card	<b>250</b>	<b>250</b>	<b>250</b>	<b>00</b>
5. Courses of Study bulletin	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
6. Institute Day Celebration	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7. Valedictory Function Fe	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>
<b>Total (A)</b>	<b>3400</b>	<b>3400</b>	<b>3400</b>	<b>3050</b>

(contd.)

**B) Per Semester Fees**

a.1. Tuition Fee - Statutory fees	5000	25000	0	00
2. Examination Fee	350	350	350	350
3. Registration Fee	200	200	200	200
4. Gymkhana Fee	500	500	500	00
*5. Hostel Seat Ren	500	500	500	00
* 6. Elect. & Water Charges	2000	2000	2000	00
b.1. Medical Fee	500	500	500	00
2. Student Benevolent Fund	500	500	500	500
*3. Hostel Establ. Charges	1000	1000	1000	00
4. Medical Fund	0	0	0	0
*5. Contribution to Hostel Subsidy	3000	3000	3000	00
6. Internet Fee	0	0	0	0
*7. Hostel Maint. Fees	0	0	0	0
<b>Total (B)</b>	<b>13,550</b>	<b>33,550</b>	<b>8550</b>	<b>1050</b>
C) Annual Med. Insu. Premium (once in a year)	126	126	126	00
<b>D) Deposits (Refundable) to be paid at the time of Admission</b>				
1. Institute Security Deposit	1000	1000	1000	00
2. Library Security Deposit	1000	1000	1000	00
*3. Mess Security Deposit	1000	1000	1000	00
<b>Total (D)</b>	<b>3000</b>	<b>3000</b>	<b>3000</b>	<b>00</b>
<b>Total Fees (A+B+C+D) -</b>	<b>20,076</b>	<b>**40,076-</b>	<b>15,076</b>	<b>4100</b>

\* Students not staying in Hostel are exempted from the payment of Hostel fees.

\*\* A proposal of Fee Waiver for Sponsored Category Students is under consideration.

**# Non-Sponsored categories :**

(1) Teaching Assistantship (TA) (2) Research Assistantship (RA) (3) Govt./Sem-Govt. Fellowships awardees (QIP/UGC/CSIR/DAE/DST/DBT/NBHM etc.)

**@ Sponsored categories :**

All other categories I.e. SW, EX, SF,CT,TAP,PA,PS, etc.

In addition to above, refundable Mess Advance of Rs. 2,000/- and Semester Mess Advance of Rs. 10,000/- is to be paid before occupying the Hostel for those who opt for staying in hostel by way of Demand Draft in favour of a Concerned Hostel.

**Candidates from reserved categories (SC/ST) are fully exempted from paying the Tuition Fees.**

**Table II: SUMMARY OF M.TECH. PROGRAMMES**

Department/ID Groups/Centre	Specialization	Code
1. Aerospace Engineering	Aerodynamics	AE1
	Dynamics & Control	AE2
	Aerospace Propulsion	AE3
	Aerospace Structures	AE4
2. Chemical Engineering	Chemical Engineering	CH
3. Civil Engineering	Transportation Systems Engg.	CE1
	Geotechnical Engineering	CE2
	Water Resources Engineering	CE3
	Structural Engineering	CE4
	Remote Sensing	CE6
4. Computer Science & Engineering	Computer Science & Engineering	CS
5. Earth Sciences	Geoexploration	GS
	Petroleum Geoscience	PG
6. Electrical Engineering	Communication Engineering	EE1
	Control & Computing	EE2
	Power Electronics & Power Systems	EE3
	Microelectronics	EE4
	Electronic Systems	EE5
7. Energy Science & Engineering	Energy Science & Engineering	EN
8. Mechanical Engineering	Thermal & Fluids Engineering.	ME1
	Design Engineering	ME2
	Manufacturing Engineering	ME3
9. Metallurgical Engineering & Materials Science	Materials Science	MM1
	Process Engineering	MM2
	Steel Technology	MM3
	Corrosion Science & Engineering	CO

<b>Interdisciplinary Groups:</b>	
10. Industrial Engineering & Operations Research	IO
11. Systems and Control Engineering	SC
<b>Centre/School :</b>	
12. Environmental Science & Engineering	EV
13. CSRE - Natural Resources Engineering	NR
14. CTARA – Technology and Development	TD
15. School of Biosciences & Bioengineering (Biomedical Engineering)	BM

**Table-III: ELIGIBILITY FOR SEEKING ADMISSION**

**TO DIFFERENT DISCIPLINES**

If you have degree or equivalent in disciplines (Refer Table II for codes)	You can seek admission to the following
Engineering/Technology	
Agricultural Engg.	EN, IO, EV, CS, NR, TD
Aerospace/Aeronautical Engg.	AE1, AE2, AE3, AE4, EE2, ME2, CO, CS, EN, IO, ME1, SC, EV, TD
Automobile Engg	ME1, ME2, EN, IO, CS, TD
Architecture & Planning	IO, CS, NR, TD
Biomedical Engg.	BM, IO, EE5, CS, TD
Biotechnical Engg.	CS, IO, TD
Ceramic and Glass Tech.	CS, CO, MM1, IO, TD
Chemical Engg.	BM, CH, CO, CS, EE2, EN, EV, IO, ME1, MM1, MM2, MM3, SC, TD
Civil Engg.	CE1, CE2, CE3, CE4, CE6, CO, CS, EN, EV, IO, AE1, AE4, SC, NR, TD
Computer Science & Engineering	BM, CS, EE1, EE3, EE4, IO, NR, TD
Energy Science & Engineering	EN, EV, IO, CS, TD
Electrical/Electronics Engg.	AE2, EE1, EE2, EE3, EE4, EE5, BM, CO, CS, EN, IO, MM1, SC, NR, TD
Telecommunication/Communication Engg.	EE1, EE2, EE3, EE4, EE5, BM, CO, CS, IO, NR, SC, TD
Electrochemical	CO, MM1, MM2, IO, CS, TD
Engineering Physics	BM, EE1, EE2, EE4, EE5, MM1, CS, IO, NR, TD

Industrial Engineering	ME3, IO, CS, TD
Instrumentation Engg.	AE2, BM, CS, EE2, EE3, EE4, EE5, SC, IO, TD
Machine Tool Engg.	ME2, ME3, IO, CS, TD
Thermal Power Engg.	EN, IO, CS, TD
Mechanical Engg.	ME1, ME2, ME3, AE1, AE2, AE3, AE4, BM, CO, CS, EE2, EN, EV, IO, MM1, MM2, MM3, SC, TD
Metallurgical Engineering	EE2, MM1, MM2, MM3, CO, CS, EN, EV, IO, SC, BM, TD
Mining Engineering	EV, CS, IO, NR, TD
Production Engineering	ME2, ME3, CS, EV, IO, TD
Petrochemical	CH, EV, IO, CS, CO, TD
Environmental Engineering	EV, CS, NR, TD
MCA (with B.Sc. with Physics & Maths)	CS, NR
<b>M.Sc. or equivalent</b>	
Agriculture	TD
Atmospheric Science	EV, CS, TD
Biochemistry	BM, EV, CS, TD
Biophysics	BM, CS, TD
Biotechnology	BM, EV, CS, TD
Chemistry	BM, CO, EV, MM1, MM2, CS, TD
Ceramics	BM, CS, NR, TD
Environmental Science	EV, CS, NR, TD
Environmental Toxicology	EV, CS, TD
Ergonomics	BM, CS, TD
Earth Sciences :- Geology/Applied Geology/Geochemistry/ Geophysics	EV, GS, CS, NR, TD
Life Sciences	EV, CS, NR, TD
Materials Science	BM, CO, MM1, MM2, CS, TD
Mathematics	BM, CS, NR, EE2, SC, TD
Microbiology	EV, CS, TD
Meteorology	EV, CS, NR, TD

Molecular Biology	BM, CS, TD
Physics	BM, MM1, CS, EV, NR, EE2, EE4, EE5, TD
Physics with Electronics as a Special Subject	BM, CS, EE1, EE5, MM1, NR, TD
Electronic Science	BM, EE1, EE4, CS, NR, TD
Physiology	BM, CS, TD
M.B.B.S (Medicine)	BM, TD
M. Pharm. B.Arch	BM, TD

Note:

1. For admission to Computer Science & Engineering (CS), the candidate should have taken the GATE Specialization Paper CS / IT.
2. For admission to EV, the candidate must have Mathematics at Higher Secondary or Intermediate level.
3. For admission to Chemical Engineering, candidates must have taken GATE specialization paper CH.
4. For admission to Systems & Control Engg., candidates should have undergone a course in Control Theory.
5. For admission to MM1 and MM2, the candidates with M.Sc. must have passed Mathematics as a subject at the B.Sc. degree level.
6. For admission to MM2, the candidates with M.Sc., should have taken either general/physical/inorganic Chemistry as specialization at the M.Sc. level.
7. For admission to various specializations in Aerospace & Electrical Engineering, there is specific requirement of GATE paper. The information is given in this brochure against respective Department.

**TABLE – IV : GATE & OTHER REQUIREMENT OF DIFFERENT DISCIPLINE**

Discipline	Eligibility Criteria First Class in marks ( 55% for SC/ST)	GATE or 60% Requirement
<b>Aerospace Engineering</b>	B.E./B.Tech. or equivalent in Aeronautical/ Aerospace are eligible for all specializations.	Valid GATE score in any discipline.
(a) Any of the specializations (AE1, AE2, AE3, AE4)	Engineering graduates in other branches of Engineering (i.e. Mechanical, Civil, of Engineering of Engineering Instrumentation or allied branches) are eligible for admission to specific specializations of Aerospace Engineering, if they have valid GATE score in disciplines as shown in the table below:	
(b) To specific specializations		
Aerodynamics (AE1)	Bachelor's degree in Mechanical Engg./ Civil Engg.	ME, CE
Dynamics & Control (AE2)	Bachelor's degree in Mech. Engg./ Electrical/ Electronics/ Instrumentation Engg.	ME/EE/EC/IN
Aerospace Propulsion (AE3)	Bachelor's degree in Mechanical Engg.	ME
Aerospace Structures (AE4)	Bachelor's degree in Mechanical Engg./ Civil Engg.	ME, CE
<b>Chemical Engineering</b>	B.E./B.Tech. in Chemical Engineering or equivalent	Valid GATE score in Chemical Engg. (CH) only
<b>Civil Engineering</b>		
Transportation Sys. Engg. (CE1)	B.E./B.Tech. in Civil Engineering or equivalent	Valid GATE score in any discipline
Geotechnical Engg. (CE2)		
Water Resources Engg. (CE3)		
Structural Engg. (CE4)		
Remote Sensing (CE6)		
<b>Computer Science &amp; Engg.</b>		
	Engineering /Bachelors degree in Master's degree in Science / MCA (with Physics & Mathematics at B.Sc. level) or equivalent degree. GATE (CS / IT) is required for all applicants (this includes Project Staff (PS)/Institute Staff(IS) and Sponsored candidates).	Valid GATE score in (CS/IT) only

## Earth Sciences

### a) Geoploration

Master's degree or equivalent in Geology / Applied Geology / Geophysics / Geochemistry

Valid GATE score in Geology & Geophysics

### b) Petroleum

Master's degree or equivalent in Geology/ Applied Geology/ Geophysics/ Applied Geophysics.

Valid GATE score in Geology & Geophysics

## Electrical Engineering

Communication Engg. (EE1)	Bachelor's degree in Computer Science and Engineering, Electrical Engineering, Electronics Engineering, Telecommunications Engineering, Engineering Physics OR Master's degree in Physics ( with specialization in Electronics) or Electronic Sciences	Valid GATE score in GATE subjects EC / EE / PH/CS
Control & Computing (EE2)	Bachelor's degree in Aeronautical/ Aerospace Engineering, Chemical Engineering, Computer Science & Engineering, Electrical Engineering, Electronics Engineering, Telecommunication Engineering, Instrumentation Engineering, Mechanical Engineering, Metallurgical Engineering, Engineering Physics OR Mater's degree in Physics Mathematics	Valid GATE score in CH, CS, EC, EE, IN, ME, MT, PH, MA, XE
Power Electronics & Power Systems (EE3)	Bachelor's degree in Computer Science and Engineering, Electrical Engineering, Electronics Engineering, Telecommunication Engineering, Instrumentation Engineering	Valid GATE score in CS, EC, EE, IN
Microelectronics (EE4)	Bachelor's degree in Computer Science, Electrical Engineering, Electronics Engineering, Telecommunication Engineering, Engineering Physics, Instrumentation Engineering OR Master's degree in Physics or Electronic Sciences with valid GATE score in CS, EC, EE, IN or PH	Valid GATE score in CS, EC, EE, IN, PH
Electronic Systems (EE5)	Bachelor's degree in Biomedical Engineering, Electrical Engineering, Electronics Engineering, Telecommunication Engineering, Engineering Physics, OR Master's degree in Electronics/ Physics (with specialization in Electronics)	Valid GATE score in EC, EE, IN, PH

## Energy Science & Engineering

Candidates with first class or 60% (55% for ST/ST) Bachelor's degree in Mechanical, Electrical, Chemical, Energy Systems, Thermal Power, Automobile Aerospace, Aeronautical, Metallurgical or Civil Engineering or equivalent with valid GATE score in any discipline are eligible for admission.

## Mechanical Engineering

Thermal & Fluids Engg.	<b>ME 1 :</b> Bachelor's degree in Mechanical/ Aeronautical/ Aerospace/ Automobile Engineering or Chemical Engg.	Valid GATE score in any discipline.
Design Engg. (ME2)	<b>ME 2 :</b> Bachelor's degree in Aerospace/ Mechanical/ Production/ Automobile/ Machine tool Engineering	Valid GATE score in any discipline.
Manufacturing Engg. (ME3)	<b>ME 3 :</b> Bachelor's degree in Mechanical Production/ Machine Tool/ Industrial Engineering	Valid GATE score in any discipline.

## Met. Engg. & Mat. Sc.

Materials Science (MM1)	<b>MM 1 :</b> Bachelor's degree in Ceramic/ Chemical/ Electrical/ Electronics/ Electrochemical/ Mechanical/ Metallurgical Engineering/ Engineering Physics or M.Sc. in Chemistry/ Materials Sciences/ Physics. AMIE/AMIIM are also eligible.	Valid GATE score in any discipline
Process Engineering (MM2)	<b>MM 2 :</b> Bachelor's degree in Chemical/ Electrochemical/ Mechanical/ Metallurgical Engineering or M.Sc. in Chemistry (General or specialization in Physical or Inorganic Chemistry)/ Materials Science. AMIE/AMIIM are also eligible.	Valid GATE score in any discipline
Steel Technology (MM 3)	Bachelor's degree in Chemical, Mechanical, Metallurgical Engg.	valid GATE score

## Corrosion Sc. & Engg. (CO)

**CO :** Bachelor's degree in Aeronautical/ Aerospace/ Chemical/ Civil/ Electrical/ Electrochemical/ Mechanical/ Metallurgical Engineering or Master's degree in Chemistry/ Material Science/ Ceramics/ Petrochemical. AMIE/AMIIM are also eligible.

<b>Industrial Engg. &amp; Operations Research</b>	Bachelor's degree in any branch of Engineering	Valid GATE score in any discipline.
<b>Systems &amp; Control Engg.</b>	Bachelor's degree in Aeronautical / Aerospace / Chemical / Electrical / Electronics / Instrumentation / Mechanical / Metallurgical Engineering. Candidate should have undergone a basic course in Control Theory.	Valid GATE score in any of these disciplines
<b>Centre for Environmental Sc. &amp; Engg</b>	Bachelor's degree in Aeronautical / Aerospace / Agriculture / Chemical / Civil/Energy/ Biotechnology / Environmental /Mechanical / Metallurgical / Mining / Production / Petrochemical Engineering or M.Sc. in Atmospheric Science/ Biochemistry / Biotechnology / Chemistry / Earth Sciences / Environmental Toxicology / Environmental Science/Life Science / Meteorology / Microbiology / Physics  The candidates with M.Sc. must have passed Mathematics as a subject at 10 + 2 level	Valid GATE score in any of these discipline.
<b>CSRE</b> ( <i>Natural Resources Engg.</i> )	Candidates with Bachelor degree in Engineering /Masters degree in Science .  The candidates with M.Sc. must have passed Mathematics as a subject at	Engineering & Science discipline Valid GATE score 10 + 2 level in AG, CE, CS, EC, EE, EV, GG, IT, MA, MN, PH, <b>Engineering Sciences (XE) with Qualifying Papers</b> (a) Computational Sciences/ (b) Electrical Sciences/ (c) Environmental Science.

<b>Centre for Technology Alternatives for Rural Areas (CTARA) -</b> ( <i>Technology &amp; Development</i> )(TD).	BE/ B.Tech. in any branch OR M.Sc. Degree in any discipline OR B.Arch / B.Tech. (Agri.)	Valid GATE score
<b>School of Biosciences &amp; Bioengineering</b> ( <i>Biomedical Engg.</i> )	i) B.E./B.Tech. In Biomedical/ Chemical/ Computer Science/ Electrical/ Electronics/ Instrumentation/ Mechanical Engg./ Metallurgy & Materials Science/ Telecommunications Engg./ Engineering Physics or ii) M.Sc. or equivalent in Biochemistry / Biophysics / Biotechnology / Ceramics / Ergonomics / Chemistry / Electronics / Materials Science / Mathematics / Molecular Biology / Physics / Physiology or iii) MBBS * or iv) M. Pharm. * v) B.V.Sc., B.D.S and B.Pharm degree (Duration 4 years or more)  **Candidate with qualifications mentioned against (iii), (iv) & (v) must submit a certificate for their having First class or 60% marks (55% for SC/ST) in qualifying degrees, failing which, they will not be eligible for admission to M.Tech in Biodomedical Engineering.	Valid GATE score in any discipline for engineering and science graduates, or AIIMS / All India MCI / JIPMER / PGI Chandigarh / AFMC-Pune / DNB Part I national level medical postgraduate entrance examinations or GATE Life Sciences examination for medical and biological sciences. All India level Pre-M.D.S/M.V.Sc. Selection



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY**

**STATEMENT OF PURPOSE**

**(only for candidates applying to Aerospace Enng & CTARA)**

(Statement of Purpose (SOP) is your opportunity to share with the admission committee your thoughts and feeling about Postgraduate studies at IIT Bombay including your preparation for the same. Briefly describe past project/ research work done by you. Restrict yourself to 500-600 words. The personal SOP will aid the admission committee in evaluating your application.)

1. Name: \_\_\_\_\_

2. Programme of study: (M.Tech.) \_\_\_\_\_

3. Department: Aerospace Engineering/CTARA

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