

INFORMATION BROCHURE

Congratulations on doing extremely well in GATE / CSA research interviews and securing admission to the Department of Computer Science and Automation! Welcome to CSA!

Information for ME (CSE) students joining CSA in year 2012

The ME (Two Years) Programme in Computer Science and Engineering (CSE) is a challenging one with courses that have high standards, interesting and stimulating content. Needless to say, you will have to work hard. Please go through this brochure carefully, and keep it as a handy reference for the future. A copy of this document is also available in the CSA Department's web page <http://www.csa.iisc.ernet.in/>.

Faculty Advisor

While we are sure that all of you have the inherent motivation and abilities to get through the programme with flying colours, we believe a little extra guidance from us will go a long way in smoothing out your adjustment to a new academic environment and in enhancing your academic performance. Your primary source of academic guidance and counseling is the faculty advisor assigned to you. During the beginning of your course, you should make it a point to get to know your advisor well, and meet your advisor frequently in the early part of your stay here, and especially whenever you face any problems. The distinction between students and faculty is more blurred: you will find faculty willing to deal with you on a more equal level, to listen to and value ideas from you that might be contradictory to their current knowledge and viewpoints, etc.

Student Advisor

There will also be a student advisor assigned to each student (M.E, M.Sc. (Engg.) and Ph.D.). They are someone with whom you can interact closely in a friendly and informal way to help yourself acclimatize to the environment here. Apart from the faculty advisor, the student advisor is another avenue for helping you in adjusting with the environment in the CSA department and the IISc campus in general.

Do not hesitate to approach senior students and faculty members for help.

Graduate vs. Undergraduate Study

A graduate student (yourself) is assumed to be fairly mature academically, and self-motivated to a large extent. Unlike undergraduate studies, your emphasis here should be on obtaining deeper understanding of challenging and interesting subjects, and less on obtaining high grades. The de-emphasizing of grades is more important, since most of you have been top rankers at your respective colleges. Naturally not all of you can become top rankers here, nor is it necessary as long as you gain a sound understanding and mastery of the subjects. Graduate studies have other equally important or superior metrics for measuring performance: how well you do in courses from a focused area of your interest and choice; how well you do in your dissertation work; may be even how well you do in academic work that you undertake beyond the classroom and project. This doesn't mean you do not strive to get the best grades. Getting superior grades is important but is only one of many aspects of the learning process here.

Doing Research as a Part of Dissertation Work

The next important issue is the idea of pursuing research. As a part of ME Programme, you are required to write a dissertation. Over the years, the nature of this dissertation work has become more research-oriented, and you are expected to publish papers in international conferences and journals from your dissertation work. Gradually, facilities have been enhanced to do this kind of dissertation work. In the good old days, papers need to be xeroxed and read, but now everything is available at your fingertips on the internet (you still need to read them). At the same time, gigabytes of storage space is also available. The only additional input you require from your end is your determination to carry out an excellent dissertation work.

Exploring Cutting-Edge Research

Considering that you are among the top students of the country, it is likely that you harbour ambitions of doing cutting-edge research in industry or pursuing an academic career. A Ph.D is a pre-requisite for such a research career. With regard to job prospects, the Indian job market now has very challenging jobs to offer for researchers. The rigours and challenges of our doctoral programme have enabled several of our Ph.D. graduates to occupy key, senior positions in corporate R & D institutions as well as in academia.

Suppose you are convinced enough to start thinking in terms of a Ph.D. The next question is: why do so at IISc? Here are a few good reasons: intellectual ambience of IISc coupled with excellent faculty at CSA. You have an opportunity here to do a world-class Ph.D. without losing out on the benefits of living in the environment and culture that you are probably most comfortable with. Now suppose you are convinced that you want to do Ph.D. at IISc. The question that arises is: how can you join Ph.D. here? There are three options available: First, you can convert your M.E. to Ph.D. at the end of first, second or third term. The only requirement is that you have a certain minimum CGPA (See the students' handbook for details).

Information for M.Sc. (Engg.) students joining CSA in year 2012

The M.Sc. (Engg.) research program is a 2 to 2.5 year's duration program. The students are expected to be self-motivated and should be able to work well in teams as well as individually. It is to be noted that, as in case of M.E. program, you can also convert to Ph.D. programme during the course of M.Sc.(Engg.). However, in case of M.Sc.(Engg.), you can also change over to Ph.D. programme at the time of submitting your M.Sc.(Engg.) thesis. Following are the guidelines based on experience, for new students, to complete the program in flying colors.

First Term

1. Getting acquainted with the people, facilities in CSA specifically and IISc in general.
2. Selection of courses (Depending on your intended area of research): The selection includes at least one mathematical or mathematical-oriented course. Most of the students take 4 courses to complete the Research Training Programme (minimum required is at least 12 credits) in the first semester itself. However, you can as well split it depending upon the availability of the required courses.
3. Selection of Research area and guide: Take help from Departmental Curriculum Committee, faculty and senior Research students in the department in this regard. There will also be a DCC meeting shortly after joining.
4. Work hard to complete your RTP with good grades. Note that if your CGPA is 6.0 and above, the general test is not mandatory.

Second Term

1. Take any advanced course useful for your Research if needed/suggested.
2. Select the problem and take help from the students working in the same area.
3. Start literature survey.
4. You have to participate in the 'Perspective Seminar' course where students present a comprehensive survey of their area of work from the standpoint of the specific problem of their investigations.

Third Term

1. Start Doing experimentation and collection of results
2. Complete the general test if your CGPA is below 6.0. It is ideal to complete the general test within one year or in the beginning of third term. This is an oral examination. The candidate is first expected to give a brief presentation on his research work. This is followed by questions on the material learned by the student from their courses taken.
3. Writing of Research paper/technical report, etc.
4. Second, you continue on to PhD immediately after submitting your M.E dissertation. Third, you apply later for PhD and appear in a research interview after graduating and leaving IISc.

Fourth Term

1. Complete the remaining work to conclude your research.
2. Start writing your thesis.
3. Prepare for your future endeavors.
4. Colloquium and thesis defense.

Information for Ph.D. students joining CSA in year 2012.

The duration of the Ph.D. program is usually 4-5 years. The students are expected to be self-motivated and should be able to work well in teams as well as individually. Following are the guidelines based on experience, for new students, to complete the program in flying colors.

First term

1. Getting acquainted with the people, facilities in CSA specifically and IISc in general.
2. Selection of courses: The courses you select depend on your intended area of research. It is compulsory that you should select at least one mathematical or mathematical-oriented course. A Ph.D. student after finishing his B.E./B.Tech. should gain at least 24 credits (which may mean usually 6-7 courses) to complete their Research Training Programme (RTP) whereas a Ph.D. student who already has a Master's degree needs to gain only 6 credits (i.e. two courses). The students are usually advised to take a maximum of 4 courses in the first semester. The students who are supposed to do 6 courses may do the remaining 2 courses in the second semester.
3. Selection of research area and guide: Take help from Departmental Curriculum Committee, faculty and senior research students in the department in this regard. A special DCC meeting will be arranged for this purpose shortly after the semester starts.
4. Work hard to complete your RTP with good grades. Award of Infosys and other fellowships for PhD also depend on your CGPA that you obtain in the first semester besides progress in research work. These fellowships are normally awarded in the beginning of every calendar year.

Second Term

1. If you haven't yet finished the required number of courses in the first semester itself, select the remaining number of courses to complete the requirements of RTP. Take any advanced course useful for your research if needed/suggested.
2. Select your research problem, and take help from the students working in the same area.
3. Start literature survey.

Third term

1. Present the Perspective Seminar, where you will present a comprehensive survey of the existing literature from the standpoint of the specific problem of your investigations.
2. Start concrete work on your solving research problem
3. A Ph.D student has to pass the comprehensive examination. You may appear for the comprehensive examination either in the third semester or in the fourth semester (before the end of two years), depending on the progress in your research work and in consultation with your advisor. In the comprehensive examination, the candidate is first expected to give a brief presentation of his/her research work. This is followed by questions on the syllabus for the RTP undergone by the student.
4. Writing of research paper/technical reports, etc.

Fourth Term

1. Complete the comprehensive examination if you haven't already completed it.
2. Continue with your research work.
3. Write more research papers.

Fifth term onwards

1. Complete the remaining work to conclude your research.
2. Once you have enough results, start writing your thesis. (You may want to consult your advisor regarding when to start writing your thesis.)
3. Prepare for your future endeavours.
4. Colloquium, Thesis defense, etc.

General Information about Courses

Course Structure

IISc follows a credit structure. Each subject has a specified number of credits. Each credit stands for one lecture hour per week or 3 hours of practicals. The credit for the course is of the form x:y, where x is the credits for lecture hours and y is the credits for practicals. In some cases, where there is limited scope for practicals, y refers to the credits for solving problems through tutorial sessions or home works. The total credits for the course is x+y..

In practice, you may (or will?) have to spend more than 3 hours per week for the 1 credit of practical. Unlike most undergraduate programs, practicals and homeworks don't have any fixed timings. You have to spend as much time as you require and complete them. You will find numbers associated with each of the subjects. For example,

E0 361	Topics in Databases	3:1
E0 228	Quantum Computing	3:0
E0 239	Electronic Commerce	3:1

Here E in E0 stands for the fact that the course is offered by in the Division of Electrical Sciences. 0 stands for Computer Science discipline, 1 stands for Intelligent Systems and Automation discipline etc. The number 228 is course number, where the first 2 stands for 200 level. A 200 level course is at Master level. A 300 Level course is at Research level.

Choosing Courses

Each of you has come in with some idea of the areas of Computer Science that are of interest to you. But the faculty here often finds that your interests are based on misconceptions about the areas! Computer Science is taught in quite a different manner here at IISc, with much more rigour, orientation towards practical aspects, and emphasis on cutting-edge topics. This is very likely to change both your impressions about different sub-areas of computer science and your interests. Therefore, it is very important for you to put aside your prior notions to a good extent, and try out a variety of courses here.

Another common phenomenon is the rush towards courses that currently have high job market value. While it is natural for students to lean towards such courses, it is equally important to not lose yourself to herd mentality or short-term prospects. So how does all this affect your ME or Research Programme here? Given the fast moving Indian industry, it is very important for you to view your stay at IISc as a long-term investment rather than short term one where you focus yourself on one sub-area of today to get a job tomorrow. It is important to broadbase your choice of elective courses. Your objective should be to gain a sound understanding and superior skills in core topics with a long term perspective. This is where continuous interaction with faculty advisors assumes much significance.

List of Courses Offered:

A listing of courses offered by the Department faculty is provided below. It gives you the general idea of the courses you can expect this year. In addition to these, some courses offered by other departments in IISc could also be of interest. For course contents of these and other possible courses, look at CSA's homepage.

Courses during August – December 2012

Course No.	Title of the Course	Credits	Instructor
E0 219	Linear Algebra and Applications	3:1	R. Vittal Rao
E0 220	Graph Theory and Combinatorics	3:1	Sunil Chandran
E0 221	Discrete Structures	3:1	Dilip Patil
E0 222	Automata Theory and Computability	3:1	Deepak D'Souza
E0 225	Design and Analysis of Algorithms	3:1	Sathish Govindarajan
E0 227	Program Analysis and Verification	3:1	K.V. Raghavan / Deepak D'Souza
E0 230	Computational Methods of Optimization	3:1	Shirish Shevade
E0 232	Probability and Statistics	3:1	Shivani Agarwal
E0 233	Information Theory, Inference and Learning Algorithms	3:1	Ambedkar Dukkipati
E0 235	Cryptography	3:1	Sanjit Chatterjee
E0 243	Computer Architecture	3:1	T. Matthew Jacob
E0 251	Data Structures and Algorithms	3:1	V. Susheela Devi
E0 253	Operating Systems	3:1	R.C. Hansdah
E0 264	Distributed Computing Systems	3:1	R.C. Hansdah
E0 271	Computer Graphics	3:1	Vijay Natarajan
E0 293	Reinforcement Learning	3:1	B. Ravindran
E0 323	Topics in Verification	3:1	Aditya Kanade
E0 331	Optimization for Machine Learning	3:1	Shirish Shevade
E0 352	Topics in Systems Research – Learning for Computer Systems	3:1	Chiranjib Bhattacharyya / K. Gopinath
E0 358	Advanced Techniques in Compilation and Programming for Parallel Architectures	3:1	B. Uday Kumar Reddy
E0 371	Topics in Machine Learning – Non-parametric Bayesian Methods and Approximate Inference	3:1	Indrajit Bhattacharya
E1 246	Natural Language Understanding	3:1	C.E. Veni Madhavan
E1 313	Topics in Pattern Recognition	3:1	M. Narasimha Murty
E1 354	Topics in Game Theory	3:1	Y. Narahari
E1 396	Topics in Stochastic Approximation Algorithms	3:0	Shalabh Bhatnagar

Courses during January – April 2013

Course No.	Title of the Course	Credits	Instructor
E0 223	Automated Verification	3:1	Aditya Kanade
E0 231	Algorithmic Algebra	3:1	Ambedkar Dukkipati
E0 238	Artificial Intelligence	3:1	V. Susheela Devi
E0 241	Computer Communication Networks	3:1	Shalabh Bhatnagar
E0 254	Network and Distributed Systems Security	3:1	R.C. Hansdah
E0 255	Compiler Design	3:1	Y.N. Srikant / Uday Kumar Reddy
E0 261	Database Management Systems	3:1	Jayant Haritsa
E0 268	Data Mining	3:1	M. Narasimha Murty / Shirish Shevade
E0 269	Probabilistic Graphical Models	3:1	Indrajit Bhattacharya
E0 270	Machine Learning	3:1	Shivani Agarwal / Chiranjib Bhattacharyya
E0 272	Formal Methods in Software Engineering	3:1	K.V. Raghavan / Deepak D'Souza
E0 320	Topics in Graph Theory	3:1	L. Sunil Chandran
E0 333	Theory of Probability and Information	3:1	Ambedkar Dukkipati / Shalabh Bhatnagar
E0 335	Topics in Cryptology	3:1	Sanjit Chatterjee
E0 343	Topics in Computer Architecture	3:1	R. Govindarajan
E0 353	Topics in Operating Systems	3:1	K. Gopinath
E0 374	Topics in Combinatorial Geometry	3:1	Sathish Govindarajan
E1 254	Game Theory	3:1	Y. Narahari
E1 335	Cognition and Machine Intelligence	3:1	C.E. Veni Madhavan

Department of Computer Science And Automation
ME Programme
Credit requirements

Computer Science And Engineering

DURATION : TWO YEARS

Department Core: A minimum of 24 credits comprising at least 8 credits each from Pool A, Pool B and Pool C as given below.

POOL A

Course No	Credits	Course Title
E0 220	3:1	Graph Theory and Combinatorics
E0 221	3:1	Discrete Structures
E0 222	3:1	Automata Theory and Computability
E0 223	3:1	Automated Verification
E0 225	3:1	Design and Analysis of Algorithms
E0 231	3:1	Algorithmic Algebra
E0 235	3:1	Cryptography

POOL B

Course No	Credits	Course Title
E0 227	3:1	Program Analysis and Verification
E0 243	3:1	Computer Architecture
E0 253	3:1	Operating Systems
E0 254	3:1	Network and Distributed Systems Security
E0 255	3:1	Compiler Design
E0 261	3:1	Database Management Systems
E0 271	3:1	Computer Graphics

POOL C

Course No	Credits	Course Title
E0 219	3:1	Linear Algebra and Applications
E0 230	3:1	Computational Methods of Optimization
E0 232	3:1	Probability and Statistics
E0 241	3:1	Computer Communication Networks
E0 268	3:1	Data Mining
E1 254	3:1	Game Theory

Project: 24 Credits

Electives: The balance of credits to make up the minimum of 64 credits of course work required for completing the ME Degree Programme (all at 200 level or higher) should be covered with elective courses from within/outside the department. These courses can be taken with the approval of the DCC/Faculty advisor only.

EP 299 0:08 August-December Term of second year
 0:16 January-April Term of second year

General Information about the Department

Laboratory Facilities

The Computing Lab is a general computing facility open 24 hours a day, 365 days a year where students work before being assigned to special purpose research labs. Our research laboratories have around 100 PCs running Linux OS. The computing lab is entirely managed by the students. Development software, DTP software, utilities, etc., are regularly updated on the machines. There is no limit to the extent to which students can experiment on the machines, provided they don't cause inconvenience to others.

Besides the general Computing Lab there are special purpose labs for project and research work. These are Algorithmic Algebra Lab, Algorithms & Verification Lab, Compiler Lab, Computer Architecture and Systems Lab, Distributed Computing Lab, Formal Verification Lab, Game Theory Lab, Graphical Models Lab, Informatics and Security Lab, Intelligent Systems Lab, Intel Lab, Machine Learning & Learning Theory Lab, Machine Learning Lab, Multicore Computing Lab, Programming Languages Lab, Stochastic Systems Lab, Topic Analysis and Synthesis Lab, Visualization and Graphics Lab. Besides, the following co-labs are also accessible as they are run by the faculty of this Department: Computer Architecture and Systems Lab (CASL), Database Systems Lab (DSL), High Performance Computing Lab (HPCL), and Microprocessor Application Lab (MAL).

IISc has a general computing facility at SERC (Supercomputer Education and Research Center) comprising of IBM Blue Gene, IBM RS/6000 SP2, DEC, TurboLaser8400, SGI Power Challenge, ONYX, RS 6000 servers and workstations, SUN Ultra Sparc and many more systems.

Departmental Activities:

DCC (Department Curriculum Committee) is a committee of faculty member whose role is primarily concerned with academic issues (new courses, changes to existing courses, allocation of courses to faculty, helping the students to choose their M.E. projects, evaluation of M.E. projects etc.) at the departmental level. Student representatives of M.E, M.Sc.(Engg.), and Ph.D. are also invited to participate in its deliberations. DCC frequently meets the students during the first term and enquires about their difficulties. This is a venue where you can open up and express your feelings through your representatives.

CSA Departmental seminars are conducted frequently. Here research students, faculty members or visiting experts present the results of their research work or emerging research topics. This gives the students an opportunity to keep abreast of current developments.

General Information about the Institute and its Surroundings

Campus walls and entrances:

There's a big wall around campus. On the south side it runs east west from Prof. CNR Rao circle (also called Tata Institute circle) along the National Highway. On the east side, it runs on New BEL road (also called BEL-HMT road) from Sadashivanagar police station to the east entrance of Ramaiah College most of the way. On the west side it runs from Yeshwatpura tollgate all the way to the west end of Ramaiah College. There are also walls encircling the JN Tata and CSIC auditoria, on Sir C.V. Raman Avenue and on Sankey Road.

The big entrances are the ones at Prof. CNR Rao circle and near Security (open 24 hours on all days). Between CSIC auditorium and the Café, there is an underbridge that lets you walk across the road. If you are crossing the road directly, please be careful! It is always safer to use the underbridge. If you walk south from CSIC auditorium (and around the ICE building), you will reach the ICE gate that lets you out next to the Mariamma temple Circle; this route leads you out of campus towards Malleswaram. The gate is officially open roughly from 8.00 am to 8.00 pm, but there is a side gate through which you can always come in.

Near the health centre, there is a yellow pedestrian overbridge across National Highway four; it takes you to the Gymkhana and the D Mess. There are other small entrances on the west side of campus. One of them is near R block: it leads to the Yeshwantpura tollgate bus stop and is also useful if you wish to walk to Yeshwantpura from the hostels. Another entrance is near D Mess; it's useful if you wish to walk to Yeshwatpura circle from the Gymkhana or D Mess. There are also a D gate on BEL-HMT road, and another gate near the telephone exchange (New BEL Road).

How to reach IISc from the Railway station/Majestic?

Get out of the station from platform number ONE and reach the prepaid auto-stand and hire a prepaid auto-rickshaw only. If you plan to take any other auto other than the pre-paid auto-stand one, you are likely to be fooled by the auto-rickshaw/taxi walahs. It takes around Rs. 40 for the rickshaw to reach IISc. Majestic is the central bus stand in Bangalore. If you happen to reach Majestic by bus, reach city bus platform number 22 from where almost all buses come to "Tata Institute" (252, 252 E, 265 A, 273, 273C, 258, 275).

Buses:

If you plan to take a bus into town, your best bet is to walk to Malleswaram 18th cross bus stand or to Yeshwantpura bus stand (2 minutes from D Mess through the turnstile). At the 18th cross bus stand, don't overlook the bus stop on Margosa road. There is also a bus stop on the highway between the yellow overbridge and Prof. CNR Rao circle, and another one at Prof. CNR Rao circle (on Sir CV Raman Road). Finally, there is a bus stop at Yeshwantpura tollgate, just off campus near R block. Most buses go to one of these places.

- Majestic, also called Bangalore Bus Station (BBS): You can get a bus from here to pretty much anywhere in Bangalore. The (City) Railway Station is also here. So are the intra-state and inter-state bus services.
- City Market, also called K.R. Market or simply Market: You probably don't want to go here. But many Market buses go via Corporation, which is a good place to get down and take another bus to locations in South Bangalore, like Jayanagar.
- Shivajinagar: A useful point to switch buses if you're heading toward East Bangalore.

Also, do look out for the newer Pushpak buses. They are light brown in colour, instead of the usual white and blue. They are much quicker and more comfortable. While returning to campus, do remember that IISc is popularly called Tata Institute, and that Yeshwatpura bus stand is nearby.

Autos:

Again, Malleswaram 18th cross and Yeshwatpura circle are the best places to catch an autorickshaw from. But if you're lucky, you'll find an auto at Prof. CNR Rao circle or at Circle Mariamma temple. Remember that autos cost 50% more at night.

Shopping and eating out:

The restaurants on campus are Kabini, Nesara, Prakruthi, Tea Board and Gymkhana Kiosk. Additionally you might wish to venture out into Malleswaram or Yeshwantpura. And of course there are the MG Road / Brigade Road / Commercial Street / Kempe Gowda Road areas for major shopping. Any Bangalore guide map will tell you where these places are located.

Malleswaram is south of campus. Mariamma temple Circle is at the north end of Malleswaram. Streets are organised as north-south "mains" and east-west "crosses". The mains increase in number as you go west. Second main is actually called Sampige Road; third main is called Margosa road. These two mains are important as buses run on them. There are lots of shops (esp. on Sampige road). The crosses increase in number as you come north, toward IISc. The 18th cross bus stand is a five-minute walk south from Mariamma temple circle, and is located at 18th cross and Margosa road. There's a nice shopping area centered at 8th cross and sandwiched between Margosa and Sampige Road.

Restaurants:

There are plenty of hotels available in both Sampige and Margosa road for all kinds of food. Bhasyam circle in Sadashivanagar is another nearby good place to eat out. There are also good hotels at Yeshwantpura circle, Mathikere main road, and New BEL Road.

Some Useful Telephone Numbers:

Please note that all four digit numbers starting with "2" (of the form 2xxx) are valid only within IISc. To call these numbers from outside IISc, prefix the number with "2293". An alternative is to call 22932001, 02, 03, 04 and 05 and ask for extension 2xxx.

CSA dept:	2368/2386/2468/2229
Health Centre	2227, 2234
Telecom Center	23600288
Railway Call Centre	139
Security (Main gate)	2400
Police: Sadashivanagar	23600358, 22942589
Indian Airlines: [Enquiry]	1407 / 1800 22 77 22
Airport	25222533 / 25226233
KSRTC [Enquiry]	22870099 / 22873377
	99809 15155 / 99809 15156
KSRTC [Reservation]	22385848 / 99809 15157
Computing Laboratory in CSA	2386/2468 extn 115
LITEC (Intel Lab), CSA	2386/2468 extn 227

Our webpage contains many more details. For example, you can look up detailed syllabi for all the courses.

Counselling and Orientation

The orientation programme is intended to help the new students in getting acquainted with the department, the courses offered, laboratory environment and facilities and also in learning and practicing C, C++, Latex and Linux. It will be conducted by senior students and will help the students to gear up for their research and studies at IISc. Additionally, faculty members will give a series of short lectures to introduce their research areas and courses. Please make it a note that attendance is compulsory in these programmes.

Schedule of the Counselling and Orientation Programme:

August 1, 2012	Wednesday	10.00 AM	Welcome to New Students
August 1, 2012	Wednesday	11.30 AM	DCC Counseling of M.E. (CSE) students
August 2, 2012	Thursday	10.00 AM	DCC Counseling of Research Students

Registration of Courses: August 1-3

**Orientation Programmes by Senior Students and Faculty: August 1 and 2
(attendance compulsory)**

Commencement of Classes: August 6th

e-mail for contact

lalitha@csa.iisc.ernet.in	(office)
dcc@csa.iisc.ernet.in	(DCC)
user_id@csa.iisc.ernet.in	(Anyone at CSA with user id user_id)

We wish you a wonderful and rewarding stay at CSA and IISc.