TAKE YOUR PICK!

The ultimate guide to choosing the perfect branch

A very precise, factual and painstakingly devised guide of the branches a student can choose before joining an engineering college created with the hope of making one the most difficult decisions you've made until now, a bit easier.

(p.s. We have taken the liberty of adding our own tidbits.
But those should be best taken with a pinch of salt!)

Applied Mathematics	Biotechnology	Earth Sciences	Civil Engineering	Electrical engineering
Computer Science And Engineering	Chemical Engineering	Engineering Physics	Mechanical Engineering	Polymer Science And Engineering
Integrated MSc. Chemistry	Electronics And Communications Engineering	Production And Industrial Engineering	Metallurgy and Materials Engineering	Integrated MSc.Physics

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the official campus media body of IIT Roorkee

Applied Mathematics

In 2007, *when the administration saw a drop in the number of postgraduate Maths students, the Society of Highly Intellectual and Trained Scientists (the acronym for which, coincidentally, is SHITS) of IITR was formed. The eminent members of the society decided to introduce the same course with a different name. The exact nature of the subjects of this branch is mentioned in the 2nd amendment of article 177A of the constitution of IITR, which states: "It's got something to do with maths."*

Courses and Syllabus

This course aims at providing its students with an in-depth understanding of the applications of mathematics in various fields like economics, business, and computer science. From the first year itself, the course has a bunch of subjects concerned with applied, as well as, pure mathematics. With courses like Numerical Methods, Linear Algebra, Discrete Mathematics and Introduction to Computer Programming, the course encourages the students to start studying and appreciating the applications of mathematics in various domains of academic and corporate disciplines.

In the subsequent years, advanced subjects such as Abstract Algebra, Fluid Dynamics, Design and Analysis of Algorithms are introduced. The topics covered focus on training you to be capable enough to implement your knowledge meticulously. As is mandatory for any Masters degree, the last semester is devoted to the thesis.

Features

One of the main features of this course is the number of contact hours it entails. With very few subjects (like Data Structures) requiring practical classes, most of the classes wrap up in one half of the day. This gives the average student plenty of time to work on projects and competitions at various levels. If at all you are determined to take some further highly competitive tests , you'll have all the time in the world to prepare. Also, the curriculum is designed so as to give you a head start for competitive exams.

Future Prospects, Internships and Placements

When it comes to internships, the five year course acts as a boon, as with an additional year in hand, the student can explore more research opportunities as well as company internships in different fields of mathematics. For the smarter ones among us, this means more countries to visit during the course.

The job prospects that the branch offers are manifold. You are taught enough to choose whether you want to pursue the computational side, or get into finance and consulting, or research. Many students pursue a career in academia and research by applying for PhDs at reputed Ivy league institutes. And if none of these fields appeal to you, with the limited contact hours, you will always have more than enough time to explore other options.

Biotechnology

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The department of Biotechnology is perhaps one of the cleanest places of IITR. That's primarily because it's got a new building. An urban legend says that the previous buildingcaught ire and was left abandoned. There are many theories surrounding the cause of ire but most of them are absurd at best.
A typical biotech undergrad usually plans his industrial trip for two whole years. He spends the next two years posting the 4200 photos he took while on the trip, while also reminiscing about the trip to anyone who'll listen.

Courses and Syllabus

The subjects can be broadly classified into two types, research based and engineering based. The former consists of Genetic Engineering, Cell and Microbiology, Immunotechnology, Biochemistry and Biophysics, Microbial Technology, Animal and Plant Technology, IPR and Bioethics, Nanobiotechnology, Food Technology and Drug Design; while the latter includes Bioreactor design, FluidMechanics, Bio-separation techniques, Principles of Bioreaction Engineering, and Enzyme Technology. There are countless research fields in this department. Broadly these fields could be related to Cancer Research, Stem Cell Research, Infectious Diseases, Immunological Studies, Drug Design, Neuroscience, Evolutionary Biology, and Biomedical Engineering.

Features

The most salient feature of the branch, apart from the glitzy new building and research labs as mentioned above, is the limited class strength, as compared to the other branches. This facilitates interaction amongst each other, and with the faculty members. Most of the coursework is focused on research based areas in biological sciences.

There are paper presentation and poster presentation competitions and global conferences related to this discipline. Undergraduate students don't generally go for these unless they have been involved in some active research alongside their coursework and the lab heads (professors) encourage them to take part and even provide suitable support (finances, permissions etc).

Future Prospects, Internships and Placements

Although the job opportunities in the core sector are limited after B.Tech, the scope widens immensely after getting a specialization. You can choose between policy making in regulatory bodies (UN, FDA, FAO), jobs as technical heads in biotech/pharmaceutical industry, and engineers in biomedical instrumentation. Engineering based internships are offered by pharmaceutical companies like Biocon, Cipla, Ranbaxy and Biozeen.

Some popular internship programs in the global scenario are Mitacs-Globalink (Canada), DAAD-WISE (Germany), VISERA (Vanderbilt University, US), Khorana Scholarship, OIST (Okinawa Institute, Japan), Duke University (US) and University of Queensland (Australia). Apart from these, due to ample flow of funds in bioscience, a lot of professors accept international interns for a period of 2-3 months for summer/winter interns in their labs. TIFR, IISc, CMBL, CBRI, CDRI etc are some of the research facilities within India which provide really good research opportunities.

Earth Sciences

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You have probably come across a handful of branches prefixed 'geo' in your information brochure. You might have scurried over a few Google results, took it as a bunch of seemingly alien subjects - magnetotellurics, plate tectonics, stratigraphy, volcanology– invariably dealing with Earth, its composition or development history, devised to fulfill some inscrutable purpose. It is likely you have treated them with close-folded arms, and post allotments, cursed the universe for landing you in a branch that cuts you off from the fancy world of computers and electronics.
In a different scenario, if you have researched a bit, you might have spurred to sudden joy, instantly learning that the average salary package is the second highest after Computer Science. In all truth, both the chunks of sketchy information can easily lead you astray .

Courses and Syllabus

Earth Science is the systematic study of Earth and its various processes, which include the formation of mountains and occurrences of earthquakes. Geoscience finds applications in a plethora of scientific fields, from reconstructing the history of Earth to mineral and oil explorations, from expounding the biogeochemical cycling of elements to contributing to environmental conservation. It forms a part of Planetary Science with geoscientists in agencies like NASA are now evaluating the feasibility of civilisations in celestial bodies.

The Department of Earth Sciences at IIT Roorkee offers five year integrated courses in two disciplines: Geological Technology and Geophysical Technology. Geophysics, which employs a wide breadth of physical methods and principles to assess Earth's dynamics, has a greater mathematical edge and frequently incorporates non core subjects. Geologists are adept at direct interpretation of geological properties for its various applications.

Features

Quite likely, in both the branches, all interesting Physics, Chemistry and Maths that you have been accustomed to, are held in abeyance for a while, easily surpassed by theoretical subjects. However, develop a slight taste and the branch has a lot to offer. Field trips are an integral component of the course curriculum. The niceties render the structure research intensive, only racked up by the combat between rising energy demands and growing environmental concerns. The fields of research in the branchcan be broadly classified into academic and industrial. Academic research deals with the core subjects like metamorphic, igneous petrology, fluid inclusion and geochemistry. Industrial research, on the other hand, deals with application of seismics, well logs, structural geology, sedimentary petrology and stratigraphy.

Future Prospects, Internships and Placements

Geoscientists play a key role in the oil and gas sector. With the increasing importance of coding on reservoir simulations, the application ofartificial neural networks in predicting river fluxes and drainage and the use of remote sensing and GIS for urban planning and study of distant planets, the field offers unlimited potential for growth. The pool of recruiters at IIT Roorkee includes some of the world's leading oilfield E&P services companies like Schlumberger, Royal Dutch Shell, Cairn India and PSUs like ONGC. The initial pay scale varies from 7 to 21 lakhs per annum, depending upon the type of job you pursue. Field engineering jobs fill your pockets deeper than the data processing ones but equally emphasize on physical fitness. The average salary figures can however be misleading, unduly surged up by a fraction of high paid ones.

Civil Engineering

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In the beginning the Universe was created. For a few billion years nothing happened. Nothing besides the cataclysmic explosion resulting in a hot dense fireball expanding light years into nothingness and ultimately condensing to form the stars, planets and Starbucks outlets. Sometime in between came the Thomason College of Civil Engineering. We believe nothing speaks as much for a department as it being the sole reason for its institute's conception. For some reason which we're sure no one has the faintest idea why, students of this department call it Royal Civil, which is widely regarded as needless nomenclature.

Courses and Syllabus

Civil engineering can be divided into various sub disciplines like structural engineering, environmental engineering and transportation engineering, geotechnical engineering, water resources engineering, wastewater engineering, construction surveying etc. Over the course of four years, equal emphasis is given to each of these sub disciplines, and a basic introduction is offered to the less important ones.

The timetable is slightly on the hectic side but with a tad bit of judgement, students manage to effectively juggle their social life and academics.

Features

The department of Civil engineering, IIT Roorkee, being the oldest and largest in the country, has over the years produced some of the finest engineers accredited with playing a significant role in various civil engineering projects in India The Ganga Canal, The Bhakra Nangal Dam, the Indira Gandhi Canal, the construction of Chandigarh, to name a few. Over the years, the department has produced numerous chairmen of the Indian Railways, CPWD, Airport Authority of India, Delhi Metro Rail Corporationand a few entrepreneurial geniuses such as Mr. Jay Prakash Gaur (JP Associates) and Mr. Rahul Gupta (Rays Experts).

Future Prospects, Internships and Placements

The faculty of the dept conduct high quality research in diverse fields ranging from building science and technology, structural engineering, geotechnical engineering to hydraulics and environmental engineering. The professors are easily approachable and supportive to undergrad students willing to undertake research projects.

The students of thedepartment have to undergo a mandatory 6 week long internship after the completion of their third year. The students have the option of doing an industry based internship to gain firsthand knowledge in the construction industry, or pursuing a research internship through DAAD, MITACS, SURA at various universities and labs around the world.

The students of the department get placed in some of the most reputed construction companies in the nation like L&T and Shapoorji Pallonji to name a few. Howeverplacements are not limited to construction firms and students holding interests in other fields may opt for analytical jobs in companies such as Flipkart, Snapdeal, Housing.com, ICICI Lombard, and Swiss Re.

Electrical Engineering

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The department of Electrical Engineering is strategically at the worst location in IITR. Strategically, because:
a) It is far from everything of vital importance: Alpahar, Nesci, Student's Club and Ravindra Canteen. And directly in front of the Director's house.
b) If an interdepartmental war breaks out, Electrical department will be hammered by the surrounding superpowers of Mechanical, Civil and EC departments. The undergrads of this branchare constantly exposed to age- old electrical machines that make funny sounds when they run. They are also on the receiving ends of requests by fellow bhawan inmates to repair their fans and geysers.

Courses and Syllabus

Electrical engineering at IITRdeals with the study and application of electricity, electronics and electromagnetism in order to design, construct and maintain products, services, and information systems. The coursework is undoubtedly rigorous but with proper time management and smart decisions you can sail through most of them along with extracurricular activities. Core Electrical subjects include Signal Processing and Instrumentation, Control System Analysis, Communication Systems, Power Electronics, RF and Microwaves. Apart from that, there are some courses from Computer Science Engineering and Electronics Engineering departments like C++, Microelectronics, etc. The concept of computing along with recent applications of computer based systems in design, analysis and efficient operation of power systems, maintaining quality and security are also included in the course.

Features

Electrical Engineering graduates could forlong their education by specialising and doing research in fields like: Power Electronics and Drives, Power Systems, Electrical Machines, Control and Instrumentation, Applied Electronics, Embedded Systems, VLSI Design. Many premier educational and research institutions regularly admit electrical engineers as graduate engineer trainees and Management Trainees to work on research projects. Research areas in the branch include Communication and Networking, Power Systems, Signal and Image Processing, Electromagnetics, etc. A good GPA along with a graduate degree from IIT should hold you in good stead, while applying for jobs or higher studies.

Future Prospects, Internships and Placements

There is no dearth of job opportunities in the public or private sectors, such as Electricity Boards, Large Scale Industries, Manufacturing Plants, Power Corporations, Hydro-Electricity sector. EE is a versatile branch where students, with some extra effort, can expand their work area into Software, Core Electrical, Electronics as well as Non Technical Profiles like consulting firms. Prominent companies which recruit Electrical Engineers from the college include: ABB, Bajaj International Private Ltd., Bharat Heavy Electricals Limited (BHEL), PGCIL, IOCL, Trident, Centre for Electronics Design and Technology, Crompton Greaves Limited (CGL), Siemens Ltd., Reliance power Ltd. and non-core companies like Goldman Sachs, Google, etc. And this is just the tip of the iceberg. Average salary for an Electrical Engineer graduate is about 13-14 lakhs per annum, though a few exceptional cases do reach a much higher sum.

Computer Science and Engineering

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The main purpose of the existence of this department is to belittle its adjoining department by offering common courses to the ECE and CS students which then the CS students end up nailing. Apart from this it offers a couple of programming courses, air conditioned labs to play Minesweeper on and a sprawling cycle stand that takes pride in its ancient history. Every once in a while, a couple of CS grads get crore plus offers and the news does the rounds in the dailies. Apart from that, there isn't much that goes on round the year.

Courses and Syllabus

The branch comprises of two main components- Computer Science and Computer Engineering. Computer science deals with the theoretical foundations of information and computation, along with practical techniques for the implementation and application of these foundations. In other words, it is the systematic study of algorithmic methods for representing and transforming information, including their theory, design, implementation, application, and efficiency. The roots of computer science extend deeply into mathematics. Computer Engineering on the other hand, typically focuses on computer hardware and software. It is, in a nutshell, an integration of computer science and electrical engineering. The curriculum covers both aspects.

Subjects like Data Structures and Algorithms, Discrete Structures, Computer Architecture, Operating Systems and Networking etc are vital for a complete understanding of the branch. But the writers of the guide would advise the freshmen to master the courses on Programming, since almost the entire CSE curriculum depends on it.

Features

There are wide areas of research that are open for any person who studies CS: Machine Learning (including Sub- domains of AI, Robotics, Natural Language Processing), Network Security, Compilers, Cryptography, Mobile Operating Systems, Real-time OSs, Cloud and Distributed Computing, Discrete Mathematics, Programming Languages, Data Mining, Database Management Systems, to name a few. In addition to these, there's the field of Data Analytics, incorporating the concepts of DBMS, Probability and Statistics, famously known as Big Data.

Computer Science, compared to the other branches of engineering, is a relatively newer field of study. The exponential burst came with the advent of corporate giants like Apple and Microsoft. Contrary to popular belief, its relevance increases day by day. CS grads who know their basics are highly in demand. But, the catch here is precision. You cannot fool or wriggle your way out of any situation. As an engineer you need to understand and deal with the realities of the problem and find out a viable solution. That takes a lot of study and practice. A job in CSE is only AND ONLY dependent upon your ability to find and solve problems.

In the industry, the job descriptions include Software Engineers, Data Analysts, System Programmers, Software Program Manager and Software Architect. Additionally, if you pursue higher studies (M.S. or PhD), you are also entitled to jobs in Universities and Research Teams in different Companies and organisations .

Future Prospects, Internships and Placements

Students apply for internships in both industry and academia. During interviews, companies mainly test your ability to code under dire circumstances along with your command over basic Algorithms and Data Structures.

The mean salary in India for a CS undergrad is easily between 10-18 lakhs. The average package is however, an unhelpful quantity, owing to the huge window in the pay package.

Algorithmic Coding is the most celebrated sport in the CS community. Not to forget the Cyber Security or Capture the Flag (CTF) contests, and the Data Science challenges which have been gaining popularity of late.

Chemical Engineering

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The department of chemical engineering is by far the most controversial dept at IITR. From misogyny to meting out of mass punishments, it has made headlines for all the wrong reasons. On the brighter side, no discussion of the chemical department can be complete without the mention of what it is that makes it so popular: the females. For long this department has been the frontrunner in diminishing the grave gender imbalance in the Roorkee ecosystem. However the writers should include here an advice from their own personal distasteful experiences that might prove in handy to the (male) bearer(s) of this guide. Sending the females cheeky messages or poking them on online social media without knowing them personally might not be such a good idea. It'll usually end up with you getting reported or blocked or both.

Courses and Syllabus

Chemical Engineering, although hinting an obvious and close relevance to Chemistry by its very name, bears no relation to it other than sharing its basic concepts. A clearer answer to what Chemical Engineering is, lies at the end of a four year long journey.

Like in most branches, it turns out that the core subjects contribute a major chunk to the grades. Thus, a list of the important courses in Chemical Engineering goes like this Engineering Management, Chemical Reaction Engineering, Transport Phenomena, Chemical Engineering Thermodynamics, Chemical Process Principles, Chemical Engineering Equipment Design, FluidMechanics and Mechanical Operations. The last two on the list, though not counted as 'core' subjects, complete the curriculum and help in understanding the fundamentals in this field of engineering.

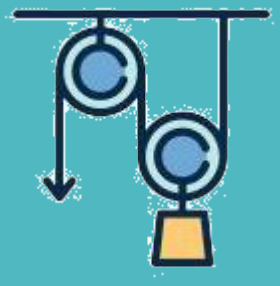
Features

The workload, to a great deal, depends on an individual's deal with the clock. Speaking in terms of contact hours, a chemical engineer works for about 26 hours a week. Generally, one lab based course engages you every semester. Some of the many diverse areas open to research for a chemical engineer are Thermodynamics and Molecular Computations, Catalysis and Reaction Engineering, Systems Design and Engineering, Transport Processes, Biological Engineering, Materials, Polymers, Surfaces and Structures, and Energy and Environmental Engineering.

Future Prospects, Internships and Placements

The industrial heavyweights like ITC, Schlumberger, Shell, RB and Reliance offer the best internship and placement opportunities. The core followers find major employers in gas and oil extraction, oil refining, nuclear and power generation and other process industries such as pharmaceuticals. A good number is absorbed by industries such as food & drinks, toiletries, pulp and paper, polymer and textile. Certain job profiles (apart from a Chemical Engineer, of course) that relate directly to this field are: Energy Engineer, Petroleum Engineer, Product/Process Development Scientist, Analytical Chemist, Energy Manager, Manufacturing Engineer, Materials Engineer, Mining Engineer, Production Manager, and Quality Manager, amongothers.

The professors eagerly back students willing to take up innovative projects. Available options include taking up simple/fun projects or experiments, such as testing the efficiency of pumping and motor systems installed in the labs, or studying theperformance of air conditioning or condenser systems in the department buildings.



Engineering Physics

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In the same building as the Mathematicsdepartment and bears an uncanny resemblance to the same: Both these departments take in young geeks having a JEE rank that could not grant them civil or chemical The entrance to the Physics department is also regarded by many as a wormhole hidden in plain sight: transporting unsuspecting entrants from a world of joy, togetherness and bunsamosas to one of misery, practical records and where you can't talk inside laboratories.

Courses and Syllabus

In it's fifth year of offering, the structure of the course offered at Roorkee consists of a package of standard undergraduate physics courses, designed to give a rudimentary understanding of most ofthebasic and popular areas of physics research to the students. Studies deal with condensed matter physics, optics, nuclear physics and atmospheric and atomic physics. Recent changes have been reflected in new courses being floated,such as those in astrophysics,space technology, nanosystems, biophysics and quantum optics.

However this being an engineering course rather than the earlier theoretical physics one, the traditional physics courses are bundled along with relevant courses from other disciplines such as those in Signals and Systems, Microprocessors and Peripheral Devices and Semiconductor Devices. Students have the option of deviating even further from the conventional by taking up elective courses such as Digital Image Processing, Data Structures, Remote Sensing, and Digital Signal Processing in their third or fourth years.

Features

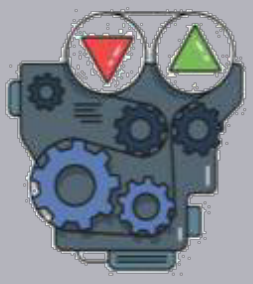
Roorkee's physics department has traditionally held a theoretical stronghold. We have a number of experienced faculty specializing in nuclear physics, condensed matter physics, atmospheric science and atomic physics. The new faculty has brought in experience in fields such as astrophysics, biophysics and solar cell research. There is an upcoming cutting edge lab in quantum optics, supposed to be operational soon, that is expected to produce quality experimental research once working. Students, especially undergraduates, have been known to participate in the department's research activities. Undergraduates are usually not expected to do research, but there have been instances of students collaborating and even taking the lead on projects leading to publications. The department is usually forthcoming to such initiatives on the student's part.

Future Prospects, Internships and Placements

Students, especially undergraduates,have ample opportunities to participate in active research during their summer and winter breaks. A number of summer fellowships have been awarded to students to work at prestigious universities and research institutions, both in India and abroad. Many senior students work with the researchers of their choice over the breaks, where they are exposed to an intensive research environment, experience they bring home to the benefit of their fellow students. There have been participants in exchange programs like the WISE (DAAD Germany), the SN

Bose Scholars Program (USA) the Mitacs Globalink Program (Canada), and other fruitful exchanges with some European universities. A number of students also participate in the IAS fellowship program, where they are paired with a leading researcher at an Indian university or institute for the summer. It is also common for students to participate in summer and winter schools and camps in specialized topics. A testament to the efficacy of such programs has been the number of publications that have come out of these projects, assuring us that the students have been exposed to quality research. This experience is vital in helping the undergraduates make an informed choice when opting for graduate school. A great experience working in the lab, or on theoretical or numerical projects has persuaded a number of skeptical students to opt to go to graduate school.

Opportunities for students after graduation are varied. On the physics front, a doctorate degree is a necessity if the students want to be researchers. With the right profile, a Roorkee graduate can make it to top schools in the US and Europe. Recent graduates have made it to top Ivy League schools, and best research groups in Europe. It is also common for students to get graduate positions at top Indian research institutes. The curious mix of courses taught at Roorkee prepares the graduating students for life ahead as a physics researcher.



Mechanical Engineering

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The Mechanical department was established in 1946. It faced many problems initially, most of which arose from one single bigger problem: a large and growing female junta. (Sarcasm alert!) This department is mainly known for its (un?)healthy sex ratio, path breaking research, use of fancy technology and tendency to give orgasmic reactions at the sight of any company with a CTC greater than 6 lacs.

Courses and Syllabus

The bachelor course for Mechanical Engineering at IITR can be broadly divided into the following subjects: Thermal Engineering and Fluids, Manufacturing, and Machine Design & Robotics.

Apart from these subjects the curriculum also includes introductory courses to the other branches. Since some courses form the foundation for the ones that follow as you move up the ladder, it is advisable to develop a thorough understanding in the subjects.

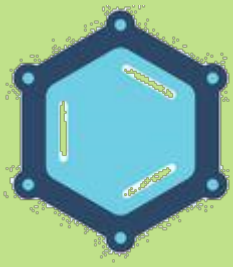
Features

The one salient feature of this branch at IITR is the presence of various students groups in the campus who have undertaken projects closely relating to the practical aspects of what you study in the classroom. Team KNOx and FSAE aim at a full design and fabrication of All Terrain vehicles and Formula cars; SAE and ASHRAE foster the concepts of Automotive Engineering and Thermodynamics; ASME for the robotics and also the newly emerging projects in aerodynamics. Walking into an IIT itself opens the doors to a plethora of career options. While many choose to stay onboard, others exhibit their dexterity at competitive or developmental programming, marketing and finance or realize that working at a consultancy firm is the safest bet.

Future Prospects, Internships and Placements

One can opt to pursue higher education in India or abroad. The master's degree can be obtained in various disciplines. Some of the research areas pertaining to branch are: Rapid Prototyping, Robotics, Vehicle-to-Vehicle Interaction, Intelligent Automotive, Energy Efficiency/ Hybrid Technologies, INDUSTRIE 4., Smart Structures, etc. A good GPA along with some project undertaking can land you at a top notch university with little effort.

It is mandatory to do an internship after the third year. However it is always better to utilize the second year holidays as well. Internships can be done in an industry or can be of the research type, which is done under the guidance of a professor. Companies such as ITC, Shell, Schlumberger and Tata Steel recruit interns from the college while you can always apply to any firm off the campus. One particular perk of the internship is that you may end up with a job offer right after your work review, which saves you from the agonizing process of placements, which, for most of the candidates turn out to be a blood pressure escalating affair. You can also try for a foreign intern in countries such as Germany, Canada, Japan and USA with the help of various intern programs.



Polymer Science and Engineering

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In the ages gone by, this department slowly and steadily built up a reputation for taking up unsuspecting freshmen joining IITR with the delusional hopes of riches and frolic in a big and happening campus and then mercilessly relegating them to a life devoid of two square treats a day to fill their bellies and repetitive bakar to temper their throats. But, no longer.

Courses and Syllabus

Polymer Science and Technology is considered a specialised domain in the broader Chemical Engineering course, therefore having a few intersecting domains. Initial courses have a fair deal in common with chemical engineering and cover topics such as Fluid Mechanics, Chemical Processes, Heat Transfer, Chemical Engineering Thermodynamics and Reaction Engineering. After building a basic background in the first two years, courses deviate towards the niche areas that make up Polymer Technology. The final two years will be spent covering topics such as Polymer Blends, Composites, Rubbers and Elastomers, Polymer Physics and Chemistry. Students can expect a fair deal of Chemistry in this branch, with courses stressing violently and repeatedly on ways to obtain negative Gibbs free energy in a system.

Features

The department of Polymer Science and Technology was located in IITR's Saharanpur Campus. Until recently, undergraduates in this department were housed and taught at the Saharanpur Campus. After repeated requests and the Great Hunger Strike of '12 for shifting students to the main campus at Roorkee, the administration decided to welcome the incoming batch of 2015-16 at Roorkee.

The absence of a structured department at Roorkee has led to courses currently being managed by the Chemical Engineering and Chemistry Departments. For specialised courses, classes were conducted by teleconferencing from Saharanpur. Labs were partly managed by the two aforementioned departments, and partly by students making trips to Saharanpur.

Future Prospects, Internships and Placements

Core intern and placement opportunities in the department are fair, albeit not headline grabbing. Students from this department have been known to intern at places suchas the Mitsui Chemical Group in Japan and GE plastics name a few. However, with the impetus given by a change in course structure and student being shifted to Roorkee, much remains to unfold over the next few years.

Electronics and Communication

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Situated precisely 33.5 degrees to the right of the ECE circle, this department boasts of many things other than their inappropriately shaped EC tower. The professors of the ECE department are characterised by their fearful, ruthless efficiency and almost a fanatical devotion to surprise quizzes. Since nobody expects their inquisition, the professors are known to declare surprise quizzes beforehand and then surprise the students by not taking any. Although some people say that this department exists only to be belittled by its adjoining department, the writers of this guide are not in possession of any concrete proof to substantiate this and hence choose to dismiss this as mere speculation. Which is just a fancy of us saying: we don't have any freaking idea.

Courses and Syllabus

This branch of engineering develops integrated circuits and printed circuit boards that can be used in devices like mobiles, computers, tablets etc. Electronics engineers design, fabricate, maintain, supervise and manufacture electronics devices. The applications are far reaching, ranging from communication and defense to the entertainment industry. In a nutshell, this branch deals with electronics devices and their software interfaces. The branch in itself, is too vast to pick upon specific topics, but Digital logic design, Analog circuits, Signals and Systems, Engineering Electromagnetics, Communication Systems and Techniques, and Digital Signal Processing form the core of the branch. This branch is filled with subjects that require practice to excel at, like Signals and Systems, Electronic Network Theory, Digital Logic and Design to name a few. A strong background in Mathematics (mainly probability and statistics) would definitely help.

Features

Different fields of research within the branch include Communication Systems, Signals and Image Processing, Microelectronics and VLSI, RF and Microwave Engineering. ECE also opens a whole new spectrum of interdisciplinary research fields some of which include Mechatronics, Robotics, Biomedical Engineering etc. ECE offers a lot of opportunities to take up projects. Some small projects are included in the course structure.To take up a Departmental Project the student can go and talk to any faculty member, working on their field of interest, to guide them on their project idea.

Future Prospects, Internships and Placements

With a Bachelor's degree in ECE a student can apply for a job in any of these sectors– Telecommunication, Hardware Manufacturing, Software Engineering/IT, Research & Development, Home Appliance and VLSI design, Television Industry and also the Power sector.

The branch offers plenty of internship opportunities. One can get an intern in any field ranging from software development to hardware engineering. One can also apply for internships abroad at various foreign universities.

Apart from that IITR has a number of student groups like the Electronics or Robotics section of the Hobbies Club that give you an opportunity of working on different projects. For those interested in mechatronics or robotics there are groups like Robocon, ASME, FSAE etc. that participate in various competitions. If working in big groups is not your cup of tea, then there are various competitions like Texas Instruments Innovation Challenge (TIIC), Microsoft Imagine Cup etc. in which you can participate in small teams.

Production and Industrial Engineering

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Production and Industrial Engineering (P&I) is a sister branch of Mechanical Engineering. The undergrads are basically Mechanical Engineers in making, only with an easierlifestyle and a larger number of female students in their batch.

Courses and Syllabus

Production and Industrial Engineering, as the name suggests, comprises of two different specializations. Production Engineering involves study and application of various manufacturing processes. There are practical and theoretical courses on Manufacturing Techniques namely Forming, Material Removal and Finishing processes and Tool Engineering. The course content is more theoretical rather than mathematical.

Industrial Engineering covers a very wide variety of subjects. It revolves around optimizing the time and resources available for a firm and running their operations. The subjects pertaining to the same are more mathematically intense than Production. Some courses in the curriculum are borrowed from Mechanical Engineering, like Machine Drawing, Thermodynamics, Fluid Dynamics and Theory of Machines, to name a few.

Features

An industrial engineer has wide knowledge of engineering practices and is aware of management challenges related to production. Most manufacturing houses look out for engineers who specialize in this field so as to reduce cost, increase efficiency and make their products marketable in this competitive era. Among the older IITs, P&I, as a branch is offered only in IIT Delhi and IIT Roorkee, along with a similar branch in IIT Kharagpur (Manufacturing Engineering), making it all the more unique.

On an average the workload is 20 hours per week, which gives a lot of time to the students to engage in extracurricular activities in the institute and carry out any research related activities in his/her area of interest.

Future Prospects, Internships and Placements

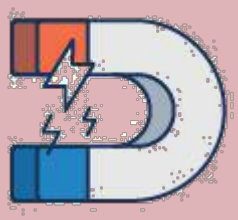
Students can, post their undergraduate studies, opt for MBA in Operations (or in general) or pursue MS in any field of Industrial Engineering (Analytics, Optimization, Facilities Systems and Network Planning, Stochastic Modelling and Simulation, Health Systems, Manufacturing, SCM, Operations Research).

For those interested in Production, the fields of research are mostly centered around manufacturing processes and their optimization, including Advanced Machining, Ultrasonic Machining, Electro Discharge Machining, Submerged Arc Welding, Computer Numerically Controlled Machining to name a few.

Not more than 10 on-campus offers for internships are offered. A lucky few get to do a fully funded research internship in Germany via DAAD, in Canada via MITACS, and

in Japan viaHondaYES+. Most students try to widen their prospects by studying business and finance related disciplines so as to get internships and jobs in those fields. Additionally, as far as campus recruitments are concerned, PI students are eligible for almost alldata-analytic and consultancy firms that visit the campus. Jobs opportunities are not scarce, but again, there is no free lunch.

Students in this branch enjoy the versatility of choice as they get placed in companies across various sectors: Oil and Gas (Shell, Schlumberger), FMCG (ITC), Automotive (TATA Motors, Hero MotoCorp, Anand Automotive, VE Commercials, Mahindra & Mahindra), eCommerce (Flipkart, Snapdeal), IT (Oracle, Wipro) and other companies visiting the campus offering roles in various domains.



Metallurgy and Materials Engineering

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Meta, as it is termed in IITR lingo, is better known as the chemical engineering department's poorer cousin. The metallurgical department undergrads are identified by their strong indulgence in the affairs of the institute and anything which isn't even remotely related to their branch.

Courses and Syllabus

The ability to understand and manipulate materials and their properties is a key factor in any industrial process or technology. Metallurgy is a domain of materials engineering that studies the physical and chemical behaviour of metallic elements, their intermetallic compounds and their mixtures called alloys. With subjects like Structural Metallurgy, Thermodynamics, Material Kinetics and Metal Casting and Joining, a holistic perspective on dealing with materials can be achieved through this course.

Features

The Metallurgical and Materials Engineering Department is one of the most active departments in IITR, with multiple societies such as METES & Material Advantage Student Chapter functional here, comprising of both students and faculty. Additionally, Material Science has immense scope for research, and many graduates opt for Masters or PhDs in the subject of their choice after graduation. A lot of research is undertaken by the professors, in the department, in the self sufficient laboratories. 330+ scores in GRE along with impeccable research profiles have taken our graduates to top research laboratories such as those in Stanford University, MIT, University of Wisconsin - Madison, Princeton etc.

Future Prospects, Internships and Placements

Broadly classified into three categories namely, research, industrial and non-core, students can pursue their interests in this period to align their professional choices. Programs such as MITACS (Canada) and DAAD (Germany) provide well-articulated research options abroad. Since these programs are associated with high GPA caps, people opt for cold-mailing professors across continents with similar research interests and enough funding, for the coveted research experience. A faction of students look upon steel giants and other associated industries to grab any opening as a summer trainee. Apart from core ventures, people tend to go for internships in the finance sector, consultancies and firms for designing & advertisements as well. As far as the campus placements are considered, students are eligible for almost all data analytics and consultancy firms that visit in the 20-day window when the campus, quite ironically, reflects cold-war & bloodshed. For some years now, Roorkee has been witness to scanty participation by core industries for the Metallurgy and Materials Engineering Dept., but the numbers are expected to turn around soon. People are also placed in consultancies such as ZS Associates, i3 consulting and several found a desk under the roof of IT houses such as Wipro & TCS.

INTEGRATED MSc. CHEMISTRY

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This is a recently introduced branch that offers a thorough insight into chemistry through a 5 year Integrated MSc. Program

Courses and Syllabus

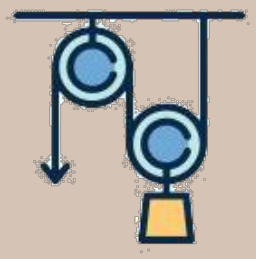
Although being a significant part of every student's preparation before coming to the institute, this major branch of science mostly goes ignore by students pursuing their degrees here. This recently introduced branch deals with subjects like Organic Chemistry, Kinetics, Advanced coordination chemistry and solid state chemistry a complete perspective on chemistry can be developed through this course.

Features

The Chemistry Department houses various Undergraduate and Masters' labs that house equipment ranging from simple titrations to advanced spectrometers. The faculty is active in several research areas including Organic Synthesis, Material Science, Polymer Chemistry and Spectroscopy.

Future Prospects, Internships and Placements

Although no recent batch has gone through a placement season as of yet, as with other branches, the categories are split into core and non-core. A few students from Masters programs are placed in core companies whilst many others prefer to undertake research in institutes in India and abroad. The faculty encourages undergraduate research and has notably recommended students to places like Georgia Tech and MIT in the past.



INTEGRATED MSc. PHYSICS

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This branch has had a volatile history and was not offered for 2 years before being recontinued in 2017. It is essentially a bigger brother of Engineering Physics sans the engineering subjects.

Courses and Syllabus

As with its Engineering counterpart, the structure of the course offered at Roorkee consists of a package of standard undergraduate physics courses, designed to give a thorough understanding of most of the basic and popular areas of physics research to the students. Studies deal with condensed matter physics, optics, quantum physics,nuclear physics and atmospheric and atomic physics. Recent changes have been reflected in new courses being floated,such as those in astrophysics , space technology, nanosystems, biophysics and quantumcomputing

This being a pure science course, the 4^{h} and 5th year of study involve a deeperlook at core physics courses including Quantum Mechanics, QFT and Statistical Mechanics.

Features

Roorkee's physics department has traditionally held a theoretical stronghold. We have a number of experienced faculty specializing in nuclear physics, condensed matter physics, atmospheric science and atomic physics. The new faculty has brought in experience in fields such as astrophysics, biophysics and solar cell research. There is an upcoming cutting edge lab in quantum optics, supposed to be operational soon, that is expected to produce quality experimental research once working. Students, especially undergraduates, have been known to participate in the department's research activities. Undergraduates are usually not expected to do research, but there have been instances of students collaborating and even taking the lead on projects leading to publications. The department is usually forthcoming to such initiatives on the student's part.

Future Prospects, Internships and Placements

Students, especially undergraduateshave ample opportunities to participate in active research during their summer and winter breaks. A number of summer fellowships have been awarded to students to work at prestigious universities and research institutions, both in India and abroad. Many senior students work with the researchers of their choice over the breaks, where they are exposed to an intensive research environment, experience they bring home to the benefit of their fellow students. There have been participants in exchange programs like the WISE (DAAD Germany), the SN

Bose Scholars Program (USA) the Mitacs Globalink Program (Canada), CERN internships and other fruitful exchanges with some European universities. A number of students also participate in the IAS fellowship program, where they are paired with a leading researcher at an Indian university or institute for the summer. It is also common for students to participate in summer and winter schools and camps in specialized topics. A testament to the efficacy of such programs has been the number of publications that have come out of these projects, assuring us that the students have been exposed to quality research. This experience is vital in helping the undergraduates make an informed choice when opting for graduate school. A great experience working in the lab, or on theoretical or numerical projects has persuaded a number of skeptical students to opt to go to graduate school.

Opportunities for students after graduation are varied. On the physics front, a doctorate degree is a necessity if the students want to be researchers. With the right profile, a Roorkee graduate can make it to top schools in the US and Europe. Recent graduates have made it to top Ivy League schools, and best research groups in Europe. It is also common for students to get graduate positions at top Indian research institutes. The curious mix of courses taught at Roorkee prepares the graduating students for life ahead as a physics researcher.

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