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# Career Handbook

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ACADEMICS & CAREER COUNCIL  
IIT KANPUR

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## CAREER HANDBOOK



# Consulting

Strategy Analyst  
Human Resource Consultant  
Financial Consultant  
Management/Business Analyst  
Business Process Analyst  
IT Consultant  
Operations Consultant



# Consulting

*The business of providing expert advice to a company or person.*

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When we hear the word “consulting”, we think of a top university MBA advising enterprise business or corporate strategy, which might not be the accurate picture.

A consultant is someone who has some level of expertise which a group of people find useful and are willing to pay for it.

Being a consultant is an exciting opportunity to learn the in's and out's of running a business in an effective and profitable way.



# Strategy Analyst

A strategy analyst helps identify business needs, coming up with proposals for achieving strategic visions. As a strategy analyst, your job duties are to lead consulting sessions with company management, rate strategy proposals based on business objectives, identify growth areas, and analyze models for data-driven strategy recommendations.

## Responsibilities

- Contribute to the company's strategy through research, analysis, and synthesis.
- Develop and execute quantitative and qualitative analyses.
- Partner with cross-functional partners on special projects in support of the company's strategy, leading workstreams and facilitating collaboration across teams to drive the business forward.
- Lead the evaluation of new business opportunities; assess market potential and partner with the Strategy & Product Operations innovation team to develop business cases for launch and scale.
- Develop executive-level presentations for key stakeholder conversations.
- Mentor more junior team members to support work planning, hypothesis generation, and structured analysis

## Skills Required

- Strong quantitative and analytical skills with ability to translate data into meaningful insights.
- Demonstrated accuracy, efficiency and attention to detail.
- Advanced skills in MS Office and various databases.
- Advanced skills in MS- Excel, VBA, R will be an added advantage.
- Exceptional verbal and written communication and interpersonal skills.
- Strong intellect with proficient commercial and entrepreneurial instinct.
- Ability to operate in an ambiguous environment, break cliches and introduce a dynamic approach.

# Human Resource Consultant

HR consultants try to optimize an organization's human capital. By creating and developing a HR model specific to the organizations that hire them, HR consultants ensure that the company is effectively using its personnel to achieve its stated goals, while

also ensuring the workforce is operating at a high level of productivity and efficiency.

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## Responsibilities

- Partner closely with key stakeholders including leaders and HRBPs to understand the business strategies and needs.
- Analyze & develop HR theories and practices applied around the world.
- Design the compensation, benefits, short and long-term incentive plans, etc. in support of business needs.
- Apply expertise in quantitative analysis to see beyond the numbers and help influence and support business decisions.
- Design and optimize benefits programs to ensure competitiveness, effectiveness and alignment with the company's core value and culture.
- Maintain strong working knowledge of legislation and work closely with the legal team to ensure existing policies are in compliance with applicable legislative and regulatory requirements.

## Skills Required

- Understanding of HR principles, metrics & practices, including employment laws and regulations, and also the knowledge of current industry trends and economic factors.
- Ability to benchmark, measure, analyze the value and return of HR initiatives, practices and policies.
- Additional operations or business experience outside of HR.
- Prior exposure to payroll processing & mastery of Microsoft Office.
- Senior Professional in Human Resources (SPHR) or Professional in Human Resources (PHR) certification is strongly preferred

# Financial Consultant

Financial consultants work with companies or individuals to plan for their financial futures by offering information and guidance on topics that include taxes, investments and insurance decisions. Often called financial advisors, they offer the clients personalized financial advice, and may also direct the buying and selling of stocks and bonds.

## Responsibilities

- Analyze financial and investment information obtained from the client to determine strategies, products and services to help the client meet their financial and investment objectives.
- Provide financial planning information/education to clients about the purpose and details of financial products, services and strategies.
- Build and maintain client base, keep client financial and investment plans up-to-date and acquire new clients on an ongoing basis.
- Provide objective financial guidance and customized financial strategies to consumer segments that demand high quality services.

## Skills Required

- The ideal candidate should have experience in handling Indian financial accounting, A/P & A/R analysis, budgeting and finalization of financial statements as per provisions of Indian GAAP, UK GAAP and IFRS.
- Candidates with additional knowledge of overseas accounting and tax regulations will be preferred.
- Problem solving & critical thinking abilities, with high attention to detail.
- In-depth understanding of operational accounting, & experience in handling and leading accounting teams, along with technical skills.
- Previous history of managing national and international internal entities/ clients.
- Experience of using Tally is a must, along with a CRM software and Microsoft Office, especially Excel, Word and Outlook.

# Management/Business Analyst

A strategy analyst helps identify business needs, coming up with proposals for achieving strategic visions. As a strategy analyst, your job duties are to lead consulting sessions with company management, rate strategy proposals based on business objectives, identify growth areas, and analyze models for data-driven strategy recommendations

## Responsibilities

- Understand business objectives and operational readiness related to a client's needs.
- Translate a client's strategic direction and business objectives into holistic project plans.
- Coordinate with technical resources in aligning deliverables to address human interaction with technical solutions.
- Actively align cross-functional stakeholders around objectives and measures of success.
- Proactively identify, mitigate and resolve issues that may adversely impact projects.
- Analyze proposed changes and determine impacts on business processes and organizational design.
- Implement communication and training programs that prepare the organization for consumption of new digital business processes and incentivize adoption.
- Collect necessary data on existing workflows to understand organizational impacts related to a specific change to the business group, customer, or partner and deliver prescriptive recommendations to ensure a smooth transition.
- Provide analytical support to project teams and conduct research and data analysis to support the team's analysis and conclusions.
- Contribute to business development activities such as pre-sales client presentations, research, requests for proposal (RFPs), and responses to statements of work (SOWs)

## Skills Required

Students should possess organizational and management skills to double up the chances of getting hired by a top-notch company. The applicant should focus on having:

- A good understanding of the business ecosystem and market trends.
- Good interpersonal and communication skills.
- Knowledge of two or more languages.
- Sharp analytical capabilities.
- The ability to work under tight deadlines and work pressure

Moreover, technologies like AI, Machine Learning, Blockchain, and Pattern Analysis are widely being used by the consultancy industry to bring innovation to their services and agility into their organizations. Hence, the existing employees are being trained in using these technologies.

Naturally, the companies give priority to the candidates acknowledged with the latest technological advancement at the time of new hiring. So, the management consultants need to be adaptable to the changing work culture and should be able to provide quick and profitable consulting solutions to the clients.

# Business Process Consultant

A business process consultant is helps businesses by analyzing the processes and systems that a business implements. Once this has been done, he or she will make recommendations to improve these processes so to improving overall efficiency. They might

also be involved in simulating the proposed solutions.

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## Responsibilities

- Implements the customer engagement and product development plans.
- Develop client specific business process plans that align with the business deliverable, enterprise strategy and influence appropriate roadmaps.
- Acquire and apply expert knowledge of the business.
- Lead alignment and development of business deliverable processes and capabilities with business needs.
- Plans, directs, and coordinates activities for complex projects.
- Analyze business process risks and apply control plans to ensure alignment with CoSA specific requirements, process requirements, and business needs.
- Develops communication plans for clients and internal stakeholders.
- Utilizes reporting, data, and analytics to measure process and project performance, deliver operational efficiencies, and inform key stakeholders.

## Skills Required

- Mastery over the art of the cold open, confidently overcoming objections, and have a healthy approach to handling rejection.
- Ability to understand and confidently speak about technology products.
- Strong written and verbal communication skills, along with disciplined organization and effective time management.
- Mastery of persuasive elevator pitches and consultative thought process.
- Experience with Salesforce or any similar CRM software is preferred.
- An MBA degree from a reputed institution is a plus

# IT Consultant

Information Technology (IT) Consultants are external analysts who evaluate a company's IT systems to help them meet their business objectives. Their primary duties include analyzing and diagnosing a company's IT infrastructure, understanding a client's business needs and designing and implementing a technology solution.

## Responsibilities

- Developing and maintaining data transformation scripts.
- Administration of all cloud infrastructure and monitoring the system performance.
- Development of deployment and automation scripts for new hospital customers onboarding to our cloud infrastructure.
- Management of technical aspects of IT security.
- Development of custom queries (SQL, Application Insights, Sumo Logic) to troubleshoot client issues.
- Hands on support of technical aspects of 3rd party identity management implementation (including SSO).
- Hands on support of the technical aspect of establishing a data connection with our customer hospitals

## Skills Required

- A fine balance between infrastructure and application.
- Ability to analyze current state, defining systems strategy, developing system requirements, prototyping, testing, training, and implementation.
- Expertise in problem resolution along with strong communication and interpersonal skills, to build strong working relationship with external stakeholders and should be able to convince/negotiate in case of conflicts.
- Excellent client facing skills along with prior demonstrated experience of leading teams at various stages, including, the ability to work effectively with minimal direction in ambiguous situations.

# Operations Consultant

An operations consultant is someone who helps an organization's management enhance their operations, which might increase business efficiency, cut costs, and raise customer responsiveness. Operations

consultants may work independently or as part of consulting firms, and their career paths can vary according to specialization or industry.

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## Responsibilities

- Building dashboards, analysis, and reports for various business units and lines of business.
- Presenting recommendations to executives and business unit leaders.
- Researching industry trends/opportunities, and preparing competitive analysis.
- Supporting Associates with acquisition due diligence.
- Analyzing strategic initiatives such as new product offerings and partnerships

## Skills Required

- Must have experience in managing facilities for a manufacturing or plant.
- Excellent customer service skills.
- Ability to lead, manage, assign, and motivate teams.
- Interpersonal influence



## Get Ready

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- Through your extracurricular activities, develop evidence of your personal effectiveness and impact in areas like teamwork, organisation and planning, leadership.
- Experience outside of the university environment will show that you can apply these competencies in a work environment. This might be an internship with a graduate employer, but vacation work, eg as a sales or office assistant or helping to run a children's summer camp, will also demonstrate this.
- Working at a management level within the institute along with good grades will help showcase the overall effectiveness and problem-solving aptitude, something that the recruiters look for in potential recruits.
- If you are looking for a Masters in Management, choosing a good college, a good domain and preparing for the relevant exam is important. Do attend events, lectures and talk to a lot of experienced people before going forward.

## CAREER HANDBOOK



# MSE

SMaterials Engineer  
Nanotechnology Engineer  
Biomaterial Engineer  
Semiconductor Engineer  
Metallurgist  
Ceramic Engineer



# Materials Science & Engineering

*Research and design of new materials*

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With rapid advances in various fields, and the increased demand for sustainable products, the need for newer materials is rising. This need has fuelled a demand for material science experts. Material science engineers are involved in the research, design and development of materials to advance technology and products. They are involved in all the phases of material development, right from selecting raw materials to creating and testing the final product.



## General Growth Opportunities

Metallurgy is a very less exploited subject. The advantage of such a course is that though jobs are limited, you have a good pay if you can prove yourself to be an able candidate. Instead of pursuing bachelors in this course, many students do prefer to do their masters before looking for job opportunities. After finishing education in metallurgy, one can get jobs in R&D (research and development) departments in companies that manufacture metals, or in factories or automobile manufacturers, nano materials and energy as well are two upcoming sectors for Metallurgists. Additional courses like non-destructive testing, can help one become the quality control officer or manager in companies dealing with metallurgical services.

## General Skills Required

- There is no doubt that CGPA will be the first thing that the company will look forward to creating an impression of the candidate. Moreover, it becomes more critical when it comes to the core job as the courses that we do provide tools for “to be engineers” in their respective fields.
- Knowledge of various characterization and testing techniques that one learns during the 4/5 years comes to handy during his/her interview. Though, in most cases, we will not have hands-on experience; in-depth theoretical knowledge is a must if one wants to pursue core engineering as a prospect.
- There is a modicum of core companies for placements; all of them mostly disposed to a few courses, and hence one must devote some extra time in going a mile ahead. One should have good knowledge of the profile that the company is offering, provided he/she wishes to apply for the same.

- One can work in any lab of the department that entices the person by getting in touch with the professor, and undoubtedly it will be beneficial during the interview as the candidate will have good practical knowledge in that field.
- Internship in the core field, either corporate or research, will definitely give a boost to the profile. Though theory provides an excellent base, the practical experiences expose the challenges that one may not face otherwise. Also, such an internship experience will brief one about the functioning of a company or an industry. One gets to meet a lot of new people in such a setting where one can benefit from the knowledge exchange and network building to burnish one's personality.

## Materials Engineer

As a materials engineer you'll be responsible for working with various materials to improve their performance, or creating new materials to help advance technologies or products. You'll need an understanding of the properties and behaviours of different substances, from raw materials to finished products. You could work with many different materials, from ceramics to plastics, and polymers to industrial minerals.

## Responsibilities

- selecting the best combination of materials for specific purposes
- testing materials to assess how resistant they are to heat, corrosion or chemical attack
- analysing data using computer modelling software
- assessing materials for specific qualities (such as electrical conductivity, durability, renewability)
- developing prototypes
- considering the implications for waste and other environmental pollution issues of any product or process
- advising on the adaptability of a plant to new processes and materials
- working to solve problems arising during the manufacturing process or with the finished product, such as those caused by daily wear and tear or a change of environment

## Career Prospects

- Career prospects are generally good within this branch of engineering. Due to the range of specialist areas and such rapid technological change in the field demand for materials engineers is consistent.
- Once you've built up experience, it's possible to move into general management roles (within laboratories or in the wider organization) or to develop a technical specialist area.
- Progression to management will depend on the size and scope of your employer. For example, a small but highly specialist biomedical laboratory cannot offer the management career potential available within a global oil and gas company.
- You can focus your career in a particular direction depending on your interests. For example, you could decide to be based in the laboratory working on research and development, or you may want to concentrate on the production and processing side.
- With significant experience you could set up your own consultancy or small specialist practice, or you could find work as a contractor for various different organisations and projects.

## Nanotechnology Engineer

Nanotechnologists manipulate matter on the nanoscale (one billionth of a metre), developing new materials and equipment as well as drugs and diagnostic tools. Nanotechnology encompasses science, physics, chemistry, biology, engineering and computer science.

## Responsibilities

Work is usually laboratory-based, but its exact nature can depend on whether you work in industry or academia. The responsibilities in both lines of work are often the same and you'll need to:

- plan and conduct experiments to investigate and analyze nano-scale systems
- operate, or design and construct, complex instrumentation
- extrapolate data to develop theories to explain experimental results
- arrange the testing of products or materials
- develop new products and ways of applying new methodology
- collaborate with other scientists, often including those from other disciplines
- disseminate new findings at departmental, institutional or national meetings and conferences, including presenting to a variety of audiences

## Career Prospects

- Career structures vary with each employer, but career paths tend to be well-defined in all sectors and are dependent on achieving research goals.
- In academic research, a PhD is usually followed by one or more short-term postdoctoral research contracts of up to three years in length. Academic promotion depends on research achievement, which is measured by the quality and quantity of original papers published.
- Progress is then to a lectureship and ultimately to a professor post with management responsibilities. However, this is only possible if you're successful in securing funding for your own research project and group.

## Biomaterial Engineer

As biomaterials science has matured, it has taken on much more biological content, moving from an approach that emphasizes inertness to one that embraces biological activity. Biomaterials science is "a growing field". Effectively, scientists working in the biomaterials field have to have a good chemistry background, perhaps a good physics background, definitely good biochemistry and biology, and a good appreciation, of course.

## Responsibilities

The tasks you carry out will vary depending on your employer and the seniority of the post you hold, but may include:

- using computer software and mathematical models to design, develop and test new materials, devices and equipment. This can involve programming electronics, building and evaluating prototypes, troubleshooting problems, and rethinking the design until it works correctly
- conducting research to solve clinical problems using a variety of means to collate the necessary information, including questionnaires, interviews and group conferences
- assessing the potential wider market for products or modifications suggested by health professionals or others
- writing reports and attending conferences and exhibitions to present your work and latest designs to a range of technical and non-technical audiences
- meeting with senior health service staff or other managers to exchange findings

## Career Prospects

- Undergraduates interested in a biomaterials career should consider spending a summer doing a medical internship, or spending some time in the research and development environment of a company or in a government institute. This will help you get acquainted with the field's objectives and demands. The more experience you get early, the better it will be for their future employment and for their future success.
- Currently, the majority of biomaterials jobs are in academia, but the private sector is showing signs of activity, with academic labs spinning out companies, pharmaceutical companies allying themselves to biomaterials companies, and traditional medical implant companies looking to replace their 50-year-old technology.

# Semiconductor Engineer

Semiconductor processing engineers oversee the manufacturing of electronic semiconductors, which are commonly known as integrated circuits or microchips. These microchips are found in all electronic devices—including cell phones, cars, and laptops—and are an important part of modern life.

## Responsibilities

- **Materials Engineering:** Materials engineers use their knowledge of the properties of various raw materials to develop specifications of materials used to manufacture semiconductor devices. They also modify materials to increase cost-effectiveness and performance.
- **Process Development:** Process development engineers modify existing or develop new processes for manufacturing semiconductor devices. They outline correct procedures for manufacturing semiconductor devices, collaborate with materials engineers to select the right raw materials and solve process-related challenges that arise during production.
- **Quality Assurance:** Quality control inspectors, also known as quality managers, work in firms that manufacture semiconductor devices where they ensure products meet industry standards. They inspect the manufacturing procedures to maintain adherence to procedures, examine products for deviations from manufacturing specifications and defects, and accept or reject products for sale based on their findings.
- **Patent Examination:** Patent examiners play an integral role in creating a competitive and innovative environment for manufacturers in the semiconductor industry. Working in regulatory agencies, patent examiners review applications from semiconductor device manufacturers to determine whether an invention is original, useful and innovative.

## Career Prospects

- An enormous number of career paths exist in this \$249 billion dollar industry.
- The biggest companies are Taiwan Semiconductor Manufacturing Company (NYSE: TSM), United Microelectronics Corporation (NYSE: UMC), Intel Corporation (NASDAQ: INTC), Toshiba Corporation, NEC Corporation, Sony Corporation, International Business Machines Corporation (NYSE: IBM), Samsung Group, Texas Instruments (NYSE: TXN), STMicroelectronics, and NXP Semiconductors.

## Metallurgist

As a metallurgist you'll be concerned with the extraction and processing of various metals and alloys. You'll investigate and examine the performance of metals such as iron, steel, aluminum, nickel and copper and use them to produce a range of useful products and materials with certain properties. Your work may be in:

- Design and manufacture
- Production management
- Quality assurance
- Research And Development

## Responsibilities

As a chemical metallurgist, you'll need to:

- design and control processes to separate metals from ore
- monitor and test for corrosion
- develop ways to improve metals by making them stronger or more adaptable
- test metals to ensure they meet quality and safety standards.

In physical metallurgy, you'll need to:

- assess the physical structure and behavior of metals
- investigate accidents, where it is suspected that the cause may be related to metallurgical failures, such as in air crashes, produce reports on research and tests carried out.

As a process metallurgist, you'll need to:

- control the shaping of metals through casting, rolling, forging, and drawing
- join metals using welding and soldering techniques
- Design Metal Components And Prototypes.

## Career Prospects

- If you remain in industry and want to stay in the technical side, you may progress to senior management positions where a high level of technical competence is expected. It's also possible to specialise in a particular area of metallurgy, such as stainless steel, non-ferrous alloys or precious metals, or in a particular industrial sector.
- If you'd prefer to move into a different role and have a good technical background with excellent communication, numerical and analytical ability, you could work in production management.
- Opportunities also exist in non-technical fields, such as:
  1. product and business development
  2. quality assurance
  3. sales and commercial work
  4. supplier and customer liaison.
- Moving into research roles is also a possibility and opportunities exist in private sector industrial firms, academic laboratories, contract research laboratories and government laboratories.
- With substantial experience, it's possible to find work as an independent consultant, contracting your services to larger organizations.

# Ceramic Engineer

Ceramic engineers are specialized materials engineers who work with ceramics, which are nonmetallic, inorganic materials that are processed at high temperatures. Glass, porcelain, brick, and cement are all examples of ceramics. Ceramic engineers develop new ceramic products as well as methods and equipment for processing ceramic materials. They work with a wide variety of products, ranging from glassware and electronic components to nuclear reactors and linings for blast furnaces and jet engines.

Most Ceramic Engineers Are Employed In The Stone, Clay, And Glass Industries. Others Work In Industries That Use Ceramics, Such As The Aerospace, Iron And Steel, And Chemical industries. Some Ceramic Engineers Teach And Do Research In Universities. Others Work For Government Agencies And Research Centers.

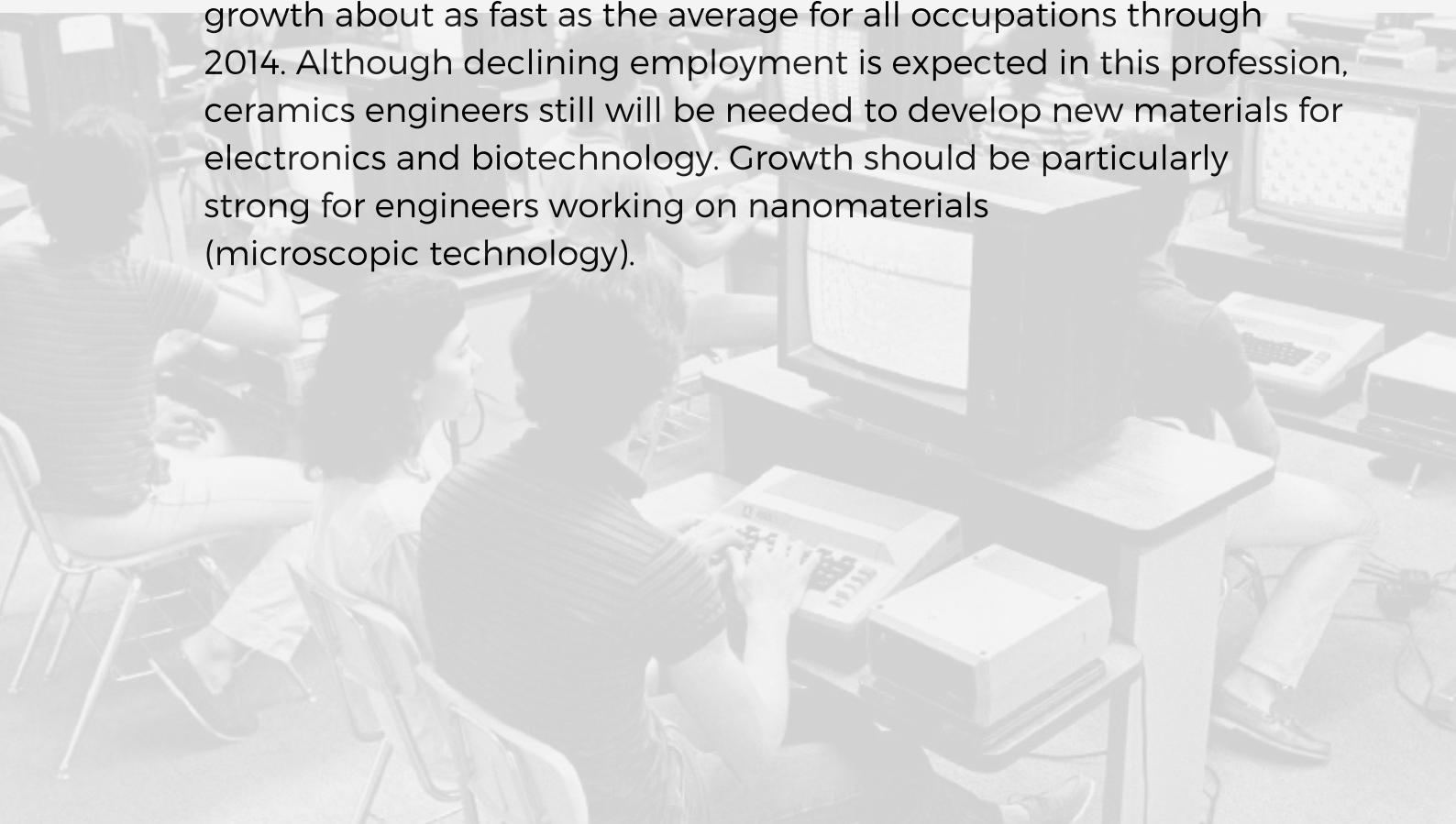
## Responsibilities

- Ceramic engineers often specialize in one type of work. For example, many are involved in research and development.
- They develop new ceramic materials synthetically or from minerals found in the earth.
- Advance the technology of existing ceramics, such as improving heat and fire resistance. Ceramic engineers may also explore new uses for ceramic products, such as using ceramics in miniaturized circuits and human bone and teeth replacements.
- Many ceramic engineers are involved in production.

- Direct the processing of the natural raw minerals and synthetic materials used to make ceramics.
- Design the kilns and other equipment used in manufacturing as well as direct the crews that build the plants and operate the kilns.
- Work in sales and show customers ways to use ceramics to solve their design and production problems. They sometimes oversee the installation and operation of ceramic equipment in customers' plants.
- There are also several product fields within the industry. Ceramic engineers usually specialize in one or more of these products.

## Career Prospects

- Ceramic engineers often start as assistants and then advance to positions with more responsibility. They can become junior members of sales or production teams. With more education and experience, they can become project supervisors, department heads, and even executives of large companies.
- Materials engineers in general are expected to have employment growth about as fast as the average for all occupations through 2014. Although declining employment is expected in this profession, ceramics engineers still will be needed to develop new materials for electronics and biotechnology. Growth should be particularly strong for engineers working on nanomaterials (microscopic technology).



# Get Ready

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- Get some work experience in a research lab during the summers, or during the semester to gain an in-depth understanding of the field that you are interested in.
- For jobs, mostly a lot of opportunities are present after post graduation.
- A lot of companies and international labs with industry tie-ups are constantly looking for motivated students to help in the projects as interns, which is a great opportunity to understand the relevance of the work in this field on day to day life.
- Think carefully and get plenty of advice before choosing your PhD topic, supervisor and university.
- Talk to your lecturers about what their jobs are like.

## CAREER HANDBOOK



# CSE

Software Engineer  
Web Developer  
Applications Developer  
IT Consultant  
Data Analyst / Scientist  
Machine Learning Engineer

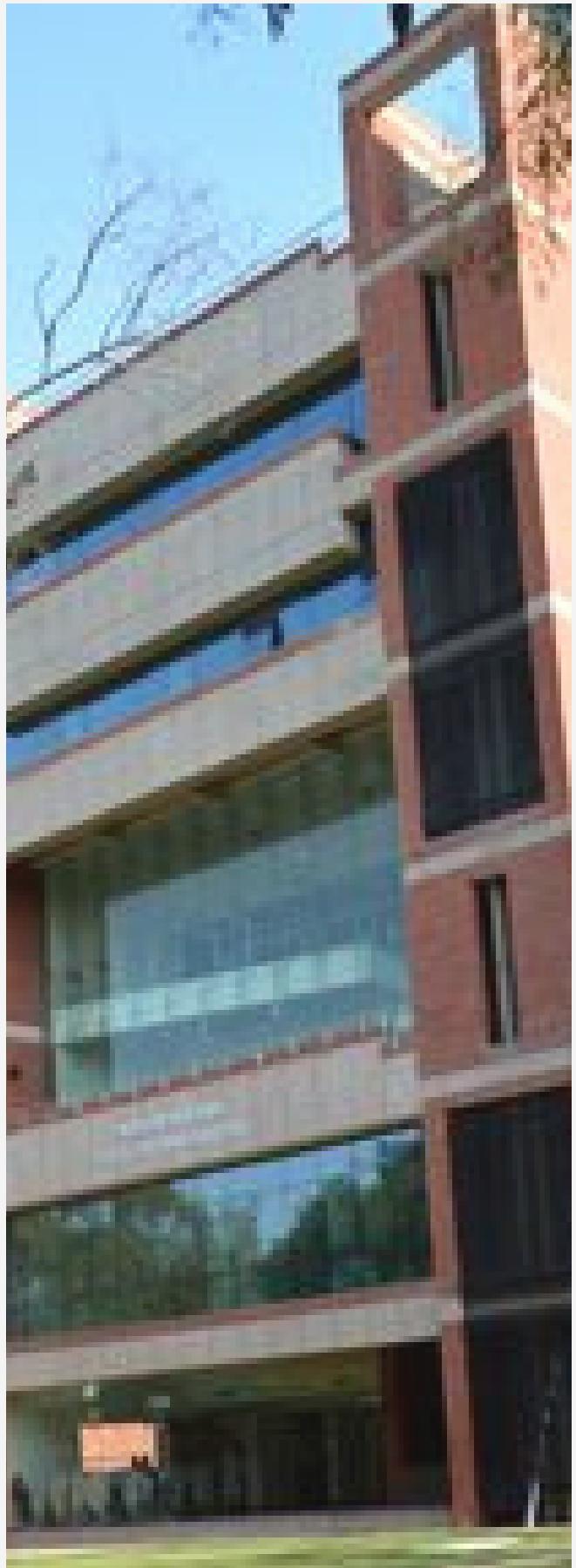


# Computer Science and Engineering

*From games developer to manager of IT and communications services, you'll have a range of opportunities open to you as a computer science graduate*

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Computer science underpins our Facebook pages, controls air traffic around the world, and ensures that we will not be too surprised when it snows. It has been applied in algebra, car manufacturing, laser surgery, banking, gastronomy, astronomy and astrology. Indeed, it is hard to find an area of life that has not been fundamentally changed and enhanced by its application. As a student of the CSE discipline you get to choose from a wide range of areas to specialize in and by no means are you confined to the norms associated with your area as it has been proven again and again you are limited only by your imagination.



# Software Engineer

As a software engineer, you'll work in a constantly evolving environment, due to technological advances and the strategic direction of the organization you work for. You'll create, maintain, audit and improve systems to meet particular needs, often as advised by a systems analyst or architect, testing both hard and software systems to diagnose and resolve system faults. The role also covers writing diagnostic programs and designing and writing code for operating systems and software to ensure efficiency. Software engineers also manage the support systems required to effectively run an organization, the role can also require you to communicate effectively and translate the needs of different teams into systems developments.

## Responsibilities

- Write and test code, refining and rewriting it as necessary and communicate with any programmers involved in the project
- Consult clients and colleagues concerning the maintenance and performance of software systems, with a view to writing or modifying current operating systems
- Write systems to control the scheduling of jobs or to control the access allowed to users or remote systems
- Develop existing programs by analyzing and identifying areas for modification

## Prospects

An entry-level post typically involves working under supervision, formulating the scope of, and objectives, for systems and designing code. After around three years, you may progress to preparing detailed specifications from which programs may be written and be competent to work at the highest technical level.

Progression is mainly into management via team leadership and project management roles, or to designer/consultant via technical specialization.

# Web Developer

Your primary task as a web developer will be to create reliable and high-performing applications and services, which can be accessed over the internet. Focusing solely on the underlying software and databases (known as the 'back end') is most common.

However, some web developers work on the interface and visual design (the 'front end'), while others combine both ('full-stack development').

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## Responsibilities

- Write code in one or more programming or scripting languages, such as PHP or JavaScript
- Test sites and applications in different browsers and environments
- Build and test Application Program Interfaces for applications to exchange data
- Design information architecture within an application or website

## Skills Required

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- Having usually started your agency or tech organization career as a junior or entry-level developer, you'll generally progress to a senior or mid-level developer role after around five years. As a senior developer, you'll usually work on more significant projects, manage one or two junior developers.
  - After ten or more years, the next step is to lead the developer, technical lead or head of development. At this level you'll usually do less coding work and will manage a team of web developers and contribute to the organization's technical strategy and goals.
  - After this, you could move into a senior or even board-level position, for example chief technical officer (CTO) or technology vice president.
  - Some organizations hire very experienced and reputable web developers known as 'evangelists'. Acting as an ambassador, they promote and train people in the use of a new technology or systems developed by the organization.

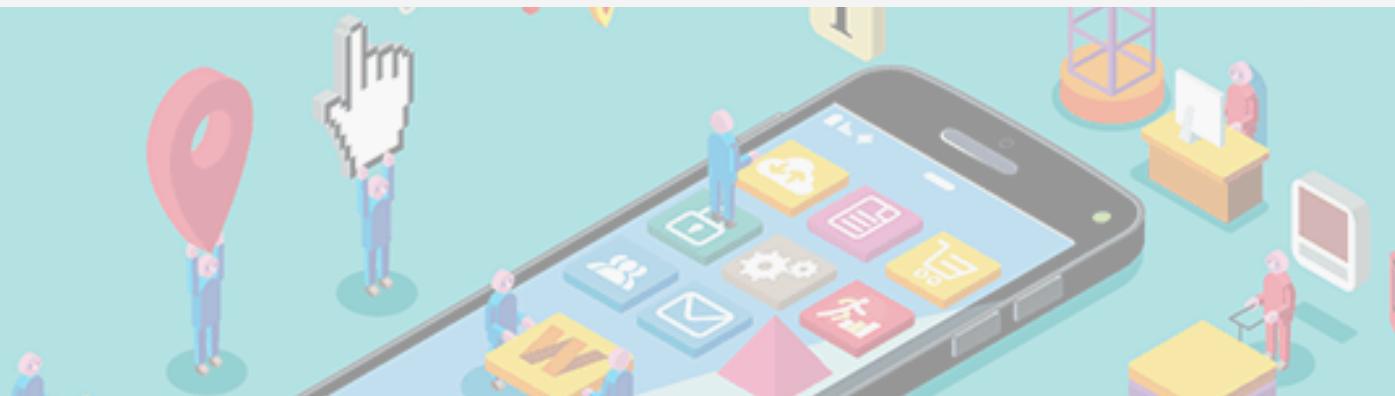
# Applications Developer

As an applications developer you'll translate software requirements into workable programming code and maintain and develop programs for use in business.

You'll usually work within a specific development field, such as mobile phone applications, accounting software, office suites or graphics software, and will have in-depth knowledge of at least one computer language.

## Responsibilities

- Establish a detailed program specification through discussion with clients
- Write the program - to do this you'll break down program specification into its simplest elements and translate this logic into a programming language
- Write detailed documentation for the operation of the program by users and computer operators



## Career Prospects

- As a graduate it's common to start with programming work, as it enables you to gain experience in systems analysis or systems design.
- In large organizations, you may be promoted to a senior application developer and be given supervisory responsibilities. With more business experience, you may move into systems analysis, or be promoted to an applications manager position.
- It's possible to move into project management, replacing your detailed perspective with an overview, and take on responsibility for supervising teams of programmers and for the overall design and specification of a project.

# IT Consultant

Your role as an IT consultant will be to work in partnership with clients, advising them, how to use information technology in order to meet their business objectives or overcome problems. You'll work to improve the structure and efficiency of IT systems in various organizations.

You'll provide strategic guidance to clients with regard to technology and IT infrastructures and will enable major business processes through enhancements to IT. You may also be called upon to provide guidance and technical expertise during other processes as well, such as selection and procurement and user training and feedback.

## Responsibilities

- Clarify a client's system specifications, understand their work practices and the nature of their business
- Analyze IT requirements within companies and give independent and objective advice on the use of IT
- Be involved in sales and support, and where appropriate, maintain contact with client organizations.

## Skills Required

Most large consultancies have an established career structure for their staff, with frequent appraisals and an emphasis on individuals managing their own careers. Typically you might move to a more strategic role with team leadership and responsibility.

Once you gain generalist experience, you may want to specialize in a sector or a program such as SAP or Oracle. Other ways to progress include developing specific technical expertise, possibly contributing at national and international technical conferences or moving into a more strategic business direction, either for a company or a management consultancy firm.

# Data Analyst/ Scientist

Data analysts are in high demand across all sectors, such as finance, consulting, manufacturing, pharmaceuticals, government and education. The ability to pay attention to detail, communicate well and be highly organized are essential skills for data analysts.

They not only need to understand the data but be able to provide insight and analysis through clear visual, written and verbal communication.

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## Responsibilities

- Develop records management processes and policies
- Identify, evaluate and implement external services and tools to support data validation and cleansing
- Prepare reports for internal and external audiences using business analytics reporting tools and present them successfully to management using a reporting tool.

## Career Prospects

- With experience, you could progress into a management role in a short space of time. Skilled analysts can also find roles in academic research or government advisory bodies.
- This demand for experienced analysts is only likely to grow in years to come, in international corporations. This is coupled with the fact that data specialists are required across multiple industries and domain types, including healthcare, manufacturing, education, media, retail and even real estate. Because of this, advancing in the role should be a fairly quick process.

# Machine Learning Engineer

As a machine learning engineer, working in this branch of artificial intelligence, you'll be responsible for creating programs and algorithms that enable machines to take actions without being directed.

A key feature of this work is that you're providing computers with the ability to learn automatically and improve from experience, without being programmed.

## Responsibilities

- Understand and use computer science fundamentals, including data structures, algorithms, computability and complexity, and computer architecture
- Use data modeling and evaluation strategy to find patterns and predict unseen instances
- Liaise with stakeholders to analyze business problems, clarify requirements and define the scope of the resolution needed
- Analyze large, complex datasets to extract insights and decide on the appropriate technique

## Career Prospects

If you've studied this discipline, your skills will be in high demand across a variety of sectors. There are opportunities for recent graduates in the field. Progressing to a senior level often involves managing a team.

Large multinational technology companies may offer the best prospects for career progression and the highest salaries. Ensuring your machine learning engineering skills are excellent is the best way to stand out and succeed in this career.

# Get Ready

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- This sector rewards people who self-develop. There are numerous online courses in programming to get you started and many of them are free. Even if you are not studying computer science, taking the initiative to develop your own projects outside of your course will make you stand out from other candidates on the job market.
- If you are more into theory, then working on a theoretical project with a Professor from the institute would be the right thing to do.
- Constantly improving your skills and building nice solutions to day to day problems would be a good way to showcase your curiosity, dedication and intellect to the recruiters
- Working in start-ups to further get an experience of working in a team, would also help you stand out from people.

## CAREER HANDBOOK



# PHYSICS

Academic Researcher  
Astronomer/Astrophysicists  
Technical Author  
Higher Education Lecturer



# Physics

*A physics degree is a great starting point for a career in scientific research, as well as in a range of careers in the business, finance, IT and engineering sectors.*



# Academic Researcher

As an academic researcher you'll apply your expertise and skills developed through study and research. You'll aim to publish papers on your work in peer-reviewed, well-respected journals and will write reports, books or chapters of books on your specialist area of knowledge.

## Responsibilities

- Carry out original, high-level individual and collaborative research with other team members
- Organise your own time and budget effectively, including for off-site and overseas visits
- Analyse large sets of data and information, drawing relevant conclusions
- Work to deadlines as required by fund or grant holder
- Prepare and deliver presentations at national and international conferences to large audiences
- Undertake thorough and comprehensive literature reviews
- Teach undergraduate and postgraduate students

## Skills Required

- A high level of intellectual ability, to plan and carry out research
- Technical aptitude, to learn how to use new equipment and emerging technology
- Interpersonal skills, to develop strong working relationships and trust with a broad range of people to foster productive collaborations and future partnerships
- Concise and meaningful high level written communication skills for publishing work, conference proceedings and funding bids
- Strong IT skills including the use of Microsoft Office, and for some areas excellent data analysis and statistical knowledge
- Excellent verbal communication skills, to present ideas and conclusions in lectures and presentation.

# Responsibilities

- Write and publish research papers in high-quality, peer-reviewed journals in line with departmental targets
- Present at conferences, lectures and other teaching responsibilities
- Contribute to writing bids and applications for research funding
- Develop collaborative relationships with staff at other institutions.
- Taking on additional responsibility, along with being a supportive and enthusiastic colleague, will also help. As you progress you'll gain more leadership and strategic responsibilities, so taking any opportunities that allow you to demonstrate and develop these skills is advisable.

# Astronomer/Astrophysicists

Astronomers are scientists who study the universe, its objects and how it works. They aim to push the boundaries of human knowledge about how the universe works by observation and theoretical modelling. You can work in observational astronomy, using telescopes and cameras to look at the stars, galaxies and other astronomical objects, or in theoretical astronomy, where you'll use maths and computer models to explain observations and predictions.

Astronomers can specialise in studying: planets, stars, galaxies, cosmology (the origin of the universe). Most Modern Research In Astronomy Involves Significant Computer Programming And Modelling, Whether You Work With Real Data From Observatories Or Do Theoretical Work.

## Responsibilities

- Collecting and analysing data from cameras, satellites and other observations
- Planning and executing research projects to answer fundamental questions (such as, how do galaxies form?)
- Applying for time to observe at international observatories
- Reading existing academic literature
- Putting your work in the context of other researchers' work
- Writing scientific articles
- Applying for grants to fund your researcher
- Collaborating with other astronomers, often internationally
- Training and mentoring students and postdoctoral researchers
- Teaching Courses In Astronomy Or Related Areas.

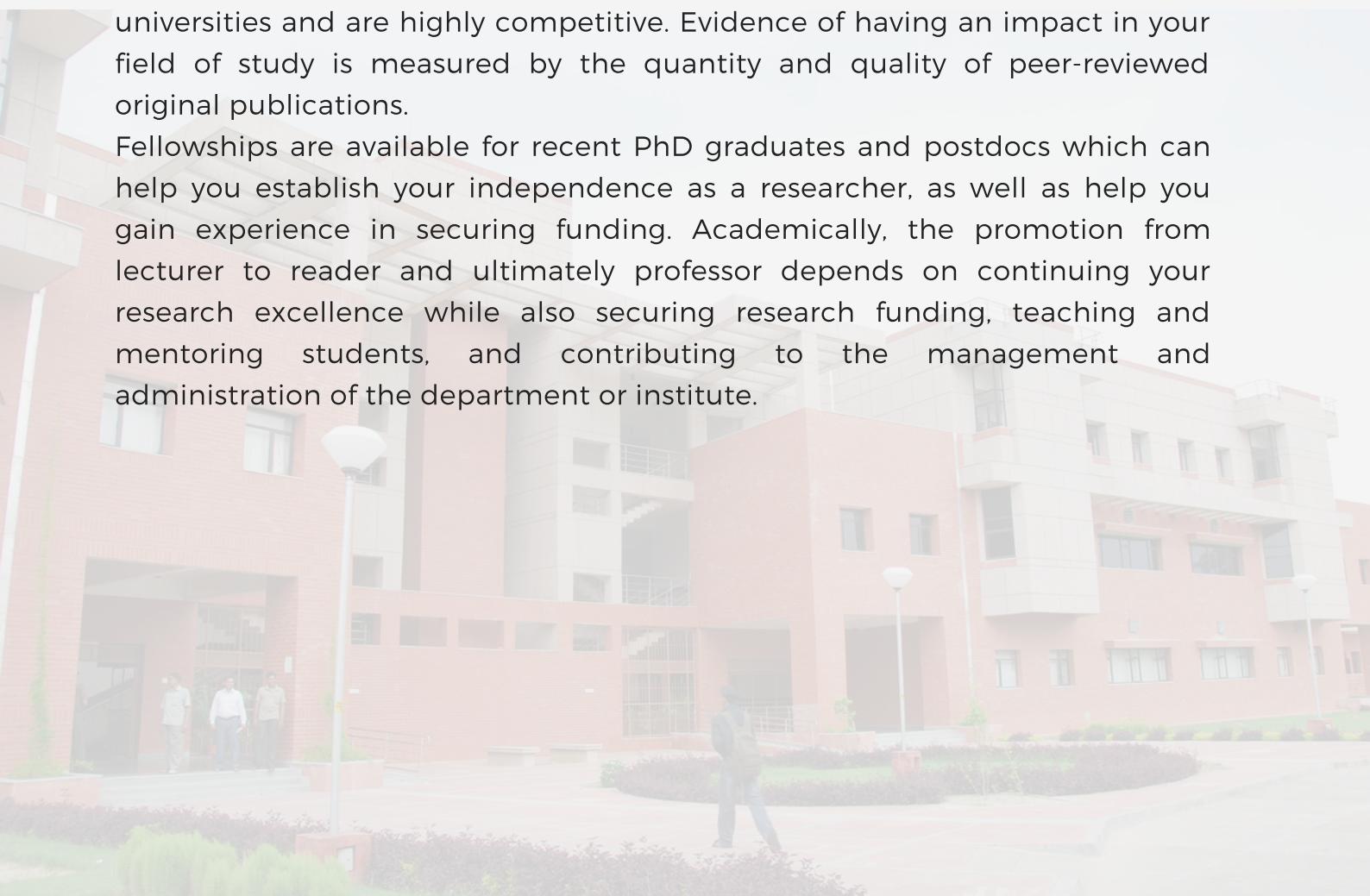
## Skills

- Strong physics, mathematics and statistics skills
- Computer programming skills
- Research and analysis skills
- Problem solving/troubleshooting skills
- Excellent communication, both oral and written
- The ability to make progress without strict deadlines
- The ability to collaborate and work in a team
- Project management skills
- The ability to train and mentor students

## Career Prospects

In academic research, a PhD is usually followed by at least one, but sometimes more, short-term postdoctoral research contracts of up to three years in length. Permanent astronomy research posts are primarily at universities and are highly competitive. Evidence of having an impact in your field of study is measured by the quantity and quality of peer-reviewed original publications.

Fellowships are available for recent PhD graduates and postdocs which can help you establish your independence as a researcher, as well as help you gain experience in securing funding. Academically, the promotion from lecturer to reader and ultimately professor depends on continuing your research excellence while also securing research funding, teaching and mentoring students, and contributing to the management and administration of the department or institute.



# Technical Author

As a technical author, you will be responsible for writing specialist information about products and services, and how they work. You will need to explain how things are used in a way that is easy to understand.

However, some web developers work on the interface and visual design (the 'front end'), while others combine both ('full-stack development'). The information may be presented in the form of user guides for software applications, reference and instruction manuals for appliances, training guides, instructional videos or online help incorporated into software and operating guides. As A Technical Author, You'll Need To Understand The Product Or Applications And Then Design And Write Documentation To Explain It To Users. You May Also Provide This Information In Various Other Forms Including Software Demos And Interactive Tutorials, Wikis, Blogs And Podcasts, Using Video, Illustrations And Graphics.

## Responsibilities

- Attend planning and briefing meetings Collaborate with developers and managers to clarify any technical issues
- Interview experts and sales and marketing specialists
- Work with translators, printers and service providers.

A large part of your job will be spent researching and gathering the information required. You'll need to:

- Use the product or service in question to understand the technology and applications for which documentation is being prepared
- Gather and analyse the information needs of the user.
- Then comes the challenge of presenting the information. For this, you'll:
- Organise information according to your user's needs
- Write and edit text
- Commission, coordinate or prepare illustrations
- Use a variety of software applications to present the information
- Index and catalogue material.

Related administration may involve:

- Working on and managing multiple projects simultaneously
- Creating work schedules
- Marketing - publicising services and skills to potential clients
- Keeping Up To Date With Developments And Trends In The Industry And Attending Training Courses.

## Skills

- A feel for words and a good command of grammar and vocabulary
- The ability to express instructions clearly and briefly in simple language
- A concern for verbal consistency and an appreciation of tone and style
- Good documentation skills and the ability to produce visually attractive instructions
- Interpersonal and communication skills to effectively gather information
- An ability to grasp and structure large amounts of information and anticipate the reader's knowledge gaps
- An enquiring mind with attention to detail
- Editorial judgement
- Accuracy and a methodical approach to work
- The ability to work to tight schedules
- Excellent planning and organisational skills
- Analytical and questioning skills to get information from experts
- The ability to work successfully as part of a multidisciplinary team
- A Good Understanding Of Computers And Other Communication Tools.

## Career Prospects

Career progression typically begins at junior technical author level up to the position of senior technical author. You may progress from there to project leader or editor. With more experience, you can go on to managing teams or becoming more involved in related areas such as usability, interface design, customer experience, training and quality assurance.

You may have to move between organisations to achieve career progression, especially if you're working for a small company with only one technical author. However, you'll have flexibility to work across different sectors, for example finance and pharmaceutical, or to use your specialist knowledge for different publications, such as writing manuals or magazines. It may even be possible to use your science and communication skills to provide instruction for specialist scientific equipment.

With experience, and once you've built up a network of contacts, there are opportunities to become a freelancer or consultant. This work tends to be project based and may lead to a higher salary or freedom to choose assignments.

# Higher Education Lecturer

As an HE lecturer, you'll need expertise in your subject area in order to teach students. Teaching methods include lectures, seminars, tutorials, practical demonstrations, field work and e-learning. Multimedia technologies are becoming increasingly used.

You'll Also Pursue Your Own Research To Contribute To The Wider Research Activities Of Your Department Or Institution. The Aim Is To Have This Published In Books Or Scholarly Articles, Which Can Help Raise Your Institution's Profile.

## Responsibilities

- Deliver lectures, seminars and tutorials
- Design, prepare and develop courses and teaching materials
- Develop and implement new methods of teaching to reflect changes in research
- Supervise students' research activities, including final year undergraduate projects, Masters or PhD dissertations
- Supervise your own research group, which typically includes research assistants (postdocs), PhD and Master students
- Support students through a pastoral or advisory role
- Undertake personal research projects and actively contribute to your institution's research profile
- Write up research and prepare it for publication
- Prepare bids to attract funding to your department for a range of research projects
- Carry out administrative tasks related to the department, such as student admissions, induction programmes and involvement in committees and boards
- Contribute to professional conferences and seminars in your field of expertise
- Establish collaborative links with other institutions, as well as with industrial, commercial and public organisations

## Skills

- Expertise in your subject area
- Enthusiasm for your specialist research area and the ability to pass this passion on to you students and peers
- Published research and a willingness to participate at professional conferences and seminars
- A capacity for original thought and the ability to produce original research for publication
- Excellent oral and written communication skills in order to write reports and applications for funding, and to deliver lectures, workshops and presentations
- Networking skills in order to build relationships with other researchers and research groups, both in the UK and overseas, as well as within your own department
- The ability to organise your own workload and research group
- The ability to manage your time within competing demands
- The capability to work both independently and as part of a team to achieve both your own research goals and the aims of your department
- Excellent analytical skills
- A flexible approach to work
- Good General It And Administrative Skills.

## Career Prospects

- Attend and participate in conferences, workshops and seminars
- Present research and papers at conferences
- Actively contribute to the research profile of your department by getting your research published in high quality, peer-reviewed journals
- Undertake work exchanges abroad
- Prepare bids and apply for research grants and funding.

Early responsibility is common and most lecturers are given a high degree of independence in their work very early on. As your career progresses, you can expect to take on further responsibility in teaching, research or administration and, in some cases, a combination of all three. Management responsibilities are also likely to increase.

Promotion to more senior levels will depend on your willingness to undertake different roles and on the continued demonstration of an active research profile. These senior levels may include posts such as senior lecturer and principal lecturer.



## Get Ready

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- Get some work experience in a research lab during the summers, or during the semester to gain an in-depth understanding of the field that you are interested in.
- Corporate jobs at the undergraduate level are limited, and but after an MS or PhD, the students get offered great roles in reputed firms.
- A lot of companies and international labs with industry tie-ups are constantly looking for motivated students to help in the projects as interns, which is a great opportunity to understand the relevance of the work in this field on day to day life.
- Think carefully and get plenty of advice before choosing your PhD topic, supervisor and university.
- Talk to your lecturers about what their jobs are like.

## CAREER HANDBOOK



# Electrical Engineering

Acoustic Consultant  
Electrical Engineer  
Electronics Engineer  
Machine Learning Engineer  
Control & Instrumentation Engineer  
Network Engineer  
IT Consultant



# Electrical Engineering

With a degree in electrical and electronic engineering you can find work in a wide range of sectors including aerospace, automotive, energy, IT and telecommunications. Electrical engineering is divided into many subfields that include electronics, digital computers, power engineering, telecommunications, control systems, radio-frequency engineering, signal processing, instrumentation and microelectronics. Electrical graduates can get job offers at industries such as defence and FMCG. Defence systems are now so integrated that engineers need to operate cross-discipline, for example using a mixture of mechanical, electronic and electrical engineering knowledge. Teaching career is also rewarding, with jobs in top engineering colleges of India offering attractive remuneration packages. Some can also join software industries which demand knowledge of electricity and electronics.



# ACOUSTIC CONSULTANT

Acoustic consultants provide acoustics, noise, and vibrations services, such as noise surveys, noise assessments, acoustic design advice, and building acoustics.

Acousticians have the option of specializing in a number of areas, including:

1. Architectural acoustics
2. Audio engineering
3. Musical acoustics
4. Ultrasound
5. Underwater acoustics.

## Responsibilities

- Tasks may vary from role to role, but generally, you'll be expected to:
- undertake noise assessments, for example in buildings to make sure they meet building regulations.
- Complete acoustic modelling, with knowledge of how changes in design affect sound levels and quality.
- Design and research medical equipment, such as ultrasound.
- Work with recording studio and broadcast sound equipment.
- Use modelling software, which could include ODEON, SoundPlan, INSUL, CadnaA and/or CATT.

# Skills Required

- Knowledge of codes of practice, policy, and legislation
- Noise modeling skills including familiarity with noise modeling software
- Excellent IT skills including proficiency in Excel and Word as well as computer simulations
- The ability to collate and analyze data
- Accuracy and quality control

# ELECTRICAL ENGINEER

As an electrical engineer, you'll design, develop and maintain electrical control systems and components to required specifications which will be used across many sectors, including:

- the building industry and services, including lighting, heating and ventilation
- transportation and transport networks
- manufacturing and construction
- production and distribution of power.

# Responsibilities

The work can vary according to the industry and your employer, but typically you'll need to:

- design systems and products
- read design specifications and technical drawings
- make models and prototypes of products using three-dimensional design software

- record, analyze and interpret test data
- propose modifications and retest products
- monitor a product in use to improve on future design.

## Skills Required

You'll need to show:

- Relevant technical knowledge and up-to-date sector knowledge
- An analytical and problem-solving approach to work
- Oral and written communication skills to make technical information easy to understand for non-technical audiences
- Flexibility in order to adapt to evolving technologies
- Planning and organizational skills, such as time and resource allocation
- A commitment to continuing professional development (CPD) throughout your career.

## Career Prospects

There's no set route for career progression and your prospects will depend to a certain extent on how you choose to develop your career and your preferred specialist area. As you gain experience, you may decide to stay in an engineering role or work in research and design (R&D). Alternatively, you may choose to:

- go into project management
- take on a management role
- pursue an academic career
- become a consultant or contractor

# ELECTRONICS ENGINEER

As An Electronics Engineer You'll Design, Develop And Test Components, Devices, Systems Or Equipment That Use Electricity As Part Of Their Source Of Power. These Components Include Capacitors, Diodes, Resistors And Transistors. You could specialise in a particular subfield of electronic engineerings, such as:

- control engineering
- instrumentation
- signal processing
- telecommunications engineering.

## Responsibilities

- Work with colleagues to design new systems, circuits and devices or develop existing technology
- Test theoretical design
- Write specifications and technical reports
- Follow defined development processes
- Systematically improve the detailed design of a piece of electronic equipment
- Ensure that a product will work with devices developed by others, can be made again reliably, and will perform consistently in specified operating environments
- Create user-friendly interfaces

# Skills Required

- Strong analysis and practical problem-solving abilities to improve designs
- Oral, written and diagrammatic communication skills, with the ability to translate complex ideas into clear concepts
- Creativity, innovation and attention to detail
- Strategic thinking and commercial awareness of the industry you're in
- An understanding of electrical health and safety legislation.

## MACHINE LEARNING ENGINEER

As a machine learning engineer, working in this branch of artificial intelligence, you'll be responsible for creating programmes and algorithms that enable machines to take actions without being directed. An example of a system you may produce is a self-driving car or a customised newsfeed.

There may be some crossover with other disciplines, including:

1. Computational statistics
2. Mathematical optimisation
3. Data mining
4. Exploratory data analysis
5. Predictive analytics.

## Responsibilities

- Understand and use computer science fundamentals, including data structures, algorithms, computability and complexity and computer architecture
- Use exceptional mathematical skills, in order to perform computations and work with the algorithms involved in this type of programming

- Collaborate with data engineers to build data and model pipelines
- Manage the infrastructure and data pipelines needed to bring code to production
- Demonstrate end-to-end understanding of applications (including, but not limited to, the machine learning algorithms) being created
- Build algorithms based on statistical modelling procedures and build and maintain scalable machine learning solutions in production
- Use data modeling and evaluation strategy to find patterns and predict unseen instances
- Analyse Large, Complex Datasets To Extract Insights And Decide On The Appropriate Technique

## Skills

- The ability to explain the complicated process to people who aren't programming experts
- Strong analytical skills
- High attention to detail
- Innovation and creativity
- The ability to work with large, complex datasets.

In some positions, depending on seniority, you may also need to demonstrate the following:

- Leadership and management of both teams and projects
- Detailed knowledge of machine learning evaluation metrics and best practice
- Strong Python coding skills
- Experience of a typed language (such as, C++ and Java)
- Linux SysAdmin skills
- Messaging (including, Kafka, RabbitMQ, ZeroMQ)
- Distributed systems tools (such as, Etcd, zookeeper, consul)
- Competence with infrastructure as code (Terraform, Cloudformation and similar)
- A portfolio of your past experience (include any blogs, talks, contributions to Open Source, Kaggle).

# CONTROL AND INSTRUMENTATION ENGINEER

Control and instrumentation (C&I) engineers are responsible for designing, developing, installing, managing and maintaining equipment which is used to monitor and control engineering systems, machinery and processes.

## Responsibilities

You'll need to develop skills in specific control disciplines, such as:

- advanced process control (APC)
- distributed control systems (DCS)
- programmable logic controllers (PLC)
- supervisory control and data acquisition (SCADA). The use of these disciplines will depend on the exact nature of your individual job.

In general, however, tasks and responsibilities can include:

- designing and developing new control systems
- testing, maintaining and modifying existing systems
- analyzing data and presenting findings in written reports
- project management within cost and time-constrained environments
- understanding and ensuring compliance with relevant health and safety regulations and quality standards
- writing computer software and test procedures

## Skills Required

- creative problem-solving and troubleshooting skills
- excellent critical thinking skills and a high level of numeracy
- flexibility and an ability to compromise
- a high level of attention to detail
- excellent customer care skills and good commercial awareness
- an understanding of, and ability to work with, high-level computer technology.

# Career Prospects

As a C&I engineer you will progress through your career typically acquiring specialist knowledge of a particular industry sector and/or area of C&I knowledge. Working towards professional registration, such as incorporated engineer (IEng) or chartered engineer (CEng) can aid career progression, depending on your level of qualification. In more senior roles you may lead a team or manage test programmes. Senior positions carry the highest level of responsibility and typically include planning and management activities, as well as leading new developments. Senior engineers in production and operation functions can often be representatives at board level.

## NETWORK ENGINEER

As a network engineer, you'll have responsibility for setting up, developing, and maintaining computer networks within an organization or between organizations. You'll offer support to users, who can be staff, clients, customers, and suppliers, and troubleshoot any problems that arise. You may, in some cases, also be involved in designing new networks. Your aim is to ensure the integrity of high availability network infrastructure to provide maximum performance for your users. Networks can include:

1. computer
2. voice
3. firewall.

## Responsibilities

As a network engineer, you'll need to:

- Establish the networking environment by designing system configuration; directing system installation and defining, documenting and enforcing system standards
- Maximize network performance by monitoring performance, troubleshooting network problems and outages; scheduling upgrades and collaborating with network architects on network optimization
- Undertake data network fault investigations in local and wide-area environments using information from multiple sources
- Secure network systems by establishing and enforcing policies, and defining and monitoring access

- Support and administer firewall environments in line with IT security policy
- Report network operational status by gathering and prioritising information and managing projects
- Upgrade data network equipment to the latest stable firmware releases
- Configure routing and switching equipment, hosted IP voice services and firewalls
- Provide remote support to on-site engineers and end users/customers during installation
- Provide remote troubleshooting and fault finding if issues occur upon initial installation
- Undertake capacity management and audit of IP addressing and hosted devices within data centres

## Skills Required

You will need:

- Up-to-date knowledge and understanding of your employer's business and industry needs, as well as the technical demands
- To recognize the importance of customer focus and/or of serving the needs of the end user
- Excellent communication skills, particularly the ability to communicate with staff who aren't technically trained

## Career Prospects

Your career path will depend, to a certain extent, on the size of the organisation you work for and the scope of its IT systems.

Having gained experience, you can progress to senior network manager and network management positions. Some network engineers choose to broaden their careers into other IT, customer-related or management functions.

Technical or infrastructure project management and network architecture are possibilities.

# IT CONSULTANT

Your role as an IT consultant will be to work in partnership with clients, advising them how to use information technology in order to meet their business objectives or overcome problems. You'll work to improve the structure and efficiency of IT systems in various organisations. You'll provide strategic guidance to clients with regard to technology and IT infrastructures and will enable major business processes through enhancements to IT..

## Responsibilities

As an IT consultant you'll need to:

- Work with clients to define the scope of a project
- Plan timescales and the resources needed
- Clarify a client's system specifications, understand their work practices and the nature of their business
- Define software, hardware and network requirements
- Analyse IT requirements within companies and give independent and objective advice on the use of IT
- Organize training for users and other consultants
- Be involved in sales and support, and where appropriate, maintain contact with client organisations

## Skills Required

If you want to enter the world of IT consultancy, you'll need to show:

- A logical approach to problem-solving/analyzing
- The ability to learn quickly
- Confident decision making
- Presentation skills
- Good organizational skills to prioritize heavy workloads
- The ability to communicate technical information to non-IT clients and colleagues

# Career Prospects

The IT industry is so diverse that you can develop your career in a number of different ways, in a number of different industries and sectors. As an IT consultant, your immediate prospects depend on the size and type of the organisation you work for. Movement between employers is common. Once you gain generalist experience, you may want to work as a senior consultant or specialise in a sector or a program such as SAP or Oracle. Other ways to progress include developing specific technical expertise, possibly contributing at national and international technical conferences or moving into a more strategic business direction, either for a company or a management consultancy firm.



## Get Ready

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- Get involved in core electrical engineering projects, through some of the clubs working in the institute or with a Professor.
- Pick up internships in this sector, either through the SPO internships, or try to get one through referrals.
- Explore on the internet about the latest technologies and implement them through self projects, scale and distribute such projects so that they have an impact.
- Become a student member of some of the electrical engineering labs in the campus, and work on long term core projects.

## CAREER HANDBOOK



# Mechanical Engineering

Automotive Engineer  
Mechanical Engineer  
Computer-Aided Design Engineer  
Control & Instrumentation  
Engineer  
Industrial Engineering &  
Operations Research



# Mechanical Engineering

Since mechanical engineering is the broadest of all engineering fields, the job prospects on offer for skilled mechanical engineers are a plenty and unending.

Mechanical engineers are required to design, test, manufacture, install, operate and maintain a wide array of machines and mechanical systems that are used in countless industries.

These professionals can find employment both in the government and private sector undertakings.



# GROWTH OPPORTUNITIES

It is expected that Employment of mechanical engineers is projected to grow 10 percent in the next few years, slower than the average for all occupations. Mechanical engineers should experience faster than average growth in architectural, engineering, and related services as companies continue to contract work from these firms. Mechanical engineers will also remain involved in various manufacturing industries—specifically, transportation equipment and machinery manufacturing.

Machinery will continue to be in demand as machines replace more expensive human labor in various industries. This phenomenon in turn should drive demand for mechanical engineers who design industrial machinery. So ample scope for employment is seen in Core Companies like thermal power industry, gas turbines industry, Air Conditioning , Refrigeration industry, Oil and Gas exploration and Refining industries, Agricultural sector, Automobile industry etc. and also FMCG Companies like HUL,ITC, Britannia, etc. People are bound to move up in the pay-scale as well as responsibility if they are willing to work hard.

# EXIT OPPORTUNITIES

A mechanical engineering degree is a great passport to a huge variety of non-engineering graduate jobs, both within the engineering industry and outside it. If you want a non-technical career in the engineering sector, a number of the larger employers run into areas such as finance and management. You could also consider jobs in areas such as supply chain or technical sales. If you wish, you could start your career in an engineering job, and then progress into a more business focused role at a later date. Mechanical engineering graduates are welcomed for their high level of numeracy and problem-solving mentality. In particular, IT companies and technical consultancies are well worth exploring, especially if you have some programming skills.Your skill set will also go down well with recruiters for finance, management and business or management consulting graduate schemes, while teachers with technical backgrounds are always in demand.

# JOB PROFILES

## AUTOMOTIVE ENGINEER

As an automotive engineer you'll design, develop and manufacture vehicles such as cars, motorbikes, buses and trucks and their engineering systems. You'll need to have a combination of engineering and commercial skills to be able to deliver projects within budget. Once you've built up experience, it's likely you'll specialise in a particular area, for example, structural design, exhaust systems or engines.

## Responsibilities

- use computer-aided design (CAD) packages to develop ideas and produce designs
- decide on the most appropriate materials for component production
- solve engineering problems using mechanical, electrical, hydraulic, thermodynamic or pneumatic principles
- build prototypes of components and test their performance, weaknesses and safety
- take into consideration changing customer needs and government emissions regulations when developing new designs and manufacturing procedures
- prepare material, cost and timing estimates, reports and design specifications

## Career Prospects

As an automotive engineer, you'll be able to choose from a range of career options. It's possible to advance to supervisory engineer roles and senior positions within project team management, general management and consultancy.

# MECHANICAL ENGINEER

As a mechanical engineer you'll provide efficient solutions to the development of processes and products, ranging from small component designs to extremely large plants, machinery or vehicles. You'll work on all stages of a product, from research and development to design and manufacture, through to installation and final commissioning.

## Responsibilities

- research and develop products - for example, mechanical hearts if working in the medical industry
- improve production processes - such as those in large oil refineries, or services within buildings
- design and implement cost-effective equipment modifications to help improve safety and reliability
- develop and use new materials and technologies
- manage people, projects and resources - this will depend on your role
- make sure a product can be made reliably and will perform consistently in specified operating environments
- use research, analytical, conceptual and planning skills, particularly those in mathematical modelling and computer-aided design

## Career Prospects

Most careers in engineering lead to a senior position with responsibility for other staff or larger projects and budgets. If you're required to lead teams or manage projects, developing people management skills will be helpful. You may be able to move into business functions, such as procurement, sales and marketing or human resources (HR). Once you have developed your technical skills, you can move into senior engineering posts, such as engineering director. You could also consider moving into engineering consultancy.

# COMPUTER AIDED DESIGN ENGINEER

A CAD engineer, also known as a draughtsperson, uses CAD software to create technical drawings and plans - also known as draughting - for products and parts used in the engineering, construction and manufacturing industries. You'll work with architects and design engineers to understand the requirements of their initial designs and turn them into accurate and detailed technical drawings in 2D and 3D models. These drawings are used at all stages of a project, from estimating cost and feasibility to creating the blueprints for manufacturing and instructions for installation.

## Responsibilities

- Create high-quality detailed technical drawings and plans based on designs supplied by architects and designers and make modifications to existing drawings
- Use a variety of CAD software programmes to create designs in 2D and 3D models
- Liaise with architects, engineers and designers to understand their design requirements and provide technical advice to manufacturing and construction technicians
- Provide accurate, detailed and to scale drawings
- Ensure drawings are compliant with industry and health and safety standards and protocols
- Calculate costs and apply knowledge of materials and engineering principles to check feasibility of manufacture and construction of the product

## What To Expect

- CAD technicians are mainly office-based and can spend long hours at a computer or drawing desk requiring periods of concentration.
- Not all the work is individual and you could be working with a team of other technicians or architects, contractors or design engineers.
- You'll typically have to meet with clients and designers to understand their requirements for a design. You could also be providing technical advice to designers, manufacturers on shop floors and engineers on construction sites.

# Career Prospects

Most careers in engineering lead to a senior position with responsibility for other staff or larger projects and budgets. If you're required to lead teams or manage projects, developing people management skills will be helpful. You may be able to move into business functions, such as procurement, sales and marketing or human resources (HR). Once you have developed your technical skills, you can move into senior engineering posts, such as engineering director. You could also consider moving into engineering consultancy.

## CONTROL AND INSTRUMENTATION ENGINEER

Control and instrumentation (C&I) engineers are responsible for designing, developing, installing, managing and maintaining equipment which is used to monitor and control engineering systems, machinery and processes. Your job is to make sure that these systems and processes operate effectively, efficiently and safely. You might work for companies who manufacture and supply the equipment or for the companies who use it, such as nuclear and renewable energy companies and environmental agencies.

## Responsibilities

- Advanced Process Control (APC)
- Distributed Control Systems (DCS)
- Programmable Logic Controllers (PLC)
- Supervisory Control and Data Acquisition (SCADA).

# What To Expect

- Your work may be based in an office, laboratory or factory, depending on the nature of the organisation.
- Visiting clients and working on-site is a common aspect of the work.
- Some positions may carry high levels of responsibility and may be stressful, particularly at a very senior level, where accountability lies directly with the C&I engineer. Similarly, C&I engineers often have to work under pressure, to tight deadlines and within budget.
- Power generation and renewable energy research are growing sectors, which means there are good opportunities for C&I engineers.
- Positions are available across the UK and opportunities to work overseas are widely available, particularly within the oil and gas industry or with global pharmaceutical and manufacturing companies.

## Career Prospects



As a C&I engineer you will progress through your career typically acquiring specialist knowledge of a particular industry sector and/or area of C&I knowledge. Working towards professional registration, such as incorporated engineer (IEng) or chartered engineer (CEng) can aid career progression, depending on your level of qualification.

# INDUSTRIAL ENGINEERING & OPERATIONS RESEARCH

Industrial Engineering is concerned with the design, analysis, and control of production and service operations and systems. Today, industrial engineers are more broadly concerned with productivity and all of the technical problems of production management and control. They work in various branches of companies: manufacturing, distribution, transportation, mercantile, and service.

## Responsibilities

An operations manager ensures smooth operation of various processes that contribute to the production of goods and services of an organization. While the manager may not be specialist in any field, expectation is to perform well in various different roles. Some roles and responsibilities of an operations manager include:

- Delivery management: ensure delivery is on-time and goods and services meet quality criteria, obtain feedback from clients and communicate it to concerned departments
- Logistics management: coordinate with quality assurance personnel to ensure that goods produced meet acceptable standards and positive feedback from clients
- Budget management: coordinate with finance department to obtain necessary approval for budget, and ensure that quality equipment are maintained
- Third-party relation management: ensure the adherence of standard procedures in hiring of outside services, and the proper execution of the agreed terms
- Inventory management: ensure that the raw materials received are properly stored and conserved
- Operational strategizing: decide how to make optimum use of resources for organization, and determine the types of equipment needed to fulfill organizational quality policy

# Other Professions In Operations Management

## Responsibilities

- IT Operations Manager: oversee teams of programmers, software engineers, and other professionals in dealing with data computing
- Financial Operations Manager: oversee company's entire finances, analyze reports to ensure company is working within budget, perform financial forecasts
- Operations Manager Research Analyst: decide how to allocate a company's resources, such as time, people, space, money and raw materials, to ensure profits
- Quality Assurance Operations Manager: lead tests and inspection of products to ensure that products are free from defects
- Industrial Production Operations Manager: perform employee scheduling, hiring and terminations, quality control, maintenance and coordinating the entire unit's activity
- Marketing Operations Manager: analyze demand and monitor consumer trends in order to find the most effective marketing strategy, forecast revenues and establish prices
- Supply Chain Management: coordinate of efforts of a network of vendors that provides specific materials and components for a company's products.

## Career Prospects

- The employment of industrial engineers is projected to grow 8 percent over the next ten years, faster than the average for all occupations. This occupation is versatile both in the nature of the work it does and in the industries in which its expertise can be put to use.

- Because they are not as specialized as other engineers, industrial engineers are employed in a wide range of industries, including major manufacturing industries, consulting and engineering services, research and development firms, and wholesale trade. This versatility arises from the fact that these engineers focus on reducing internal costs, making their work valuable for many industries. For example, their work is important for manufacturing industries that are considering relocating from overseas to domestic sites.
- Industrial engineers who are just starting out usually work under the supervision of experienced engineers. In large companies, new engineers also may receive formal training in classes or seminars. As beginning engineers gain knowledge and experience, they move on to more difficult projects with greater independence to develop designs, solve problems, and make decisions.
- Eventually, industrial engineers may advance to become technical specialists, such as quality engineers or facility planners. In that role, they supervise a team of engineers and technicians. Earning a master's degree facilitates such specialization and thus advancement.
- Many industrial engineers move into management positions because the work they do is closely related to the work of managers.

$$X_{1/2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$X^2 + px + q = 0$$



$$x = 6 - 2y$$

$$x + a = b$$

$$f(x) = \tan x$$

$$f(x) = \sin x$$



$$X_{1/2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$



## Get Ready

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- Mechanical Engineers should be masters of certain hard skills. Most individuals list out their soft skills such as leadership, good communication, compassion, etc in their resume. They are applicable to most jobs. The more important ones are the hard skills and employers are always on the lookout for them. Showcasing projects, as well as research projects showing how you applied the theoretical concepts into practice would be a big plus.
- Your work experience will determine your capabilities, talent, leadership skills, and commitment. Getting internships in companies that work in the sector you are interested in, is important. You can do so, by either the SPO internship or by working in start-ups, that specifically work in the domain you are interested in.
- Working in teams for participating in specific challenges and competitions, that involve mechanical engineering concepts would also help in getting the experience and develop more understanding about your field of interest.

# Note

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- The opportunities described in this handbook pertaining to each of the branches are not only limited to the branch it is listed in. A lot of cross overs are possible.
- This is not an exhaustive list, it is a compilation of some of the common roles. New roles are to be added in each iteration of this handbook.
- The handbook has a brief description of most of the roles present, and in no form is it able to capture all of the information for a branch. Furthermore, the details of this handbook are subject to change according to the trends in the industry.
- This Handbook has been compiled by the members of the Career Development Wing, AnC Council IIT Kanpur.
- The information has been compiled from a lot of resources, including publically available handbooks. Due credits and references will follow in the next part.