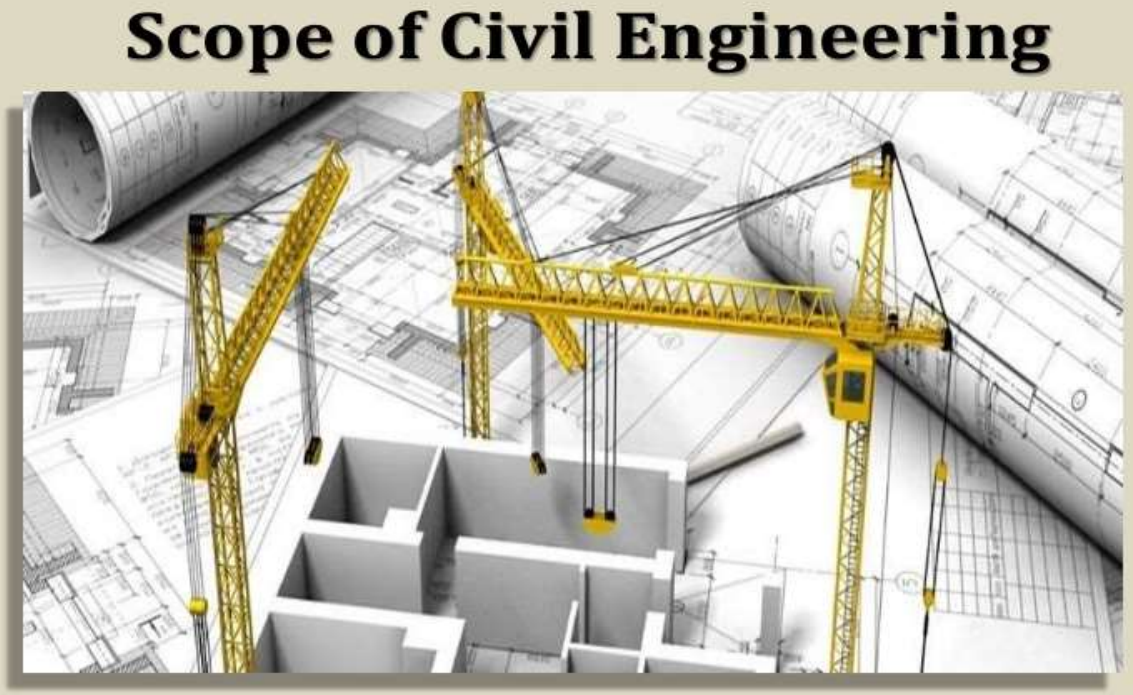
Scope of work involved in various branches of Civil Engineering and Future Vision



Introduction to Civil Engineering

- Civil engineering is a professional discipline that deals with the design, construction and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewerage systems, pipelines, structural components of buildings and railways.
- It is considered the second-oldest engineering discipline after military engineering.
- Civil engineering takes place in the public sector from municipal through to national governments, and in the private sector from individual homeowners through to international companies.

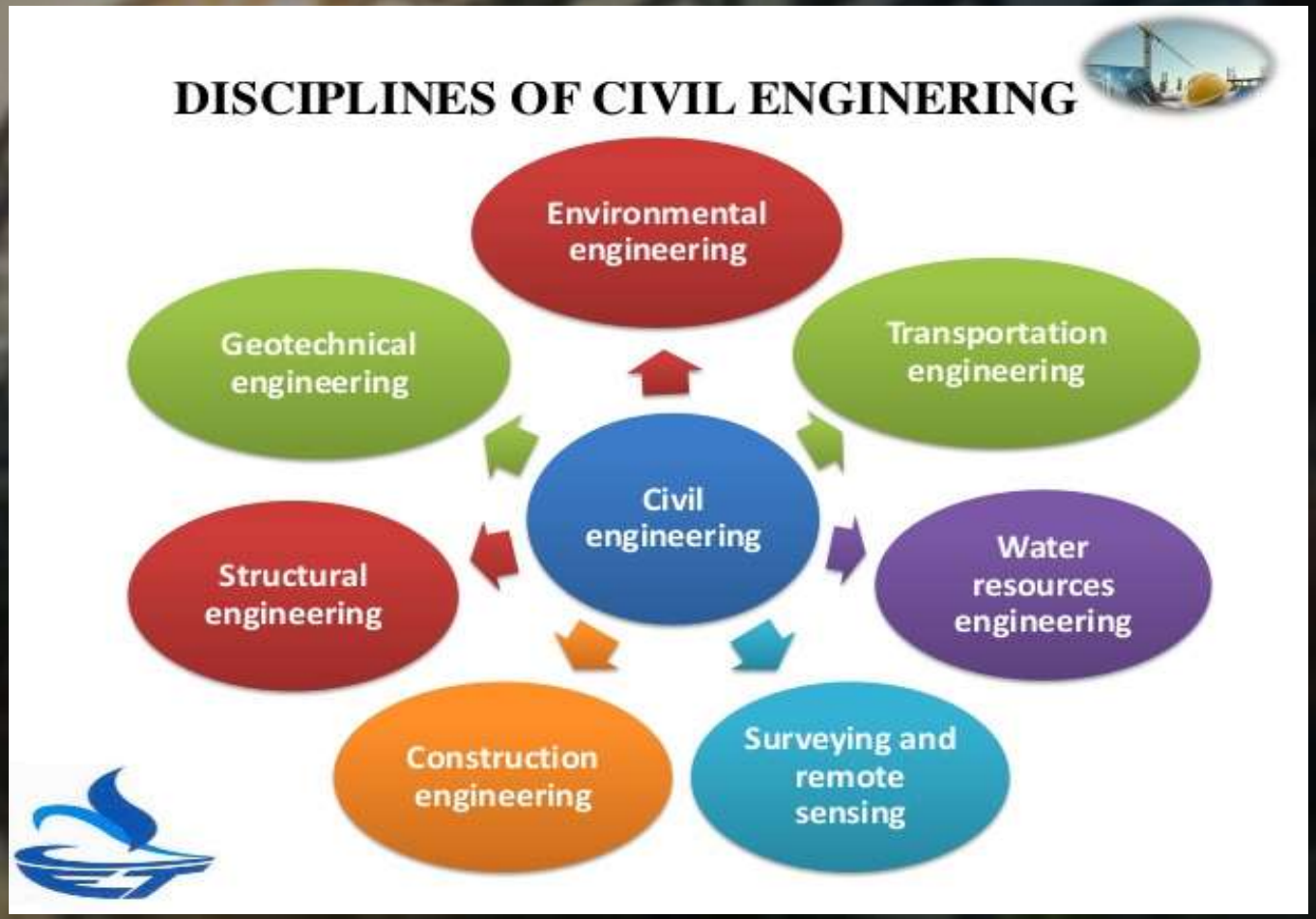
- Civil engineering is the best branch of engineering from the growth perspective. The demand for skilled civil engineers will never slow down worldwide as infrastructure projects, constructing the building, and much more structures will keep on increasing and will never be stagnant. The infrastructure projects include roads, buildings, airports, tunnels, dams, systems for water supply, bridges, and many more.
- The employment areas of the civil engineers are construction firms, Defense Forces Development Boards, Municipal Bodies, renewable energy projects, and many other firms.

Scope of Work in Civil Engineering

- The main scope of civil engineering or the task of a civil engineer is planning, designing, estimating, supervising construction, managing construction, execution and maintenance of structures like building, roads, bridges, dams, etc.
- Civil engineers are key figures in the development of the community and play an important role in the same.
- Civil engineering is a wide-ranging profession, including several specialized sub-disciplines, as its history is linked to the knowledge of structures, materials sciences, geography, geology, mechanics and other fields.

- There are a number of sub-disciplines within the broad field of civil engineering which are:

➢Coastal engineering
➢Construction engineering
➢Earthquake engineering
➢Environmental engineering
➢Forensic engineering
➢Geotechnical engineering
➢Materials science and engineering
➢Structural engineering
➢Surveying
➢Transportation engineering
➢Municipal or urban engineering
➢Water resources engineering
➢Civil engineering systems



Construction Engineering

- Construction Engineering is a professional discipline that deals with the designing, planning, construction and management of infrastructures such as roads, tunnels, bridges, airports, railroads, dams and other projects.
- Construction engineers learn some of the design aspects similar to civil engineers as well as project site management aspects.
- The difference between a civil engineer and a construction engineer is that construction engineering students take Basic design courses as well as Construction management courses.

Geotechnical Engineering

- Geotechnical Engineering is the application of scientific methods and engineering principles to the interpretation and use of knowledge of materials of the Earth's crust and earth materials for the solution of engineering problems and the design of engineering works.
- Geotechnical engineering is important in civil engineering but also has applications in military, mining, petroleum and other engineering disciplines that are concerned with construction occurring on the surface or within the ground.
- Geotechnical engineering uses principles of soil mechanics and rock mechanics to investigate subsurface conditions and materials.

- As there is a shortage of experienced geotechnical engineers, job prospects are good, and you can expect better-than-average job security.
- A master's degree in geotechnical engineering and additional work experience will help you become a senior geotechnical project manager or senior geotechnical engineer.
- Every building needs a foundation, and as the foundation is the most important thing for a building so indirectly every building or project needs a geotechnical engineer.

Structural Engineering

- Structural Engineering is a sub-discipline of civil engineering in which structural engineers are trained to design the 'bones and muscles' that create the form and shape of man-made structures.
- Structural engineers need to understand and calculate the stability, strength and rigidity and earthquake of built structures for buildings and non-building structures.
- Structural engineering depends upon a detailed knowledge of applied mechanics, material sciences and applied mathematics to understand how structures support and resist self-weight and imposed loads.

- Structural engineering is a rewarding career that is perfect for anyone who wants to make a positive, creative impact on the world as a structural engineer works closely with clients, architects, building contractors and other engineers.
- Structural engineers ensure that buildings and bridges are built to be strong enough and stable enough to resist all appropriate structural loads (e.g., gravity, wind, snow, rain, seismic (earthquake), earth pressure, temperature, and traffic) to prevent or reduce the loss of life or injury.

Surveying

- Surveying or land surveying is the technique, profession, art and science of determining the terrestrial or three-dimensional positions of points and the distances and angles between them.
- The planning and design of all Civil Engineering projects such as construction of highways, bridges, tunnels, dams etc. are based upon surveying measurements.
- They use equipment such as total stations, theodolites, GNSS receivers, retroreflectors, 3D scanners, radios, digital levels, drones, GIS and surveying software.
- It is an important tool for research in many other scientific disciplines.

Environmental Engineering

- Environmental engineering is the branch of engineering that is concerned with protecting people from the effects of adverse environmental effects, such as pollution, as well as improving environmental quality.
- Environmental engineering has immense scope in India for professionals who are qualified in chemical, biological, thermal, radioactive or even civil and mechanical engineering as environmental engineering is a diverse field and requires

  people from diverse background.
- Environmental engineers conduct hazardous -waste management studies in which they evaluate the significance of a hazard and advise on treating and containing it.

Transportation Engineering

- Transportation engineering is a branch of civil engineering that is involved in the planning, design, operation, and maintenance of safe and efficient transportation systems.
- Transportation engineering, primarily involves planning, design, construction, maintenance, and operation of transportation facilities. The facilities support air, highway, railroad, pipeline, water, and even space transportation.
- The role of a transportation engineer is to develop efficient transportation systems that fulfill these needs.

- It is the transportation engineer's responsibility to plan, design, build, operate and maintain these systems of transport, in such a way as to provide for the safe, efficient and convenient movement of people and goods.
- Employment opportunities are available both in the public sector (e.g., federal and provincial government transportation ministries, regional and municipal roads, traffic and transit agencies) and the private sector (e.g., engineering consultants, trucking, railroad and airline companies, vehicle manufacturing).

Coastal Engineering

- Coastal engineering is a branch of civil engineering concerned with the specific demands posed by constructing at or near the coast, as well as the development of the coast itself.
- Besides the design, building and maintenance of coastal structures, coastal engineers are often interdisciplinary involved in integrated coastal zone management, because of their specific knowledge of the coastal system.
- The coastal environment produces challenges specific for this branch of engineering: waves, storm surges, tides, tsunamis, sea level changes, sea water and the marine ecosystem.

- Coastal sciences, defined here as nearshore oceanography and coastal geology, are the scientific knowledge base for coastal engineering. A number of coastal engineers are involved in research in many aspects of coastal sciences, such as sediment transport in the surf zone and the mechanics of breaking waves.
- More and more, the role of the coastal engineer is also expanding to encompass environmental and ecological issues and as the role of wetlands and water quality becomes more important, coastal engineers have a full scope of professional services for engineered coastal structures located in the marine environment.

Forensic Engineering

- Forensic engineering has been defined as "the investigation of failures - ranging from serviceability to catastrophic - which may lead to legal activity, including both civil and criminal".
- It therefore includes the investigation of materials, products, structures or components that fail or do not operate or function as intended, causing personal injury, damage to property or economic loss.
- The purpose of a forensic engineer is to locate the cause or causes of failure with a view to improve performance or life of a component, or to assist a court in determining the facts of an accident.

- Other than vehicles and machines, any case involving the accidental collapse of bridge, railway track, huge buildings or any such infrastructure are to be considered under this science.
- There are endless opportunities in this field because of unlimited crimes in the world is happening. The scope of forensic science study is vast. One can get jobs in various governments & private sectors. One can open a forensic practice & forensic service offices or also may employ in Forensic Laboratories, Detective Offices, Banks and other Govt. and private agencies. So the job opportunities in the field of forensic science are endless.

Future Vision of Civil Engineering

- "Projects we have completed demonstrate what we know - future projects decide what we will learn."
- Employment of civil engineers is projected to grow 6 percent from 2020 to 2028, about as fast as the average for all occupations.
- A growing population likely means that new water systems will be required while at the same time, existing water systems must be maintained to reduce or eliminate leaks. In addition, more waste treatment plants will be needed to help clean the nation's waterways. Civil engineers will continue to play a key part in all of this work.

- The work of civil engineers will be needed for renewable-energy projects.
- As a country, we are developing faster than ever especially when it comes to infrastructure.
- The BWSL(Bandra -World Sea Link) is just one of the many examples that show how we are coming up with innovative solutions to meet the changing requirements.
- One of the main reasons for such rapid development of this engineering discipline is the rise in population and urbanisation.

- By completing a programme from one of the best engineering institutes, students can work on sustainable infrastructure solutions, green buildings, and more all over the globe. All we need to learn is how to make the most of it with the right kind of education and skills. With this unique combination, Civil Engineering aspirants are set for a brighter tomorrow.

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Thanking You
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