



Scope of work involved in various branches of Civil Engineering and future vision



What is Civil Engineering?

- Civil engineering is a professional engineering discipline that deals with the design, construction and maintenance of the physical and natural built environment, including public works such as roads, bridges, canal, dams, airports, sewerage system, pipelines, structural components of buildings and railways.



Importance of Civil Engineering

- To build nation
- For development of society
- To generate employment
- Civil Engineers make the roads for transportation
- Dams and Canals :- for electricity and farming
- And so many things.



Scope of work

- The main scope of civil engineering or the task of civil engineering is planning, designing, estimating, supervising construction, managing construction, execution, and maintenance of structures like building, roads, bridges, dams, etc.
- One who designs and maintains works of public utility is known as civil engineer. Civil engineer should have qualities like scientific attitude, imaginative and intuitive approach, He should be able to use operation research techniques for solution of management problems.

Branches of Civil Engineering

- Surveying
- Construction engineering
- Transportation engineering
- Forensic engineering
- Material science and engineering
- Environmental engineering
- Geotechnical engineering
- Structural engineering
- Coastal engineering
- Site Development & Planning
- Earthquake engineering
- Hydraulic engineering



Surveying

- Surveying or land surveying is the technique, profession, art, and science of determining the terrestrial two-dimensional or three dimensional positions of points and the disturbances and angles between them.
- A professional in land surveying is called a land surveyor
- They use equipment, such as total stations, robotic total stations, theodolites, GNSS receivers, retroreflectors, 3D scanners, lidar sensors, radios, inclinometer, handheld tablets, optical and digital levels, subsurface locators, drones, GIS, and surveying software.



Coastal Engineering

Coastal engineering is a specialized field of civil engineering that focuses on the design, construction, and maintenance of coastal structures and defenses to protect against the forces of the sea and to preserve the coastal environment.

Coastal engineers work to:

1. Prevent coastal erosion and flooding
2. Protect shorelines and beaches
3. Design and build seawalls, breakwaters, and jetties
4. Develop strategies for coastal zone management
5. Mitigate the impacts of storms, sea level rise, and climate change



Construction Engineering

- Construction engineering is a branch of civil engineering that deals with the planning, design, and management of construction projects. It involves the application of engineering principles and techniques to ensure that construction projects are completed safely, on time, within budget, and to the required quality standards.



Transportation Engineering

- Transportation engineering is a branch of civil engineering that deals with the planning, design, construction, and maintenance of transportation systems. It involves the application of engineering principles and techniques to ensure safe, efficient, and sustainable movement of people and goods.

Transportation engineers aim to:

1. Ensure safety and efficiency
2. Minimize congestion and delays
3. Reduce environmental impact
4. Enhance mobility and accessibility
5. Promote economic growth and development



Structural Engineering

- Structural engineering is a branch of civil engineering that deals with the design, analysis, and construction of buildings, bridges, towers, and other structures. It involves the application of engineering principles and techniques to ensure that structures are safe, durable, and able to withstand various loads and stresses.



Geotechnical Engineering

- Geotechnical engineering is a branch of civil engineering that deals with the behavior of earth materials, such as soil and rock, and their interaction with man-made structures. It involves the application of engineering principles and techniques to ensure that structures are stable, secure, and able to withstand various geological conditions.
- Geotechnical engineers aim to:-
 - Understand soil and rock mechanics
 - Assess site conditions and geological hazards
 - Design stable and safe structures
 - Prevent settlement, collapse, and other failures
 - Mitigate environmental impacts



Environmental Engineering

Environmental engineering is a branch of engineering that focuses on protecting the environment and public health by developing solutions to environmental problems. It combines principles from engineering, biology, chemistry, and other sciences to design and implement systems that:

1. Control and mitigate pollution
2. Manage and conserve natural resources
3. Develop sustainable systems and technologies
4. Remediate contaminated sites



Forensic Engineering

Forensic engineering is the application of engineering principles and methods to investigate and analyze failures, accidents, or other incidents, often for legal or insurance purposes. It involves:

1. Investigating the cause of a failure or accident
2. Analyzing evidence and data
3. Reconstructing events
4. Identifying contributing factors
5. Providing expert opinions and testimony



Material Science and Engineering

Materials Science and Engineering (MSE) is an interdisciplinary field that combines principles from physics, chemistry, biology, and engineering to understand the properties and applications of various materials.

MSE involves:

1. Studying the structure, properties, and processing of materials
2. Developing new materials with specific properties
3. Improving existing materials
4. Investigating material failures and degradation
5. Designing and optimizing material systems



Earthquake Engineering

Earthquake engineering is a branch of civil engineering that deals with the design, construction, and retrofitting of structures to withstand earthquakes and minimize damage.

Earthquake engineers aim to:

1. Reduce the risk of structural collapse
2. Minimize damage and losses
3. Ensure public safety
4. Develop resilient infrastructure
5. Improve seismic design and construction practices



Hydraulic Engineering

Hydraulic engineering is a branch of civil engineering that deals with the design, construction, and management of systems that involve the flow of water and other fluids. It involves:

1. Water supply and treatment
2. Flood control and drainage
3. Irrigation and water resources management
4. Hydroelectric power generation
5. Water transportation (canals, locks, etc.)
6. Water quality management



Site Development & Planning

Site Development & Planning engineering involves the planning, design, and development of land for various uses, such as:

1. Residential communities
2. Commercial centers
3. Industrial parks
4. Infrastructure projects (roads, utilities, etc.)
5. Public spaces (parks, plazas, etc.)





Future vision

The future of civil engineering is sustainable, innovative, and resilient. Civil engineers will design smart, adaptive infrastructure that integrates technology and green materials. Digital twin technology and modular construction will revolutionize the building process. Resilient infrastructure will withstand natural disasters and adapt to climate change. Autonomous equipment and lifelong learning will drive progress. Civil engineers will shape a better future, improving lives and creating a thriving world.

Thank You.....



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