

1st & 2nd Sem  
Section

MODULE No. - 1.

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Unit - 1 : Introduction to Civil Engineering And Engineering Mechanics

Civil engineering is the oldest branch of engineering which is growing right from stone age of civilization. Civil engineering involves number of operations like planning, surveying, analysis design, estimate, execution of work and maintain the structures for its life time.

Civil engineering has created scope by providing great diversity within itself leading to many specialization. Among them Construction is the largest field involving building of small home to high rise buildings, rural work to big industrial structures. From small irrigation tanks to major dams and other structures like power houses (hydel, thermal nuclear), runways in air-ports, high towers, tunnels bridges, bunkers, cooling towers, recreational centers and other civil structures.

Construction industry exhibits all kinds of technologies from Medieval period to ultramodern periods. It involves many stages like production, supply and transport of all type of construction materials. It has a perfect blend of labours, animals, heavy machines well controlled by computers for a wide variety of work.

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Civil engineers help to elevate the standard of living and adds to the comfort of life.

Civil engineering is a vast area. The first hut built with Bamboos and leaves can be taken as the first Civil engineering Construction Carried out to satisfy the needs of shelter.

The scope of Civil engineering is widening with advent of new Construction materials, techniques, equipments, facilitates technical knowledge and Practices.

→ What is Civil engineering?

" Civil engineering is the profession in which a knowledge of the mathematical and physical sciences gained by study, experience, and practice is applied with judgement to develop ways to economic utilization of materials and forces of nature for the progressive well being of man.

→ Scope of different fields of Civil Engineering  
Civil engineering may be divided into the following fields,

- 1) Surveying
- 2) Building materials
- 3) Construction technology.
- 4) Structural engineering.
- 5) Geo-technical engineering
- 6) Water resource and Irrigation engineering
- 7) Transportation engineering.
- 8) Environmental engineering
- 9) Architecture and Town Planning.

Prakhar  
GBB

→ 1) Surveying :

It is the science of map making. Before construction of any project, the process of surveying is very important. It is the process of measurement



of relative positions of various Objects on the ground in horizontal and vertical directions.

These measurements of positions of various Objects on the ground are transferred to paper sheet by using suitable scale.

→ Scope :

- ① To know the ground profile.
- ② To establish boundaries of land.
- ③ To measure the area and volume of land.
- ④ To select suitable site for an engineering project.
- ⑤ To prepare the plan (or) Map.
- ⑥ To determine the dimensions and Contours of any part of the Earth surface.

*Geetika*  
G.B.B.

2) Building materials :

For Construction of any projects, the building materials are most fundamental units. Without building materials there is no Construction activities. The most commonly used building materials are stone's Bricks, Timber, Lime, Cement, Sand, Tiles and Tiles. The traditional building materials used are steel, Aluminium, Glass, Glazed tiles, Paints, Varnishes etc/.

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The mixture of Cement, fine aggregates and Coarse aggregate and water is known as "Concrete".

The mixture of Cement, sand, Coarse aggregate steel bars and water is known as "Reinforced Cement Concrete (RCC)".

P. Sekhari  
QBB.

### 3) Construction Technology :

Building Construction is a traditional science which deals with the modern methods of Construction, incorporating appropriate use of materials, sufficient strength and performance, maximum utility, good proportion and grace. The Construction industry is becoming complex day by day due to rapid accumulation of scientific techniques, New types of Construction materials, sophisticated and heavy equipments and management techniques to complete the project within the stipulated time.

Here comes the role of management, the technology deals with the material things and resources where as management deals with the material things as well as human beings.

Management increases the productivity through technological innovation, taking into consideration the human factor etc/.

#### 4) Structural engineering :

It is most important part of Civil engineering. It includes planning, design and analysis of structures. Finding the suitable size of the structural components (i.e. Beams, slab, Column, Foundation etc) is known as Design of structures. Due to load acting on the structures, the movement of internal stresses (or) Internal forces will take place from one Component to another Component. It can be analysed by analysis process.

Prekkeri  
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#### → Scope :

- 1) The structural engineer plays vital role in the planning, designing and building the structures.
- 2) Structural analysis and structural design are the components of structural engineering.
- 3) The structural engineer plays important role to build industrial production and manufacturing units.
- 4) The structural engineer is the key man for total planning and designing of Nuclear.



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Power plants also to Care about environmental safety including radiation, protection and thermal pollution.

5) Structural engineer should take the responsibility about the safety and serviceability of the structure for its lifetime.

6) The structural engineer should introduce new techniques, technologies, materials, equipments, Computational tools for safe, efficient and economical Construction of the project.

7) The structural engineers are involved in analyse and design and other activities such as research and development, which is vital force in improving the structures of tomorrow.

Prakash  
QBR

5) Water resource engineering and Irrigation engineering :

Water is very important natural resource for a development of a Country. It is necessary to make the proper, efficient and economic use of this natural resource through technology to serve the mankind.

The Water resource and irrigation engineers involve storage of water by constructing a barrier and (or) bund is known as Dam.

The stored water is used for water supply and irrigation purpose. The water supply to the town and cities by making pipelines from the Dam and to the agricultural fields by making Canals.

→ Scope :

- 1) It gives scope for utilization of water in beneficial purpose by providing water supply, irrigation hydro-electric power development and navigational improvement.
- 2) Water quality Control (or) Pollution Control is the important phase of water resource engineering.
- 3) Preservation of natural beauty of flora and fauna is the scope of water resource engineering.
- 4) To protect fish and wild life.
- 5) Diversion of stored water to Canals for Distribution.
- 6) Lifting of water by digging wells and feed to small Canals.
- 7) Distribution of water.
- 8) Development of hydro-electric power.
- 9) Drainage and relieving the water logging to maintain high productivity of Canals.
- 10) Conveyance of water to agricultural fields by some suitable Distribution system like flood - ing, furrow, Sub-soil irrigation, sprinkler and drip irrigation.

Exertori  
QBB.



## 6) Geo-technical engineering :

The geo-technical engineering purely deals with the soil. Soil property changes from place to place, even in the same place it may not be uniform at various depths of the soil. Soil property may vary from season to season due to variation in moisture content.

The geo-technical engineering is mainly deals with the study of the properties, behaviour and use of earth materials (Soils and Rocks) in engineering works.

Chakraborty  
G.B.B.

### → Scope :

1) Before Construction of any project we should check the safe bearing capacity (SBC) of soil.

SBC of soil means, structural load carrying capacity of soil. If SBC of soil is within the standard limit then we can't construct the structure in such a place.

2) It is also useful to check the various properties of soil such as liquid limit, plastic limit, Maximum dry density, Optimum moisture content, CBR value etc/. Using specific equipments.

3) Helpful to investigate the soil and bedrock below the structure and study the soil-structure interaction.

- 4) Helpfull to design the foundation of (i) Buildings, Dams, Bridge's, Retaining walls, Road pavements, Railway line, Offshore structure
- 5) To select the type of foundation, earth works for a particular structure.
- 6) To design foundation for Underground structure like tunnels, Conduits, Power houses etc/.

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### 7) Environmental engineering :

The environmental engineering involves mainly the proper distribution of water to rural areas, towns and cities and disposal of waste water and solid waste.

(or) removal of waste water and solid waste. Industrialization and Increase in vehical, traffic (or) Number of vehical are creating pollution problems. The environmental engineering considers all these problems and provides healthy environment to public.

#### → Scope :

- 1) The importance of protection and Conservation of our environment.
- 2) The provision of safe, Portable and Public water supply with water treatment facility.
- 3) Solution of problems of environmental sanitation with waste water treatment.

- (10)
- (11)
- 4) Proper disposal of (or) recycle of waste water and solid waste.
  - 5) Adequate drainage of Urban, rural and re-creational areas.
  - 6) Elimination of industrial health hazards.
  - 7) Control of noise pollution.
  - 8) Control of air pollution.
  - 9) Hazardous waste management and risk management with the mitigation measures.
  - 10) To supply study the environmental impact assessment.

### 8) Transportation Engineering

Transportation means the movement of the men and goods from one point to another. It is as old as civilization. It contributes to the economic, industrial, social and cultural development of the country. There are 3 major modes of transportation.

\* Landways.

- a) Roadways (or) Highways.
- b) Railways.

\* Waterways.

\* Airways.

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The transportation engineering includes design of base Courses, sub-base Courses, wearing Courses, Cross-drainage Work, road intersections, bridges etc/. It also includes carrying out the traffic survey, design, Construction and Maintenance of roads, bridges, railways, harbours and airports etc/.

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→ Scope :

- 1) It Contributes to the economic, Industrial, social and cultural development of the Country.
- 2) For economic development of any region, because, every Commodity whether it is food, clothing, Industrial product, Water, Gas (or) Medicines needs transport system for its distribution.
- 3) To promote the public transport and mass transport.
- 4) To provide Co-ordination amongst various modes of transportation, which improves service level and quality.
- 5) It involves accident study for safe and safe design, material study, formation design, Construction and maintenance.
- 6) For traffic performance and Control.
- 7) To optimise the transportation Cost, maintenance and administrative Overheads.

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- 8) Planning the transport process with respect to survey and analysis of existing condition and forecasting the future condition.

→ Infrastructure :

→ Types of Infrastructure :

Infrastructure facilities involves Civil engineering amenities, electricity, telephone, internet facility, education and health care facilities etc/.

Civil engineering amenities in the infrastructure Development are listed below :

- 1) A good town planning and developing sites.
- 2) Providing suitable roads and network of roads.
- 3) Railways Connections to important places
- 4) Airports of national and inter-national standards.
- 5) Assured water supply to towns, Cities and Rural areas.
- 6) A good drainage and waste disposal system.
- 7) Pollution free environment.

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## → Role of Civil engineers in the Infrastructure Development :

Civil engineers has a very important role in the development of following infrastructure.

- 1) He plans the Buildings, Towns, Cities, and Re-creational Centre's. ~~Becken~~  
GBB
- 2) He builds the structure like Buildings, Dams, Bridges, Reservoirs, tunnels, Pathways, Harbours etc.
- 3) He builds the water purifying units and distributes water for drinking purpose.
- 4) He distributes the water for agricultural fields.
- 5) He provides proper drainage system and keep environment clean.
- 6) He provides transport network through road, railways, harbours port and Docks, airports, tunnels, subways etc.
- 7) He improves the ground water by providing rainwater harvesting and water management techniques.
- 8) The Construction of dams and power stations. that provides electricity we use everyday, this requires Civil engineers.



9) Civil engineers play very important role in the disaster management and Rehabilitation.

10) He helps in maintaining the infrastructure at least practical cost.

11) He monitors land, water and air pollution and take measures to control them.

12) He sets the standards, design facilities and assess their conditions.

→ Impact of infrastructure facilities on socio-economic development of a country:

In general, infrastructure is the basic structure on which the whole country, society and organization or an enterprise is developed.

Development of infrastructure has number of good impacts which can be listed as follows.

→ Good Impacts:

\* It is the basic necessity for any country or state.

- \* It forms a part of business, research and education.
- \* It improves health care and social activities.
- \* It provides direct employment to many numbers of skilled, semi-skilled and unskilled labourers.
- \* It leads to the growth of associated industries like cement, steel, glass, timber, plastic, paints, electrical goods etc/.
- \* It helps in increasing food production and protection from famine.
- \* Exporting agricultural goods can fetch foreign currency.   
 *Exeter's GDP.*
- \* It provides housing and means of communication to people.
- \* It increases people's living standards.
- \* Improved economic power of country brings a respectable position (or) status in the world.

→ Bad or ill impacts:

- 1) Exploitation of natural resources can lead to environmental disasters.
- 2) Migration of people from villages to towns and cities in search of jobs takes place.
- 3) Slums are created in cities.
- 4) It becomes huge financial burden on the Government.