Graduate Certificate in Dam Engineering

Dam Design and Construction

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Dam Design and Construction is a critical aspect of civil engineering that involves the planning, design, and construction of structures built across rivers, streams, or other water bodies to regulate water flow, create reservoirs, or prevent flooding. Dams play a crucial role in water resource management, irrigation, hydropower generation, and flood control. The Graduate Certificate in Dam Engineering provides specialized knowledge and skills in designing and constructing dams that are safe, efficient, and environmentally sustainable.

Abutment

An abutment is a supporting structure that anchors the ends of a dam to the surrounding rock or soil. Abutments provide stability to the dam by resisting the forces exerted by the water and the weight of the structure. Proper design and construction of abutments are essential to ensure the overall safety and stability of the dam.

Arch Dam

An arch dam is a curved concrete or masonry structure that resists the water pressure by transferring it to the abutments on either side of the dam. Arch dams are suitable for narrow canyons or gorges where the abutments can support the horizontal thrust of the dam. The shape of the arch helps distribute the forces more efficiently, making arch dams ideal for high-pressure conditions.

Buttress Dam

A buttress dam is a type of dam that consists of a series of supports or buttresses on the downstream side of the structure. The buttresses help distribute the water pressure and stabilize the dam. Buttress dams are commonly used in areas with wide valleys or soft foundations where the weight of the buttresses can counteract the uplift forces.

Cofferdam

A cofferdam is a temporary structure built to divert water or create a dry work area during the construction of a dam. Cofferdams are typically made of sheet piles, concrete blocks, or earth embankments and are used to isolate the construction site from the water flow. Once the dam is completed, the cofferdam is removed, and the reservoir is filled.

Concrete Dam

A concrete dam is a type of dam constructed using concrete as the primary building material. Concrete dams can be gravity dams, arch dams, or buttress dams, depending on their design and structural

requirements. Concrete dams are durable, long-lasting, and resistant to erosion, making them suitable for high-pressure or high-risk locations.

Crest

The crest of a dam is the topmost part of the structure that defines the maximum water level in the reservoir. The crest may be straight, curved, or stepped, depending on the design requirements. Proper design and maintenance of the crest are crucial to prevent overtopping and ensure the safety of the dam.

Embankment Dam

An embankment dam is a type of dam constructed by compacting layers of earth, rock, or other materials to form a barrier against water flow. Embankment dams rely on the weight of the fill material to resist the water pressure. Embankment dams are versatile and can be built in a wide range of geologic conditions.

Foundation

The foundation of a dam is the underlying rock or soil on which the structure is built. The foundation provides support and stability to the dam by distributing the load and resisting the forces acting on the structure. Proper site investigation and foundation design are essential to ensure the safety and longevity of the dam.

Gravity Dam

A gravity dam is a type of dam that relies on its weight to resist the water pressure and hold back the reservoir. Gravity dams are typically made of concrete or masonry and are well-suited for low to moderate water pressures. The stability of a gravity dam depends on its weight and the foundation's ability to support it.

Hydraulic Structures

Hydraulic structures are engineered systems that control or manipulate the flow of water in rivers, canals, reservoirs, or other water bodies. Dams, weirs, spillways, and gates are examples of hydraulic structures used in water resource management, flood control, irrigation, and navigation. Proper design and construction of hydraulic structures are essential to ensure their effectiveness and safety.

Intake

An intake is a structure built in a dam or reservoir to draw water for various purposes, such as irrigation, drinking water supply, or hydropower generation. Intakes may include gates, screens, or pipes to control the flow and quality of water entering the system. Proper design and maintenance of intakes are crucial to maximize water utilization and minimize sedimentation.

Masonry Dam

A masonry dam is a type of dam constructed using stone, brick, or other masonry materials bonded together with mortar. Masonry dams can be gravity dams, arch dams, or buttress dams, depending on their

design and construction methods. Masonry dams are durable and aesthetically pleasing but may require regular maintenance.

Overtopping

Overtopping occurs when the water level in a reservoir exceeds the crest of a dam, resulting in water flowing over the top of the structure. Overtopping can lead to erosion, structural damage, and potential failure of the dam. Proper spillway design and maintenance are essential to prevent overtopping and protect the dam.

Reservoir

A reservoir is an artificial lake created by damming a river or stream to store water for various purposes, such as irrigation, drinking water supply, or hydropower generation. Reservoirs can also provide recreational opportunities and wildlife habitat. Proper management of reservoirs is essential to balance water supply, environmental conservation, and human needs.

Rockfill Dam

A rockfill dam is a type of dam constructed by placing layers of rock or gravel fill material in embankments to form a barrier against water flow. Rockfill dams rely on the weight of the fill material to resist the water pressure. Rockfill dams are flexible, cost-effective, and suitable for a wide range of geologic conditions.

Spillway

A spillway is a structure built in or adjacent to a dam to safely release excess water from the reservoir during floods or high flow conditions. Spillways prevent overtopping of the dam and help control the water level in the reservoir. Different types of spillways, such as gated spillways, labyrinth spillways, or chute spillways, are used based on the design requirements.

Upstream Face

The upstream face of a dam is the side of the structure facing the reservoir or water flow. The upstream face is designed to withstand the water pressure and erosion caused by the reservoir. Proper slope, surface treatment, and drainage features are essential to protect the upstream face from damage and maintain the dam's integrity.

Uplift Pressure

Uplift pressure is the hydrostatic pressure exerted by groundwater on the base of a dam, tending to lift the structure upward. Uplift pressure can reduce the effective weight of the dam and potentially cause instability or sliding. Proper foundation design, drainage systems, and grouting are essential to mitigate uplift pressure and ensure the dam's stability.

Valve

A valve is a device used to control the flow of water or other fluids in hydraulic systems, such as dams,

pipelines, or irrigation networks. Valves may be manual, automated, or remote-controlled and are essential for regulating water levels, releasing pressure, or diverting flow. Proper selection, installation, and maintenance of valves are crucial to ensure efficient operation and safety.

Water Resources Engineering

Water resources engineering is a branch of civil engineering focused on the planning, design, and management of water-related infrastructure, such as dams, reservoirs, irrigation systems, and water supply networks. Water resources engineers work to optimize water use, protect the environment, and ensure sustainable development of water resources. The Graduate Certificate in Dam Engineering provides specialized training in water resources engineering principles and practices.