KG REDDY
College of Engineering
& Technology

Value Added Course in Civil Engineering with Specialization in "Prestressed Concrete" Held On July 2017 to November 2017

Department of Civil Engineering,

KG Reddy College of Engineering & Technology

Chilkur(Village), Moinabad(Mandal), Hyderabad RR Dist-501504

Coordinator

Principal

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SUMMARY REPORT ON PRESTRESSED CONCRETE

About Course

The value added course on Prestressed Concrete is concluded its work successfully by department of Civil Engineering (CE) in KG ready college of Engineering and technology (KGRCET), Hyderabad, Telangana. This course is a forum to bring together students to discuss innovative ideas and diverse topics of this course on next generation of information technologies. Department has taken a new step for students to improve the quality of study through this course and become most wide scale, extensive, spectacular event in Civil Engineering. The course was held in two locations of the department (a) Department E-learning room for theory class and (b) Department laboratory for practical class.

Prestressed concrete is a structural material that allows for predetermined, engineering stresses to be placed in members to counteract the stresses that occur when they are subject to loading. It combines the high strength compressive properties of concrete with the high tensile strength of steel.

Prestressed concrete is a highly versatile construction material as a result of it being an almost ideal combination of its two main constituents: high-strength steel, pre-stretched to allow its full strength to be easily realised; and modern concrete, pre-compressed to minimise cracking under tensile forces.

Objectives of the course

The aim in the use of prestressed concrete is to increase the tensile strength of concrete by introducing an internal compressive stress, counteracting in part the tensile stresses caused by these loads on the structural element. Prestressed concrete is a form of concrete used in construction. It is substantially "prestressed" (compressed) during its fabrication, in a manner that strengthens it against tensile forces which will exist when in service.

Scope of the Course

The prestressed concrete (PC) wire and strand are largely used in the construction processes for bridges, arches, tunnels, buildings, road slabs, and others. The growth in the construction sector is directly linked with the growth of the market. The construction sector growth is largely dependent on the emerging countries. It is anticipated that emerging markets to account for nearly half of the global construction activities. India became the third largest construction market in the world computing an average growth.

Output

This course was not only shared the knowledge among students but also tied up with expert for upcoming course.
The main outputs are mentioned below:

- The expert shared his knowledge among students.
- Students learned from this course and tried to use the techniques for their project as well as research work.

- Students interact with expert to gain their additional knowledge for future research work.
- Students found new ideas, concept, knowledge on technology, different application of methodologies from different session of course.
- Department tried to do their collaborative research work on this course with university as well as industries.
- It was created different domains of research field from this course for possible topic of civil engineering.
- It helped to make industrial project.

Summary of Participants

(a) Number of students attended this course: 82
(b) Number of students received certificates: 82

In July 2017

Inauguration of value added course

The first day of value added course started with welcoming and opening ceremony at the KGRCET conference Hall. The following dignitaries were representatives of the value added course who were addressed and pointed out the importance on course with short welcoming speeches.

Welcome addressed by Dr. T. S. Ramesh Babu, HOD, CE, KGRCET
About the value added course by Principal Dr. R. S. Jahagirdar, KGRCET.
Importance of this course by expert trainer, Mr. K.Thangamani
Interaction with 3rd /year 1st semester students

Prestressed concrete is a form of concrete used in construction. It is substantially "prestressed" (compressed) during its fabrication, in a manner that strengthens it against tensile forces which will exist when in service.

This compression is produced by the tensioning of high-strength "tendons" located within or adjacent to the concrete and is done to improve the performance of the concrete in service.[4] Tendons may consist of single wires, multi-wire strands or threaded bars that are most commonly made from high-tensile steels, carbon fiber or aramid fiber. The essence of prestressed concrete is that once the initial compression has been applied, the resulting material has the characteristics of high-strength concrete when subject to any subsequent compression forces and of ductile high-strength steel when subject to tension forces. This can result in improved structural capacity and/or serviceability compared with conventionally reinforced concrete in many situations. In a prestressed concrete member, the internal stresses are introduced in a planned manner so that the stresses resulting from the superimposed loads are counteracted to the desired degree.

Prestressed concrete is used in a wide range of building and civil structures where its improved performance can allow for longer spans, reduced structural thicknesses, and material savings compared with simple reinforced concrete. Typical applications include high-rise buildings, residential slabs, foundation systems, bridge and dam structures, silos and tanks, industrial pavements and nuclear containment structures.

First used in the late-nineteenth century, prestressed concrete has developed beyond pre-tensioning to include post-tensioning, which occurs after the concrete is cast. Tensioning systems may be classed as either monostrand, where each tendon's strand or wire is stressed individually, or multi-strand, where all strands or wires in a tendon are stressed simultaneously. Tendons may be located either within the concrete volume (internal prestressing) or wholly outside of it (external prestressing). While pre-tensioned concrete uses tendons directly bonded to the concrete, post-tensioned concrete can use either bonded or unbonded tendons.

Prestressed concrete is a structural material that allows for predetermined, engineering stresses to be placed in members to counteract the stresses that occur when they are subject to loading. It combines the high strength compressive properties of concrete with the high tensile strength of steel. In ordinary reinforced concrete, stresses are carried by the steel reinforcement, whereas prestressed concrete supports the load by induced stresses throughout the entire structural element. This makes it more resistant to shock and vibration than ordinary concrete, and able to form long, thin structures with much smaller sectional areas to support equivalent loads.

It is now commonly used for floor beams, piles and railways sleepers, as well as structures such as bridges, water tanks, roofs and runways. Generally, prestressed concrete is not necessary for columns and walls, however, it can be used economically for tall columns and high retaining walls with high bending stresses. The principle behind prestressed concrete is that compressive stresses induced by high-strength steel tendons in a concrete member before loads are applied will balance the tensile stresses imposed in the member during service. Steel used for prestressing may be in the form of wire or tendons that can be grouped to form cables. Solid bars may also be used. Wire is made by cold-drawing a high carbon steel rod through a series of reducing dies. The wire diameter typically ranges from 3-7 mm and may be round, crimped or indented to give it better bond strength. Another form of tendon is strand which consists of a straight core wire around which is wound in helixes around further wires to give formats such as 7 wire (6 over 1) and 19 wire (9 over 9 over 1). Similar to wire tendons, strand can be used individually or in groups to form cables.

In August 2017

Method

The process of prestressed concrete can be either through pre-tensioning or post-tensioning.

Pre-tensioning

This process involves the stressing of wires or cables by anchoring them at the end of a metal form, which may be up to 120 m in length. Hydraulic jacks stress the wire as required, often adding 10% to accommodate creep and other pre-stress losses that may be incurred. Side moulds are then fixed and the concrete placed around the tensioned wires.

The concrete hardens and shrinks, gripping the steel along its length, transferring the tension from the jacks to exert a compressive force in the concrete.
Once the concrete has reached the desired strength, the tensioned wires are released from the jacks. A typical concrete strength of 28 N/mm2 can be achieved by 24-hour steam curing, as well as using additives. To create shorter members, dividing plates can be placed at any point along the member which, when removed, permit the cutting of the wires.

Post-tensioning

This follows the reverse method to pre-tensioning, whereby the concrete member is cast and the prestressing occurs after the concrete is hardened. This method is often used where stressing is to be carried out on site after casting an insitu component or where a series of precast concrete units are to be joined together to form the required member.
The wires, cables or bars may be positioned in the unit before concreting, but bonding to the concrete is prevented by using a flexible duct or rubber sheath which is deflated and removed when the concrete has hardened.

Stressing is carried out after the concrete has been cured by means of hydraulic jacks operating from one or both ends of the member. Due to the high local stresses at the anchorage positions it is common for a helical (spiral) reinforcement to be included in the design. When the required stress has been reached, the wire or cables are anchored to maintain the prestress. The ends of the unit are sealed with cement mortar to prevent corrosion due to any entrapped moisture and to assist in stress distribution. Anchorages used in post-tensioning depend on whether the tendons are to be stressed individually or as a group. Most systems use a form of split cone wedges or jaws which act against a form of bearing or pressure plate.

There are many different post-tensioning systems. For example, the Freyssinet system enables the stressing strands to be tensioned simultaneously using centre hole tensioning jacks, anchored by tapered jaws. This is suitable for pre-stressing elements up to 50 m in length. The Mac alloy system on the other hand, involves applying stress to the concrete by means of a solid bar, usually with a diameter of 25-75 mm. The bar is anchored at each end by a special nut which bears against an end plate to distribute the load.

The advantages of prestressed concrete include:

- The inherent compressive strength of concrete is used to its fullest.
- The special alloy steels used to form the prestressing tendons are used to their fullest.
- Tension cracks are eliminated, reducing the risk of the steel components corroding.
- Shear stresses are reduced.
- For any given span and loading condition a reduction in weight can be achieved from using a component with a smaller cross section.
- A composite member can be formed by joining individual precast concrete units together.

The disadvantages of prestressed concrete include:

- A high degree of workmanship and control is required.
- Special alloy steels are more expensive than traditional steels used in reinforced concrete.
- Expensive equipment is needed and there are complex safety requirements.

Pre-tensioned concrete

Pre-tensioned concrete is a variant of prestressed concrete where the tendons are tensioned prior to the concrete being cast. The concrete bonds to the tendons as it cures, following which the end-anchoring of the tendons is released, and the tendon tension forces are transferred to the concrete as compression by static friction.

Pre-tensioning is a common prefabrication technique, where the resulting concrete element is manufactured remotely from the final structure location and transported to site once cured. It requires strong, stable end-anchorage points between which the tendons are stretched. These anchorages form the ends of a "casting bed" which may be many times the length of the concrete element being fabricated. This allows multiple elements to be constructed end-to-end in the one pre-tensioning operation, allowing significant productivity benefits and economies of scale to be realized. The amount of bond (or adhesion) achievable between the freshly set concrete and the surface of the tendons is critical to the pre-tensioning process, as it determines when the tendon anchorages can be safely released. Higher bond strength in early-age concrete will speed production and allow more economical fabrication. To promote this, pre-tensioned tendons are usually composed of isolated single wires or strands, which provides a greater surface area for bonding than bundled-strand tendons.

Unlike those of post-tensioned concrete (see below), the tendons of pre-tensioned concrete elements generally form straight lines between end-anchorages. Where "profiled" or "harped" tendons are required, one or more intermediate deviators are located between the ends of the tendon to hold the tendon to the desired non-linear alignment during tensioning. Such deviators usually act against substantial forces, and hence require a robust casting-bed foundation system. Straight tendons are typically used in "linear" precast elements, such as shallow beams, hollow-core planks and slabs; whereas profiled tendons are more commonly found in deeper precast bridge beams and girders. Pre-tensioned concrete is most commonly used for the fabrication of structural beams, floor slabs, hollow-core planks, balconies, lintels, driven piles, water tanks and concrete pipes.

Post-tensioned concrete

Post-tensioned concrete is a variant of prestressed concrete where the tendons are tensioned after the surrounding concrete structure has been cast. The tendons are not placed in direct contact with the concrete, but are encapsulated within a protective sleeve or duct which is either cast into the concrete structure or placed adjacent to it. At each end of a tendon is an anchorage assembly firmly fixed to the surrounding concrete. Once the concrete has been cast and set, the tendons are tensioned ("stressed") by pulling the tendon ends through the anchorages while pressing against the concrete. The large forces required to tension the tendons result in a significant permanent compression being applied to the concrete once the tendon is "locked-off" at the anchorage. The method of locking the tendon-ends to the anchorage is dependent upon the tendon composition, with the most common systems being "button-head" anchoring (for wire tendons), split-wedge anchoring (for strand tendons), and threaded anchoring (for bar tendons)

Tendon encapsulation systems are constructed from plastic or galvanised steel materials, and are classified into two main types: those where the tendon element is subsequently bonded to the surrounding concrete by internal grouting of the duct after stressing (bonded post-tensioning); and those where the tendon element is permanently debonded from the surrounding concrete, usually by means of a greased sheath over the tendon strands (unbonded post-tensioning. Casting the tendon ducts/sleeves into the concrete before any tensioning occurs allows them to be readily "profiled" to any desired shape including incorporating vertical and/or horizontal curvature. When the tendons are tensioned, this profiling results in reaction forces being imparted onto the hardened concrete, and these can be beneficially used to counter any loadings subsequently applied to the structure.

In September 2017

Bonded post-tensioning

The bonded post-tensioning, prestressing tendons are permanently bonded to the surrounding concrete by the *in situ* grouting of their encapsulating ducting (after tendon tensioning). This grouting is undertaken for three main purposes: to protect the tendons against corrosion; to permanently "lock-in" the tendon pre-tension, thereby removing the long-term reliance upon the end-anchorage systems; and to improve certain structural behaviors of the final concrete structure.

Bonded post-tensioning characteristically uses tendons each comprising *bundles* of elements (e.g. strands or wires) placed inside a single tendon duct, with the exception of bars which are mostly used unbundled. This bundling makes for more efficient tendon installation and grouting processes, since each complete tendon requires only one set of end-anchorages and one grouting operation. Ducting is fabricated from a durable and corrosion-resistant material such as plastic (e.g. polyethylene) or galvanised steel, and can be either round or rectangular/oval in cross-section. The tendon sizes used are highly dependent upon the application, ranging from building works typically using between 2 and 6 strands per tendon, to specialized dam works using up to 91 strands per tendon.

Fabrication of bonded tendons is generally undertaken on-site, commencing with the fitting of end-anchorages to formwork, placing the tendon ducting to the required curvature profiles, and reeving (or threading) the strands or wires through the ducting. Following concreting and tensioning, the ducts are pressure-grouted and the tendon stressing-ends sealed against corrosion.

Unbonded post-tensioning

Unbonded post-tensioning differs from bonded post-tensioning by allowing the tendons permanent freedom of longitudinal movement relative to the concrete. This is most commonly achieved by encasing each individual tendon element within a plastic sheathing filled with a corrosion-inhibiting grease, usually lithium based. Anchorages at each end of the tendon transfer the tensioning force to the concrete, and are required to reliably perform this role for the life of the structure.

Unbonded post-tensioning can take the form of:

- Individual strand tendons placed directly into the concreted structure (e.g. buildings, ground slabs), or
- Bundled strands, individually greased-and-sheathed, forming a single tendon within an encapsulating duct that is placed either within or adjacent to the concrete (e.g. restressable anchors, external post-tensioning)

For individual strand tendons, no additional tendon ducting is used and no post-stressing grouting operation is required, unlike for bonded post-tensioning. Permanent corrosion protection of the strands is provided by the combined layers of grease, plastic sheathing, and surrounding concrete. Where strands are bundled to form a single unbonded tendon, an enveloping duct of plastic or galvanised steel is used and its interior free-spaces grouted after stressing. In this way, additional corrosion protection is provided via the grease, plastic sheathing, grout, external sheathing, and surrounding concrete layers.

Individually greased-and-sheathed tendons are usually fabricated off-site by an extrusion process. The bare steel strand is fed into a greasing chamber and then passed to an extrusion unit where molten plastic forms a continuous outer coating. Finished strands can be cut-to-length and fitted with "dead-end" anchor assemblies as required for the project.

Comparison between bonded and unbonded post-tensioning

Both bonded and unbonded post-tensioning technologies are widely used around the world, and the choice of system is often dictated by regional preferences, contractor experience, or the availability of alternative systems. Either one is capable of delivering code-compliant, durable structures meeting the structural strength and serviceability requirements of the designer.

The benefits that bonded post-tensioning can offer over unbonded systems are:

- Reduced reliance on end-anchorage integrity
  Following tensioning and grouting, bonded tendons are connected to the surrounding concrete along their full length by high-strength grout. Once cured, this grout can transfer the full tendon tension force to the concrete within a very short distance (approximately 1 metre). As a result, any inadvertent severing of the tendon or failure of an end anchorage has only a very localised impact on tendon performance, and almost never results in tendon ejection from the anchorage.
- Increased ultimate strength in flexure
  With bonded post-tensioning, any flexure of the structure is directly resisted by tendon strains at that same location (i.e. no strain re-distribution occurs). This results in significantly higher tensile strains in the tendons than if they were unbonded, allowing their full yield strength to be realised, and producing a higher ultimate load capacity.
- Improved crack-control
  In the presence of concrete cracking, bonded tendons respond similarly to conventional reinforcement (rebar). With the tendons fixed to the concrete at each side of the crack, greater resistance to crack expansion is offered than with unbonded tendons, allowing many design codes to specify reduced reinforcement requirements for bonded post-tensioning.
- Improved fire performance
  The absence of strain redistribution in bonded tendons may limit the impact that any localised overheating has on the overall structure. As a result, bonded structures may display a higher capacity to resist fire conditions than unbonded ones.

The benefits that unbonded post-tensioning can offer over bonded systems are:

- Ability to be prefabricated
  Unbonded tendons can be readily prefabricated off-site complete with end-anchorages, facilitating faster installation during construction. Additional lead time may need to be allowed for this fabrication process.
- Improved site productivity
  The elimination of the post-stressing grouting process required in bonded structures improves the site-labour productivity of unbonded post-tensioning.
- Improved installation flexibility
  Unbonded single-strand tendons have greater handling flexibility than bonded ducting during installation, allowing them a greater ability to be deviated around service penetrations or obstructions.
- Reduced concrete cover
  Unbonded tendons may allow some reduction in concrete element thickness, as their smaller size and increased corrosion protection may allow them to be placed closer to the concrete surface.
- Simpler replacement and/or adjustment

Being permanently isolated from the concrete, unbonded tendons are able to be readily de-stressed, re-stressed and/or replaced should they become damaged or need their force levels to be modified in-service.

- Superior overload performance
  Although having a lower ultimate strength than bonded tendons, unbonded tendons' ability to redistribute strains over their full length can give them superior pre-collapse ductility. In extremes, unbonded tendons can resort to a *catenary*-type action instead of pure flexure, allowing significantly greater deformation before structural failure.

In October 2017

Tendon durability and corrosion protection

Long-term durability is an essential requirement for prestressed concrete given its widespread use. Research on the durability performance of in-service prestressed structures has been undertaken and anti-corrosion technologies for tendon protection have been continually improved since the earliest systems were developed.

The durability of prestressed concrete is principally determined by the level of corrosion protection provided to any high-strength steel elements within the prestressing tendons. Also critical is the protection afforded to the end-anchorage assemblies of unbonded tendons or cable-stay systems, as the anchorages of both of these are required to retain the prestressing forces. Failure of any of these components can result in the release of prestressing forces, or the physical rupture of stressing tendons.

Modern prestressing systems deliver long-term durability by addressing the following areas:

- Tendon grouting (bonded tendons)
  Bonded tendons consist of bundled strands placed inside ducts located within the surrounding concrete. To ensure full protection to the bundled strands, the ducts must be pressure-filled with a corrosion-inhibiting grout, without leaving any voids, following strand-tensioning.
- Tendon coating (unbonded tendons)
  Unbonded tendons comprise individual strands coated in an anti-corrosion grease or wax, and fitted with a durable plastic-based full-length sleeve or sheath. The sleeving is required to be undamaged over the tendon length, and it must extend fully into the anchorage fittings at each end of the tendon.
- Double-layer encapsulation
  Prestressing tendons requiring permanent monitoring and/or force adjustment, such as stay-cables and re-stressable dam anchors, will typically employ double-layer corrosion protection. Such tendons are composed of individual strands, grease-coated and sleeved, collected into a strand-bundle and placed inside encapsulating polyethylene outer ducting. The remaining void space within the duct is pressure-grouted, providing a multi-layer polythene-grout-plastic-grease protection barrier system for each strand.
- Anchorage protection
  In all post-tensioned installations, protection of the end-anchorages against corrosion is essential, and critically so for unbonded systems.

Application

Prestressed concrete is a highly versatile construction material as a result of it being an almost ideal combination of its two main constituents: high-strength steel, pre-stretched to allow its full strength to be easily realised; and modern concrete, pre-compressed to minimise cracking under tensile forces. Its wide range of application is reflected in its incorporation into the major design codes covering most areas of structural and civil engineering, including buildings, bridges, dams, foundations, pavements, piles, stadiums, silos, and tanks.

Building structures

Building structures are typically required to satisfy a broad range of structural, aesthetic and economic requirements. Significant among these include: a minimum number of (intrusive) supporting walls or columns; low structural thickness (depth), allowing space for services, or for additional floors in high-rise construction; fast construction cycles, especially for multi-storey buildings; and a low cost-per-unit-area, to maximise the building owner's return on investment.

The prestressing of concrete allows "load-balancing" forces to be introduced into the structure to counter in-service loadings. This provides many benefits to building structures:

- Longer spans for the same structural depth
  Load balancing results in lower in-service deflections, which allows spans to be increased (and the number of supports reduced) without adding to structural depth.
- Reduced structural thickness
  For a given span, lower in-service deflections allows thinner structural sections to be used, in turn resulting in lower floor-to-floor heights, or more room for building services.
- Faster stripping time
  Typically, prestressed concrete building elements are fully stressed and self-supporting within five days. At this point they can have their formwork stripped and re-deployed to the next section of the building, accelerating construction "cycle-times".
- Reduced material costs
  The combination of reduced structural thickness, reduced conventional reinforcement quantities, and fast construction often results in prestressed concrete showing significant cost benefits in building structures compared to alternative structural materials.

In November 2017

Civil structures

Bridges

Concrete is the most popular structural material for bridges, and prestressed concrete is frequently adopted. When investigated in the 1940s for use on heavy-duty bridges, the advantages of this type of bridge over more traditional designs was that it is quicker to install, more economical and longer-lasting with the bridge being less lively. One of the first bridges built in this way is the Adam Viaduct, a railway bridge constructed 1946 in the UK By the 1960s, prestressed concrete largely superseded reinforced concrete bridges in the UK, with box girders being the dominant form.

In short-span bridges of around 10 to 40 metres (30 to 130 ft), prestressing is commonly employed in the form of precast pre-tensioned girders or planks.[39] Medium-length structures of around 40 to 200 metres (150 to 650 ft), typically use precast-segmental, *in-situ* balancedcantilever and incrementally-launched designs. For the longest bridges, prestressed concrete deck structures often form an integral part of cable-stayed designs.

Dams

Concrete dams have used prestressing to counter uplift and increase their overall stability since the mid-1930s. Prestressing is also frequently retro-fitted as part of dam remediation works, such as for structural strengthening, or when raising crest or spillway heights.

Most commonly, dam prestressing takes the form of post-tensioned anchors drilled into the dam's concrete structure and/or the underlying rock strata. Such anchors typically comprise tendons of high-tensile bundled steel strands or individual threaded bars. Tendons are grouted to the concrete or rock at their far (internal) end, and have a significant "de-bonded" free-length at their external end which allows the tendon to stretch during tensioning. Tendons may be full-length bonded to the surrounding concrete or rock once tensioned, or (more commonly) have strands permanently encapsulated in corrosion-inhibiting grease over the free-length to permit long-term load monitoring and re-stressability.

Silos and tanks

Circular storage structures such as silos and tanks can use prestressing forces to directly resist the outward pressures generated by stored liquids or bulk-solids. Horizontally curved tendons are installed within the concrete wall to form a series of hoops, spaced vertically up the structure. When tensioned, these tendons exert both axial (compressive) and radial (inward) forces onto the structure, which can directly oppose the subsequent storage loadings. If the magnitude of the prestress is designed to always exceed the tensile stresses produced by the loadings, a permanent residual compression will exist in the wall concrete, assisting in maintaining a watertight crack-free structure.

Nuclear and blast-containment structures

Prestressed concrete has been established as a reliable construction material for high-pressure containment structures such as nuclear reactor vessels and containment buildings, and petrochemical tank blast-containment walls. Using prestressing to place such structures into an initial state of bi-axial or tri-axial compression increases their resistance to concrete cracking and leakage, while providing a proof-loaded, redundant and monitorable pressure-containment system.

Nuclear reactor and containment vessels will commonly employ separate sets of post-tensioned tendons curved horizontally or vertically to completely envelop the reactor core. Blast containment walls, such as for liquid natural gas (LNG) tanks, will normally utilise layers of horizontally-curved hoop tendons for containment in combination with vertically looped tendons for axial wall prestressing.

Hardstands and pavements

Heavily loaded concrete ground-slabs and pavements can be sensitive to cracking and subsequent traffic-driven deterioration. As a result, prestressed concrete is regularly used in such structures as its pre-compression provides the concrete with the ability to resist the crack-inducing tensile stresses generated by in-service loading. This crack-resistance also allows individual slab sections to be constructed in larger pours than for conventionally reinforced concrete, resulting in wider joint spacings, reduced jointing costs and less long-term joint maintenance issues. Initial works have also been successfully conducted on the use of precast prestressed concrete for road pavements, where the speed and quality of the construction has been noted as being beneficial for this technique.

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CIRCULAR

All the students of III-Year I-semester B.Tech CIVIL are here by instructed to enroll for the value added course on "Prestressed Concrete", which is offered by KG Reddy college of Engineering and Technology from July 2017 to November 2017. Interested students are instructed to contact Mr.K.Thangamani for completing their registration before 20/07/2017.

HOD

HEAD
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KG REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VALUE ADDED COURSE ON PRESTRESSED CONCRETE

SCHEDULE

In July 2017

Introduction, Prestressing Systems and Material Properties
- Basic Concept, Early Attempts of Prestressing
- Development of Building Materials
- Definitions, Advantages of Prestressing
- Limitations of Prestressing

Types of Prestressing
- Source of prestressing force,
- External or internal prestressing,
- Pre-tensioning or post-tensioning,
- Linear or circular prestressing,
- Full, limited or partial prestressing,
- Uniaxial, biaxial or multiaxial prestressing

In August 2017

Prestressing Systems and Devices
- Pre-tensioning, Introduction, Stages
- Advantages, Disadvantages
  Devices
  Jacks, Anchoring devices, Harping devices

Hardened Concrete
- Stress-strain curves for concrete
- Creep of concrete
- Shrinkage of concrete
- Properties of Grout
- Codal Provisions

In September 2017

Losses in Prestress

- Notations, Geometric properties
- Load variables, Elastic shortening
- Pre-tensioned axial members
- Pre-tensioned bending members
- Post-tensioned axial members
- Post-tensioned bending members
- Friction, Anchorage slip
- Force Variation Diagram
- Creep of concrete, Shrinkage of concrete
- Relaxation of steel, Total Time-dependent Loss

In October 2017

Transmission of Prestress

- Introduction, Pre-tensioned members
- Transmission length: Development length
- End zone reinforcement
- Post-tensioned members
- End zone reinforcement
- Bearing plate

Cantilever and Continuous Beams

- Cantilever Beams: Introduction
- Analysis, Determination of limiting zone
- Cable profile, Analysis

In November 2017

- Incorporation of moment due to reactions
- Pressure line due to prestressing force
- Concordant cable profile, Cable profiles
- Partially continuous beams
- Analysis at ultimate limit state
- Moment redistribution

SUBJECT WISE ATTENDANCE

For Subject : Precasting Class : III Semester : I

Sl. No.	Roll (H.T.) Number	Name of the Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Month	7	7	7	7	8	8	8	8	9	9	9	9	10	10
		Date	7	14	21	28	4	11	18	25	1	15	22	29	6	20
		Lecture No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	15-107	B. Ramanjaneyulu	2	4	6	8	10	12	12	14	16	18	20	20	22	22
2	15-117	K. Karthik	2	4	6	8	8	10	12	14	16	18	22	24	26	28
3	15-120	K. Raghudeep	0	2	4	6	8	10	12	14	14	16	18	20	22	24
4	15-122	L. Pridhvi Raj	2	4	6	8	10	12	14	16	16	18	20	22	24	26
5	15-124	M. Tulasi	0	2	4	6	8	10	12	12	14	16	18	20	22	22
6	15-128	MD. Sajeed	2	4	6	8	P	12	14	16	18	20	22	22	24	24
7	15-129	MD. Shahbaaz	0	2	4	6	8	10	10	12	14	14	16	18	18	20
8	15-135	MD. Waqi	2	4	6	8	8	10	12	12	14	16	18	20	22	24
9	16-101	Abu Sharma	2	4	6	8	8	10	12	14	14	16	16	18	20	22
10	102	A. Bala Chandar	0	2	2	4	6	8	10	12	14	16	18	20	22	22
11	105	Ch. Sai Ram Goud	2	4	6	8	10	12	14	16	16	18	18	20	22	24
12	107	G. Laxmi Kanth	2	6	8	10	12	14	16	18	20	22	24	26	26	28
13	109	J. Vamshidhar	0	2	4	4	6	8	10	12	14	16	18	20	22	24
14	110	Likhalej	6	2	4	6	8	10	12	14	16	18	20	22	24	24
15	114	M. Ansari	2	4	6	8	10	12	14	16	18	20	22	24	26	28
16	115	P. Shivani	2	4	6	8	10	12	14	16	18	18	20	20	22	24
17	116	P. Arpitha	2	4	6	8	9	10	12	12	14	16	18	20	22	22
18	118	Shahid Ali Khan	2	4	6	8	10	12	14	16	18	20	22	24	26	28
19	121	E. Abhishek	2	4	6	8	10	12	14	16	18	20	22	24	26	28
20	17-101	A. Prem kumar	0	2	2	4	4	6	8	10	12	14	16	18	20	22
21	102	B. Praful	2	4	6	8	10	12	14	16	18	20	20	22	24	24
22	103	B. Rahul	2	4	6	8	10	12	14	16	18	20	22	24	26	26
23	104	B. Sravan kumar	2	4	6	8	10	12	14	16	16	18	20	22	24	24
24	105	B. Shyam kumar	2	4	6	8	10	12	14	16	16	18	20	22	24	26
25	106	G. Gouri Shankar	0	2	4	6	6	8	10	12	14	16	18	20	22	24
26	107	D. Sai kumar	0	2	2	4	4	6	8	10	12	14	16	16	18	20
27	108	D. Vamshi krishna	2	4	6	6	8	10	12	14	14	16	18	20	22	24
28	109	G. Swathi	2	4	6	8	8	10	12	12	14	16	18	20	22	24
29	110	J. Sneha	2	4	6	8	10	12	14	16	18	20	22	24	24	24
30	111	J. Narendar	0	2	2	4	6	6	8	10	12	14	16	18	20	22
31	112	J. Chandra kanth	2	4	6	8	10	12	14	16	18	20	22	24	26	26
32	113	K. Sathish	0	2	4	8	10	12	14	16	18	20	22	24	26	26
33	114	K. Tirupathi	2	4	6	6	8	8	10	12	14	16	16	18	18	20
34	115	K. Vamshi Vardhan	2	4	6	8	10	12	14	16	16	18	20	22	24	26
35	116	K. Bhasker	2	4	6	8	10	12	12	14	16	18	20	22	22	22
		Signature of the Lecturer :	K	K	K	K	K	K	K	K	K	K	K	K	K	K

SUBJECT WISE ATTENDANCE For Subject : Precasting Class : III Semester : I

Sl. No.	Roll (H.T.) Number	Name of the Student																
		Month	7	7	7	7	8	8	8	8	9	9	9	9	10	10	11
		Date	7	14	21	28	4	11	18	25	1	15	22	29	6	20	3
		Lecture No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
36	17-117	K. Eshwar	2	4	6	8	8	10	10	12	14	16	18	20	22	24	26
37	118	P. Vinay kumar	2	4	6	6	8	10	12	14	16	18	20	22	24	24	26
38	120	P. Sai kumar	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28
39	121	U. Manideep.	2	4	6	8	10	12	14	16	18	20	22	24	24	26	28
		Signature of the Lecturer :															

SUBJECT WISE ATTENDANCE For Subject :

Sl. No.	Roll (H.T.) Number	Name of the Student	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
			2	3	3	3	3	3	3	3	3	3	3	4	4	4	4		
			23	2	2	9	9	16	16	23	23	30	30	6	6	13	13		
1	15-107	B. Ramanjaney	13	14	15	16	17	18	18	19	20	21	22	23	24	25	26		
2	15-117	K. Karthik	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
3	15-120	K. Raghudeep	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
4	15-122	L. Pruthvi Raj	13	14	15	16	17	18	18	19	19	20	21	22	23	24	25		
5	15-124	M. Tulasi	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
6	15-128	Md. Sajeed	12	13	14	15	16	16	17	18	18	19	20	21	21	22	23		
7	15-129	Md. Shahbaaz	13	14	15	16	17	18	19	20	21	23	24	25	26	27	28		
8	15-135	Md. Waqi	11	12	13	14	15	16	17	18	19	20	21	22	23	24	24		
9	16-101	Aleushahma	15	16	17	18	19	20	21	22	23	24	25	26	26	27	28		
10	102	A. Bala Chanda	13	14	15	16	17	18	19	20	21	22	23	24	25	26	26		
11	105	Ch. Sai Ram Goud	13	14	15	16	17	18	18	19	20	21	22	23	24	25	26		
12	107	G. Laxmikanth	14	14	14	15	16	17	18	19	20	21	22	23	24	24	24		
13	109	K. Vamshidhar	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
14	110	Likha Tej	15	16	17	18	19	20	21	22	23	24	25	26	27	28	28		
15	114	M. Angali	9	10	11	12	13	14	15	16	17	18	19	20	20	21	21		
16	115	P. Shivani	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
17	116	P. Arpitha	15	16	17	18	19	20	21	22	23	24	25	26	27	28	28		
18	118	Shahid Ali Khan	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
19	121	K. Abhishek.	13	14	15	16	17	18	19	20	21	22	23	24	24	25	25		
20	17-101	A. Prem Kuma	15	16	17	18	19	20	20	21	21	22	23	24	24	25	26		
21	102	B. Praful	15	16	17	18	19	20	21	21	22	23	24	25	05	26	27		
22	103	B. Rahul	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
23	104	B. Sravan Kum	14	15	18	16	17	18	19	19	20	21	22	23	23	24	24		
24	105	B. Shyam Kum	15	16	17	18	19	20	21	22	23	24	25	26	27	28	28		
25	106	G. Gouri Shanka	12	13	14	14	15	15	16	17	18	18	19	20	21	22	22		
26	107	D. Sai Kumar	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
27	108	D. Vamshi Kris	15	16	17	18	19	20	21	22	23	24	25	26	27	28	28		
28	109	G. Swathi	13	14	14	15	16	17	18	19	20	21	22	23	24	25	26		
29	110	J. Sneha	14	15	16	17	18	18	19	20	21	22	23	24	25	26	27		
30	111	J. Narendar	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
31	112	J. Chandrakant	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
32	113	K. Sathish	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26		
33	114	K. Pasupathi	14	15	16	17	18	19	20	21	21	22	23	23	23	24	24		
34	115	K. Vamshi Vard	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
35	116	K. Bhasker.	15	16	17	18	19	20	21	22	23	24	24	25	26	27	28		
		Signature of the																	

SUBJECT WISE ATTENDANCE

For Subject

Sl. No	Roll (H.T.) Number	Name of the Student	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
			2	3	3	3	3	3	3	3	3	3	3	4	4	4	4			
			23	2	2	9	9	16	16	23	23	30	30	6	6	13	13			
36	17-117	K. Eshwar	14	15	16	17	18	19	20	21	22	23	24	25	26	27	27			
7	118	P. Kiran kumar	16	17	18	18	19	19	20	21	[illegible]	22	23	24	25	26	26			
8	120	P. Sai Kumar	9	10	11	12	13	14	15	16	17	18	19	20	21	22	22			
[illegible]	121	U. Manideep.	13	14	15	16	17	18	19	19	20	21	21	22	23	24	24			
		Signature of the	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

KG REDDY
College of Engineering
&Technology

CERTIFICATE

Name: AENUGU SURYA PRAKASH REDDY

Roll No: 15QM1A0103

Has successfully completed the prescribed requirements for the award of value added course on **"PRESTRESSED CONCRETE"** conducted by Civil Engineering held in month from July 2017 to November 2017 in the academic year 2017-2018.

Date:

M. R. [signature]

Course Coordinator

Principal

KG REDDY
College of Engineering
&Technology

CERTIFICATE

Name: A VENKATESHWAR REDDY

Roll No: 15QM1A0105

Has successfully completed the prescribed requirements for the award of value added course on **"PRESTRESSED CONCRETE"** conducted by Civil Engineering held in month from July 2017 to November 2017 in the academic year 2017-2018.

Date:

M. R. [signature]

Course Coordinator

Principal