निर्माण प्रबंधन (Construction Management) के सिद्धांत

[Nirman prabandhan (Construction Management) ke Siddhant]

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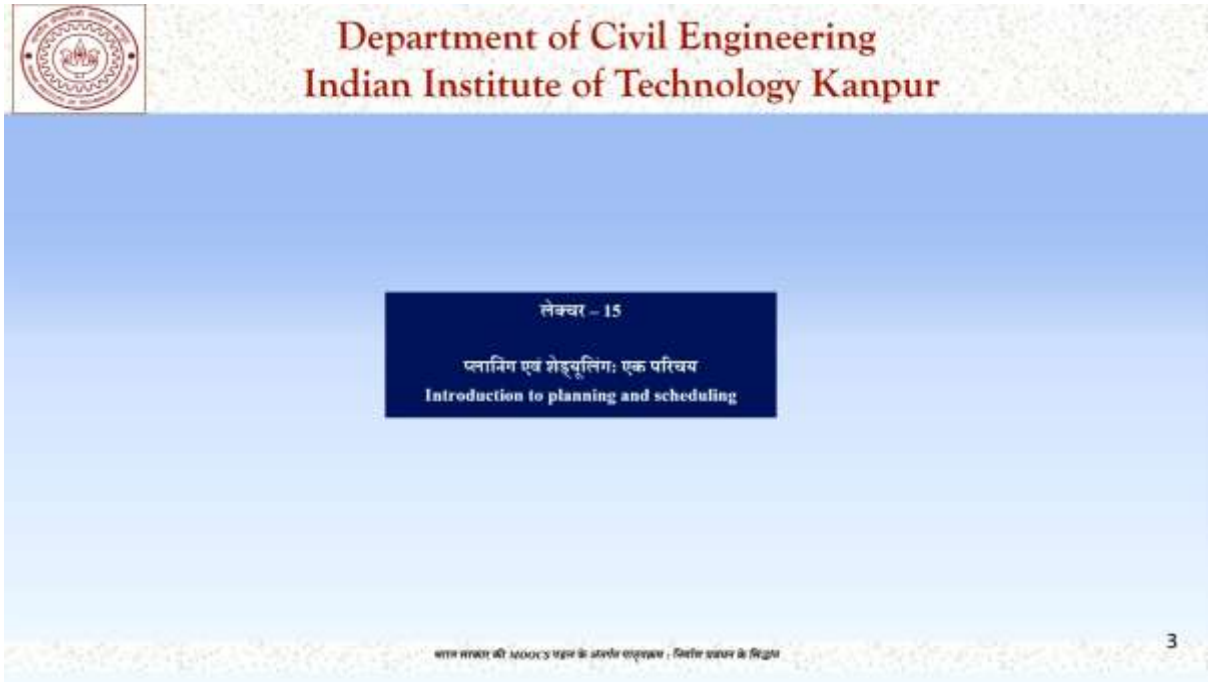
Lecture – 15

Planning evan Scheduling : Ek Parichay

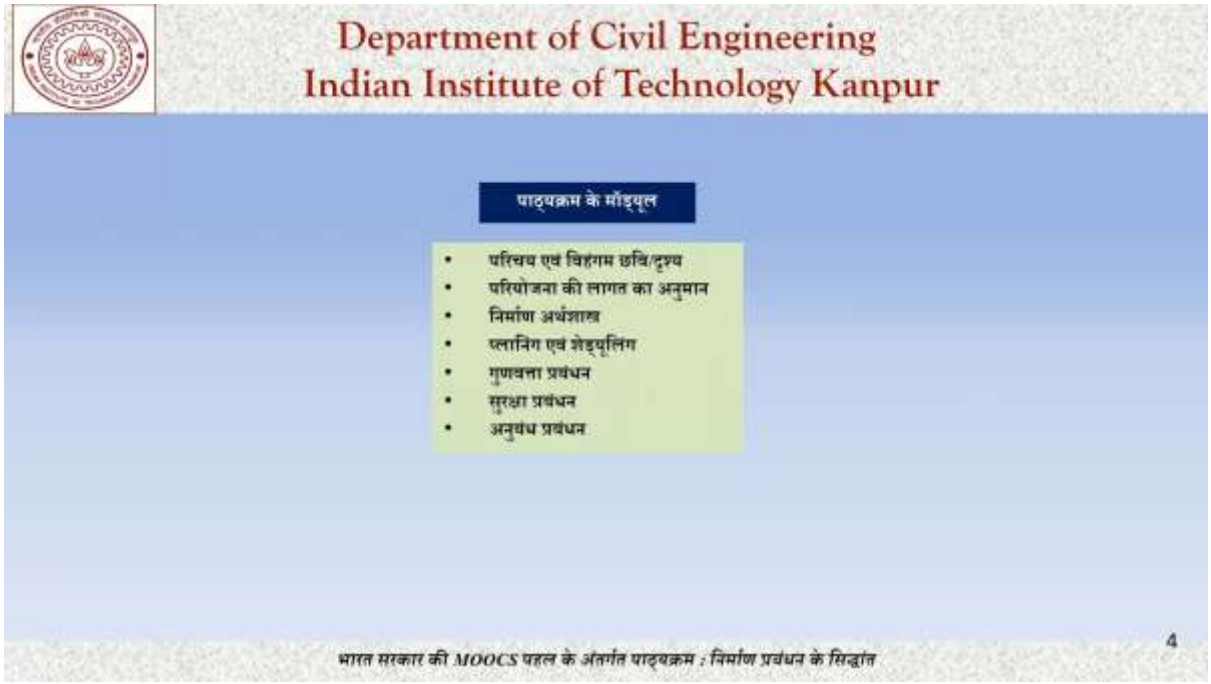
Namaskaar aur svaagat hai aapaka ek baar phir Bhaarat sarakaar kee moocs pahal ke antargat paathyakram Nirmaan Prabandhan ke Siddhaant (Principles of Construction Management) mein.

(Reference Time 00:24)



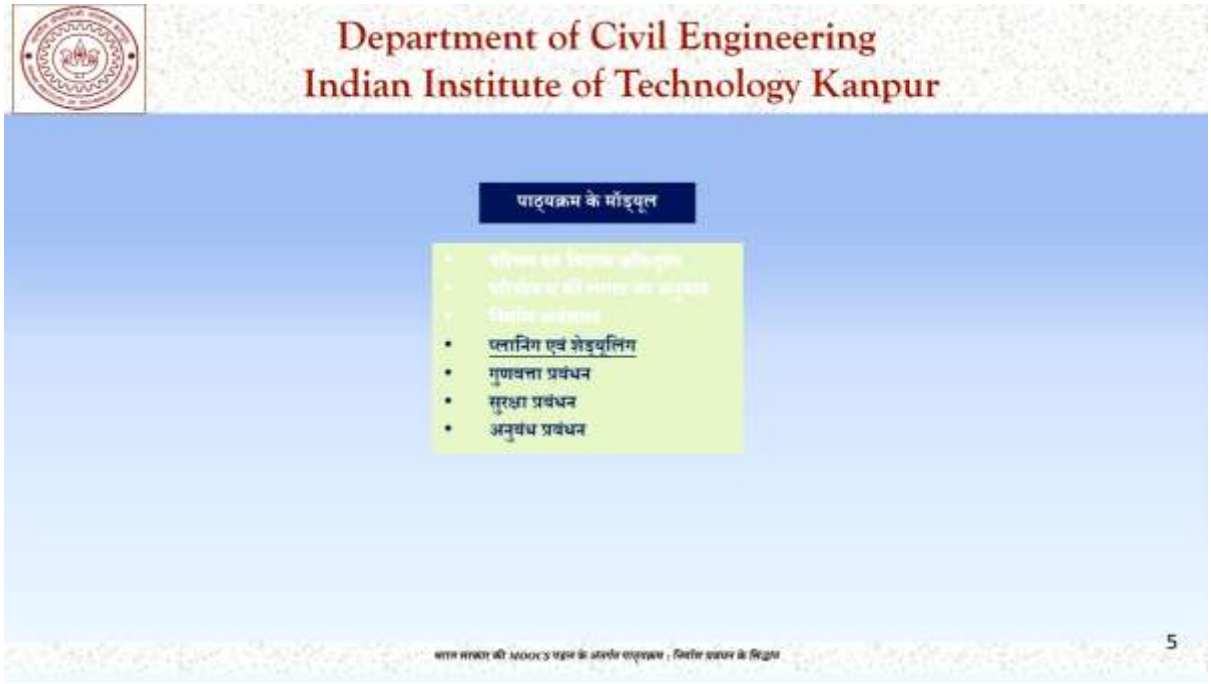
Aaj ham lecture 15 par hain aur ham ek nae module planning evan scheduling ko shuroo karane ja rahe hain.

(Reference Time 00:36)



Is paathyakram mein in modules par charcha ho rahee hai.

(Reference Time 00:37)



Aur inamen se pahale teen module jinamen se ki ek parichay ka tha, ek pariyojana kee laagat ke anumaan ka tha aur ek nirmaan arthashaastr ka tha yah samaapt ho chuke hain. Is module

par charcha karane se pahale main chaahoonga ki ham ek project ko kriyaanvit karane mein jo vibhinn pahaloo hain un par ek baar phir vistrt charcha karen.

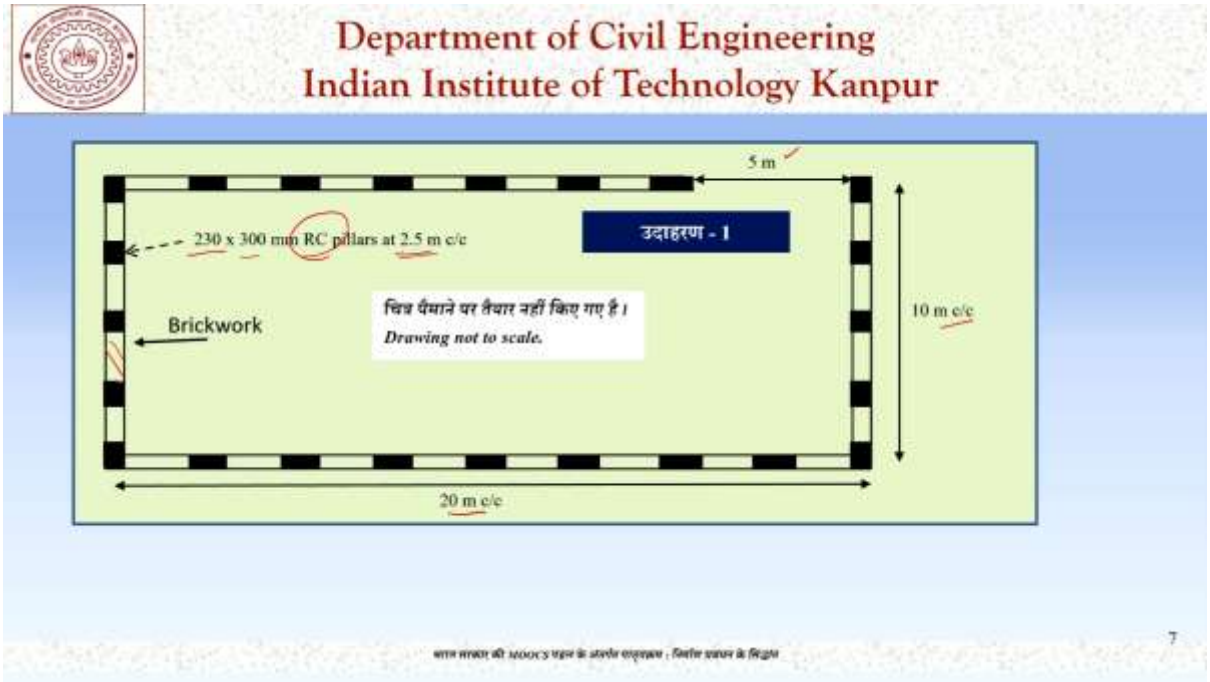
(Reference Time 01:03)

Bhavishy mein utpann hone vaalee sambhaavanaon ko dhyaan mein rakhate hue kisee pariyojana ke kaaryaanvayan kee yojana taiyaar karane kee prakriya ko planning kaha jaata hai. Planning mein nimn avashy shaamil hone chaahie. Praudyogikee ya technology ka chayan karana kisee bhee nirmaan prakriya mein tamaam vikalp hote hain, chhotee se chhotee baat ko karane ke lie kaee tareekon ka prayog kiya ja sakata hai usamen se ham kis tareeke ka prayog karenge yah aavashyak hai. Unamen se kis vidhi ka prayog hoga yah tay kar dena aavashyak hai. Kaaryon aur unake aavantan ko paribhaashit karana, yah vibhinn hitadhaarakon ke beech mein jo scope hai usako tay karane kee baat hai. Arthaat anubandhon ko theek prakaar se likhana jisamen ki har hitadhaarak ke adhikaaron aur usake kartavyon ko aise likha jae jisamen ki koee ambiguity na ho, usako ek hee tareeke se samajha jae. Aavashyak sansaadhanon ko chinhit karana aur unakee maatra ka aakalan karana, aavashyak sansaadhan praudyogikee par nirbhar karenge agar ham kisee kaary ko ek vidhi se karenge to hamen kuchh sansaadhan chaahie yadi doosaree vidhi hogee to sansaadhan badal jaenge. Tamaam kaaryon aur gatividhiyon kee avadhi ka anumaan lagaana avadhi ka anumaan arthaat samay us project ko poora karane mein kitana samay lagega isakee jaanakaaree hee hamaare is module planning and scheduling visheshakar scheduling ka ek hissa hai. Project kee avadhi sabhee gatividhiyon kee avadhi ka jod hota hai lekin arithmetic sum nahin hai agar ham is baat ko dekhenge ki agar do gatividhiyaan hain usamen 4 din aur 6 din lagate hain yah aavashyak nahin kee project poora karane mein 10 din lagenge is baare mein phir charcha hogee aap is par vichaar keejiega. Vibhinn gatividhiyon ke beech paraspar nirbharata kee pahachaan karana yah baat pichhale vaaky se judee huee hai agar un gatividhiyon mein aisa sambandh hai ki ek gatividhi ko shuroo karane se pahale doosaree gatividhi ka poora hona aavashyak hai tab to 4 aur 6 din, 10 din project mein lagenge. Lekin agar usamen nirbharata nahin hai to ham donon gatividhiyon ko ek sang shuroo kar sakate hain aur project kee avadhi 6 din hee ho sakatee hai. Ab ham 6 din rakhate hain ya nahin rakhate hain vah

tamaam any kaaranon par nirbhar karega. Pariyojana ke pratyek hitadhaarak ya stakeholder apane drshtikon se planning karate hain.

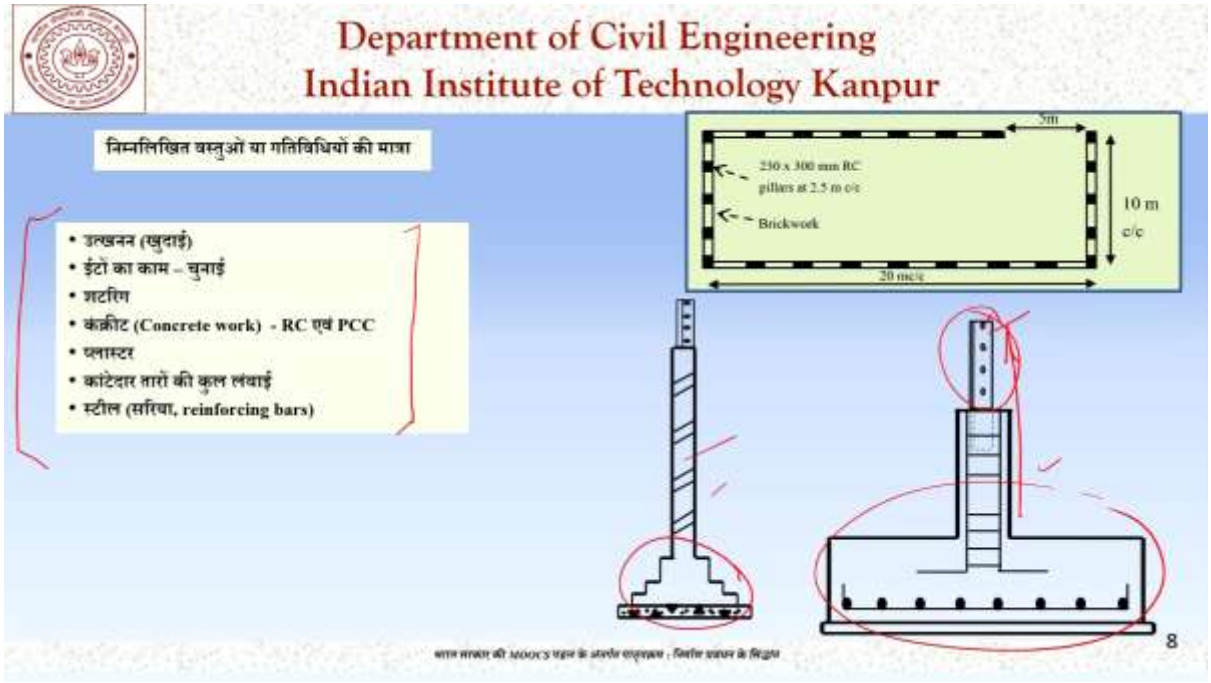
Pariyojana kee planning karate samay nimn ka vishesh dhyaan rakha jaana chaahie. Sabase pahale samay project kab khatm hoga yah har ek ke lie jaanana aavashyak hai. Gunavatta project khatm karana hee aavashyak nahin hai yah aavashyak hai ki sabhee kaary maanakon ke anusaar gunavatta sunishchit kee jae. Suraksha yah bhee aavashyak hai ki project ke kriyaanvayan ke dauraan, construction ke dauraan, nirmaan kaary ke dauraan koee durghatana na ho durghatana hotee hai to usake lie hamen taiyaar rahana chaahie taaki jaan maal kee kshati kam se kam ho aur ant mein laagat aakhirakaar ham chaahate hain ki koee bhee pariyojana samay se ho; achchhee quality kee ho; bina kisee durghatana ke ho lekin laagat bhee kam lage. In sabhee objectives ko optimizing karana hee project planning and scheduling ka ek focus hota hai usaka uddeshy hota hai. Aage badhane se pahale ham chaahenge ki kuchh udaaharanon ko lekar ham in binduon par vichaar karen.

(Reference Time 05:16)



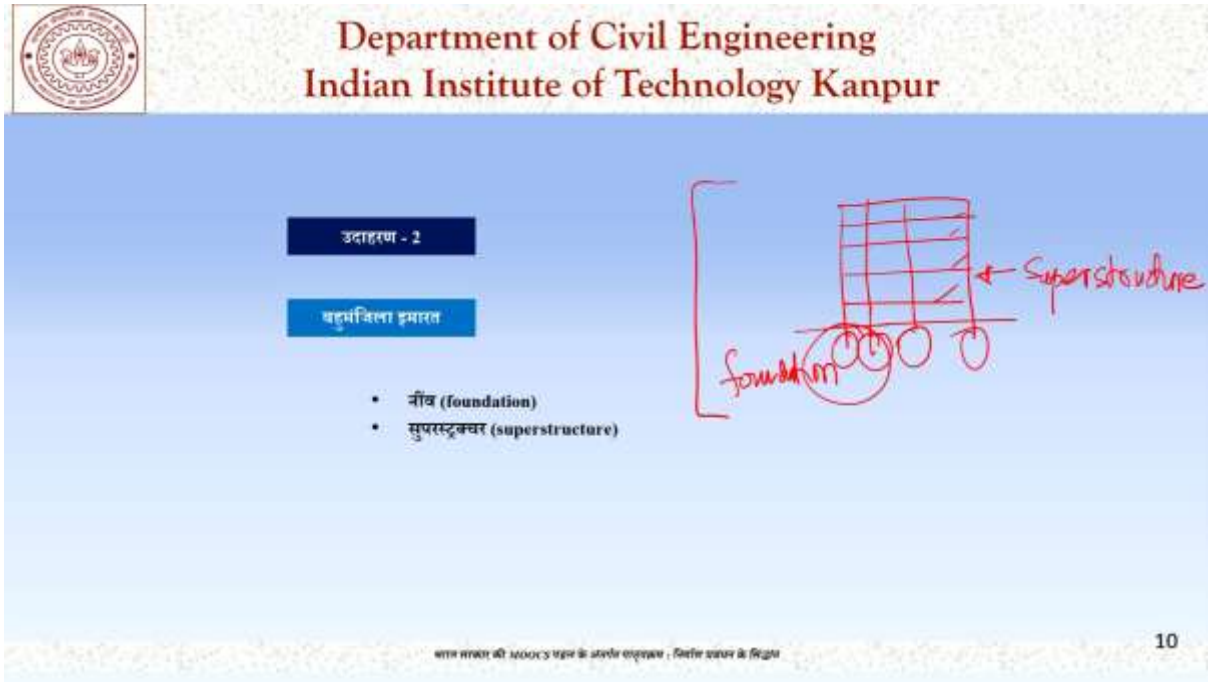
Yah hai pahala udaaharan puraanee boundary wall arthaat vo boundary wall jis par ham tamaam charcha kar chuke hai. Is boundary wall mein sabhee kuchh hamako diya hua hai. Ham yah maanakar chale the ki yahaan par 5 meter kee opening hogee, yah 20 meter center to center dooree hai yahaan par 10 meter hai aur isamen 230 by 300 ke reinforced concrete ke pillars hain aur vo 2.5 meter kee dooree par hai aur usake beech mein eete se chunaee kee gaee hai.

(Reference Time 05:49)



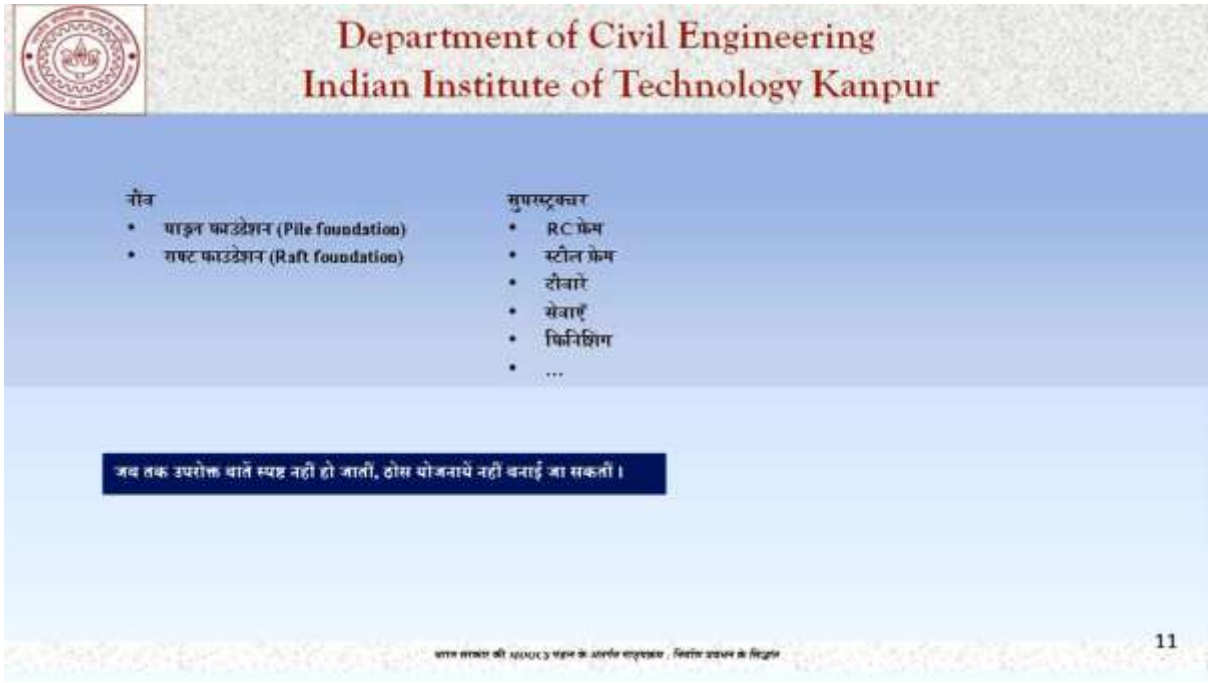
Saath hee saath is tareeke kee cross sectional chitr bhee hamako upalabdh the jisamen ki aarasee pillar kee foundation kya hogee? Usake oopar ka praaroop kya hoga? Jo angle lagega vah kaisa hoga? Aur jo chunaee hai vah kis prakaar se kee jaegee? To yah dekhane ke baad hamane tamaam gatividhiyon ko chinhit kiya tha. Utkhanan arthaat khudaee eenton ka kaam chunaee; shuttering work; concrete; plaster; kaantedaar taaron kee lambaee; steel ya sariya ka kaam. To in gatividhiyon kee maatra nirdhaarit karane ke baad hamane usaka total kul laagat bhee nikaalee thee. Ab ham jab technology ke chayan kee baat karate hain to yahaan par bahut jyaada vikalp nahin banenge lekin haan thode bahut vikalp ban sakate hain ham kah sakate hain ki yah angle ham kahaan par kaatenge, kahaan par isamen yah chhed kie jaenge, kya yah kaary site pe kiya jaega, kya yah kar workshop mein kiya jaega. Usee prakaar jo concrete hai kya vah site par mix kee jaegee ya ek ready mix concrete plant dvaara laee jaegee ya ham precast arthaat vah jo raft hai vah ham baahar banaenge aur ek crane ke maadhyam se yahaan par sirph install kar denge vahaan par usako rakh denge. Agar ham is prakaar se in technology ke vikalpon ko dekhakar unaka chayan karate hain to aap samajh sakate hain ki jo sansaadhan hamen chaahie jitana samay is project mein lagega vah alag ho sakata hai.

(Reference Time 07:33)



To aaiye doosara udaaharan dekhate hain jo ki hai ek bahumanjila imaarat. Yahaan par hamako kuchh bhee nahin pata hai hamako. Maatr maan leejie yah pata hai ki ek 5 manjil, 6 manjil imaarat banaee jaanee hai. To agar ham yah soche ki usamen kya-kya aavashyak hoga? To pahalee baat banatee hai neev. Usamen neev kis prakaar kee hogee agar hamane imaarat kee oonchaee aur us par aane vaale load tay kar lie hain to hamen neev nirdhaarit karanee hotee hai. Saath hee saath supar structure kaisa hoga. Jab ham imaarat banaate hain to agar is prakaar se imaarat hai to satah ke neeche jo bhee nirmaan kaary hota hai usako ham foundation ya neev kah sakate hain kahate hain aur oopar aane vaale structure ko super structure kaha jaata hai. To ab ek 5-6 manjil imaarat jo ki is prakaar se hogee jisamen ki tamaam yah floors honge, yahaan par ham usako frame kar sakate hain, yahaan par har column kee foundation denee hogee. Ab is motee jaanakaaree ke saath agar ham aage badhate hain to hamen aur kya pata hona chaahie?

(Reference Time 08:56)



Jahaan tak neev ka savaal hai ground condition jo vahaan par jameen hai usakee condition ko dekhate hue kya hamen pile foundation karanee hogee ya hamen raft foundation karanee hogee ya hamen kisee prakaar ka ground improvement vahaan par usamen sudhaar karana hoga yah jaanakaaree agar hamako nahin hai to ham neev ke baare mein koee bhee planning nahin kar sakate hain. Agar hamako pata hai ki haan yahaan par pile foundation karanee hogee to ham piling ke hisaab se sansaadhan jutaayenge aur usako kriyaanvit karenge.

Super structure par agar ham aate hain to tamaam vikalp kholate hain jaise ki kya hamaaree building reinforced concrete frame kee hogee ya steel frame se banegee lekin yah to baat maatr frame kee hai inake beech mein deevaaren to avashy hogee, ab vah deevaaren kaisee hogee; kya vah eent kee hogee ya ACC blocks honge ya precast concrete panels honge in baaton ko tay karana bhee aavashyak hai tabhee ham ek thos plan bana sakate hain. Us building mein sevaen kaisee hogee, kitanee chaahie. Sevaen kaun see hotee hai? Building ke sandarbh mein sevaen hotee hain air conditioning, fire, volt, water, agnishaman, paanee kee supply aur waste water ko kis prakaar se building se hata karake treatment ke lie le jaaya jaega ya to vah shahar kee seevar lain mein jod diya jaaye, building ke baahar koee treatment plant lagaaya jae, to kis prakaar kee sevaen hain; kis prakaar se ham unako building ke har kone mein pahunchaenge. Finishing yah to bahut hee mahatvapoorn bindu hai kya hamaaree flooring kota kee hogee; yah tailing hogee hamaara. Furniture kis prakaar ka hoga? Modular hoga, lakadee ka hoga, steel ka hoga jab tak yah baaten tay nahin hotee tab tak ham ek vaastavik plan nahin bana sakate. Maine aapase kaha ki har hitadhaarak apanee tareeke se planning karata hai to jo thekedaar hai usako ya to bataaya jaega client dvaara ki yahaan par steel kee alamaariyaan lagaee jaegee, ye RC frame se building banaee jaegee, deevaaren ACC block kee hongee tab thekedaar usake anusaar sansaadhanon ko jutaata hai. Kabhee-kabhee yah vikalp thekedaar ke lie chhod diya jaata hai thekedaar tamaam vikalpon kee soochee banaakar client ko deta hai aur client hee antatah ek nirnay karata hai. To nirnay to client ka hota hai lekin un vikalpon ko is prakaar pesh karana jin par ki ek decision liya ja sake ek nirnay liya ja sake taaki vah project samay se kam laagat mein poora kiya ja sake. Kabhee-kabhee hota hai ki project mein samay se adhik paise ko mahatv diya jaata hai, kabhee paise se adhik samay ko mahatv diya jaata hai to in sab baaton ka antim nirnay to client karata hai lekin us nirnay ke aadhaar par hee planning kee ja sakatee hai. Finishing ke

alaava tamaam aisee chhotee-chhotee baaten hotee hain jaise plumbing, wiring, electrical fixtures in sab baaton par bhee ek-ek bindu par nirnay liya jaana hota hai. Jab tak ki in baaton mein spashtat: nahin aa jaatee yah baaten spasht nahin ho jaatee thos yojanaen banaee hee nahin ja sakatee hai. To in baaton se jo do udaaharan hamane lie boundary wall ka ek bahumanjilee imaarat ka isase mera uddeshy tha aapako is baat se avagat karaana ki koee bhee thekedaar ya koee bhee hitadhaarak tamaam tareeke ke plan banaata hai ya usake lie vah plan banaana anivaary hai. Har plan ek doosare se juda hota hai lekin alag bhee hota hai. Aaiye aage dekhate hain ki hamen kis prakaar ke plans banaane hote hain.

(Reference Time 13:19)

Pahalee baat hotee hai samay kee, ki hamaare is project mein kitana samay lagega is baat par ham is module mein scheduling ke antargat vistaar se charcha karenge. Gunavatta ke lie ek plan banaana ek yojana banaana atyant aavashyak hai. Yah samajhana chaahie ki jab ham project karate hain to kaee baaton ko dhyaan mein rakhana hota hai aur project kee quality ek hee baat par nahin tamaam baaton par nirbhar karatee hai. Kya ham achchhee saamagree le aaen aur usako theek se upayog na karen to hamaara project achchha hoga? Nahin arthaat khareedee jaane vaalee saamagree tatha usaka prayog donon hee maanakon ke anusaar hone chaahie. Nirmaan prakrti, nirmaan kee prakriya mein tamaam labour ya shramik kaam karate hain, engineer karate hain unako apana kaam aana chaahie, unakee training honee chaahie, unako yah pata hona chaahie ki gunavatta kaise sunishchit kee jae. To jo labour hotee hai jo hamaare shramik hain unakee training bhee gunavatta plan ke antargat hotee hai. Saath hee saath har gatividhi alag-alag samay par hotee hai. Electrical wiring kaaphee baad mein hogee; concreting pahale hogee to us gatividhi se sambandhit gunavatta ko sunishchit karane ke lie jo bhee sansaadhan chaahie vah sahee samay par sahee jagah par upalabdh ho is baat ko sunishchit karana hee gunavatta planning ka focus hota hai.

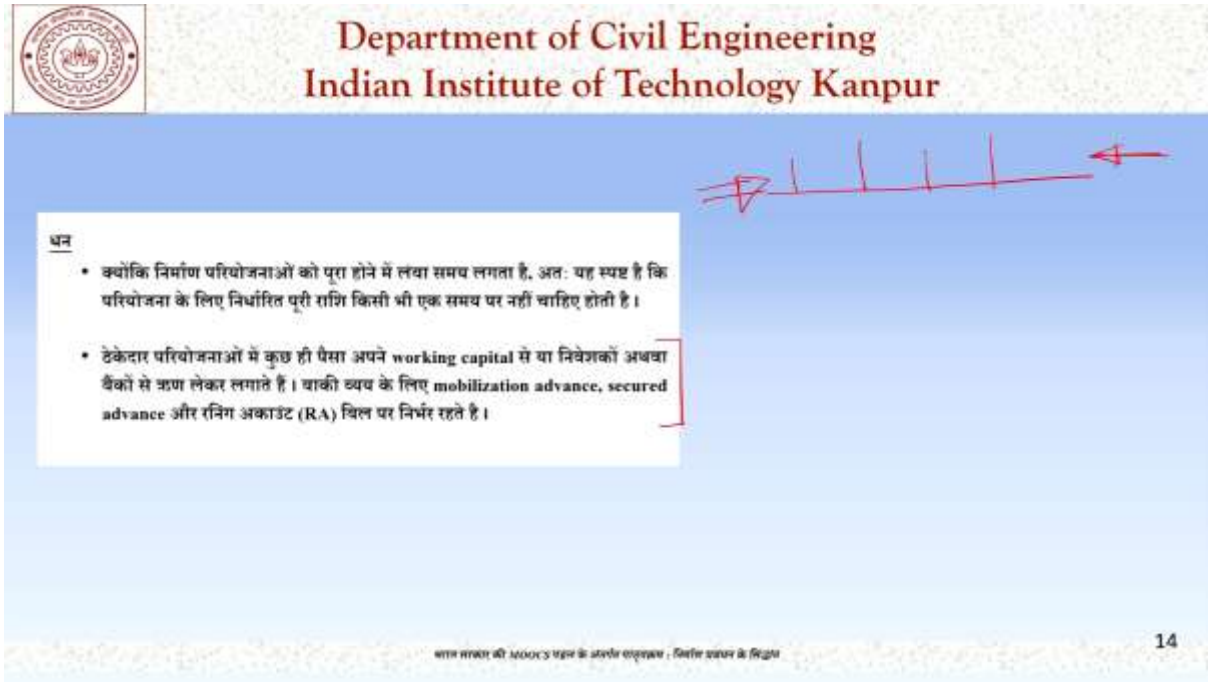
Ab ham aate hain suraksha par. Suraksha hamane pahale bhee kaha durghatanaon se bachana aur yadi durghatana ho jaatee hai to usase nipatana yah donon suraksha plan ke abhinn ang hain. Suraksha kee planning karane ke lie hamen yah pata hona chaahie ki hamaara nirmaan kaary kahaan ho raha hai, kis prakaar ka hai jaise ki agar hamaara nirmaan kaary paanee ke

paas ho raha hai ya paanee mein ho raha hai bridge ka nirmaan paanee mein hota hai to usamen suraksha kee drshti se yah aavashyak hai ki ham doobane kee baat karen. Hamaare labour, hamaara work force paanee mein doob na jaaye, paanee mein gir na jaaye vaheen agar hamaaree building 50 manjil hai. Working at heights ya oonchaee par kaary karate samay jo bhee precautions liye jaane chaahiye vo liye jaayen to yah baat aavashyak hai ki ham apanee pariyojana ko bhaleebhaanti samajhen usake vaataavaran ko samajhen. Kya ham raat mein kaam karenge ya nahee. Agar hamako raat mein bhee kaam karana hai to hamen vahaan par suraksha ke anukool kadam uthaane honge arthaat kam se kam lighting hogee jab ham lighting dete hain to ham jo taar vahaan lagaate hain usamen koee phans na jae, vahaan short circuit na ho in tamaam baaton ko dhyaan mein rakhana aur unake lie plan karana usako ensure karana hee suraksha planning mein aata hai.

Maanav sansaadhan, abhee baat ho rahee thee training kee. To training maanav sansaadhan kee planning ka ek abhinn ang hai. Saath-saath yah bhee hai ki ek pariyojana mein ek nirmaan kaary mein tamaam tareeke ke trend workman kee aavashyakata hotee hai welders, masons, carpenters tamaam log milakar hee us pariyojana ko kriyaanvit karate hain. Air conditioning se sambandhit log, bijalee se sambandhit log, plumbing se sambandhit log to inakee aavashyakata kitanee hogee, kab hogee aur kis level ke logon kee hamen aavashyakata hogee, kitana unake educational qualification honee chaahie shaikshanik yogyata kitanee ho, unako kitana anubhav ho is baat ko samay ke anusaar hamaare plan mein samaaveshit karana maanav sansaadhan planning ka uddeshy hota hai.

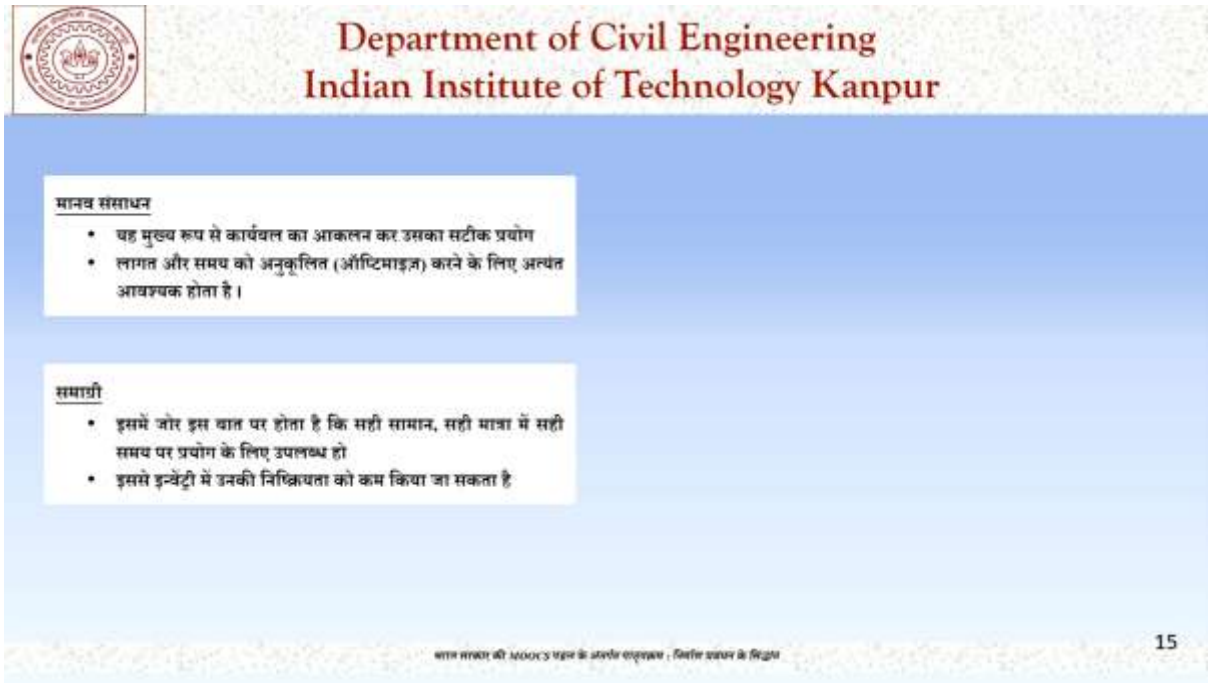
Saamagree arthaat ro material- row material se sambandhit ek mahatvapoorn plan banata hai ki hamen kis samay kya material chaahie, kitana chaahie is baat ko hamen document karana hoga usake lie taiyaar hona hota hai. Upakaran evan machine ki kaun see machine chaahie, kab chaahie yah bhee hamen plan karana hoga. Dhan sabase badee baat hai ki hamen kitana paisa kis samay chaahie. Vidhi evan anubandh, hamane pahale baat kee ki tamaam hitadhaarak ek doosare se anubandh se bandhe hote hain arthaat unake sambandh anubandhon dvaara paribhaashit hote hain to isalie yah aavashyak hai ki sabhee log apane adhikaaron evan daayitv se bhalee prakaar parichit hon. To aaiye inamen se kuchh baaton par ham phir se ek baar vichaar karen.

(Reference Time 18:38)



Jahaan tak dhan ka savaal hai kyonki nirmaan pariyojanaon ko poora karane mein lamba samay lagata hai atah yah spasht hai ki pariyojana ke lie nirdhaarit pooree raashi kisee bhee ek samay par nahin chaahie hotee hai to yah aavashyak hai ki ham yah samajh len ki hamako is pariyojana mein kis samay kitana dhan chaahie. Agar hamen is baat kee sateek jaanakaaree hai to ham tamaam byaaj dene se bach sakate hain. Kyonki thekedaar kuchh paisa working capital ya apane niveshakon ya bank se rin lekar lagaate hain baakee vyay ke lie mobilization advance, secured advance and running account bills par nirbhar rahate hain. To yah kisee bhee thekedaar ke lie cash flow kee jo jaanakaaree hai jis par ki ham vichaar kar chuke hain is course mein. Jo cash flow kee jaanakaaree hai vah bahut hee mahatvapoorn hotee hai.

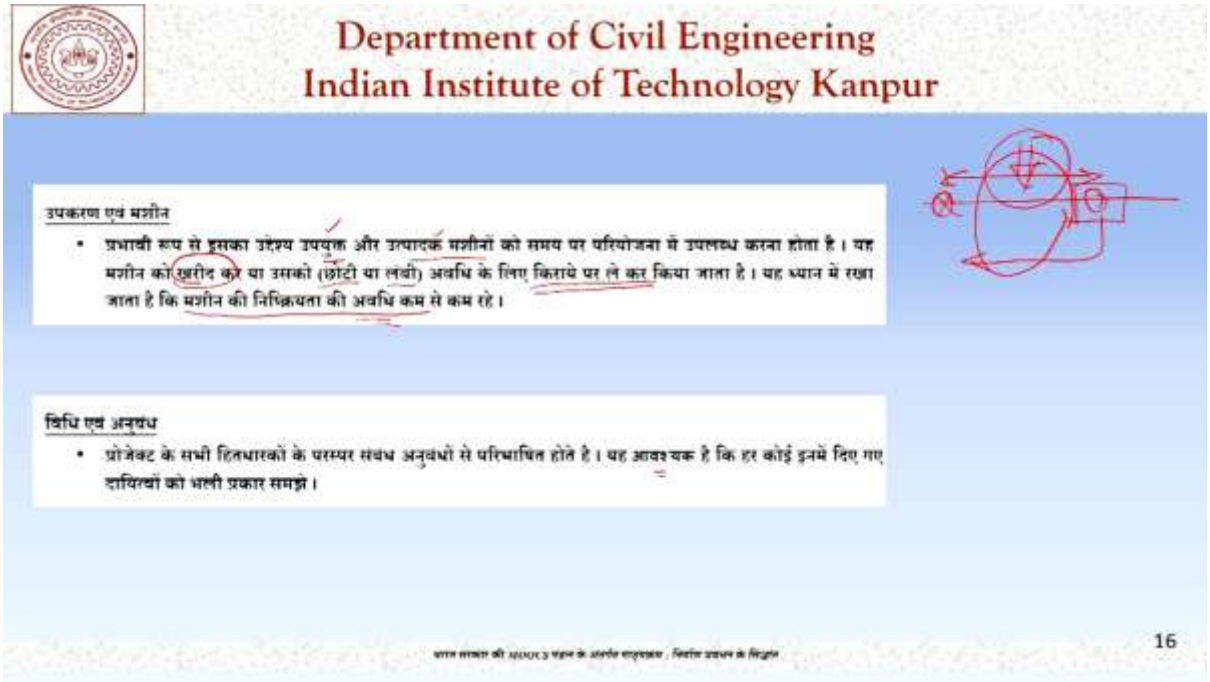
(Reference Time 19:35)



Jahaan tak maanav sansaadhan ka savaal hai ham log charcha kar chuke hain. Yah mukhy roop se kaary bal ka aakalan kar isaka sateek upayog karana isase sambandhit hota hai. Laagat aur samay ko anukoolit ya optimize karane ke lie yah atyant aavashyak hota hai. Seedhee see baat hai ki yadi ham apane kaary bal ko nishkriy hone se rok le, ham welders ko bulaakar yah na kahen ki chaar din hamaare welders baithe hain kyonki jisako ki construction kee bhaasha mein chaal kahate hain, unake paas work front nahin hai kaary karane ke lie jo aavashyak jameen hai vah upalabdh nahin hai kyonki pichhala kaary khatm nahin hua hai aisee sthiti na utpann ho. To ham apane kaaryabal ko nishkriy na rakhen jo bhee hamaare paas kaary bal hai vah hamesha apane kaary mein laga ho. Is baat kee planning atyant aavashyak hai.

Jahaan tak saamagree aur row material ka sambandh hai isamen jor is baat par hota hai ki sahee saamaan sahee maatra mein sahee samay par prayog ke lie upalabdh ho. Uddeshy yah hai ki inventory mein usakee nishkriyata kam kee jae arthaat jis prakaar hamane builders kee baat kee is prakaar yah nahin hona chaahie ki ham kuchh bhee padaarth lekar rakh len aur usako upayog na karen, upayog maheene bhar baad karen 2 maheene baad karen yah bhee aavashyak hai ki jab hamen material chaahie to vah upalabdh ho. To is just in time vaale concept ko kriyaanvit karana inventory management ya material management ka ek bahut mahatvapoorn hissa hota hai.

(Reference Time 21:20)



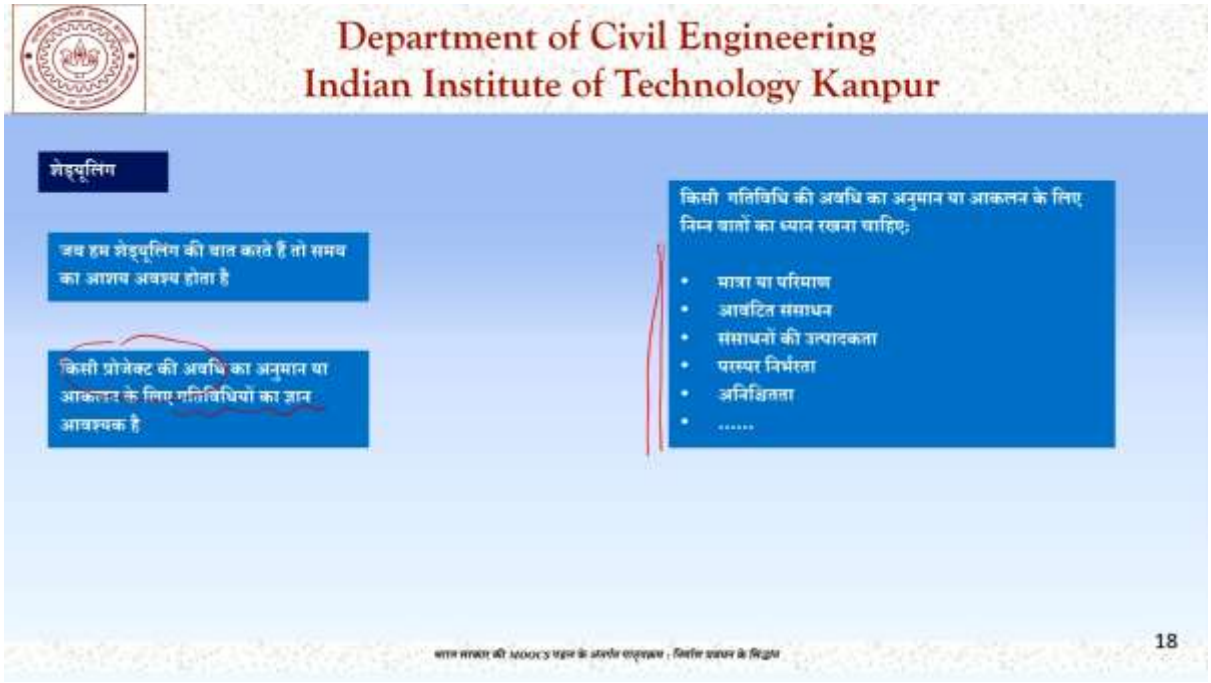
Aage badhate hain aur upakaran evan machine kee baat karate hain. Prabhaavee roop se isaka uddesh upayukt aur utpaadak machineon ko samay par pariyojana mein upalabdh karaana hota hai. Machines ko khareed kar ya usako chhotee ya lambee avadhi ke lie kirae par lekar kiya jaata hai yah bhee dhyaan mein rakhana chaahie kee machine kee nishkriyata kee avadhi kam se kam rahe. Aaiye ham in teen binduon par charcha karate hain. Pahalee baat hai upayukt aur utpaadak machine hai arthaat appropriate and productive. Jo machine ham site par lekar aaen vah us project mein prayog ho rahee technology ke upayukt hon productive hon, yah nahin ki vah machine dheeme chale ya bahut tej chale yah baat dhyaan mein rakhate hue hee hamen machine ko site par laana hota hai. Ab yah machine kaise aaegee ya to ham

usako khareed len arthaat thekedaar apanee machine khareed le ya chhotee ya lambee avadhi ke lie kirae par le le yah nirnay karana aavashyak hai ki koee bhee machine kab khareedee jae aur kab kirae par lee jae. Yah nirnay karana bahut hee mahatvapoorn hota hai kis paristhiti mein khareedana anukool hai ya kirae par lena anukool hai is baat par ham kabhee charcha kar sakate hain. Philahaal ham aapako isako homework ke roop mein chhod dete hain. Ki aap sochie ki kya ek vazan uthaane ke lie agar hamen ek crane chaahie 50 ton kee crane chaahie, to ham use 50 ton kee crane ko khareed len ya ham us 50 ton kee crane ko kirae par le yah nirnay ham kin baaton ko dhyaan mein rakhakar karenge is baat par ham kabhee charcha karenge aap abhee sochie. Aur teesara bindu hai machine kee nishkriyata kee avadhi kam karana. Yah bhee bahut hee aavashyak hai kyonki crane ka hee udaaharan le leejiye. Maan leejie hamako ek crane ek project mein yahaan par aur yahaan par do gatividhiyon ke lie prayog karanee hai, to in donon gatividhiyon ke beech mein yah jo avadhi hai agar hamaaree crane yahaan par nishkriy rakhee rahegee to usaka koee phaayada nahin hai. To hamako yah vichaar karana chaahie ki kya yah gatividhi ham kisee bhee tareeke se yahaan la sakate hain arthaat is nishkriyata kee avadhi ko kam kar sakate hain. Vidhi evan anubandh, project ke sabhee hitadhaarakon ke paraspar sambandh anubandhon se paribhaashit hote hain ya aavashyak hai ki har hitadhaarak in anubandhon mein die gae apane daayitvon aur adhikaaron se bhalee prakaar parichit ho. In adhikaaron aur daayitvon mein nirmaan kaary ke paripekshy mein kya aata hai? Scope of work jaisa ki hamane jab boundary wall kee charcha ho rahee thee to ye tha ki jo mittee nikalegee, dispose kee jaanee hogee arthaat kaheen par usako nikaal kar rakhana hoga; kahaan rakhana hai, kaun rakhega? Agar excavation thekedaar aur concrete ka thekedaar alag-alag hue to kya jo mittee nikaalee gaee usako vahaan par hee rakha gaya thode din ke lie, to vah concrete ke thekedaar ke kaary mein vighn daalega usake lie concrete ka thekedaar ho sakata hai harjaana ya muaavaja maange. To in baaton ko dhyaan mein rakhana ya in baaton par vichaar karana anubandh mein diya hua hota hai. To isalie chaahe vah concrete ka thekedaar ho chaahe, vah khudaee ka thekedaar ho aur antat: client kyonki kaun kya karega kisake scope mein kya hai yah baat spasht ho jaanee chaahie aur har hitadhaarak ko bhalee bhaanti apane roll ke prati jaagarook hona chaahie.

(Reference Time 25:37)

In plans ke alaava gunavatta kee yojana hotee hai jisamen ki hamane bataaya ki isaka focus yah sunishchit karana hota hai kee khareeda aur prayog mein laaya gaya saamaan evan nirmaan prakriyaen sambandhit agency ke maanakon ke anukool ho. Isake lie aavashyak prashikshan aaj bhee kie jaate hain, kya vah pareekshan site par kie jaenge ya samples lekar ke kaheen baahar kie jaenge to unakee reports kab aaegee; kaun unako except karega yah sab bhee tay karana hota hai. Suraksha se sambandhit ham log charcha kar chuke hain. Jahaan tak suraksha yojana ya safety plan ka savaal hai isaka uddeshy hota hai yah sunishchit kiya jae ki site par koee bhee apratyaashit durghatana na ho aur jeevan ya sansaadhanon ka nukasaan na ho. Uchit planning kisee pariyojana ka nirdhaarit tithi se pahale ya baad mein poora hone mein mahatvapoorn bhoomika nibhaatee hai. Yah pariyojana kee pooree laagat ko bhee prabhaavit kar sakatee hai.

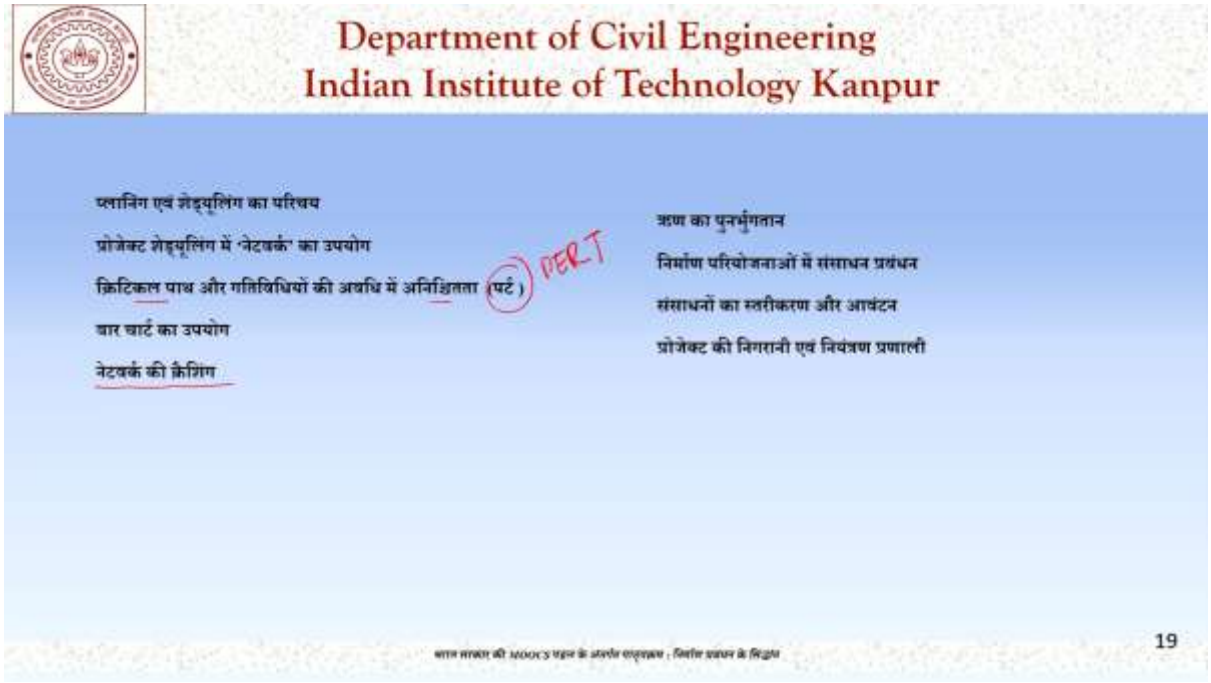
(Reference Time 26:41)



To aaiye aage badhate hain ham log scheduling par charcha shuroo karenge jo ki hamaare is module ka kendr hai. Jab ham scheduling kee baat karate hain to samay ka aashay kaheen na kaheen aavashyak hota hai. Kisee project kee avadhi ka anumaan ya aakalan karane ke lie us project mein aane vaalee tamaam gatividhiyon ka gyaan aavashyak hai. Ab gatividhiyon ke gyaan kee jab baat hotee hai to hamen us gatividhi ke baare mein kya-kya pata hona chaahie hamane udaaharan liya tha ki ek project mein do gatividhiyaan hain ek mein chaar din lagate hain aur ek mein chhah din lagate hain aur unamen paraspar nirbharata hai ya nahin isase yah project ya to 6 din mein hee khatm kiya ja sakata hai ya 10 din lagenge. Yah 4 din aur 6 din yah avadhi tay karane ke lie hamen un gatividhiyon ke baare mein kya pata hona chaahie? Usamen hamen pata hona chaahie ki maatra ya parimaan kya hai, us gatividhi mein kitanee maatra involved hai agar khudaee hai, chunaee hai to kya ek cubic meter hai; 100 cubic meter hai yah pata hona chaahie pahalee cheej. Doosaree baat hai aavantit sansaadhan. Ham us gatividhi ko karane ke lie kitana sansaadhan upalabdh kara sakate hain. Chhotee see baat agar ham le hamen ghar mein putaee karanee hai, to ham putaee 4 din mein kar sakate hain 10 din mein kar sakate hain to putaee ke lie kitana kaaryabal hai? Ek aadamee putaee kar raha hai ya chaar aadamee kar rahe hain isamen yah bhee sochana hoga ki kya ham 100 aadamee lagaakar putaee kar sakate hain? Yah to nahin ho sakata hai kyonki ek hee kamare mein ek

limit hai ek kamare mein putaee karane mein adhik se adhik do log teen log isase adhik putaee vaale nahin kaam kar sakate arthaat ek nyoonatam avadhi to hogee hee. Ham 100 logon ko lagaakar 1000 logon ko lagaakar kshan mein putaee nahin kar sakate. To is baat ko bhee dhyaan mein rakhana hota hai ki aavantit sansaadhan kitane hain. Phir sansaadhanon kee utpaadakata kya hai? Har vyakti har machine ek hee tareeke se utpaadakata nahin detee. Ek excavator hoga vah 1 ghante mein 100 cubic meter excavate kar dega. Doosara excavator ho sakata hai 50 cubic meter hee excavate kare to usakee utpaadakata kya hai. Usee prakaar kaary bal mein bhee yadi hamaare karmachaaree nae hain to unako kaary ko seekhane mein samay lagata hai to unakee utpaadakata kam hotee hai. Dheere-dheere jab vah seekh jaate hain paripakv ho jaate hain to unakee utpaadakata badh jaatee hai to is parimaan aur is maatra kee gatividhi karane mein vah kam samay lete hain isaka dhyaan bhee rakhana hoga. Phir baat aatee hai paraspar nirbharata kee ek gatividhi aur doosaree gatividhi mein kya sambandh hai? Kya ham chunaee ko khudaee ke pahale kar sakate hain? Kya ham concrete kee foundation ya neenv khudaee se pahale daal sakate hain? Yah nahin ki nahin daal sakate hain yadi ham precast concrete karana chaahen, to haan ham concrete kee foundation kaheen par bhee banaakar rakh sakate hain aur jab khudaee pooree ho jaegee tab hamen un foundations ko install karana hoga. To yah technology bhee aavashyak hai ki ham kin technology ko use karenge usake anusaar ham use gatividhi ko samajhen aur usamen dekhen ki kitana samay lagega. To samay jo 4 din aur 6 din kee baat ho rahee thee vah itanee aasaanee se nahin nikalata, usake lie tamaam cheejen hamaare back end par dimaag mein hotee hai aur unake aadhaar par hee ham is gatividhi mein kitana samay lagega isaka aakalan karate hain. Aur ant mein baat aatee hai anishchitata kee. Agar nirmaan kaary Kanapur jaisee jagah mein joon ya July mein ho raha hai, to varsha hone kee sambhaavana adhik hai. Yahee kaary agar April mein ho raha hai to shaayad varsha hone kee sambhaavana kam hai. To kya hamaaree koee bhee gatividhi karane mein varsha ka koee sambandh nahin hoga? Avashy hoga arthaat jab ham kahate hain ki is gatividhi mein 4 din lagenge to ham us anishchitata ko kaise account for karate hain kaise apane calculation mein lete hain is baat ko bhee dhyaan mein rakhana hoga. To jab in tamaam baaton ko ham dhyaan mein rakhate hain tabhee ham project kee avadhi to door kisee bhee gatividhi kee avadhi ka aakalan kar sakate hain is baat kee charcha is module mein vistaar se kee jaegee. To aaj kee baat samaapt karane se pahale main is module mein jo lecture hamaare honge unake vishayon par thodee see charcha kar len.

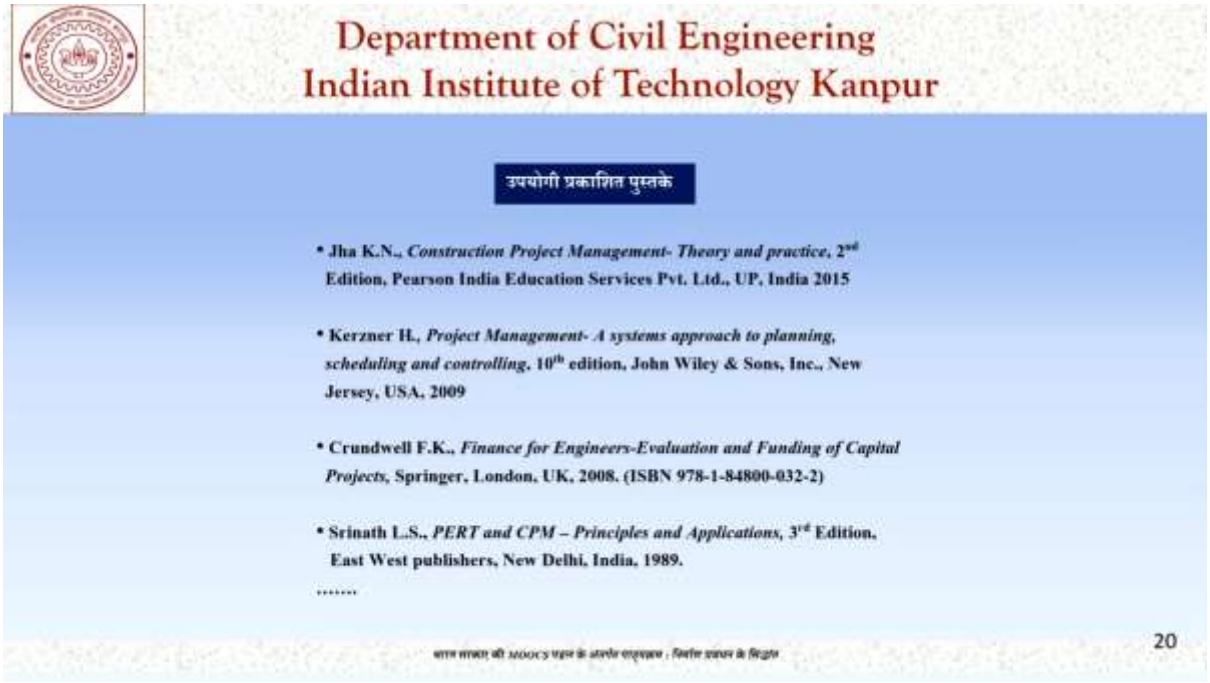
(Reference Time 32:31)



To planning evan scheduling ka parichay jo ki aaj ham logon ne poora kiya. Project scheduling mein network ka upayog. To network ka upayog ham kis prakaar kar sakate hain yah ham log charcha karenge. Critical path aur gatividhiyon kee avadhi mein anishchitata, is baat par bhee ham log dhyaan denge ki ham tamaam gatividhiyon ko kis prakaar kriyaanvit karen taaki ham kam se kam samay mein us project ko poora kar saken isake lie jahaan tak critical path ya anishchitata ka savaal hai jahaan par ki part aa jaega PERT, jisako English mein kahate hain Project Evaluation and Review takaneek. Do cheejen ham dhyaan mein rakhenge ek hai gatividhiyon kee paraspar nirbharata aur doosaree hai unamen anishchitata. Baar chart ka upayog, network kee crashing. Yah crashing ka jo concept hai vah aata hai avadhi aur laagat in do concepts ko jodakar. Agar kaha jae ki yah project 10 din mein poora hoga aur prashn kiya jae ki jo 4 din aur 6 din kee baat ho rahee thee, kya ek gatividhi 4 kee jagah 3 aur doosaree gatividhi 6 kee jagah 5 din mein pooree kee ja sakatee hai? Ho sakata hai uttar ho haan, lekin ek-ek din kam karane ke lie hamen adhik sansaadhan lagaane honge. Un adhik sansaadhanon ko lagaane mein kitana vyay hoga? Kya vah vyay justified kiya ja sakata hai?

Pahale bhee hamane baat kee thee ki ham samay ko praathamikata den ya ham laagat ko praathamikata den. Agar hamen samay ko praathamikata denee hai, to ham kahenge agar hamaaree total cost badhatee bhee hai to ham usako 8 din mein ya 9 din mein poora karana chaahenge. Lekin kabhee-kabhee aisa bhee hota hai ki agar ham kuchh gatividhiyon mein sansaadhan badhaakar usamen adhik cost lagaakar bhee hamaaree overall cost (kul laagat) kam ho sakatee hai yah kaise hota hai isaka uttar jab ham crashing par charcha karenge tab aaega lekin tab tak aap usake baare mein vichaar kar sakate hain. Samay agar bacha to ham log charcha karenge rin ke punarbhugataan par. Nirmaan pariyojanaon mein sansaadhan prabandhan par. Sansaadhanon ke stareekaran evan aavantan arthaat resource leveling and allocation project kee nigaraanee evan niyantran pranaalee par. Yah outline hai hamaare is module kee.

(Reference Time 34:57)



Aur kuchh upayogee prakaashit pustaken yah list yahaan dee gaee hai aur isase aap is lecture mein hee nahin balki is paathyakram mein cover kie jaane vaale vibhinn vishayon par adhik jaanakaaree haasil kar sakate hain. Namaskaar. Jay hind.