

<b>INSTITUTE</b>	<b>FACULTY OF TECHNOLOGY</b>
<b>PROGRAM</b>	<b>BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)</b>
<b>SEMESTER</b>	<b>6</b>
<b>COURSE TITLE</b>	<b>ADVANCED CONSTRUCTION TECHNOLOGY</b>
<b>COURSE CODE</b>	<b>01CI1614</b>
<b>COURSE CREDITS</b>	<b>3</b>

**Objective:**

- 1 Explain the limitations of conventional methods and the need for advanced construction technologies.
- 2 Introduce modern methods such as high-rise, prefabrication, precast, and specialized construction techniques.
- 3 Familiarize students with mechanization, automation, and digital technologies used in construction
- 4 Develop the ability to apply sustainable and innovative practices in complex construction projects

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Compare conventional and advanced construction methods in terms of time, cost, quality, and safety.
- 2 Apply advanced techniques in high-rise, prefabricated, and precast construction.
- 3 Demonstrate the use of mechanization, automation, and digital tools such as BIM and drones in construction projects.
- 4 Evaluate sustainable and innovative technologies for their applicability to real-world construction challenges.

**Pre-requisite of course:** Building Construction Technology

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	0	0	50	30	20	25	25

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Introduction to Advanced Construction</b> Overview of conventional vs. advanced construction methods: Limitations of traditional methods (time, cost, safety, quality), Need for advanced technology & Emerging Trends in Construction: Mechanization, digitalization, automation, Smart and sustainable construction., Criteria for Selecting Technology/Equipment: Project scale, cost-benefit analysis, Availability of skilled labor, environmental conditions & Case Studies: Metro rail projects, High-rise towers (Burj Khalifa).	2
2	<b>Construction of Highrise Building</b> Introduction to high rise building, establishing site, deep excavation, earth support system., Formwork, common construction equipment for excavation, concreting and lifting, Concrete placement and curing techniques, floor by floor construction method, in-situ prestressing in high rise structures, structural glazing.	6
3	<b>Prefabrication and Precast Technology</b> Need, Advantage and disadvantages, Modular Construction: Container-based housing, Prefab modular classrooms & hospitals, Disaster relief shelters., Prefabrication Systems: Structural prefabrication (frames, trusses), Non-structural prefabrication (facades, partitions), Advantages: speed, quality, waste reduction., Precast Concrete Elements: Slabs, beams, columns, wall panels, Manufacturing process in precast yards, Transportation and erection challenges., Connection Methods in Precast Structures: Bolted connections, Welded joints, Grouted & dry connections.	5
4	<b>Specialized Construction Techniques</b> Construction aspects and procedures of specialized construction techniques like box pushing., Diaphragm walls, reinforced wall, gabion wall, ground water control techniques, pipe lying., Vacuum dewatering-finishing & curing methods, 3D Printing in Construction: Printing methods (extrusion, powder-bed), Materials used: geopolymers concrete, special mixes, Case studies (ICON homes, Apis Cor houses).	10
5	<b>Mechanization and Automation in Construction</b> Bridge Construction: Types, bridge construction methods: in-situ and pre-cast construction methods, balanced cantilever methods, span-by-span method, incremental launching method, Tunnel Construction: Site investigation and geological studies, drilling, pneumatic breakers, explosives, blasting, tunneling technology: mechanized, shield, micro, special methods; hazards and safety, trenchless techniques, Offshore Construction: Equipment, crane barges, derrick barges, drilling vessels; underwater construction; stages of offshore structure, construction, facilities and methods of fabrication, Robotics in Construction: Robotic bricklaying (SAM, Hadrian X), Robotic welding & demolition, Digital Technologies: Drones for surveying, monitoring, AI in construction management (predictive analytics), BIM (Building Information Modelling), 3D, 4D (time), 5D (cost), 6D (sustainability), Digital Twin technology for lifecycle monitoring	14

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
6	<b>Pile Foundation, Caisson &amp; Cofferdam</b> Pile Foundation: Classifications of piles, Types of piles, Pile accessories and tools, Pile driving methods, Failure or settlement of piles, Caisson: Caisson Definition, uses, Types of caisson, Cofferdam: Types, requirements, Selection criteria, Design features, Introduction to Caissons	5
<b>Total Hours</b>		<b>42</b>

### Textbook :

- 1 Sustainable Construction Technologies: Life-Cycle Assessment, Vivian W.Y. Tam; Khoa N. Le, Elsevier; Butterworth-Heinemann, 2019

### References:

- 1 Sustainable Nanomaterials for the Construction Industry, Sustainable Nanomaterials for the Construction Industry, Ghasan Fahim Huseien, Kwok Wei Shah, CRC Press, 2022
- 2 Building Construction, Building Construction, Gurucharan Singh, Amit Publisher and Distributors, 2019

### Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
5.00	10.00	30.00	30.00	15.00	10.00

### Instructional Method:

- 1 At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- 2 Lectures will be taken in class room with the use of multi-media presentations, white board– mix of both.
- 3 Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- 4 Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation
- 5 Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- 6 Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.

**Supplementary Resources:**

- 1 <https://www.radhatmt.com/blog/advanced-construction-techniques-builder-should-know/>
- 2 <https://www.mooc-list.com/tags/construction>
- 3 [https://onlinecourses.nptel.ac.in/noc22\\_ce58/preview](https://onlinecourses.nptel.ac.in/noc22_ce58/preview)
- 4 <https://www.coursera.org/courses?query=construction>