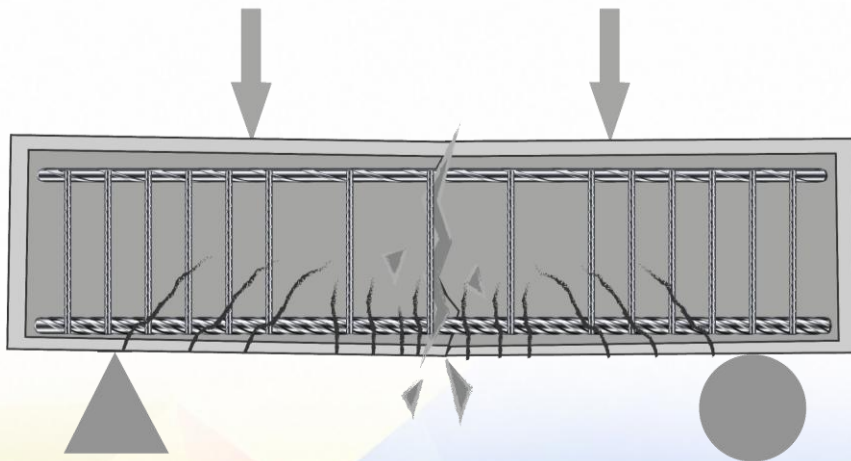


RULEBOOK

SEASON 3



FLEXURE FURY

Welcome to “**Flexure Fury**”, an engineering challenge designed to push the boundaries of structural design, material science, and mechanical testing. In civil engineering, a structure’s ability to resist bending forces without catastrophic failure is one of the most critical design parameters. Flexure Fury challenges participants to transform theoretical mechanics of materials into high-performance physical structures capable of withstanding the ultimate bending moment.

Objective:

This initiative aims to integrate theoretical reinforced concrete design with practical fabrication by challenging students to design and cast a high-performance rectangular reinforced beam that achieves maximum flexural load through sound engineering design and quality workmanship.

Eligibility:

- Each team shall consist of a **maximum of 3 members**.
- **Cross Institutional** team is **not allowed**.
- Each team must involve a **faculty advisor** as their supervisor.
- **Participants must remain undergraduate students until 1 January 2027. Anyone whose undergraduate student status ends before this date will not be eligible to participate.**
- Participants must carry a valid university ID card for verification.
- Teams must register by the announced deadline via the official CEvilization registration portal.
- Each university may send multiple teams, provided they are registered separately.
- A faculty advisor may **supervise** multiple teams.
- Team names should be **unique and professional**.

Materials:

- **Cement:** Portland Cement per **ASTM C150 / C150M**.
- **Aggregates:** Crushed stone (coarse) and natural sand (fine) per **ASTM C33/C33M**.
- **Reinforcement:** **#3** deformed bars as longitudinal reinforcement and **#3** or smaller deformed bars as shear reinforcement per **ASTM A615/A615M**.
- **Admixtures:** Any kind of strength-enhancing additive or chemical admixture is allowed.
- **Water:** Potable water meeting **BNBC/ASTM** standards.

Additive Support: Specialized materials (e.g., chemical admixtures, silica fume, fly ash) can be supplied by the organizing committee on a payment basis upon prior request.

Additional Materials:

- Any material that may enhance the strength of concrete can be used only with proper documentation and prior declaration.
- Polymer fiber and steel fiber may be used as concrete ingredients.

Prohibited Materials: Any reinforcement beyond the specified #3 rebar is strictly prohibited, such as structural steel shapes, wire mesh, post-tensioning tendons, external fiber wraps (CFRP/GFRP), and epoxy-based structural bonding agents.

Rules and regulations:

❖ **Geometry:**

- The beam shall be **36" long**. The dimensional tolerance is $\pm 1/2"$.
- The beam must weigh no more than **50 pounds**.
- The section may be used according to design.

❖ **Casting Procedure:**

- Each team must cast their reinforced concrete beam at their respective university campus under the supervision of a faculty advisor.
- The casting process must be properly documented with photos and short clips as evidence of authenticity.
- Each team shall prepare one reinforced concrete beam for testing.
- Also, each team must cast three **4 in. × 8 in. cylinders** for the concrete cylinder test report.
- All specimens must be cured for **28 days** before testing.

❖ **Design and Documentation:**

- RC beams must be designed and detailed per **BNBC 2020 or ACI 318-08**.
 - Beam section Design.
 - Reinforcement Detailing.
 - Target Strength and theoretical calculations.
 - Material cost breakdown and total mix **cost per m³**.
- Each team must prepare **three reports**:
 - Beam Design and Detailing Report (covering items **i to iv** above)
 - Concrete Mix Design Report.
 - Concrete Cylinder Test Report.

- **Reports 1 and 2** must be submitted online within 10 days of casting.
- Hard copies of all three reports (**Reports 1, 2, and 3**) must be submitted on the day of the competition.
- A cost-performance ratio will be considered during evaluation to encourage economical design.
- The submitted design & other documentation must be signed by the team leader and faculty advisor.

Curing and Storage

- Cylinders must be cured using standard water curing methods (submerged or moist curing) at normal temperature. Curing at elevated pressure or temperature is prohibited.
- Teams must ensure the specimens are properly labeled with team name/code and casting date.
- Teams are responsible for transporting the beam safely to the venue.

The testing process

- The RC beam's dimensions (cross-section, length, and weight) will be measured before testing.
- Testing will be conducted during the competition day using a Flexure Testing Machine **at DUET campus** under the supervision of the Technical Committee.
- The flexural test will be conducted using the Third-Point Loading Method. A stiff spreader beam apparatus will divide the machine load (P) into two equal concentrated **point loads ($P/2$)**, applied at the exact **one-third points** of the clear span of the RC beam.
- A small seating load of **1 kN (approx. 200 lbs.)** will be applied to ensure uniform contact along all bearing plates, and monotonic, shock-free continuous loading will be applied until ultimate structural failure occurs.
- The Ultimate Load will be recorded as the maximum load achieved before failure.
- Teams must be present during the testing session.

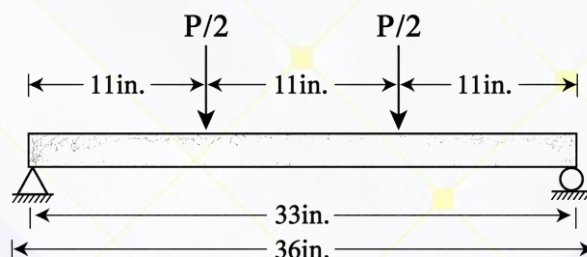


Fig: Beam Support and Loading Configuration

Evaluation:

Category	Mark	Formula	Notation
Flexural Capacity	50	$S_{flex} = 50 \times \frac{P_{team}}{P_{max}}$	P_{team}: Ultimate load sustained by the team's beam (kN) P_{max}: Highest ultimate load achieved among all participating teams (kN) C_{beam}: Total material cost of the single beam specimen in BDT (concrete ingredients + steel rebar)
Cost Economy	15	$S_{eco} = 15 \times \frac{E_{team}}{E_{max}}$ $E_{team} = \frac{P_{team}}{C_{beam}}$	E_{team}: Load-to-cost ratio (kN/BDT) E_{max}: Highest load-to-cost ratio among all teams.
Strength-to-Weight Efficiency	15	$S_{eff} = 15 \times \frac{\eta_{team}}{\eta_{max}}$ $\eta_{team} = \frac{P_{team}}{W_{beam}}$	W_{beam}: Total measured weight of the beam specimen before testing (kg) h_{team}: Strength-to-weight ratio (kN/kg) h_{max}: Highest strength-to-weight ratio among all teams.
Technical Report & Design	10	Submitted report evaluation	
Viva	10	Oral defense	

Final Score Calculation:

$$\text{Total score} = S_{flex} + S_{eco} + S_{eff} + S_{rep} + S_{viva}$$

$$\text{Final score} = \text{Total score} - \text{Penalty}$$

Penalties and disqualification:

❖ Penalties (Score Deductions):

➤ Points will be deducted directly from the total score:

- Dimensional Non-Compliance:** 5-mark deduction if beam length falls outside 35.5 in. – 36.5 in. (36 in. $\pm$ 0.5 in.).
- Overweight:** 2-mark deduction per lb. exceeding the 50 lbs. limit.

- iii. **Damaged / Cracked Specimen:** 5-mark deduction for beams with visible structural cracks, chipped edges, or severe honeycombing before testing.
- iv. **Over-Age Specimen:** 2-mark deduction per day for specimens older than 32 days on testing day.
- v. **Elevated Curing Violation:** 10-mark deduction if accelerated curing (heat, steam, or high-pressure systems) is detected.
- vi. **Late Documentation:** 2-mark deduction per day of delay for late submission of reports, mix design records, or faculty advisor endorsements.

Disqualifications (Immediate Rejection):

- ❖ **A team or specimen will be disqualified without testing only for:**
 - **Academic Dishonesty:** Providing forged, fabricated, or deliberately misleading data in reports or mix sheets.
 - **Unauthorized Materials:** Using prohibited internal or external reinforcement (such as structural steel shapes, wire mesh, post-tensioning tendons, fiber wraps, or epoxy bonding agents).
 - **Absenteeism:** Failure of at least one student team member to be present during official check-in or testing.
 - **Ineligible Enrolment:** Any team member not actively enrolled as an undergraduate student on the competition day.

IMPORTANT DATES:

Topic	Date	Medium/Venue
Registration Starts	20 October, 2026	Online
Workshop on Flexure Fury	will be announced	Online
Casting of Specimens	29 November, 2026	On Campus
Video Submission	12 December, 2026	Online
Report submission	12 December, 2026	Online
Cylinder Test	28 December, 2026	On Campus
Specimen test	01 January, 2027	DUET Campus

- The specified casting date is the earliest allowable date. Teams may cast their specimens **after** this date at their own discretion (which may result in lower strength due to shorter curing time). However, casting **before** this date will incur the penalty.

Prize Pool

- Prizes will be awarded to the **Champion, 1st Runner-up, and 2nd Runner-up** based on their final scores.
- The total prize pool is **BDT 50k+**, distributed as follows:

Champion	:	BDT 25k
1st Runner-up	:	BDT 15k
2nd Runner-up	:	BDT 10k
- The winners of the **Flexure Fury** segment will receive a **Gorgeous Crest and a Certificate**.

N.B. The rules and guidelines stated above are **subject to change** at the discretion of the organizing committee. Participants are advised to **check official announcements** regularly for any updates or changes.

Registered Participants will receive →

- Event Kits [T-Shirt + Merchandise + ID Card]
- Breakfast and Lunch
- Participation Certificate
- Transport Facilities (Specific Routes)

REGISTRATION PROCESS:

Registration Fee	: 1,800 BDT/Team
Payment Method	: Online payment gateway via the official website.
Registration Link	: https://ascechapter.duet.ac.bd/cevilization/22
Registration Deadline	: Will be announced
Event Date	: January 1, 2027 (Friday)

For Further Queries

Segment In-charge	: Md. Naziur Rahman Santo
Phone No.	: 016226184408
Email	: naziur.me@gmail.com
Segment In-charge	: M. Majharul Hasan
Phone No	: 01706-965700
Email	: majharul103304@gmail.com

For More Updates

Website	: https://ascechapter.duet.ac.bd/cevilization
Facebook Page	: www.facebook.com/cevilization.duet
Email	: cevilizationduet@gmail.com