K. S. INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU, Approved by AICTE

Department of Mechanical Engineering

FIRST / SECOND SEMESTER SYLLABUS

Course : **Building Science And Mechanics**		Semester	I/II
Course Code	**25BESC104A / 204A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course Objectives (Course Skill Set)

1: To introduce students to the fundamentals of building science, civil engineering fields, and basic construction materials and their applications in practice

2: To develop awareness of sustainable building practices, emerging materials, and green building rating systems for environmentally responsible construction.

3: To impart knowledge of basic engineering mechanics concepts such as force systems, resolution and composition of forces, and their applications through problem-solving

4: To enable students to analyze equilibrium conditions, draw free body diagrams, and determine support reactions in statically determinate structures.

5: To train students in determining centroids of simple and composite plane figures using analytical methods and apply the concept to basic structural elements.

Module-1

Introduction to building science:

Importance and Scope of various fields of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management.

Basic Materials of Construction: Types and Uses of Bricks, Stones, Cement, Structural Steel, Wood and Concrete.

Structural Elements of a Building: Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.

Number of Hours:8

Module-2

Sustainable Built Environment: Emerging materials: Types and Uses of Autoclaved Aerated Concrete (AAC) blocks, Bamboo, Recycled plastics, Material selection criteria, Durability, Sustainability, Smart City concept.

Green Building : Green building materials and rating systems IGBC, LEED, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weightage.

Number of Hours:8

Module-3

Force Systems: Concept of idealization, System of forces, Principles of transmissibility of a force, Resolution and composition of forces, Law of Parallelogram of forces, Concurrent and non-concurrent coplanar force systems, Moment of forces, Couple, Varignon's theorem: Numerical examples.

Number of Hours:8

Module-4

Equilibrium and Support Reactions

Free body diagram, equations of equilibrium, Lami's Theorem, Equilibrium of Coplanar Concurrent and Non -concurrent force systems: Numerical examples. Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures (Definitions with examples only), Support reactions: Numerical examples on Statically determinate beams.

Number of Hours:8

Module-5

Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle and quadrant of a circle using method of integration, centroid of composite areas and simple built up sections: Numerical examples.

Number of Hours:8

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

CO1: Identify the scope of different fields of Civil Engineering and **describe** basic construction materials and building components.

CO2: Explain the principles of sustainability in construction, including the use of emerging and green building materials, and **interpret** rating systems such as IGBC, LEED, and GRIHA.

CO3: Apply the principles of force systems to **analyze** the resolution, composition, and moments of forces using engineering mechanics concepts.

CO4: Demonstrate the ability to draw free body diagrams, **analyze** equilibrium conditions, and **compute** support reactions for statically determinate beams.

CO5: Calculate the centroid of simple and composite plane areas using integration methods and **apply** the concept in analyzing structural elements.

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year) Text Books:

Textbooks:

1. Rangwala, Building Construction,33rd Edition, 2016, Charotar Publishing House Pvt. Ltd., ISBN-10 : 9385039040, ISBN-13 : 978-9385039041
2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 3rd Edition, 2015, Laxmi Publications, ISBN: 9789380856674.
3. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 11th Edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896

Reference books / Manuals:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers: Statics and Dynamics, 4th Edition, 1987, McGraw Hill, ISBN: 9780070045842
2. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–6th Edition,2008, Wiley publication.
3. Irving H. Shames, Engineering Mechanics-Statics and Dynamics, 4th Edition, 2002, Prentice-Hall of India(PHI)
4. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press, New Delhi
5. Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, 5th Edition, 2017,McGraw Hill Publisher, ISBN: 9781259062667
6. Bhavikatti S S, Engineering Mechanics, 4th Edition, 2018, New Age International Publications.
7. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 3rd Edition 2013, BS Publications.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT

- https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2
- https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
- https://www.youtube.com/watch?v=3YBXteL-qY4
- https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
- https://www.youtube.com/watch?v=ksmsp9OzAsI • https://www.youtube.com/watch?v=x1ef048b3CE
- https://www.youtube.com/watch?v=l_Nck-X49qc
- https://www.youtube.com/watch?v=R8wKV0UQtlo
- https://www.youtube.com/watch?v=0RZHHgL8m_A
- https://www.youtube.com/watch?v=Bls5KnQOWkY

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA):

CCE will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.

Learning Activity : Case Study Presentation **(25 Marks)**)

Rubrics for Learning Activity:

Case Study Presentation (25 Marks)

Case Study topic should relate to key learning area from the syllabus and allow exploration of practical applications, challenges, and innovations relevant to engineering education and industry.

Performance Indicators	Excellent	Good	Satisfactory	Needs Improvement	Poor
Understanding of Case (5 Marks) (PO 1)	Demonstrates deep understanding **(5)**	Good understanding **(4)**	Adequate understanding. **(3)**	Limited understanding **(2)**	No clear understanding. **(0-1)**
Analysis & Critical Thinking (10 Marks) (PO 2)	Thorough, logical analysis with strong reasoning and innovative insights. **(9-10)**	Clear analysis with mostly logical reasoning. **(7-8)**	Basic analysis with some reasoning gaps. **(5-6)**	Weak analysis; mostly descriptive without reasoning. **(3-4)**	No clear analysis or reasoning. **(0-2)**
Documentation & Presentation Skills (10 Marks) (PO 9)	Documentation is complete, accurate, well structured, follows all formatting guidelines. Well-structured,	Documentation is mostly complete and accurate, well organized, follows formatting guidelines with	Documentation covers most required elements but has some inaccuracies or omissions. Average	Documentation is incomplete with noticeable inaccuracies. Poor organization;	Documentation is largely missing or irrelevant, lacks structure.

	clear, confident delivery; excellent visuals. **(9-10)**	minor deviations. Good structure, clear delivery; visuals mostly effective. **(7-8)**	structure; delivery clear but lacks engagement. **(5-6)**	visuals unclear. **(3-4)**	Unclear, disorganized presentation. **(0-2)**
Q&A Handling (5 Marks) (PO 9)	Confident, accurate, and concise responses. **(5)**	Good responses with minor gaps. **(4)**	Adequate responses; some uncertainty. **(3)**	Weak or hesitant responses. **(2)**	Unable to answer questions. **(0-1)**

Suggest Innovative Deliver Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play