BUILDING SCIENCE AND MECHANICS		Semester	I/II
Course Code	**1BESC104A/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	3	Exam Hours	3
Examination type (SEE)	**Theory**		

Course outcomes

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

CO1: Explain the fundamental concepts of building science, disciplines of civil engineering, construction materials, and structural elements of buildings.
CO2: Evaluate the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems.
CO3: Apply the principles of force systems and equilibrium to determine support reactions.
CO4: Locate the centroid of simple and composite plane areas using first principles.

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:08

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:08

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:08

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:08

Module-5 (08 Hours)

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.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals)

Text books:

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:

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

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- https://www.youtube.com/watch?v=Zrc_gB1YYS0
- https://www.youtube.com/watch?v=Hn_iozUo9m4

Teaching-Learning Process (Innovative Delivery Methods)

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. Flipped class
2. Chalk and talk
3. NPTEL and other videos for theory topics
4. Partial Delivery of course by Industry expert/ industrial visits
5. ICT-Enabled Teaching
6. Individual teachers can device innovative pedagogy to improve teaching-learning

Assessment Structure: (Both CIE and SEE)

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 Evaluation (CCE):

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 -1: (Marks- __)

Learning Activity -2 (optional):: (Marks- __

Rubrics for Learning Activity(Based on the nature of the learning activity, design the rubrics for each activity) :

	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator-1(CO/PO Mapping)					
Performance Indicator-1(CO/PO Mapping)					
…					
Performance Indicator-n(CO/PO Mapping)					

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

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

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