

**I/II Semester
(CV Stream)**

BUILDING SCIENCES AND MECHANICS

Course Code: ESC131/231

Credits: 3:0:0

Prerequisites: NIL

Contact Hours: 45L+45S

Course Coordinators: Dr Basavana Gowda GM

Unit I

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, Fine and Coarse aggregates, Structural Steel, Wood and Concrete.

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

- Pedagogy / Course delivery tools: ➤ Chalk and talk
- Links: ➤ Introduction: <https://a.impartus.com/ilc/#/video/id/534326>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/video/id/536441>

Unit II

Sustainable Built Environment:

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

Green Building: Concept of HVAC, 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.

- Pedagogy / Course delivery tools: ➤ Chalk and talk
- Links: ➤ <https://www.cedengineering.com/userfiles/Leed%20Rating%20System.pdf>
- Impartus recording: ➤ <https://www.mapleridge.ca/1780/Sustainable-Building-Features>

Unit III

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.

Equilibrium of concurrent Force system: Free body diagram, equations of equilibrium, Lami's Theorem, Numerical examples.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power Point Presentation, videos
- Links: ➤ Introduction to Engg. Mechanics
<https://a.impartus.com/ilc/#/video/id/532408>
- Impartus recording: ➤ Resultants - <https://a.impartus.com/ilc/#/video/id/537603>

Unit IV

Equilibrium of non-concurrent Force system:

Equilibrium of Coplanar 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.

Pedagogy / Course ➤ Chalk and talk, Power Point Presentation, Videos
delivery tools:

Links: ➤ <https://a.impartus.com/ilc/#/video/id/550330>

Impartus recording: ➤ <https://a.impartus.com/ilc/#/video/id/550330>

Unit V

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.

Moment of Inertia of plane Areas: Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration, Numerical examples.

Pedagogy / Course ➤ Chalk and talk
delivery tools:

Links: ➤ Centroid: https://www.youtube.com/watch?v=QK_TuE2lfSc

➤ Moment of Inertia:
<https://www.youtube.com/watch?v=BlS5KnQOWkY>

Impartus recording: ➤ <https://www.youtube.com/watch?v=BlS5KnQOWkY>

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
4. M N Shesha Prakash And Ganesh B Mogaveer, Elements Of Civil Engineering And Engineering Mechanics, 3rd Edition, Phi Learning ., ISBN: 978-8120350014

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.

Course Outcomes

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

1. Explain the fundamental concepts of building science, disciplines of civil engineering, construction materials, and structural elements of buildings.(PO-1,PO-6)
2. Describe the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems.(PO-1,PO-6)
3. Apply the principles of equilibrium for Coplanar Concurrent force systems.(PO-1,2,3)
4. Compute the support reactions using Conditions of Equilibrium. .(PO-1,2,3)
5. Determine the centroid and Moment of Inertia of simple and composite plane areas using first principles. .(PO-1,2,3)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	Marks	Course outcomes addressed
Internal test – I	30	CO1,CO3,CO4
Internal test – II	30	CO2,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	Marks	Course outcomes addressed
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

ENGINEERING MECHANICS

Course Code: PSCCV24

Credits: 3:0:0

Prerequisites: NIL

Contact Hours: 45L+45S

Course Coordinators: Dr. Santhosh D

Unit I

Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management.

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

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

- Pedagogy / Course delivery tools: ➤ Chalk and talk
- Links: ➤ Introduction: <https://a.impartus.com/ilc/#/video/id/534326>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/video/id/536441>

Unit II

Coplanar force system: Basic dimensions and units, Idealisation, Force, Classification of force system, principle of transmissibility of a force, Composition and resolution of forces, Free body diagrams, Resultant of coplanar concurrent and non-concurrent force system, Moment, Couple and Characteristics of couple, Varignon's theorem: Numerical Examples.

- Pedagogy / Course delivery tools: ➤ Chalk and talk
- Links: ➤ Introduction to Engg. Mechanics
<https://a.impartus.com/ilc/#/video/id/532408>
- Impartus recording: ➤ Resultants - <https://a.impartus.com/ilc/#/video/id/537603>

Unit III

Equilibrium: Conditions of static equilibrium, Equilibrium of coplanar concurrent force systems,

Equilibrium of coplanar non-concurrent force system, Numerical examples. Types of supports, loadings and beams, Concept of statically determinate and indeterminate beams. Support reactions for statically determinate beams subjected to various loadings: Numerical examples.

- Pedagogy / Course delivery tools: ➤ Chalk and talk, Power Point Presentation, videos
- Links: ➤ <https://a.impartus.com/ilc/#/video/id/550330>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/video/id/550330>

Unit IV

Friction: Introduction, Types of friction, Concept of static friction, Kinetic (Dynamic) friction, Laws of friction, Angle of repose, Cone of friction, Equilibrium of blocks on horizontal and inclined plane, Ladder friction: Numerical examples.

- Pedagogy / Course ➤ Chalk and talk, Power Point Presentation, Videos

delivery tools:

Links: ➤ <https://www.youtube.com/watch?v=AlenFWwK3Ek>

Impartus recording: ➤ <https://www.youtube.com/watch?v=AlenFWwK3Ek>

Unit V

Centroid: Introduction, definitions of centroid and Centre of Gravity. Axes of symmetry, Locating the centroid of square, rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, Centroid of composite areas and simple built- up sections: Numerical examples.

Moment of Inertia of plane Areas: Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration. Moment of inertia of square, rectangular, triangular and circular areas from the method of Integration, Moment of inertia of composite areas and simple built-up sections: Numerical Examples.

Pedagogy / Course ➤ Chalk and talk

delivery tools:

Links: ➤ Centroid: https://www.youtube.com/watch?v=QK_TuE2lfSc

➤ Moment of Inertia:
<https://www.youtube.com/watch?v=Bl55KnQOWkY>

Impartus recording: ➤ <https://www.youtube.com/watch?v=Bl55KnQOWkY>

Text books:

- 1 Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674.
- 2 Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, Eleventh 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, Fourth edition, 1987, McGraw Hill, ISBN: 9780070045842.
- 2 Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition, 2008, Wiley publication.
- 3 Irving H. Shames, Engineering Mechanics-Statics and Dynamics, fourth edition, 2002, Prentice-Hall of India(PHI).
- 4 Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, fourteenth edition, 2017, Pearson Press, New Delhi. ISBN: 9789332584747.
- 5 Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, fifth Edition, 2017, McGraw Hill Publisher, ISBN: 9781259062667
- 6 Bhavikatti S S, Engineering Mechanics, fourth edition, 2018, New Age International Publications.
- 7 Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, third edition 2013, BS Publications.
- 8 J K Gupta and S K Gupta, Engineering Mechanics and Applied Mechanics, first edition, 2021, Cengage learning. ISBN: 9789353505851.

Course Outcomes

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

1. Explain the various disciplines of civil engineering, construction materials, and building components. (PO-1, Po-6)
2. Apply the principles of equilibrium for force systems. (PO-1, 2, 3)

3. Compute the reactions using Conditions of Equilibrium. (PO-1,2,3)
4. Apply the principles of friction for various Civil Engineering problems. (PO-1,2,3)
5. Determine the centroid and Moment of Inertia of simple and composite plane areas using first principles(PO-1,2,3)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	Marks	Course outcomes addressed
Internal test – I	30	CO1,CO2,CO3
Internal test – II	30	CO3,CO4,CO5
Average of the two internal tests will be taken for 30 marks.		
Other components	Marks	Course outcomes addressed
Quiz	10	CO1,CO2,CO3
Assignment	10	CO3,CO4,CO5
Semester End Examination (SEE)	100	CO1,CO2,CO3,CO4,CO5

MECHANICS AND MATERIALS LABORATORY

Course Code: PSCLCV28

Credits: 0:0:1

Prerequisites: NIL

Contact Hours:30P

Course Coordinator: Dr Lakshmikanth S

Part-A

1. Verification of Lami's Theorem.
2. Equilibrium of concurrent forces.
3. Parallel force system- Simply supported beam.
4. Verification of Varignon's theorem.
5. Specific Gravity, Bulk Density & Water Absorption of
 - a) Fine aggregates.
 - b) Coarse aggregates.
 - c) Cement.
6. Sieve analysis of sand

Part-B

1. Field tests on cement.
2. Field tests on soil
3. Field tests on Brick.
4. Particle size distribution of soil - Gap graded, uniformly graded, well graded
5. Visual identification of building materials: Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes.

Text books:

1. Laboratory manual prepared by the Civil Engineering Department, RIT, Bangalore.
2. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi, ISBN-135551234001965.
3. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674
4. Ramamrutham.S, Engineering Mechanics, Dhanpat Rai Books, 2013,ISBN: 9789352164271.
5. Soil Mechanics and foundation Engineering by B C Punmia, Ashok kumar jain, Arun Kumar Jain, 18th edition, 2023, Laxmi Publications New Delhi.

Reference books / Manuals:

1. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication.
2. Rattan S.S., Strength of Materials, Third edition, 2017, McGraw Hill Education; New Delhi. ISBN- 13978-9385965517.
3. Bansal R K, Strength of Materials, Laxmi Publications. 2023, 4th Edition, ISBN:978-8131808146.
4. IS 4031 (Part 11):1988 – Specific gravity test for hydraulic cement.
5. IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete.
6. IS 2386(Part 3):1963 Methods of test for aggregates for concrete: Part 3 Specific

gravity, density, voids, absorption and bulking.

7. IS 2720 (Part 3/Sec 1):1980 – Determination of specific gravity of soil.
8. Relevant IS Codes.

Course Outcomes

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

1. Analyze coplanar force systems by analytical and graphical methods and verifying Lami's theorem.(PO-1,7,8)
2. Compute support reactions in simply supported beams experimentally and analytically. (PO-1,7,8)
3. Identify and understand the properties of various construction materials. .(PO-1,7,8)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50		
Assessment Tool	Marks	Course outcomes addressed
Weekly evaluation of laboratory reports after the conduction of every experiment.	30	CO1,CO2,CO3
Average of the two internal tests will be taken for 30 marks.		
Other components	Marks	Course outcomes addressed
Practical test 20	20	CO1, CO2, CO3
Semester End Examination (SEE)	50	CO1, CO2, CO3