



PROFICIENCY CERTIFICATION PROGRAM ON

STRUCTURAL ANALYSIS & DESIGN OPTIMIZATION: THEORY & PRACTICE

**Offered By: Centre for Continuing Education (CCE) - Indian
Institute of Science (IISc)**

PROFESIONAL
Certification

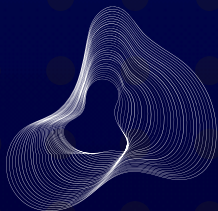
LIVE ONLINE
Delivery mode

JAN-MAY 2027
Proposed course period

ABOUT

Advanced research in material science to enhance the life of structures with reduced cost resulted in metal alloys, plastics, composites and nano materials.

Structural design and optimization of components with unusual shapes became possible with FEM software tools such as ANSYS, COMSOL, NASTRON, ABACUS, SYSNOISE, LSDYNA and MATLAB etc. The fundamental knowledge of stress, strain, shear and torsion in relation to the structures and S-N curves in relation to material fatigue life and failure analysis becomes important. The interpretation of the FEM software results necessitates the knowledge of structural system analysis and design optimization. Training engineers, scientists, entrepreneurs and instructors in industries, institutes and universities to optimally design structural systems for technically superior and commercially viable value-added products to achieve “EMPOWER INDIA WITH SKILL AND Knowledge” for “AATMANIRBHAR BHARAT ABHIYAN”.



COURSE COORDINATOR



Prof. S. B. Kandagal

Chief Research Scientist

Department of Aerospace Engineering

Indian Institute of Science (IISc)

His work spans structural dynamics, vibration and noise control, smart structures, experimental modal analysis, structural optimization, and piezoelectric energy harvesting. He has contributed to aerospace vibration analysis and control using piezoelectric sensors and actuators, published research papers, collaborated on sponsored projects, and mentored postgraduate and doctoral researchers

WHO SHOULD ATTEND?

Mechanical, Aerospace, Automotive, Industrial engineers, Civil, R & D Labs, Construction technologists, New product design and development groups, Entrepreneurs and Engineering college instructors. Professionals to pursue postgraduate and higher studies.

WHO CAN APPLY & BENEFIT?

BE, ME, MSc, AMIE, 3rd year and final year undergraduate students, engineers passionate about product design, structural analysis and design optimization



CURRICULUM

APPLIED MECHANICS & STRENGTH OF MATERIALS

- Applied mechanics and solid mechanics
- Stress and strain
- Constitutive laws
- Engineering materials and their properties
- Tension, compression, shear, and torsion
- Coupled structural systems
- Fatigue and S-N curves
- Shear-force diagrams (SFD), bending-moment diagrams (BMD), and axial-force diagrams (AFD)
- Mohr's circle
- Stability and structural failure theories

STRUCTURAL ANALYSIS AND DESIGN

- Structural analysis of members under tension, compression, shear, and torsion
- Beam design
- Torsion-member design
- Compression-member design
- Fastener design: pins, bolts, rivets, and welds

- Composite materials: properties, applications, and role in structural design optimization
- Design methods for practical structures, supported by worked examples

PRODUCT DESIGN, DEVELOPMENT, AND TESTING

- Product design and development procedures
- Structural testing under static and dynamic loading
- Crash, shock, and vibration analysis
- Design principles for scaled rigid models
- Design principles for aeroelastic models

ENGINEERING OPTIMIZATION

- Optimization principles and terminology
- Formulation of objective functions and design constraints
- Classification of optimization problems
- Single-variable and multivariable optimization
- Optimization with equality and inequality constraints
- Practical optimal-design examples for structures and subsystems

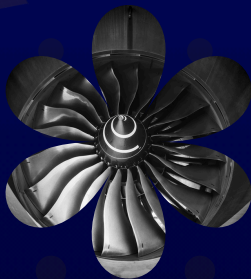
DESIGN OPTIMIZATION CASE STUDIES

- Brake drum
- DWR/tracking ground and ship-borne antenna (Indian Patent)
- Sluice valve
- Cup anemometer
- Hydraulic crawler drilling machine
- Car window regulator
- Metal-composite sprocket
- Super-insulated thermal box
- Impeller
- Box culverts (US Patent)



FAILURE ANALYSIS CASE STUDIES

- Turbine blades
- Power-plant bed plate
- Piston drill bit
- Raiser arm
- Induction ladle



FIELD, STABILITY, & IMPACT STUDIES

- Field audit of a 275-multi-flue chimney
- Vehicle impact and collision analysis
- Stability analysis of a 250 cc motorcycle
- Trainer-aircraft model studies
- Aeroelastic model studies for reusable launch vehicles, chimneys, & crew modules

SPECIALIZED DESIGN PROJECTS

- Bonnell spring with coir for mattress design
- Six-degree-of-freedom (6-DOF) internal/external force balance
- TDEM underslung system
- Antivibration mount (AVM) design optimization for:
 - i. Large blast-hole drilling equipment
 - ii. Washing machines
 - iii. Engines
- Centre-of-gravity (CG) estimation rigs for UAVs, MAVs, and drones



COURSE DETAILS

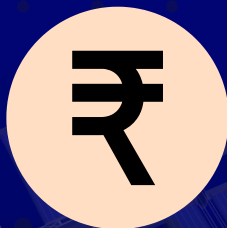
Course Fee: ₹10,000

Application Fee: ₹500

GST: 18%

Total Fee: ₹12,390

(including GST)



Start Date: 23rd Jan 2027

Duration: Jan – May 2027

Mode: Online

Class Days: Every Saturday

Timings: 12 - 2 PM



CONTACT US

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MORE DETAILS

