# SYLLABUS

# OF

## *M. TECH*
## *(Structural Engineering)*
## *I YEAR*

## (CBCS)

### DEPARTMENT OF CIVIL ENGINEERING

## INTEGRAL UNIVERSITY
## LUCKNOW

# STUDY AND EVALUATION SCHEME (Full Time)

## M.Tech. (Structural Engineering)

## (w.e.f. 2021-22)

## Semester – I

| S. No. | Course Category | Code No | Name of Subject | Periods | | | | Evaluation Scheme | | | | Subject Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | Continuous Assessment (CA) | | | Exam ESE | |
| | | | | | | | | CT | TA | Total | | |
| 1 | DC | CE501 | Theory of Elasticity and plasticity | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 2 | DC | CE502 | Advanced Structural Analysis (Matrix Approach) | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 3 | DC | CE503 | Advanced Concrete Design | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 4 | DE | As per Annexure | Departmental Elective - I | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 5 | DC | CE509 | Structural Engg Lab | - | - | 3 | 2 | 40 | 20 | 60 | 40 | 100 |
| **Total** | | | | **12** | **4** | **3** | **18** | | | | | **500** |

## Semester – II

| S. No. | Course Category | Code No | Name of Subject | Periods | | | | Evaluation Scheme | | | | Subject Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | Continuous Assessment (CA) | | | Exam ESE | |
| | | | | | | | | CT | TA | Total | | |
| 1 | DC | CE510 | Structural Dynamics | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 2 | DC | CE511 | Numerical Analysis and Finite Element Method | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 3 | DC | CE512 | Advanced Steel Structures | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 4 | DC | CE552 | Research Methodology | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 5 | DC | CE514 | Seminar | - | - | 3 | 2 | - | - | 60 | 40 | 100 |
| **Total** | | | | **12** | **4** | **3** | **18** | | | | | **500** |

**L –** Lecture; **T –** Tutorial; **P –** Practical; **C** – Credits; **CT** – Class Tests; **TA** – Teacher Assessment
**Continuous Assessment (CA)** = Class Tests + Teacher Assessment

**Subject Total** = Continuous Assessment (CA) + End Semester Examination (ESE)

**DC** – Departmental Core **DE** – Departmental Elective

**Departmental Elective – I**

CE505 Design of foundation structures
CE506 Design of steel Concrete composite Structures
CE507 Advanced Concrete Technology
CE513 Theory of Plates and Shell

**Integral University, Lucknow**

| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE501 | **Title of the Course** | Theory of Elasticity and Plasticity | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To make learner understand the concept of Elasticity & Plasticity of material. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Knowing the basics of elastic theory, learner will understand the concept of stress tensor & stress Invariants and be able to perform axis transformation in Cartesian coordinates. |
| **CO2** | In two dimensional Cartesian coordinate system, learner will understand about bi-harmonic equation for plane stress and be able perform elastic calculation of stress and strain. |
| **CO3** | In two dimensional Polar coordinate system, learner will understand equilibrium and compatibility equations and be able perform elastic calculation of stress and strain. |
| **CO4** | Knowing the plastic behavior, learner will understand analysis principle and be able to establish failure criteria. |
| **CO5** | To make learner understand bending behavior of beam in plastic torsion and able to perform deformation analysis of it. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction | Analysis of stress and strain, Stress strain relationship. Generalized Hooke's Law. Plane stress and plane stress plane strain. | 08 | CO1 |
| 2 | Stress and Strain in Cartesian Co-Ordinates | Two dimensional problems in Cartesian co-ordinates for simple problems of structures. | 08 | CO2 |
| 3 | Stress and Strain in Polar Co-Ordinates | Two dimensional problems in polar co-ordinates for simple problems of structures. | 08 | CO3 |
| 4 | Introduction to Plasticity | Introduction to problems in plasticity. Physical assumption- criterion of yielding, yield surface, Flow rule (plastic stress strain relationship). | 08 | CO4 |
| 5 | Elasto-Plasticity | Elastic plastic problems of beams in bending- plastic torsion. | 08 | CO5 |

**Reference Books:**


Timoshenko, S. and Goodier T.N. "Theory of Elasticity" Mc Graw Hill Book Co. Newyork. II Edition 1988.

Chwo P.C. and pagano, N.J. "Elasticity Tensor, Dyadic and Engineering applications" D.Van Nestrand Co. In Co. 1967.

Chenn, W.P and Henry D.J. "plasticity for structural Engineers", Springer Verlag New Yark 1988.

Sadhu Singh, "Theory of Elasticity", Khanna publishers, New Delhi 1988.

Verma PDS, "Theory of Elasticity", Vikas publishing Pvt. Ltd. New Delhi – 1997.

Sadhu Singh, "Theory of plasticity", Khanna publ


**e-Learning Source:**

https://nptel.ac.in/courses/105105177/

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| **CO2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO3** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO4** | 2 | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| **CO5** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

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| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE502 | **Title of the Course** | Advanced Structural Analysis (Matrix Approach) | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To developed understanding of structural analysis by matrix approach.<br>• To analyze the structures using displacement methods and force methods. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | To understand the basis methods of structural analysis and basic concepts of matrix approach. |
| **CO2** | Learner will be able to formulate displacement matrix and analyses continuous beams, rigid & pin jointed plane frames by displacement method. |
| **CO3** | Learner will be able to formulate flexibility matrix and analyze rigid jointed plane frames by force method. |
| **CO4** | Learner will be able to analyze rigid & pin jointed space frames & space using displacement method. |
| **CO5** | Learner is familiarized with static condensation procedure and will be able to analyses large structures using sub structuring technique. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Review of Basic Concept in Structural Analysis & Introduction to Matrix Method of Analysis | Basic method of Structural Analysis, Flexibility & Stiffness matrices. | 08 | CO1 |
| 2 | Displacement Method -2D Analysis | Introduction to Matrix Methods- displacements formulation analysis of continuous beams, rigid and pin jointed plane-frames. | 08 | CO2 |
| 3 | Force Method | Matrix flexibility methods- general formulation-application to plane rigid jointed plane frame | 08 | CO3 |
| 4 | Displacement Method -3D Analysis | Displacement method for three dimensional structure- analysis of pin-jointed and rigid jointed space frames. | 08 | CO4 |
| 5 | Special Problems and Techniques | Analysis of large structures- sub-structuring static condensation procedure-Simple problems only. | 08 | CO5 |

**Reference Books:**


Coates, R.C., Coutie M.G., and Kong, F.K, Structural Analysis, John Wiley and Sons, 1979.

Mc Guire, W., and Gallagher, R.H., Matrix Structural Analysis, John Wiley and Sons, 1979.

John L. Meek., Matrix structural Analysis, Mc Graw Hill Book Company, 1971.

G.S.Pandit & S.P.Gupta, Advance Structural Analysis (A Matrix Approach) Tata Mc Graw Hill,


**e-Learning Source:**

https://nptel.ac.in/courses/105106050/

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 3 |
| **CO2** | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 3 |
| **CO3** | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 3 |
| **CO4** | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 3 |
| **CO5** | 3 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 3 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2019-20** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE503 | **Title of the Course** | Advanced Concrete Design | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | CE302 | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To Developed the Basic Knowledge Required for Designing of Flat and Grid Slabs, Shear Wall, Deep Beam and Application of Ductile Detailing. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Understand the background of structural concrete and behavior of beam and slab. |
| **CO2** | Able to design structure for serviceability condition (Deflection and Crack width). |
| **CO3** | Able to design deep beam and Grid floor. |
| **CO4** | Able to design flat slab with different support conditions. |
| **CO5** | Understand the method of field control of concrete and concepts of detailing for ductility. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Review of Limit State Design of Beam, Column & Slab | Review of limit state design of beam, slab, ordinary column & slender column, Design of ordinary R.C wall. | 08 | CO1 |
| 2 | Introduction to Deflection & Crack Width | Calculation of deflection and crack width according to IS 456-2000, Design of spandrel beams. | 08 | CO2 |
| 3 | Design of Grid Floor, Shear Wall and Corbels | Types of shear walls, Design of Shear wall, Design of Corbels, Design of Grid floors. | 08 | CO3 |
| 4 | Design of Flat Slabs, Plates and Deep Beams | Design of flat slabs and flat plates according to ACI method, Design of deep beams | 08 | CO4 |
| 5 | Utility of Ductile Detailing and Fire Resistant Building | Detailing for ductility, fire resistance of buildings, field control of concrete. | 08 | CO5 |

**Reference Books:**


Purushothaman, P, Reinforced Concrete Structure Structural Elements: Behavior Analysis and Design, Tata Mc Graw Hill,1986.

Varghese, P.C., Limit State Design of Reinforced Concrete, prentice Hall of India, 1995.

Krishna Raju, N.Advanced Reinforced Concrete Design, CBS publishers and Distributors, 1986.

N. Subramanlan, Design of Reinforced Structural Oxford University Press 2014.

Ashoke K. Jain, Reinforced Concrete Limit State Design, New Chand & Bros. Roorkee 2012


**e-Learning Source**

https://nptel.ac.in/downloads/105105104/

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 |
| **CO2** | 2 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 |
| **CO3** | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 |
| **CO4** | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 |
| **CO5** | 2 | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE505 | **Title of the Course** | Design of Foundation Structures | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To impart knowledge of method of soil investigation for determining geotechnical design parameters and to familiarize the students for design of different type of foundation. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Structure of Environment – interaction between biological and chemical components, Basics of hydrosphere, atmosphere, lithosphere, biosphere, scope and importance of environmental science. |
| **CO2** | Student will be able to explain the interaction between different species of the environment. |
| **CO3** | Student will learn about different microorganisms present in environment and their significance. |
| **CO4** | Student will be able to understand the basics of different enzymes reactions and the basic of aquatic chemistry. |
| **CO5** | Student will be able to understand the basics of atmospheric chemistry. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction | Soil Investigation report for design of foundation structures. General principles of design of reinforced concrete shallow and deep foundations. | 8 | CO1 |
| 2 | Design of Shallow and Deep Foundations | Shallow foundations- Beams on elastic foundations, Design of isolated & rafts foundation, Basement design, Deep foundations- Load carrying capacity of different types of piles and detailing of reinforcements according to IS 2911- Design of pile caps. | 8 | CO2 |
| 3 | Design of Pile Foundations | Design of eccentric loaded piles, Laterally loaded piles and their efficiency, Design of pile caps. | 8 | CO3 |
| 4 | Design of Well Foundations | Deep foundation- Design of well foundation on cohesive & no cohesive soils, Method of constructions. | 8 | CO4 |
| 5 | Tower Foundations | Design of foundations for towers- Structural design of support for foundation excavation, design of ground anchors. | 8 | CO5 |

**Reference Books:**


Thomlinson, M.J. and Boorman.R., "Foundation design and construction", ELBS Longman VI Edt. 1995.

Nayak, N.V., "Foundation Design manual for practicing Engineers". Dhanpat Rai and Sons, 1982.

Winterkorn H.F., and Fang H.Y., "Foundation Engineering Hand book –Van Nostrard – Reinhold 1976.


**e-Learning Source:**

https://nptel.ac.in/downloads/105101083/

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 0 | 3 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 3 |
| **CO2** | 3 | 0 | 3 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 3 |
| **CO3** | 3 | 0 | 3 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 2 |
| **CO4** | 3 | 0 | 3 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 2 |
| **CO5** | 3 | 0 | 3 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE506 | **Title of the Course** | Design of Steel Concrete Composite Structure | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To get knowledge about composite section of steel-concrete.<br>• To understand the steel sandwich construction.<br>• To study the behavior and to design the composite beam and column sections and composite trusses.<br>• To know about different types of connections in composite structures and to design it.<br>• To understand the behavior of box girder bridges and its design concept | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | en problem learner will get knowledge about composite section of steel-concrete. |
| **CO2** | will understand the steel sandwich construction. |
| **CO3** | will understand the behavior of composite section and will learn how to design composite trusses. |
| **CO4** | will get knowledge about different types of connections in composite structures. |
| **CO5** | en problem learner will be able to understand the behavior of box girder bridges and learn how to design it. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction | Introduction to steel concrete composite construction, theory of composite structures, introduction to steel Concrete – Steel sandwich construction. | 8 | CO1 |
| 2 | Design of Composite Columns | Different type of composite columns, behavior of composite columns, design of steel concrete composite columns. | 8 | CO2 |
| 3 | Design of Composite Beams & Trusses | Different type of composite beams, behavior of composite beams, design of composite beams. Behavior of trusses, design of trusses. | 8 | CO3 |
| 4 | Design of Connections | Types of connections – Design of connections in the composite structures- Shear connections- Design of connections in composite trusses. | 8 | CO4 |
| 5 | Composite Box Girder Bridges | Introduction – Behavior of box girder bridges – Design concepts. | 8 | CO5 |

**Reference Books:**


Neville, A.M, Properties of concrete, Pitman publishing Limited London.

Shetty M.S., Concrete Technology, S. Chand and Company Ltd. Delhi.

Rudhani G., Light Weight Concrete Academic Kiado, publishing Home of Hungarian Academy of Sciences, 1963.


**e-Learning Source:**

https://nptel.ac.in/courses/105106112/

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 |
| **CO2** | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 |
| **CO3** | 3 | 2 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 |
| **CO4** | 2 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 |
| **CO5** | 3 | 2 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2023-24** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE507 | **Title of the Course** | Advance Concrete Technology | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To understand the types and roles of concrete materials with in depth understanding of manufacturing and hydration of cement.<br>• To develop the ability to recognize the properties fresh and hardened concrete and to perform nondestructive tests.<br>• To perform Mix Proportioning as per IS 10262-2016.<br>• To familiarize with special types of concrete and quality control procedures. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Capability to perform tests on concrete materials as per Indian Standard and skill to manage the manufacturing of cement with in-depth knowledge of process, reaction and hydration of cement. |
| **CO2** | Quality and properties assessment of fresh concrete by performing the required tests as per Indian Standard. |
| **CO3** | Quality and properties assessment of hardened concrete by performing the required tests as per Indian Standard. |
| **CO4** | Capability to perform Mix proportioning as per IS10262 using the materials available near the concerned site and demand. |
| **CO5** | Ability to perform the quality checks on concrete structures with the knowledge of special types of concretes. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Cement and Aggregates | Cement, Grade of cement, Chemical composition, testing of concrete, Hydration of cement, structure of hydrated cement. Aggregates classification, IS specifications, properties, Grading, Methods of combining aggregates, specified grading, Testing of aggregates. | 08 | CO1 |
| 2 | Fresh Concrete and Admixtures | Properties of fresh concrete: basics regarding fresh concrete – mixing, workability, placement, consolidation, and curing, segregation and bleeding. Chemical Admixtures: types and classification; actions and interactions; usage; effects on properties of concrete. Mineral Admixtures: Flyash, ground granulated blast furnace slag, rice-husk ash and silica fume; effects on properties of concrete; advantages and disadvantages. | 08 | CO2 |
| 3 | Hardened Concrete and Durability | Properties of hardened concrete: Strength- compressive tensile and flexure - Elastic properties - Modulus of elasticity – Sampling - Creep and shrinkage. Durability of concrete: Durability concept; factors affecting, reinforcement corrosion; fire resistance; frost damage; sulfate attack; alkali silica reaction; concrete in sea water, statistical quality control, acceptance criteria as per BIS code. | 08 | CO3 |
| 4 | Mix Proportioning | Principle of concrete mix design, Concrete mix proportioning using IS 10262. Ready mix concrete and its merits & demerits. | 08 | CO4 |
| 5 | Special Concrete & Concreting Methods | Light weight concrete, Fly ash concrete, Fiber reinforced concrete, polymer Concrete, Super plasticized concrete, Other special concrete, Epoxy resins and Applications High performance concrete, Extreme weather concreting, special concreting methods, vacuum dewatering underwater concrete, special from work. | 08 | CO5 |

**Reference Books:**


Neville, A.M., properties of Concrete, pitman publishing Limited, London.

Shetty M.S., Concrete Technology, S. Chand and Company Ltd. Delhi.

Rudhani G., Light Weight Concrete Academic Kiado, Publishing Home of Hungarian Academy of Sciences, 1963.


**e-Learning Source:**

https://nptel.ac.in/courses/105102012/

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 0 | 2 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| **CO2** | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| **CO3** | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 |
| **CO4** | 3 | 0 | 3 | 1 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 3 | 1 | 3 |
| **CO5** | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 3 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE513 | **Title of the Course** | Theory of Plates and Shells | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To learn about the behavior of plates, various boundary conditions and solution of plates.<br>• To analyze plates of various shape and to design them.<br>• To analyze the cylindrical shells and to get numerical solutions.<br>• To know about approximate design methods for doubly curved shells, Design criteria, code specification and stability consideration.<br>• To study the structural behavior of folded plates and its design considerations. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Learner will learn about the behavior of plates, various boundary conditions and solution of rectangular and Circular plates. |
| **CO2** | One will be able to analyze plates of various shape and can design it. |
| **CO3** | Learner will be able to analyze the cylindrical shells and can get numerical solutions. |
| **CO4** | One will get knowledge about design methods for doubly curved shells, Design criteria and stability consideration. |
| **CO5** | Learner will learn structural behavior, method of analysis of folded plates and its design considerations. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction of Plates | Plates; basic concept, governing equations, boundary conditions, plates of various shapes. | 8 | CO1 |
| 2 | Behavior of Plates | Solution of rectangular and circular plates by classical methods, numerical methods, design criteria. | 8 | CO2 |
| 3 | Behavior of Shells | Shells; basic concepts, membrane and bending Analysis of cylindrical shells, shell of revolution, edge perturbations and secondary stresses; numerical solutions. | 8 | CO3 |
| 4 | Doubly Curved Shells | Approximate design methods for doubly curved shells; design criteria, code specification and parametric proportioning, stability considerations. | 8 | CO4 |
| 5 | Folded Plates | Folded plates; forms, structural action, method of analysis, design considerations. | 8 | CO5 |

**Reference Books:**


S. Timoshenko – Theory of plate and shells.

L.G. Jaeger – Elementary theory of elastic plates.

G. Ramaswamy – Design of Concrete Shells.

Ramchandran - J.- Thin Shells –Theory and problems.


**e-Learning Source:**

https://nptel.ac.in/courses/105105041/m6132.pdf

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 |
| **CO2** | 2 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 |
| **CO3** | 2 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 |
| **CO5** | 2 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE509 | **Title of the Course** | Structural Engineering Laboratory | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | I | 0 | 0 | 3 | 2 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To understand the types and roles of concrete materials within depth understanding of manufacturing and hydration of cement.<br>• To develop the ability to recognize the properties fresh and hardened concrete and to perform nondestructive tests.<br>• To perform Mix Proportioning as per IS 10262-2016.<br>• To familiarize with special types of concrete and quality control procedures. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Capability to perform tests on concrete materials as per Indian Standard to retrieve data for mix proportioning. |
| **CO2** | Capability to perform Mix proportioning as per IS10262 to meet concrete performance. |
| **CO3** | Quality assessment of mix proportioning by performing the required tests on fresh concrete as per Indian Standard. |
| **CO4** | Quality assessment of mix proportioning by performing the non-destructive tests on hardened concrete as per Indian Standard. |
| **CO5** | Quality assessment of mix proportioning by performing the destructive tests on hardened concrete as per Indian Standard. |

| **Unit No.** | **Unit Title** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Exercise 1 | Testing of fine and coarse aggregate. (Specific Gravity, Water Absorption and Sieve Analysis) | 03 | CO1 |
| 2 | Exercise 2 | Concrete mix design. | 03 | CO2 |
| 3 | Exercise 3 | Properties and testing of fresh concrete. (Workability by Slump, Bleeding and Honey Combing Visually) | 03 | CO3 |
| 4 | Exercise 4 | Non- destructive testing of hardened concrete. (Rebound Hammer Test) | 03 | CO4 |
| 5 | Exercise 5 | Destructive testing of hardened concrete. (Compression Test of Cube, Flexure Test of Prism) | 03 | CO5 |
| 6 | Exercise 6 | Plotting of distribution Curve. | 03 | CO5 |
| 7 | Exercise 7 | Strength, fracture and micro structural characteristics of mild steel. | 03 | CO4 |

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 0 | 3 | 3 | 0 | 3 | 3 | 3 |
| **CO2** | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 0 | 3 | 3 | 0 | 3 | 3 | 3 |
| **CO3** | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 0 | 3 | 3 | 0 | 3 | 3 | 3 |
| **CO4** | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 0 | 3 | 3 | 0 | 3 | 3 | 3 |
| **CO5** | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 0 | 3 | 3 | 0 | 3 | 3 | 3 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2023-24** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE510 | **Title of the Course** | Structural Dynamics | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | II | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To Make Learner Understand the Concept of Structural Dynamics and its Application | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Lerner will be able to identify, formulate and solve free response of single degree freedom system. |
| **CO2** | Lerner will be able to identify, formulate and solve forced responses of single-degree freedom system. |
| **CO3** | Lerner will be able to determine natural frequencies & modes shapes of multi-degree of freedom system by approximate methods |
| **CO4** | Lerner will be able to understand the behavior of Earthquake-induced vibrations and the Design Acceleration spectrum |
| **CO5** | Lerner will be able to understand Codal provisions for the dynamic analysis of structures |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction & Free Vibration of Single Degree of Freedom System | Basic concepts of vibration, dynamic loading, types of vibration and ground motions. Free vibration of a single degree of freedom system. | 08 | CO1 |
| 2 | Forced Vibrations of Single Degree of Freedom System | Forced vibrations of a single degree of freedom system, response to harmonic, periodic, impulsive and general dynamic loading, response of SDOF to an earthquake. | 08 | CO2 |
| 3 | Free Vibration of Multi Degree of Freedom System | Free vibration of lumped multi-degree of freedom system. Approximate methods for obtaining natural frequencies and mode shapes. | 08 | CO3 |
| 4 | Earthquake-induced vibrations and Design Acceleration spectrum | Strong ground motions: Characteristics, Influencing factors; Indian Standard Code Provisions: IS1893 Seismic Zoning, Design Acceleration spectrum | 08 | CO4 |
| 5 | Codal provisions for the dynamic analysis of structures | Structural Irregularities: Stiffness, Mass and Geometrical. Lateral Force on Structures: Concept, Limits, Importance Factor, Response reduction factor, Equivalent static method, Dynamic analysis method. | 08 | CO5 |

**Reference Books:**


Glen V.Berg – Element of structural Dynamics.

Agarwal, Pankaj; & Shrikhande, Manish; Earthquake Resistant Design of Structures.

Paz, Mario; Structural Dynamics – Theory and Computations.

Chopra, Anil Kumar; - Dynamics of Structures.

Damodar Swami - Structural Dynamics & A seismic Design.

IS1893:1984 – Criteria for earthquake design of structure


**e-Learning Source:**

https://nptel.ac.in/courses/105104189

https://nptel.ac.in/courses/105101004

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 3 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 |
| **CO2** | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 |
| **CO3** | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 |
| **CO4** | 3 | 0 | 2 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 3 | 0 | 0 |
| **CO5** | 3 | 0 | 2 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 3 | 0 | 0 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2023-24** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE511 | **Title of the Course** | Numerical Analysis and Finite Element Method | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | II | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To understand the types and roles of concrete materials with0in depth understanding of manufacturing and hydration of cement.<br>• To develop the ability to recognize the properties fresh and hardened concrete and to perform nondestructive tests.<br>• To perform Mix Proportioning as per IS 10262-2016.<br>• To familiarize with special types of concrete and quality control procedures. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Capability to perform tests on concrete materials as per Indian Standard and skill to manage the manufacturing of cement with in-depth knowledge of process, reaction and hydration of cement. |
| **CO2** | Quality and properties assessment of fresh concrete by performing the required tests as per Indian Standard. |
| **CO3** | Quality and properties assessment of hardened concrete by performing the required tests as per Indian Standard. |
| **CO4** | Capability to perform Mix proportioning as per IS10262 using the materials available near the concerned site and demand. |
| **CO5** | Ability to perform the quality checks on concrete structures with the knowledge of special types of concretes. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Numerical Solution to Linear Equation | Newton-Raphson Method, Regula-Falsi Method, Gauss-Elimination Method, Gauss-Jordan Method, Gauss-Jacobi Method. | 08 | CO1 |
| 2 | Numerical Solution to Integration & Ordinary Differential Equations | Trapezoidal Rule for Single & Multiple Integration, Simpson's 1/3rd Rule, Simpson's 3/8th Rule, Simpson Double integration, Taylor's Series Method. | 08 | CO2 |
| 3 | Interpolation & Boundary Value Problems | Gauss's Forward Interpolation, Gauss's Backward Interpolation, Divided Differences Method, Finite Difference Method. | 08 | CO3 |
| 4 | Finite Element Methods -1 | Introduction of FEM, Various types of Finite Elements, Stiffness Matrix of Spring Elements, Problems on Assemble of Spring Elements, Derivation of Stiffness Matrix of Bar Elements, Problems on Assemble of Bar Elements. | 08 | CO4 |
| 5 | Finite Element Methods -2 | Shape Function of Beam Elements, Problem on Beam Elements, Global & Local Coordinate System, Transformation Matrix. | 08 | CO5 |

**Reference Books:**


Krishnamurathy , Finite Element Analysis.

Budvanan, G.R. Finite Element Analysis.

Zienkiewiez, O Finite Element Method its Basic & Fundamentals


**e-Learning Source:**

https://nptel.ac.in/courses/105105041/

https://nptel.ac.in/courses/111107062/

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| **CO2** | 3 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| **CO3** | 3 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| **CO4** | 3 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 |
| **CO5** | 3 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE512 | **Title of the Course** | Advanced Steel Structures | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | II | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To impart behavior and design procedures of tension members, compression members and connections.<br>• To impart behavior and design procedures of flexural member.<br>• To impart requirements and concepts involves in analysis and design of steel chimneys & towers<br>• To study the behavior and design requirements of Industrial building.<br>• To impart the concept and application of plastic analysis in steel structures. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Learner should be able to understand the types and design requirement of tension and compression steel members, then they should be able to design them with connections for given conditions by following the guidelines of Indian codes. |
| **CO2** | Learner should be able to understand the behavior of steel flexure member, then able to analysis and design them with connections for given conditions by following the guidelines of Indian codes |
| **CO3** | Learner should know the structural behavior of tower and chimney, then should be able to design self supported steel chimney and tower as Indian code provisions |
| **CO4** | Learner should be able to understand the requirement and behavior of Industrial building and also able to design elements of industrial building for given conditions by following guide line of Indian codes. |
| **CO5** | Learner should be able to apply concept of plastic analysis to analysed steel structures for given conditions |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Design of Steel Structural Element | Connections, Design of compression and tension members. | 08 | CO1 |
| 2 | Flexural Member | Design of rolled section beams and plate girder. | 08 | CO2 |
| 3 | Tower & Chimney | Analysis and design of steel towers. Design of self-supporting chimney. | 08 | CO3 |
| 4 | Industrial Building | Analysis and design of industrial buildings and bents – Design of bracings – Design of crane and gantry girder | 08 | CO4 |
| 5 | Plates Analysis & Design | Plastic design of beams, shape factors, moment distribution. Plastic analysis of fixed and continuous beams, propped cantilevers, single bay and two bay portal frames. | 08 | CO5 |

**Reference Books:**

Sarvar Alam Raaz–Design of Steel Structures.

Kazmi and Jindal–Design of Steel Structures.

Limit State Design of Steel Structures by S. K. Duggal, Tata Mc-Graw-Hill Publishing Company.

IS-800-2007And IS-800-1984

**e-Learning Source:**

https://nptel.ac.in/courses/105105162/

https://nptel.ac.in/courses/105106113/18

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 2 | 1 | 3 |
| **CO2** | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 2 | 1 | 3 |
| **CO3** | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 2 | 1 | 3 |
| **CO4** | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 2 | 1 | 3 |
| **CO5** | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 2 | 1 | 3 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2020-2021** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE552 | **Title of the Course** | Research Methodology | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | II | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | To develop critical thinking and understand the concept of gap identification for research.<br>To identify appropriate research methods for a specific research problem and prepare professional research report | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Develop the student's understanding of research methods and applying those methodology to solve complex research problems. |
| **CO2** | Develop student's understanding of sampling techniques for research. |
| **CO3** | Develop student's understanding of different data collection methods and their suitability. |
| **CO4** | Students will gain understanding of analyzing the quantitative data. |
| **CO5** | Students will gain understanding of analyzing the qualitative data and will learn how to write a professional research report. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction to Research and Problem Definition | Meaning, Objective and importance of research, Types of research, research process, Challenges in research, Philosophical worldviews in research. | 8 | CO1 |
| 2 | Research Design | Research design, Methods of research design, Selection of a Research Design research process and steps involved, Literature Survey, Bibliometric analysis. | 8 | CO2 |
| 3 | Data Collection | Sample Design, Sampling Methods, sampling errors, Classification of Data, Measurement and Scaling, Methods of Data Collection, data preparation. | 8 | CO3 |
| 4 | Data Analysis and interpretation | Data analysis, Statistical techniques and choosing an appropriate statistical technique, Hypothesis, Hypothesis testing, Data processing software (e.g. SPSS etc.), statistical inference, Interpretation of results. | 8 | CO4 |
| 5 | Technical Writing and Reporting of Research | Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Mechanics of writing a report, Research Journals, Indexing and citation of Journals, Intellectual property, Plagiarism, Oral Presentation. | 8 | CO5 |

**Reference Books:**


C. R. Kothari, Gaurav Garg, Research Methodology : Methods And Techniques, New Age International Publishers; Fourth edition (1 September 2019)

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

Sekaran, U., & Bougie, R. (2016). Research methods for business: A skill building approach. John Wiley & Sons.


**e-Learning Source:**

https://onlinecourses.nptel.ac.in/noc22_ge08/preview

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO2** | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO3** | 3 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO5** | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

**Integral University, Lucknow**

| **Effective from Session: 2016-17** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE514 | **Title of the Course** | Seminar | **L** | **T** | **P** | **C** |
| **Year** | I | **Semester** | II | 0 | 0 | 3 | 2 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To understand organization of topic for presentation and research.<br>• To learn the skill set required to perform research. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Skill to search on any topic to extract the inference. |
| **CO2** | Ability to organize – deliver presentation and report on any topic. |

| **Unit No.** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|
| 1 | Seminar shall be delivered preferably on the topic of dissertation or at least the area of dissertation. The concepts must be clearly understood and presented by the student. Prior to presentation, he/she shall carry out the detailed literature survey from Standard References such as International Journals and Periodicals, recently published reference Books etc. All modern methods of presentation should be used by the student. A hard copy of the report (25 to 30 pages) should be submitted to the Department before delivering the seminar. A PDF copy of the report in soft form must be submitted to the supervisor along with other details if any. Supervisor should guide concern student 2hrs /week/student for seminar. | 03hrs | CO1 and CO2 |

| | **Course Articulation Matrix: (Mapping of Cos with Pos and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 0 | 0 | 0 | 3 | 3 | 1 | 2 | 1 | 3 | 3 | 0 | 3 | 3 | 3 |
| **CO2** | 0 | 0 | 0 | 0 | 3 | 1 | 2 | 1 | 3 | 3 | 0 | 3 | 3 | 3 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**