

**SCHEME & SYLLABUS**  
*M.Tech. (Regular) Civil Engineering*

*As per NEP 2020*



**Department of Civil Engineering, UIET**  
**Sant Baba Bhag Singh University**  
**2023 onwards**

## SEMESTER I

### Scheme for M. Tech. 1<sup>st</sup> Year (As per NEP 2020)

#### I. Theory Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Core (PC)	CE501	Pre-stressed concrete Structures	4:0:0	4:0:0	4	4
2	Major Core (PC)	CE503	Repair and Retrofitting of Structures	4:0:0	4:0:0	4	4
3	Major Core (PC)	CE505	Concrete Construction Technology	4:0:0	4:0:0	4	4
4	Minor (DSE-I/PE-I)	CE507	Bridge Engineering	3:0:0	3:0:0	3	3
		CE509	Design of Industrial Structures				
5	Minor (DSE-II/PE-II)	CE511	Wind Engineering	3:0:0	3:0:0	3	3
		CE513	Engineering Behavior of Soil				
6	VAC/AUDIT		Value added Course-I/ Audit	3:0:0	3:0:0	3	3

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Core/ PC lab	CE515	Concrete Structure Lab	0:0:4	0:0:4	4	2

Total Contact Hours = 25  
Total Credits Hours = 23

**SEMESTER II**  
**Scheme for M. Tech. 2<sup>nd</sup> Semester (As per NEP 2020)**

**I. Theory Subjects**

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Core/ PC	CE502	Analysis and Design of Foundation	4:0:0	4:0:0	4	4
2	Major Core/ PC	CE504	Reinforced cement concrete Structures	4:0:0	4:0:0	4	4
3	Major Core/ PC	CE506	Site Investigation	4:0:0	4:0:0	4	4
4	Minor DSE-III/PE	CE508	Advanced Solid Mechanics	3:0:0	3:0:0	3	3
		CE510	Finite Element Analysis				
5	Minor DSE-IV/PE	CE512	Advanced Steel Structures	3:0:0	3:0:0	3	3
		CE514	Hydraulic Structures				
6	OE-I/Audit*	CE611	Introduction to Rural Technology and Community Development	2:0:0	2:0:0	2	2
		ME 611	Industrial Safety Engineering				
		ME 613	Concepts of Composite Materials				
		ME615	Concepts of Renewable Energy Resources				
		EE611	Electrical Installation and safety				
		COM223	Business Analytics				
		CSE540	Introduction to Internet of things				
CSE542	Software Project Planning and Management						

**II.**

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major/PC lab	CE516	Material Testing Lab	0:0:4	0:0:2	4	2
2	Minor (DSE/PE lab)	CE518	Geotechnical Lab	0:0:2	0:0:1	2	1

Total Contact Hours = 26  
Total Credits Hours = 23

## SEMESTER III

### Scheme for M. Tech. 3<sup>rd</sup> Semester (As per NEP 2020)

#### 1. Theory Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major (PC)	CE601	Tall Buildings	3:0:0	3:0:0	3	3
2	Major (PC)	CE603	Composite Structures	3:0:0	3:0:0	3	3
3	Major (PC)	CE605	Research Methodology	3:0:0	3:0:0	3	3
4	Research	CE607	Research and Publication Ethics	2:0:0	2:0:0	2	2
5	Research	CE609	Applications of ICT Tools in Research	2:0:0	2:0:0	2	2

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Core / PC lab	CE613	Dissertation-I	0:0:8	0:0:4	8	4
2	PROJ	CE615	Mini project with seminar	0:0:4	0:0:2	4	2

Total Contact Hours = 25  
Total Credits Hours = 19

## SEMESTER IV

### Scheme for M. Tech. 4<sup>th</sup> Semester (As per NEP 2020)

#### I. Theory Subjects

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major (PC)	CE602	Pavements Design and Analysis	4:0:0	4:0:0	4	4
2	Major (PC)	CE604	Advanced Concrete Technology	4:0:0	4:0:0	4	4
3	Major	CE606	Intellectual Property Rights	4:0:0	4:0:0	4	4
4	AEC	CE608	Technical writing	2:0:0	2:0:0	2	2

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	SEC/Research	CE610	Dissertation-II	0:0:16	0:0:8	16	8

Total Contact Hours = 30

Total Credits Hours = 22

**COURSE SCHEME SUMMARY AS PER NEP 2020**

Semester	L	T	P	Contact hrs/wk	Credits	Major (PC)	DSE/ PE/ Minor	Multidisciplinary	AEC	SEC	VAC	Vocational	SI	Research
1	21	0	4	25	23	12	6				3			
2	20	0	6	26	23	12	6	2						
3	13	0	12	25	19	9								8
4	14	0	16	30	22	12			2					8
<b>M.Tech with Research</b>	<b>68</b>	<b>0</b>	<b>38</b>	<b>106</b>	<b>87</b>	<b>45</b>	<b>12</b>	<b>2</b>	<b>2</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>16</b>

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**\*\* Audit Courses:**

<b>COURSE CODE:</b>	<b>ENG001</b>	English for Research Paper Writing
	<b>EVS501</b>	Disaster Management
	<b>LAW006</b>	Constitution of India
	<b>EDU002</b>	Personality Development through Life Enlistment Skills
	<b>EDU003</b>	Pedagogy Studies
	<b>SSC008</b>	Value Education
	<b>PED001</b>	Stress Management for Yoga

**OPEN ELECTIVE-I**

S. No.	Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE	CE611	Introduction to Rural Technology and Community Development	4:0:0	4:0:0	4	4
2	OE	ME611	Industrial Safety Engineering	4:0:0	4:0:0	4	4
3	OE	ME613	Composite Materials	4:0:0	4:0:0	4	4
4	OE	ME615	Renewable Energy Resources	4:0:0	4:0:0	4	4
5	OE	EE611	Waste to Energy Technology	4:0:0	4:0:0	4	4
6	OE	COM223	Business Analytics	4:0:0	4:0:0	4	4
7	OE	CSE611	Introduction to internet of things	4:0:0	4:0:0	4	4
8	OE	CSE613	Software Project Planning and Management	4:0:0	4:0:0	4	4

*First*  
*Semester*



<b>Course Code</b>	<b>CE501</b>
<b>Course Title</b>	<b>Pre-Stressed Concrete Structures</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course prerequisite</b>	<b>Design of Concrete structures building materials Concrete Technology</b>
<b>Course Objective (CO)</b>	To impart to students the knowledge of methods of pre stressing, analysis and design of various pre stressed concrete elements under relevant code provisions.

## **SYLLABUS**

### **UNIT-I**

Reinforced and pre-stressed concrete construction - Prefabricated structures - Production of ready mixed concrete - Productivity analysis.

Principles of pre-stressing, pre-stressing systems, losses of pre-stress, short term and long term deflections of re-stressed concrete members.

### **UNIT-II**

Cable profile and cable layout, concept of load balancing and stresses in cables. End blocks, Stress distribution in end blocks, Anchorage zone reinforcement

### **UNIT-III**

Design of Pre-stressed concrete continuous beams, slab and domes, Analysis and design of Pre-stressed concrete members for flexure, shear, bond, torsion and bearing.

### **UNIT-IV**

Concepts of design of composite beams. Circular pre-stressing, Types of Pre stressed concrete pipes, Design of PSC concrete pipes.

<b>Suggested textbooks</b>			
<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Pre-stressed concrete.	Krishna Raju N.	Tata McGraw Hill Company, 1998.
<b>2</b>	Fundamentals of Pre stressed Concrete	V. Natarajan	
<b>3</b>	Modern pre stressed concrete Design	Ramaswamy G.S.	New Delhi: Arnold Heinimen, 1990

<b>Course Code</b>	<b>CE503</b>
<b>Course Title</b>	<b>Repair and Retrofitting of Structures</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course prerequisite</b>	<b>Basic civil engineering techniques</b>
<b>Course Objective (CO)</b>	<b>The objectives of this course is to make students to investigate the cause of deterioration of concrete structures, To strategize different repair and rehabilitation of structures. To evaluate the performance of the materials for repair.</b>

#### **UNIT-I**

##### **Maintenance and repair strategies:**

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of distress and deterioration of concrete- Evaluation of existing buildings through field investigations, Seismic evaluation of existing buildings.

##### **Serviceability and durability of concrete:**

Quality assurance for concrete construction concrete properties – strength, permeability, thermal properties and cracking. – Effects due to climate, temperature, chemicals, corrosion – design and construction errors – Effects of cover thickness and cracking.

#### **UNIT-II**

##### **Materials and techniques for repair:**

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, Sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete. Rust eliminators and polymers coating for rebar during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning - Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating and cathodic protection.

#### **UNIT-III**

##### **Repairs, rehabilitation and retrofitting of structures:**

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure - Special techniques for structural Retrofitting (Bracing, Shear walls, Base isolation etc.

#### **UNIT-IV**

##### **Demolition techniques:**

Engineered demolition techniques for Dilapidated structures – case studies - Case Studies on Restoration of fire damaged buildings, Case study on repairs and strengthening corrosion damaged buildings; Case study on use of composite fiber wraps for strengthening of building components.

#### **Suggested textbooks**

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Repair of Concrete structures	R.T. Allen and S.C. Edwards,	Blakie and Sons, UK, (1987)
<b>2</b>	Concrete Structures, Materials, Maintenance and Repair	Denison Campbell, Allen and Harold Roper	Longman Scientific and Technical UK
<b>3</b>	Concrete Technology- Theory	M. S. Shetty,	Chand and Company, New Delhi, (1992).

<b>Course Code</b>	<b>CE505</b>
<b>Course Title</b>	<b>CONCRETE CONSTRUCTION TECHNOLOGY</b>
<b>Type of Course</b>	<b>PE</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course Objectives</b>	The objective of the teacher is to impart knowledge and abilities to the students to: a. Understand the theoretical concept of Concrete material which includes Cement, Admixtures and Aggregates, b. Learn different types of aggregates, admixtures & know the mechanism of hydration of cement.
<b>Course Outcome (CO)</b>	The learner will be able to- <ul style="list-style-type: none"> <li>• The students will be able to think logically for development Concrete technology application in field of Civil Engineering.</li> <li>• The students will gain an experience in the implementation of Concrete Materials on engineering concepts which are applied in field Construction Fields.</li> </ul>

#### **UNIT- 1.**

Introduction of Concrete materials, Admixtures, Fly Ash, Polymers, Early Age Properties, Strength, Permeability & Durability.

Principles of Concrete mix design, Concrete Mix Design procedure by: IS/ACI/British Standards.

#### **UNIT-2**

Concreting Operations-Practices and Equipment, Batching; Mixing; Transporting; Placing and Compacting; curing.

Properties and technique of construction for concrete, Fiber reinforced concrete, light weight concrete, Heavy weight concrete, Foam concrete, High performance Concrete.

#### **UNIT-3**

Special concrete operations, shot Crete, grouting, grunting, under water concreting, hot and cold Weather concrete, pumpabale concrete.

Construction techniques for reinforced concrete elements-materials, Principles and procedures for Beams, slabs, columns, Foundations, walls and tanks, design and fabrication of form work for R.C.C Elements.

#### **UNIT-4**

Prestressed concrete construction-Principle, methods, materials, Tools and equipment for the construction of a prestressed bridge.

Inspection and Quality Control of Concrete Construction-Stages, Principles, Checklist, Statistical Controls, procedures.

#### **BOOKS RECOMMENDED:**

1. Concrete Technology by M.L. Gambhir
2. Concrete Technology, by Neville and Brooks
3. Properties of Concrete by Neville.
4. Concrete Microstructure, Properties and Materials  
P.K. Mehta and PJM Monteiro
5. Concrete Technology – M.S. Shetty.

<b>Course Code</b>	<b>CE507</b>
<b>Course Title</b>	<b>Bridge Engineering</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Concrete Structures Steel Structures</b>
<b>Course Objective (CO)</b>	<b>To familiarize with the types, suitability, selection, design criteria of various types of bridges, Introduction to Analysis and Design of various types of bridges.</b>

### Syllabus

#### UNIT-I

Introduction-definition and components of bridges. Layout and planning of bridges- classification, investigations for bridges, preliminary data collection, choice of type of the bridges, hydraulic design of bridges, traffic design of bridges.

#### UNIT-II

Analysis and design of superstructure of straight and curved bridge decks- Loadings details, specification-reinforced concrete and steel decks. Decks of various types like slab, hollow and voided slab, beam and slam, box girder etc.

#### UNIT-III

Design of substructure-piers and abutments of different types. Analysis and design of foundations-shallow foundations (open Foundations), deep foundations- well foundations and caisson.

#### UNIT-IV

Modern methods of construction of concrete and steel bridges- their impact on the analysis and the design. Introduction to analysis and design of long span bridges like suspension and cable stayed bridges. Special aspects in analysis and design, based on construction methodology. Inspection and maintenance and rehabilitation of bridges.

#### Suggested textbooks

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Design of Concrete Bridges	Vazirani V. N.	Khanna publishers,2004
<b>2</b>	Design of Bridges,	N.Krishna Raju,	Oxford and IBH Publications
<b>3</b>	Bridge Superstructure	N. Rajagopalan,	Narosa Publishing House
<b>4</b>	Bridge Engineering Handbook	W. F. Chen and L. Duan,	CRC press

<b>Course Code</b>	<b>CE509</b>
<b>Course Title</b>	<b>Design of Industrial Structures</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Design of roof trusses steel structures</b>
<b>Course Objective (CO)</b>	<b>It provides the ability in analysis and design of basic reinforced concrete and Steel components. To study of advanced topics including theory and design of reinforced concrete structures</b>

### Syllabus

#### UNIT-I

##### **ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS:**

Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular c truss, Truss for a railway platform.

#### UNIT-II

Planning of Industrial Structures, Steel Gantry Girders, Portal Frames, Gable Structures, Light-weight Structures

#### UNIT-III

Steel Bunkers- Silos, RC Bunkers and Silos- Water Tanks

#### UNIT-IV

Design of Steel Chimneys, Towers, Hyperbolic Cooling Towers.

#### **Suggested textbooks:**

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Advanced Reinforced Concrete Design	N. Krishna Raju.	New Delhi: CBS Publishers Distributors
<b>2</b>	Design of Steel Structures	Duggal	New Delhi: McGraw-Hill Education

<b>Course Code</b>	<b>CE511</b>
<b>Course Title</b>	<b>Wind Engineering</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Knowledge of structures.</b>
<b>Course Objective (CO)</b>	<b>To familiarize the students regarding wind loading and the effects of wind on behavior of buildings and other structures.</b>

### Syllabus

#### UNIT-I

##### Introduction

Nature of wind storm, Design wind speed, Atmospheric boundary layer and Wind turbulence.

Basic Bluff body aerodynamics: Flow around bluff bodies, Pressure & force coefficients flow around flat plates, Walls, Prismatic shapes.

#### UNIT-II

Wind effects on Low Buildings: Low buildings with different roof shapes and multi-span buildings.

Wind effects on Tall Buildings: Along wind effects, across wind effects and vortex shedding.

#### UNIT-III

##### Wind effects on Bridges

Basic force coefficients for bridges, Nature of dynamic response of long span bridges, Flutter instability, Buffeting of long span bridges.

#### UNIT-IV

##### Role of Wind Tunnel

Flow simulation, Modelling, Flow measurement, Pressure measurement, Deformation measurement.

##### Suggested textbooks:

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	An Introduction to Wind Engineering	John Wiley & Sons,	
<b>2</b>	Wind Forces in Engineering,	Sachs, P	Pergamon Press

<b>Course Code</b>	<b>CE513</b>
<b>Course Title</b>	<b>Engineering Behavior of soil</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Soil Mechanics, Foundation Engineering, Rock Mechanics and Geology</b>
<b>Course Objective (CO)</b>	<b>1. To be able to ascertain the behavior of Soil as a construction material or supporting medium for Civil Engineering structures. 2. To be able to analyze distress/failure condition relating to Soil and hence to suggest remedial measures.</b>

### **Syllabus**

#### **UNIT-I**

##### **Origin, nature and distribution of soils**

Engineering Behavior of Soils of India: Black cotton soils, alluvial silts and sands, laterites, collapsible and sensitive soils, aeolin deposits.

#### **UNIT-II**

##### **Description of individual particle**

Clay mineralogy, clay-water-electrolytes. Soil fabric and structure. Effective stress principle. Steady state flow in soils. Effect of flow on effective stress.

##### **Consolidation**

One, two and three dimensional and radial consolidation. Sand drain and prefabricated drain. Variation of effective stress during consolidation, Stress-path. Shear behavior of granular soils. Factors affecting shear behavior. Determination of parameters. Shear behavior of fine grained soils. Pore- pressure parameters. UU, CU, CD tests. Total and effective stress paths.

#### **UNIT-III**

##### **Factors affecting strength**

Stress history, rate of testing, structure and temperature. Anisotropy of strength, thixotropy, creep. Stress-strain characteristics of soils. Determination of modulus values. Critical state model.

##### **Geo-synthetics**

Types and functions; Materials and manufacturing processes; Principles of soil reinforcement; Design and construction of geo-synthetic reinforced soil retaining structures – walls and slopes; embankments on soft soils; Geo-synthetics in Pavements: Geo-synthetics in roads and railways; separations, drainage and filtering in road pavements and railway tracks.

#### **UNIT-IV**

##### **Methods of site investigations**

Direct methods, semi-direct methods and indirect methods, Drilling methods. Boring in soils and rocks, methods of stabilizing the bore holes, measurement of water table, field record. Field tests: In-situ shear test, in-situ permeability test, SPT, DCPT, SCPT, in-situ vane shear test, pressure meter test, Dilatometer test Codal provisions.

<b>Suggested textbooks</b>			
<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Soil Mechanics	Lambe, T.W., and Whitman, R.V.,	John Wiley and Sons
<b>2</b>	Geotechnical Engineering	Gulhati, Shashi K., and Datta Manoj	Tata Mcgraw-Hill Company Ltd.
<b>3</b>	Advanced soil Mechanics”,	Das, B.M.,	Taylor and Francis



<b>Course Code</b>	<b>CE515</b>
<b>Course Title</b>	<b>Concrete structure Lab</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>0 0 4</b>
<b>Credits</b>	<b>2</b>
<b>Course prerequisite</b>	<b>Concrete technology, basic knowledge of concrete structures</b>
<b>Course Objective (CO)</b>	<b>To make students well acquainted with techniques of testing various materials.</b>

#### **SYLLABUS**

1. Determination of specific gravity of cement.
2. Determination of standard consistency.
3. Determination of the initial setting time.
4. Determination of the final setting time.
5. To determine the compressive strength of 1:3 cement and sand mortar cubes after 3 days and 7 days curing.
6. Gradation of fine aggregate (fineness modulus).
7. To study the bulking of fine aggregate.
8. Gradation of coarse aggregates.
9. To determine the slump value of a prepared concrete mix (Slump test).
10. To determine the compaction factor of concrete mix of given proportion (Compaction factor test).

<b>Course Code</b>	<b>CE517</b>
<b>Course Title</b>	<b>Material Testing Lab</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>0 0 4</b>
<b>Credits</b>	<b>2</b>
<b>Course prerequisite</b>	<b>Basic knowledge of Construction material.</b>
<b>Course Objective (CO)</b>	<ol style="list-style-type: none"> <li><b>1. Understand the use of non-conventional civil engineering materials.</b></li> <li><b>2. Identify various building materials and to understand their basic properties</b></li> <li><b>3. Study suitable type of flooring and roofing in the construction process.</b></li> <li><b>4. Characterize the concept of plastering, pointing and various other building services.</b></li> </ol>

### **Syllabus**

- 1.** To determines water absorption of brick.
- 2.** To determine the shape and size of the supplied brick.
- 3.** To determines the compressive strength of bricks.
- 4.** This test method covers the determination of Bulk and Apparent Specific Gravity and Absorption of fine aggregate.
- 5.** This test method covers the determination of Bulk and Apparent Specific Gravity and Absorption of fine aggregate.
- 6.** This method covers the determination of the particle size distribution the fine and coarse aggregate by sieving.
- 7.** To ascertain the bulking phenomena of given sample of sand.

# *Second Semester*

<b>Course Code</b>	<b>CE502</b>
<b>Course Title</b>	<b>Analysis and Design of Foundation</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course prerequisite</b>	<b>Foundation Engineering</b>
<b>Course Objective (CO)</b>	<b>To develop an understanding of the behaviour of foundations for engineering structures and to gain knowledge of the design methods that can be applied to practical problems.</b>

### Syllabus

#### UNIT-I

Introduction to shallow and deep footings, Design of strap, Raft and combined footings, Design of pile footings, Caps for piles, design of different components of well foundations.

#### UNIT-II

Footings subjected to eccentric loading, uplift and overturning, Soil-Structure interaction, Sub grade reaction method, Geotechnical design considerations, Site and soil conditions.

#### UNIT-III

Soil liquefaction, evaluating the liquefaction potential by Standard Penetration Tests, by Cone Penetration Tests, by Shear Wave Velocity, Liquefaction of clayey soil, Mitigation of Liquefaction Hazard by site modification, Mitigation of Liquefaction Hazard by Structural Design.

#### UNIT-IV

Seismic Settlement, Subsidence and Differential Compaction, Fault Rupture, Lateral Seismic Earth Pressures.

#### Suggested textbooks:

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Analysis and Design of Sub-Structure	Saran S	Oxford and IBH, New Delhi
<b>2</b>	Foundation Analysis and Design	Bowls J E	Mc Graw Hill, New York
<b>3</b>	Foundation Design	Teng W C	Prentice Hall, New Delhi

<b>Course Code</b>	<b>CE504</b>
<b>Course Title</b>	<b>Reinforced cement concrete Structures</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course prerequisite</b>	<b>Design of Concrete Structures</b>
<b>Course Objective (CO)</b>	<b>To make the students well acquainted with the basics of RCC structures and design of various RCC structural components using appropriate codes.</b>

## SYLLABUS

### UNIT I

#### Review of Basic Concepts

Behavior and Design of Reinforced Concrete members considering flexure, Torsion, combined with flexure and flexural shear, axial compression deflection and crack width as per IS-456-2000.

#### Design of Slender Columns:

**Concentrically loaded slender columns, eccentrically loaded slender columns, slender columns subjected to axial and transverse loads, Structural behavior of columns in braced and unbraced frames, Codal procedure for design of slender columns.**

### UNIT II

#### Slabs

**Elements of flat slabs, Codal procedure for design of flat slabs, Behavior of flat slab in shear, One way and two way shear, Equivalent Frame Method, Openings in flat slabs, Effect of pattern loading in flat slabs.**

#### Yield Line Analysis

Design of slabs of various shapes and having various support conditions using yield line analysis approach.

### UNIT-III

#### Design of Beam Column Joints

**Types of joints, Joints in multistoried buildings, Forces acting on joints, Design of joints for strength, Anchorage requirement in joints and detailing of reinforcement in joints.**

#### Deep Beams

General features, Parameter influencing design, Flexural bending and shear stresses in deep beams. Design provisions of IS-456, checking for local failures, strut and tie analysis of deep beams, Detailing of reinforcement in deep beams.

### UNIT-IV.

Design of grid floors.

**Design of Chimneys, Design of silos and bunkers.**

<b>Suggested textbooks</b>			
<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Advanced R.C. Design	Krishna Raju.	CBS Publishers
<b>2</b>	Limit State Design	A.K Jain	
<b>3</b>	Advanced Reinforced Concrete Design	Varghese P C	Prentice-Hall of India Pvt. Ltd New Delhi
<b>4</b>	Limit state theory and design of reinforced concrete	Dr. S.R. Karve and Dr. V.L. Shah	Standard publishers, Pune,
<b>5</b>	Comprehensive RCC Design	Dr.B.C.Punmia	

<b>Course Code</b>	<b>CE506</b>
<b>Course Title</b>	<b>Site Investigation</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course prerequisite</b>	<b>Soil Mechanics</b>
<b>Course Objective (CO)</b>	<b>The course is intended for geotechnical engineers/engineering geologists to gain a practical understanding of the planning and design of site investigations, the spectrum of investigation techniques available, laboratory test scheduling, and interpretation of results</b>

Syllabus

**UNIT-I**

**Introduction:** Soil formation Processes – Characteristics of major soil deposits of India. Necessity and Importance of soil exploration Method of sub surface exploration Test pits , Trenches, Caissons, Tunnels and drifts, Wash boring , Percussion drilling , Rotary drilling, Factors affecting the selection of a suitable method of boring. Extent of boring, Factors controlling spacing and depth of bore holes, Spacing and depth for various Civil engineering structures.

**UNIT-II**

Indirect method of exploration, Seismic method, Electrical resistivity, Resistivity sounding and profiling, Qualitative and quantitative interpretation of test results, Comparison of resistivity and seismic surveys, Shortcomings.

Ground water Observation: Different method of ground water observation: Time lag in observation, Sampling of ground water.

**UNIT-III**

Sampling: Source of disturbance and their influence, Type of sampler, Principle of design of sampler, Representative and undisturbed sampling in various types of soils, Surface sampling, Amount of sampling, Boring and sampling record, Preservation and shipment of sample preparation of bore log. Standard penetration test, Dynamic cone penetration tests with and without bentonite mud slurry. Static cone penetration test, Surface sampling. Cyclic plate load test, Large shear box test, Vane shear test, Pile load, In situ Permeability. Pumping in test and pumping out test

**UNIT-IV**

Investigation below sea/river bed – methods and equipment's – interpretation of offshore exploration, Instrumentation in soil engineering - strain gauges - resistance and inductance type - load cells, earth pressure cells - settlement and heave gauges - piezometers and slope indicators - inclinometer, Field visit, data and report preparation.

**Suggested textbooks:**

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Site investigation"	Simon and Cayton	
<b>2</b>	Foundation Analysis and Design	Bowles J E	McGraw Hill, New York

<b>Course Code</b>	<b>CE508</b>
<b>Course Title</b>	<b>Advanced Solid Mechanics</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Solid Mechanics</b>
<b>Course Objective (CO)</b>	<b>Introduce Fracture Mechanics and its applications to Structural Engineering students</b>

### Syllabus

#### UNIT-I

Theory of stress, state of stress in a body, Differential equations of equilibrium. Analysis of state of stress at a given point in a body

#### UNIT-II

Geometrical theory of strains, displacement components and strain components and relation between them, generalized hooks law.

#### UNIT-III

Strains expressed in terms of stresses, stresses expressed in terms of strains, torsion of prismatic bars and bending.

#### UNIT-IV

Saint- Venant method, three dimensional stress systems, tensors, unsymmetrical bending.

## Suggested textbooks

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Theory of elasticity.	S.Timoshenko.	New Delhi: McGraw-Hill Publishing Company



<b>Course Code</b>	<b>CE510</b>
<b>Course Title</b>	<b>Finite Element Analysis</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course Objective (CO)</b>	<b>The course provides an introduction to Finite element methods with a focus on one and two dimensional problems in structures, heat transfer, static and dynamics.</b>

### Syllabus

#### UNIT-I

Historical Background – Mathematical Modeling of field problems in Engineering – Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems

#### UNIT-II

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors- Assembly of Matrices – Solution of problems from solid mechanics and heat transfer

#### UNIT-III

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation –Finite Element formulation – Triangular elements – Shape functions and element matrices and vectors. Application to Field Problems

#### UNIT-IV

Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations – Plate and shell elements.

#### Suggested textbooks

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Theory of elasticity.	S.Timoshenko.	New Delhi: McGraw-Hill Publishing Company

<b>Course Code</b>	<b>CE512</b>
<b>Course Title</b>	<b>Advanced Steel Structures</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Design of Steel Structures</b>
<b>Course Objective (CO)</b>	<b>To strengthen the basic fundamentals of plastic design of steel structures.</b>

### Syllabus

#### UNIT-I

##### Concept of Plastic Design

Introduction, Theory of plastic bending, Assumptions, Bending of rectangular section, Plastic hinge, Redistribution of moments, Computation of plastic moment, Shape factor, Overload factor, Method of plastic analysis : Statical Method, Mechanism method, Upper bound, Lower bound and uniqueness theorem, Partial, Complete and over complete failure of indeterminate structures.

#### UNIT-II

##### Plastic Analysis and design of Beams

Single span and continuous Beam, Moment Balancing Method.

Plastic Analysis of Frames

Plastic analysis and design of portal frames subjected to transverse and lateral loads, Analysis of gable frames, Analysis of multibay, multi storeyed frames.

#### UNIT-III

##### Minimum Weight Design

Concept, Assumptions, Design of frames with prismatic members, Elements of linear programming and its applications to minimum weight design problems.

##### Deflections

Assumption, Calculation of deflection at ultimate loads, Deflection at working loads, Rotation capacity.

#### UNIT-IV

##### Secondary

##### Design

##### Considerations

General, Influence of axial force on the plastic moment, Influence of shear force, Local buckling of flanges and webs, Lateral buckling, General design procedure. Introduction to Light Gauge Steel Structures.

##### Suggested textbooks:

S. No	Name	Author(S)	Publisher
1	Analysis and Design of Sub-Structure	Saran S	Oxford and IBH, New Delhi
2	Foundation Analysis and Design	Bowls J E	Mc Graw Hill, New York
3	Foundation Design	Teng W C	Prentice Hall, New Delhi

<b>Course Code</b>	<b>CE514</b>
<b>Course Title</b>	<b>Hydraulic Structures</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Fluid Mechanics, Irrigation Engineering</b>
<b>Course Objective (CO)</b>	<b>To know the basics of Hydraulic structures along with the design of different components associated with it.</b>

### Syllabus

#### UNIT-I

Planning and investigations of reservoir and dam sites, Choice of dams, preparation And protection of foundation and abutments.

#### UNIT-II

Forces acting on solid gravity dam, modes of failures, stability analysis, elementary and practical profile of gravity dam, internal stresses and stress concentrations in gravity dam joints, seals, keys in gravity dams, dam safety and hazard mitigation.

Homogeneous and zoned embankment dams, factors influencing design of embankment dams, criteria for safe design of embankment dam, steps in design of embankment dam, seepage analysis and its control through body and dam foundation, classification of rock fill dams and their design considerations.

#### UNIT-III

Capacity of spillways, components and profile of different types spillways, Non-conventional type of spillways, selection and design of energy dissipaters Components of diversion head works and their functions, design of weirs and barrages on permeable foundations.

#### UNIT-IV

Canal regulation structures and design of cross drainage works, canal drops, operation and maintenance of canals. Review of codes of practices

#### Suggested textbooks

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Irrigation Engineering and Hydraulic Structures	R.k. Sharma	Oxford and IBH Publishing Co New Delhi, 1984.
<b>2</b>	Hydraulic Structures	Novak P	Taylor and Francis Group publishers
<b>3</b>	Theory and Design of Irrigation Structures,	R.S. Varshney, S.C. Gupta and R.L. Gupta;	Nemchand & Brothers ,Roorkee, 1992.

<b>Course Code</b>	<b>CE516</b>
<b>Course Title</b>	<b>Material Testing Lab</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>0 0 4</b>
<b>Credits</b>	<b>2</b>
<b>Course prerequisite</b>	<b>Concrete technology.</b>
<b>Course Objective (CO)</b>	<b>To make students well acquainted with techniques of testing various materials.</b>

### Syllabus

#### Syllabus

1. To determines water absorption of brick.
2. To determine the shape and size of the supplied brick.
3. To determines the compressive strength of bricks.
4. This test method covers the determination of Bulk and Apparent Specific Gravity and Absorption of fine aggregate.
5. This test method covers the determination of Bulk and Apparent Specific Gravity and Absorption of fine aggregate.
6. This method covers the determination of the particle size distribution the fine and coarse aggregate by sieving.
7. To ascertain the bulking phenomena of given sample of sand.

<b>Course Code</b>	<b>CE518</b>
<b>Course Title</b>	<b>Geotechnical Lab</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>0 0 2</b>
<b>Credits</b>	<b>1</b>
<b>Course prerequisite</b>	<b>Concrete technology.</b>
<b>Course Objective (CO)</b>	<b>To make students well acquainted with techniques of testing various materials.</b>

## **SYLLABUS**

### **List of experiments**

1. Permeability test using Constant-head test method.
2. Permeability test using Falling-head method.
3. Relative density.
4. Consolidation Test.
5. Tri axial Test(UU)
6. Vane shear test
7. Direct Shear Test
8. Unconfined Compression Strength Test

*Third*  
***SEMESTER***

<b>Course Code</b>	<b>CE601</b>
<b>Course Title</b>	<b>Tall Buildings</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course prerequisite</b>	<b>Design of concrete, steel structures, earthquake engineering</b>
<b>Course Objective (CO)</b>	<b>The objective of the study is to identify the structural systems for various combinations of gravity and horizontal loading considering their functional use and heights. The students Should be able to analyze the behaviour and drift capacities of various high rise structural forms.</b>

### Syllabus

#### Unit-I

Definition of tall building-need for constructing tall building-Historic background-factors affecting growth. Design Criteria, Design Philosophy of High Rise structures, Materials, Loading gravity loading- Dead and live load, live load reduction techniques-sequential loading, Impact loading, Wind Loading, Wind Characteristics, Static and Dynamic wind Effects.

#### UNIT-II

Analytical and wind tunnel experimental method, Earthquake loading-equivalent lateral force method, modal analysis, Introduction to Performance based seismic design. Structural form, Floor systems, Rigid frame Structures-rigid frame behaviour –approximate determination of member forces by gravity loading- two cycle moment distribution, approximate determination of member forces by lateral loading- Portal method, Cantilever method, approximate analysis of drift.

#### UNIT-III

Structural design of tall concrete and masonry buildings: commentary structure a standards, plastic analysis-strength of members and correction, non-linear analysis and limit design, stability, stiffness and crack control creep shrinkage and temperature effects. Limit state design, masonry structures.

#### UNIT-IV

Frame-shear wall systems: Twist of frame. Analysis of shear wall, frame wall interaction, analysis of coupled shear wall, computation of earthquake load dynamic analysis of tall building.

<b>Suggested textbooks</b>			
<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	High rise Building Structures”	Schumelles W	John Wiley and Sons, New York
<b>2</b>	Structural Analysis and Design of Tall Buildings	Taranath Bungale	McGraw Hall
<b>3</b>	Tall Building structures: Analysis and Design	Smith Bryan Stafford, Coull Alex.	New York Wiley-Inter science, , 1991.
<b>4</b>	High Rise Building structures	Wolfgang Schuller.	UK: JohnWiley and sons,1977

<b>Course Code</b>	<b>CE603</b>
<b>Course Title</b>	<b>Composite Structures</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>3 0 0</b>
<b>Credits</b>	<b>3</b>
<b>Course Objective (CO)</b>	<b>The objective of this course is to know about composite structures, their elastic behavior and their strength.</b>

### Syllabus

#### UNIT-I

##### Introduction

Definition, Classification and characteristics of Composite materials, advantages and limitations, Current Status and Future Prospects

##### **Basic concepts and characteristics:**

Homogeneity and heterogeneity, isotropy, orthotropy and anisotropy; characteristics and configurations of lamina, laminate, micromechanics and macro mechanics, constituent materials and properties.

#### UNIT-II

##### **Elastic behavior of unidirectional lamina: -**

Anisotropic, separately orthotropic and transversely isotropic materials, stress-strain relations for thin lamina, transformation of stress and strain, transformation of elastic parameters.

##### **Strength of unidirectional lamina:**

Macro mechanical failure theories- Maximum stress theory, maximum strain theory, Deviatoric strain energy theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu).

#### UNIT-III

##### **Elastic Behavior of multidirectional laminates**

Basic assumptions, Stress-strain relations, load deformation relations, symmetric and balanced laminates, laminate engineering properties.

#### UNIT-IV

##### **Bending and vibration of laminated plates**

Governing equations, Deflection of simply supported rectangular symmetric angle-ply, especially orthotropic, antisymmetric cross-ply laminates.

##### **Suggested textbooks**

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Mechanics of Composite materials	R.M. Jones	Taylor and Francis
<b>2</b>	Engineering mechanics of Composite materials	I. M. Daniel and O. Ishai	Oxford University press
<b>3</b>	Fiber-reinforced Composites	32 P.K. Mallick	Marcel Dekker Inc.
<b>4</b>	An introduction to composite materials	D. Hull and T. W. Clyne	Cambridge University press



<b>Course Code</b>	<b>CE605</b>
<b>Course Title</b>	Research Methodology
<b>Type of Course</b>	Audit
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Basic knowledge of mathematical concepts
<b>Course Objectives (CO)</b>	The course aims at equipping students with an understanding of the research process, tools and techniques

### SYLLABUS

#### **Unit –I**

An Introduction to Research: Meaning, Definition, Objectives and Process; Research Problem: Selection of Problem, Understanding Problem, Necessity of Defined Problem; Review of Literature in Research. Research Design: Meaning, Types –Descriptive, Diagnostic, Exploratory and Experimental.

#### **Unit –II**

Sources Of Data: Primary And Secondary; Data Collection Methods; Questionnaire Designing: Construction, Types And Developing A Good Questionnaire. Sampling Design and Techniques, Scaling Techniques, Meaning, Types, Data Processing Operations, Editing, Coding, Classification, Tabulation. Research Proposal/Synopsis Writing.

#### **Unit –III**

Statistics - Descriptive Statistics: Central Tendency and Dispersion, Correlation: Linear, Partial and Multiple, Simple and Multiple Regression, Discriminant Analysis, Conjoint Analysis, Time Series and Business Forecasting. Applications of Index Numbers; Sampling Distribution; Tests Of Significance: Z- Test, T-Test, Chi-Square Test, F -Test, And ANOVA; Use Of SPSS For T-Test, Chi-Square Test and ANOVA.

#### **Unit –IV**

Multi-Dimensional Scaling: Factor Analysis, Cluster Analysis, Interpretation of Data, Report Preparation and Presentation.

Each Student has to prepare Mini Research Project on Topic / Area of their Choice and Make Presentation. The report should consist of application of tests and techniques mentioned in above units. Relevant Case Studies should be discussed in class.

Note: Practical-Use of SPSS / Systat and Excel.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
1	Business Research Methods	D R. Cooper, & P.S,Schindler	Tata McGraw Hill
2	An Applied Orientation	N. Malhotra, and S.,Dash, Marketing Research	Pearson Education
3	Research Methodology: Methods & Techniques	C.R,Kothari	New Age International Publishers
4	Business Research Methods	Willian G.Zikmund	Thomson South-Western Learning
5	SPSS Explained	Hiolton, Brownlow McMurray,Cozens	Tata McGraw Hill

<b>Course Code</b>	<b>CE607</b>
<b>Course Title</b>	<b>Research and Publication Ethics</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>2 0 0</b>
<b>Credits</b>	<b>2</b>
<b>Course Objective (CO)</b>	The course aims at equipping students with an understanding of the research process, tools and techniques in order to facilitate managerial decision making.
<b>Course Outcomes (CO)</b>	At the end of this course, students will be able to 1. Analyze research related information 2. Follow research ethics 3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

## **SYLLABUS**

### **UNIT-I**

#### **Philosophy and Ethics-**

Introduction to Philosophy- Definition, Nature and Scope, Concept, Branches

Ethics- Definition, Moral philosophy, Nature of moral judgements and reactions.

### **UNIT-II**

Scientific Conduct: Ethics with respect to science and research, Intellectual honesty and research integrity

Scientific Misconducts: Falsification, Fabrication and Plagiarism (FFP), Redundant publications- Duplicate and

overlapping publications, Selective reporting and misrepresentation of data.

### **UNIT-III**

Publication Ethics: Definition, Introduction and importance, Best Practices or standards setting initiatives and guidelines: COPE, WAME etc, Conflicts of Interest

Publication Misconduct- definition, concept, problems that lead to unethical behavior and vice-versa, types

Violation of publication ethics, authorship and contributorship, Identification of publication , misconduct, complaints and appeals, Predatory publishers and journals

### **UNIT-IV**

Open Access Publishing-

Open Access publications and initiatives, Journal Finder/Journal suggestion tools. Use of plagiarism softwares-

Urkund, Turnitin

**Suggested Books:-**

<b>S. No.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
<i>1</i>	Research Publication and Ethics: Moral Rules for Researcher (1)	SHIV RAJ, Dr Suman Sharma	Kindle Edition
<i>2</i>	RESEARCH & PUBLICATION ETHICS	Seema Shukla; Yogendra Kumar; Dinesh Sriwash	NOTION PRESS

<b>Course Code</b>	<b>CE609</b>
<b>Course Title</b>	<b>Application of ICT tools in Computer Research</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>2 0 0</b>
<b>Credits</b>	<b>2</b>
<b>Course Objective (CO)</b>	Identify appropriate information sources <ul style="list-style-type: none"> <li>• critically analyse information</li> <li>• research effectively</li> <li>• manage information</li> <li>• use the information to extend and communicate knowledge across subject fields</li> </ul>
<b>Course Outcomes (CO)</b>	<ul style="list-style-type: none"> <li>• identify appropriate information sources</li> <li>• critically analyse information</li> <li>• research effectively</li> <li>• manage information</li> <li>• use the information to extend and communicate knowledge across subject fields</li> </ul>

## SYLLABUS

### UNIT-I

- a) What is the need of online tools for researchers?
- b) ICT application in pre-data analysis,
  - i. Article Availability
  - ii. Thesis and Dissertation Availability
  - iii. Literature Search- Shodh Ganga, Google scholar
  - iv. Content Search
  - v. Literature Tracking
  - vi. Quantitative Data Collection
  - vii. Qualitative Data Collection
  - viii. Big Data and Its Analytics
- c) ICT application in data analysis
  - i. Quantitative Data Analysis
  - ii. Qualitative Data Analysis
- d) ICT application in post-data analysis.
  - i. References and Bibliography Compilation
  - ii. Article and Thesis / Dissertation's Discussion among Researchers, Supervisors, Supervises and during Viva Voce
- e) Plagiarism Detection
- f) Journal Manuscripts Submission

### UNIT-II

- i. Search Engine & Research Papers, Shared Dataset and Code, Connect & Communicate with experts & researchers, Free Digital Library
- ii. Simulation/Lab and project management –

#### a. Designing tools-

1. Unified Modelling language and tools used- Smart Draw, Visual studio
2. Virtual Labs

#### b. Engineering tools- Matlab

**Introduction to Matlab:** Matlab as {best} calculator, Standard Matlab windows, Operations with variables - Naming, checking existence, Clearing, Operations. Familiarize Command

Window, History, Workspace, Current Directory, Figure window, edit window, Shortcuts, Help files

**Arrays:** Columns and rows: creation and indexing, Size & length, Multiplication, division, Power, Operations.

**Control Structures:** For loops, While, If control structures, Switch, Break, Continue statements

c. Programming tools-

1. Web based technology

2. Java based technology

d. Project Management tools- Gantt Pro

### **UNIT-III**

a. Database Technology tools

a. SQL plus

b. MS-access

b. Networking and Hardware tools

c. MS-Office in Research

### **UNIT-IV**

a. Tools for collaboration and sharing research- Google drive, Facebook, Orcid, Research gate, Courseera, Khan academy

b. Grammar checking tools, Plagiarism checking tool

### **RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>AUTHOR(S)</b>	<b>PUBLISHER</b>
1	<a href="#">Application of ICT in Research, Role and Tools of ICT   Scholarify.in</a>		e-book

<b>Course Code</b>	<b>CE601-19</b>
<b>Course Title</b>	<b>Dissertation-I</b>
<b>Type of Course</b>	<b>PC</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course Prerequisites</b>	<b>Research Methodology and IPR</b>
<b>Course Objectives (CO)</b>	<b>1) To understand the need of problem formulation, literature review. 2) To understand the format of writing research paper and thesis report</b>

### **Syllabus**

**DISSERTATION-I:** Students are expected to have expertise in your selected area including a solid understanding of the literature in your field before you delve into solving a specific research problem within that field. In the master's research you present an idea along with a preliminary plan for your research and convince the faculty that the proposed research is worthy of a dissertation. This document can't be a static one. It has to be updated regularly to track the dissertation. This Paper should be of 20-30 pages. It includes the following elements:

- 1) Abstract
- 2) Introduction
- 3) Brief overview of Literature
- 4) Problem Statement
- 5) Dissertation Goal
- 6) Research Questions
- 7) References
- 8) Appendix (if needed)

#### **Guidelines for Dissertation-I**

- Give a survey of the basic facts and theories in the field of research.
- Give an account of the recent work done by other researchers, and what important questions still remain unanswered
- Show what ideas you have for new research to find the answers to some of these questions
- Give details of
  - a. the new information you will seek
  - b. the materials to be used
  - c. the equipment needed
  - d. the observations and measurements to be made
  - e. how the data will be analysed

<b>Course Code</b>	<b>CE615</b>
<b>Course Title</b>	<b>Mini project with seminar</b>
<b>Type of course</b>	<b>PC</b>
<b>L T P</b>	<b>0 0 4</b>
<b>Credits</b>	<b>2</b>
<b>Course Objective (CO)</b>	<b>This course focuses on implementation of various real time projects</b>

### **Syllabus**

Seminar is a course requirement wherein under the guidance of a faculty member a student is expected to do an in depth study in a specialized area by doing literature survey, understanding different aspects of the problem and arriving at a status report in that area. It should provide insights into research methodology in the field, as well as an introduction to the meaning of research. While doing a seminar, the student is expected to learn investigation methodologies, study relevant research papers, correlate work of various authors/researchers critically, study concepts, techniques, prevailing results etc., analyze it and present a seminar report along with a project in the area of study. It is mandatory to give a seminar presentation and show the running project before a panel constituted for the purpose. The grading is done on the basis of the depth of the work done, understanding of the problem, report and presentation by the student concerned. Students will submit their report for seminar. Report which is to about 10-20 pages which should be based work done.

# Fourth SEMESTER



<b>Course Code</b>	<b>CE602</b>
<b>Course Title</b>	<b>PAVEMENT DESIGN AND ANALYSIS</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course Objective (CO)</b>	<ol style="list-style-type: none"> <li><b>1. Understand the factors affecting pavement design and performance.</b></li> <li><b>2. Evaluate the strength of soil subgrade soil and factors that affect the behavior of soil.</b></li> <li><b>3. Design of flexible pavements.</b></li> <li><b>4. Compute the stresses and deflections in flexible pavement layers under the action of wheel loads.</b></li> <li><b>5. Design the thickness of concrete pavements and joints</b></li> </ol>

### Syllabus

#### UNIT-I

##### Road Pavements and pavement layers

Road pavements types, functions, choice Factors affecting design and performance of flexible and rigid pavements – Pavement design factors, loads – axle load distribution, ESWL, EWL, VDF due to varying loads and CSA.

#### UNIT-II

Subgrade support - CBR and plate bearing tests, Resilient Modulus, fatigue tests, permanent deformation Pavement material Characteristics, climatic, drainage and environmental factors, their effects and evaluation. Factors affecting design and performance of airport pavements.

#### UNIT-III

Stresses and Deflection / strain in flexible pavements  
Application of elastic theory, stresses, deflections / strains in single, two and three layer system, Applications in pavement design. Problems

#### UNIT-IV

Flexible pavement design: Empirical, semi- empirical and theoretical design approaches, principle, advantages and application. Design steps by CBR method as per IRC, outline of other common design methods such as AASHTO and Asphalt Institute methods, Problems.

##### Suggested textbooks

<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Principles of Pavement Design	Yoder and Witczak	John Wiley and sons, New Jersey
<b>2</b>	Design of functional pavements	Yang	Mc Graw Hill, New York
<b>3</b>	Design & Performance of Road Pavements	David Croney, Paul Croney	Mc Graw Hill, New York

<b>Course Code</b>	<b>CE604</b>
<b>Course Title</b>	<b>Advanced Concrete Technology</b>
<b>Type of course</b>	<b>PE</b>
<b>L T P</b>	<b>4 0 0</b>
<b>Credits</b>	<b>4</b>
<b>Course prerequisite</b>	<b>Concrete Technology</b>
<b>Course Objective (CO)</b>	<b>This course is designed to Provide the ability in analysis and design of basic reinforced concrete components Study of advanced topics including theory and design of reinforced concrete structures</b>

### Syllabus

#### UNIT-I

##### **Structural Concrete:**

High strength concrete, materials for High Strength Concrete, Use of admixtures/superplasticizers, Mix Design procedures for High Strength Concrete mixes.

#### UNIT-II

##### Fly Ash Concrete:

Classification and properties of Fly ash, Reaction mechanism of Fly ash, Properties of Fly ash Concrete,

Mix Design procedure for Fly ash Concrete.

##### High Performance Concrete:

Materials for High Performance Concrete, Properties of High Performance Concrete, Self-compacting concrete and its properties, RMC , Guidelines for mix proportioning of HPC and self-compacting concrete.

#### UNIT-III

##### Polymer Concrete:

Classification of Polymer concrete, Properties of constituent materials, Polymer impregnated concrete, Properties and applications of Polymer and Polymer Impregnated concrete.

#### UNIT-IV

**Fiber Reinforced Concrete:** Properties of constituent materials, Mix proportioning guidelines, Mechanics and properties of Fiber Reinforced Concrete, Applications of fiber Reinforced Concrete.

<b>Suggested textbooks</b>			
<b>S. No</b>	<b>Name</b>	<b>Author(S)</b>	<b>Publisher</b>
<b>1</b>	Advanced Concrete Technology.	Krishnaraju, N.	New Delhi: CBS Publishers, 1985
<b>2</b>	Fiber Reinforced Concrete"	Bala Guru and Shah.	
<b>3</b>	Concrete Technology	Santhakumar, A.R..	New Delhi: Oxford University Press, 2006

<b>Course Code</b>	<b>CSE606</b>
<b>Course Title</b>	<b>Intellectual Property Rights In Research</b>
<b>Type of Course</b>	PC
<b>L T P</b>	4 0 0
<b>Credits</b>	4
<b>Course Prerequisites</b>	Basic knowledge of mathematical concepts
<b>Course Objectives</b>	The objective of the course is: <ul style="list-style-type: none"> <li>➤ To understand the concepts IPR</li> <li>➤ To understand Copyrights, Patents and Industrial Designs.</li> <li>➤ To understand Trademarks, Trade Secrets and Geographical indication of goods.</li> <li>➤ To understand the concepts of Cyber laws in IPR.</li> </ul>
<b>Course Outcomes (CO)</b>	At the end of the course, student will be able to:- <ol style="list-style-type: none"> <li>1. Demonstrate understanding of basic concepts of IPR.</li> <li>2. Understand Copyrights, Patents and Industrial Designs..</li> <li>3. Differentiate between Trademarks, Trade secrets and Geographical Indication of goods.</li> <li>4. Gain Knowledge on Cyber law</li> </ol>

## SYLLABUS

### Unit I

**Introduction:** Introduction to Intellectual Property Rights, types of intellectual property, importance of intellectual property rights, Evolution of IP acts and treaties, Agencies responsible for IPR registrations, Role and value of IP in international commerce, Issues affecting IP internationally.

### Unit II

**Patent Rights:** Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases, Surrender and Revocation of Patents, Infringement, Remedies and Penalties, Patenting under PCT.

**Copy Rights:** Origin, Definition and fundamentals of copyright law, Registration procedure, Assignment & license, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software

**Industrial Designs:** Kind of protection provided in Industrial design

### Unit III

**Trademarks:** Origin, Meaning and Nature of Trade Marks, Types, Selecting and evaluating trademark, Registration of Trade Marks, claims.

**Trade Secrets:** Trade secret law, determination of trade secret status, liability for misappropriation of trade secrets, trade secret litigation.

**Geographical Indication of Goods:** Basic aspects and need for the registration

### Unit IV

**Introduction to Cyber law:** Information Technology Act, cyber-crime and e-commerce, data security, confidentiality, privacy, international aspects of computer and online crime.

<b>RECOMMENDED BOOKS</b>			
<b>Sr. no.</b>	<b>Name</b>	<b>AUTHOR(S)</b>	<b>PUBLISHER</b>
1	Intellectual property rights	Neeraj Pandey, Khushdeep Dharni	PHI Publications
2	Law Relating To Intellectual Property Rights	Dr. M.K. Bhandari	Central Law Publications

<b>Course Code</b>	<b>CE608</b>
<b>Course Title</b>	<b>Technical Writing</b>
<b>Type of course</b>	<b>AEC/ Audit</b>
<b>L T P</b>	<b>2 0 0</b>
<b>Credits</b>	<b>2</b>
<b>Course prerequisite</b>	<b>Nil</b>
<b>Course Objective (CO)</b>	<ol style="list-style-type: none"> <li>1. Understand that how to improve your writing skills and level of readability</li> <li>2. Learn about what to write in each section</li> <li>3. Understand the skills needed when writing a Title</li> <li>4. Ensure the good quality of paper at very first-time submission</li> </ol>
<b>Course Outcome (CO)</b>	<p>The learner will be able to-</p> <ol style="list-style-type: none"> <li>1. Develop writing skills by analyzing model texts</li> <li>2. Expand academic vocabulary</li> <li>3. Consolidate more advanced aspects of English grammar relevant to writing research papers</li> <li>4. Consolidate language functions found in research papers</li> <li>5. Compare various practices and conventions used in writing research papers across a range of disciplines.</li> </ol>

### **Syllabus**

#### **UNIT-I**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

#### **UNIT-II**

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

#### **UNIT-III**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

#### **UNIT-IV**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions. Useful phrases, how to ensure paper is as good as it could possibly be

#### **RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
<b>1</b>	Writing for Science	Goldbort R (2006)	Yale University Press (available on Google Books)
<b>2</b>	How to Write and Publish a Scientific Paper	Day R (2006)	Cambridge University Press

<b>Course Code</b>	<b>CE610</b>
<b>Course Title</b>	<b>Dissertation-II</b>
<b>Type of Course</b>	<b>PC</b>
<b>L T P</b>	<b>0 0 32</b>
<b>Credits</b>	<b>16</b>
<b>Course Prerequisites</b>	<b>Dissertation-I</b>
<b>Course Objectives (CO)</b>	<b>The objective of this course is to successfully complete Dissertation with report, research paper with results in UGC approved journal and implementation of work under research</b>

### Syllabus

#### DISSERTATION-II:

In Dissertation, the students are required to do the research work related to their field. It involves two steps pre-submission & Final Submission of dissertation. In Pre-submission, every student will submit the synopsis on the selected topic and give the synopsis presentation also. In Final submission, every student will submit the detailed report on the selected topics and will present the findings of the report in front of the examination board.

- (1) Each M.Tech candidate shall be allotted a dissertation supervisor
- (2) Topic should be allotted to the student in third semester
- (3) Report may be divided into the number of chapters as required. Format of the report is as follows
  - **Introduction**
  - **Review of Literature**
  - **Methodology**
  - **Results**
  - **Conclusion**
    - the general background of your work,
    - a review of the work done by other people,
    - the objective of your own work,
    - the reasons why your work is interesting and useful.

**The Middle Chapters** should give detailed information about your work so that other people could repeat what you have done, or could do further work starting where your work finished.

In these chapters you should

- explain the theory,
- describe exactly how you did the work,
- give the results you obtained.

**the Last Chapter** should:

- state the conclusions you have drawn from your work,
- compare your conclusions with the opinions of other people (Are your conclusions the same or different?),
- suggest what new work should be done to answer questions raised by your work and extend our knowledge further.

Evaluation of the dissertation will be done by the Supervisor, Nominee and External expert.

# **OPEN ELECTIVE**

<b>Course Code</b>	<b>CE611</b>
<b>Course Title</b>	<b>Introduction To Rural Technology &amp; Community Development</b>
<b>Type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	Community Development
<b>Course Objectives (CO)</b>	The objective of this course is to make students aware of the various elements of rural technology and community development.

### SYLLABUS

#### UNIT-I

##### **Data analysis and measures of central tendency**

Meaning nature scope and limitations of statistics, collection of statistical data, classification, tabulation and diagrammatic representation of data, measures of central tendency : statistical averages means, media and mode.

#### UNIT-II

##### **Data Information and Knowledge**

Concept of information, need of information(professional education, research), qualities of information, value of information, difference between data and information, properties of the needed information, information and management, planning organizing, Coordinating and controlling

#### UNIT-III

##### **Concept of Marketing**

Difference between marketing selling and retailing, marketing mix, market segmentation, marketing planning, strategy and approaches; modern concept of marketing

##### **Community Development**

Concept, definition, meaning, need, history, principles objectives and scope. Community building: coming age, regenerating community, community model

#### UNIT-IV

##### **Consensus Organizing model**

What's behind building healthy communities, participatory democracy? The role of various NGOs in community development. The role of business and government in community development initiatives, how to form a non profit corporation fund raising and grant writing.

#### **RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
1	Encouraging community development	Biddle William wishart	Mcgraw hill
2	Sustainable rural technology	M.S Virdi	Daya publishing house
3	Rural technology	Punia RD Roy	Satyaparkashan
4	Rural education and technology	S.B Verma, S.K Jiloka	Deep and deep publication



<b>Course Code</b>	<b>ME611</b>
<b>Course Title</b>	<b>Industrial Safety Engineering</b>
<b>Type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	This course has no prerequisite other than knowledge of business process and data mining techniques
<b>Course Objectives (CO)</b>	<ol style="list-style-type: none"> <li>1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics</li> <li>2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors</li> <li>3. an ability to communicate effectively with a range of audiences</li> <li>4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts</li> <li>5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives</li> </ol>
<b>Course Outcomes</b>	The student will be able to identify and solve complex engineering principles.

### SYLLABUS

#### **UNIT-I**

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

#### **UNIT-II**

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

#### **UNIT-III**

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

#### **UNIT-IV**

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

#### **UNIT-V**

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. ~~4P~~ <sup>4P</sup> ~~al~~ <sup>al</sup> ~~cPh~~ <sup>cPh</sup> ~~ian~~ <sup>ian</sup> ~~ge~~ <sup>ge</sup> etools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

**RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>AUTHOR(S)</b>	<b>PUBLISHER</b>
1	Maintenance Engineering Handbook	Higgins & Morrow	Da Information Services
2	Maintenance Engineering	H. P. Garg	S. Chand and Company
3	Pump-hydraulic Compressors	Audels	McGraw Hill Publication
4	Foundation Engineering Handbook	Winterkorn, Hans	Chapman & Hall London

<b>Course Code</b>	<b>ME613</b>
<b>Course Title</b>	<b>Concept of Composite Materials</b>
<b>Type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	Basics of Engineering mechanics
<b>Course Objectives (CO)</b>	1. Ability to solve mechanics of composite materials problems using classical methods Assignments: Weekly problem sets are assigned. 2. Ability to do research and present on an advanced material topic Assignment: Students submit a research paper and present it in class
<b>Course Outcomes</b>	1 Some understanding of types, manufacturing processes, and applications of composite materials 2 Ability to analyze problems on macromechanical behavior of lamina 3 Ability to analyze problems on micromechanical behavior of lamina 4 Ability to analyze problems on macromechanical behavior of laminate

### SYLLABUS

#### UNIT-I

**INTRODUCTION:** Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

#### UNIT – II

**REINFORCEMENTS:** Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

#### UNIT – III

**Manufacturing of Metal Matrix Composites:** Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

#### UNIT-IV

**Manufacturing of Polymer Matrix Composites:** Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

#### UNIT – V

**Strength:** Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

**RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>AUTHOR(S)</b>	<b>PUBLISHER</b>
1	Material Science and Technology – Vol 13 – Composites	R.W.Cahn	VCH, West Germany
2	Materials Science and Engineering, An introduction	WD Callister, Jr., Adapted by R. Balasubramaniam	John Wiley & Sons, NY, Indian edition, 2007
3	Hand Book of Composite Materials		ed-Lubin.
4	Composite Materials	K.K.Chawla	
5	Composite Materials Science and Applications	Deborah D.L. Chung	
6	Composite Materials Design and Applications	Danial Gay, Suong V. Hoa, and Stephen W. Tasi	

<b>Course Code</b>	<b>ME615</b>
<b>Course Title</b>	<b>Concepts of Renewable Energy Resources</b>
<b>type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	Energy resources
<b>Course Objectives (CO)</b>	The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro.

### SYLLABUS

#### UNIT-I

**Principles of solar radiation:** Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

#### UNIT-II:

**Solar energy collection:** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**Solar energy storage and applications:** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

#### UNIT-III:

**Wind energy:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

**Bio-mass:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

#### UNIT-IV:

**Geothermal energy:** Resources, types of wells, methods of harnessing the energy, potential in India.

**Ocean energy:** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

**Direct energy conversion:** Need for DEC, Carnot cycle, limitations, principles of DEC

#### Recommended Books

S.No.	Name	Author(s)	Publisher
1	Non-Conventional Energy Sources	G.D. Rai	Khanna Publishers
2	Renewable Energy Resources	Twidell&Wier	CRC Press( Taylor & Francis)
3	Renewable energy resources	Tiwari and Ghosal	Narosa.
4	Renewable Energy Technologies	K Mittal	Wheeler

<b>Course Code</b>	<b>EE611</b>
<b>Course Title</b>	<b>Electrical Installation and safety</b>
<b>Type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	Electrical energy
<b>Course Objectives (CO)</b>	To demonstrate the viability – financial, environmental and social – of a decentralized, community-based and pro-poor waste management model that has at its core the conversion of the organic fraction of municipal solid waste into energy, and which is in support of national policies; To develop a multi-stakeholder partnership which can serve as a blueprint for further replication of the model in other locations in Indonesia and other countries in Asia-Pacific.
<b>Course Outcomes</b>	The development of the project will holistically take into account five pillars – institutional, political/policy, social, technical and economic/financial

### SYLLABUS

#### UNIT-I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

#### UNIT-II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

#### UNIT-III

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

#### UNIT-IV

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

### RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Non Conventional Energy	Desai, Ashok V.	Wiley Eastern Ltd., 1990
2	Biogas Technology - A Practical Hand Book	Khandelwal, K. C. and Mahdi, S. S.	Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983
3	Food, Feed and Fuel from Biomass	Challal, D. S.	IBH Publishing Co. Pvt. Ltd., 1991
4	Biomass Conversion and Technology	C. Y. WereKo-Brobby and E. B. Hagan	John Wiley & Sons, 1996

<b>Course Code</b>	<b>COM223</b>
<b>Course Title</b>	<b>Business Analytics</b>
<b>Type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	This course has no prerequisite other than knowledge of business process and data mining techniques
<b>Course Objectives (CO)</b>	<ol style="list-style-type: none"> <li>1. Understand the role of business analytics within an organization.</li> <li>2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.</li> <li>3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.</li> <li>4. To become familiar with processes needed to develop, report, and analyze business data.</li> <li>5. Use decision-making tools/Operations research techniques.</li> <li>6. Manage business process using analytical and management tools.</li> <li>7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.</li> </ol>
<b>Course Outcomes</b>	<p>At the end of the course-</p> <ol style="list-style-type: none"> <li>1. Students will demonstrate knowledge of data analytics.</li> <li>2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.</li> <li>3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.</li> <li>4. Students will demonstrate the ability to translate data into clear, actionable insights.</li> </ol>

## SYLLABUS

### UNIT-I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview

### UNIT-II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

### UNIT-III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

### UNIT-IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

### UNIT-V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

**UNIT-VI**

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

**RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>AUTHOR(S)</b>	<b>PUBLISHER</b>
1	Business analytics Principles, Concepts, and Applications	Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey	Pearson FT Press
2	Business Analytics	James Evans	Pearson Education



<b>Course Code</b>	<b>CSE540</b>
<b>Course Title</b>	<b>Introduction to Internet of Things</b>
<b>Type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	This course has no prerequisite other than knowledge of business process and data mining techniques
<b>Course Objectives (CO)</b>	1. Understand the role of internet in e -commerce
<b>Course Outcomes</b>	At the end of the course- 1. Students will demonstrate knowledge of data analytics. 2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics. 3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making. 4. Students will demonstrate the ability to translate data into clear, actionable insights.

### SYLLABUS

#### UNIT-I

Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

#### UNIT-II

IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network, Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

#### UNIT-III

Challenges in IoT Design challenges, Development challenges, Security challenges, Other challenges Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications

#### UNIT-IV

Developing IoTs Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python

### RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Designing the Internet of things	Adrian McEwen and Hakim Cassimally	Amazon
2	The Internet of Things – The Next Industrial Revolution Has Begun: How IoT, big data, predictive analytics, machine learning and AI will change our lives forever	<u>Magnus Unemyr</u>	Potscapes.com

<b>Course Code</b>	<b>CSE542</b>
<b>Course Title</b>	<b>Software Project Planning &amp; Management</b>
<b>Type of Course</b>	OE
<b>L T P</b>	2 0 0
<b>Credits</b>	2
<b>Course Prerequisites</b>	Software Engineering
<b>Course Objectives (CO)</b>	Student learn to select and apply software metrics and project management techniques for process modeling, planning, estimation, process metrics and risk management; perform software verification and validation using inspections, design and execution of system test cases.

### SYLLABUS

#### **UNIT-I**

##### **Software Project Management**

Project Definition, Contract Management, Activities covered By Software Project Management, Overview of Project Planning, Stepwise Project Planning.

##### **Project Evaluation**

Strategic Assessment, Technical Assessment, Cost Benefit Analysis –Cash Flow Forecasting, Cost Benefit Evaluation Techniques, Risk Evaluation.

##### **Activity Planning**

Objectives, Project Schedule, Sequencing and Scheduling Activities –Network Planning Models, Forward Pass, Backward Pass, Activity Float, Shortening Project Duration, Activity on Arrow Networks, Risk Management, Nature Of Risk, Types Of Risk, Managing Risk, Hazard Identification, Hazard Analysis, Risk Planning And Control

#### **UNIT-II**

##### **Monitoring And Control**

Creating Framework, Collecting Data, Visualizing Progress, Cost Monitoring, Earned Value, Prioritizing Monitoring, Getting Project Back To Target, Change Control, Managing Contracts, Introduction, Types Of Contract, Stages In Contract Placement, Typical Terms Of A Contract, Contract Management, Acceptance.

##### **Managing People And Organizing Teams**

Introduction, Understanding Behavior, Organizational Behaviour: A Background, Selecting The Right Person For The Job, Instruction In The Best Methods, Motivation, The Oldham, Hackman Job Characteristics Model, Working In Groups, Becoming A Team, Decision Making, Leadership, Organizational Structures, Stress, Health And Safety, Case Studies

#### **UNIT-III**

##### **Software Metrics**

Measurement in software engineering, objectives & scope of software metrics, quality models & measures, measurement & models

##### **Empirical Investigation**

Principles Of Investigation, Procedures For Experiments, Types Of Experimental Designs, Nested Vs Crossed Designs.

##### **Software-Metrics Data Collection & Analysis**

Defining Data, Faults, Collecting, Storing & Extracting Data, Analyzing results of experiments, Examples of simple analysis techniques, Measuring internal& external product attribute

#### **UNIT-IV**

##### **Software Reliability& Process Predictions**

Reliability Theory, Software Reliability Problem, Measuring Productivity, Teams, Tools, And Methods, Making Process Predictions, Cost Estimation: Problems And Approaches, Models Of Effort And Cost, Dealing With Problems Of Current Estimation Methods.

##### **Planning A Measurement Program**

Metrics Plans, Developing Goals, Questions, And Metrics, Mapping Measures To Activities, Assessment Tools, Measurers, Analysts, And Audience

**RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
1	Software Project Management	Bob Hughes, Mike Cotterell	Third Edition, Tata McGraw Hill, 2004
2	Software Project Management in Practice	Jalote	Pearson Education
3	Software Metrics And Project Management	Madhuvanti Joshi Teje	Vision Publications

# AUDIT COURSES

<b>Course Code</b>	<b>ENG001</b>
<b>Course Title</b>	<b>ENGLISH FOR RESEARCH PAPER WRITING</b>
<b>Type of Course</b>	Audit Course
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Nil
<b>Course Objectives (CO)</b>	<ol style="list-style-type: none"> <li>1. Understand that how to improve your writing skills and level of readability</li> <li>2. Learn about what to write in each section</li> <li>3. Understand the skills needed when writing a Title</li> <li>4. Ensure the good quality of paper at very first-time submission</li> </ol>

### **Syllabus**

#### **UNIT-I**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

#### **UNIT-II**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

#### **UNIT-III**

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

#### **UNIT-IV**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

#### **UNIT-V**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions.

#### **UNIT-VI**

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

### **RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
1	Writing for Science	Goldbort R (2006)	Yale University Press (available on Google Books)
2	How to Write and Publish a Scientific Paper	Day R (2006)	Cambridge University Press
3	Handbook of Writing for the Mathematical Sciences	Highman N (1998)	SIAM. Highman's book
4	English for Writing Research Papers	Adrian Wallwork	Springer New York Dordrecht Heidelberg London, 2011

<b>Course Code</b>	<b>EVS501</b>
<b>Course Title</b>	<b>DISASTER MANAGEMENT</b>
<b>Type of Course</b>	Audit Course
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Nil
<b>Course Objectives (CO)</b>	<ol style="list-style-type: none"> <li>1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.</li> <li>2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives</li> <li>3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.</li> <li>4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in</li> </ol>

### SYLLABUS

#### UNIT-I

**Introduction Disaster:** Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

#### UNIT-II

**Repercussions of Disasters and Hazards:** Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

#### UNIT-III

**Disaster Prone Areas In India Study Of Seismic Zones:** Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

#### UNIT-IV

**Disaster Preparedness And Management Preparedness:** Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

#### UNIT-V

**Risk Assessment Disaster Risk:** Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

#### UNIT-VI

**Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.**

### RECOMMENDED BOOKS

Sr. no.	Name	Author(s)	Publisher
1	Disaster Management in India: Perspectives, issues and strategies	R. Nishith, Singh AK	New Royal book Company.
2	Disaster Mitigation Experiences And Reflections	Sahni, Pardeep et al. (Eds.)	Prentice Hall Of India, New Delhi
3	Disaster Administration And Management Text And Case Studies	Goel S. L.	Deep & Deep Publication Pvt. Ltd., New Delhi

<b>Course Code</b>	<b>SSC008</b>
<b>Course Title</b>	<b>VALUE EDUCATION</b>
<b>Type of Course</b>	Audit Course
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Nil
<b>Course Objectives (CO)</b>	1. To get knowledge of self-development 2. Learn the importance of Human values 3. Developing the overall personality
<b>Course Output</b>	The student will be able to 1. Understand value of education and self- development 2. Imbibe good values in students 3. Let the should know about the importance of character

### **SYLLABUS**

#### **UNIT-I**

- Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.Moral and non- moral valuation. Standards and principles.
- Value judgements

#### **UNIT-II**

- Importance of cultivation of values.
- Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.
- Honesty, Humanity. Power of faith, National Unity.
- Patriotism. Love for nature, Discipline

#### **UNIT-III**

- Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.
- Punctuality, Love and Kindness.
- Avoid fault Thinking.
- Free from anger, Dignity of labour.
- Universal brotherhood and religious tolerance.
- True friendship.
- Happiness Vs suffering, love for truth.
- Aware of self-destructive habits.
- Association and Cooperation.
- Doing best for saving nature

#### **UNIT-IV**

- Character and Competence –Holy books vs Blind faith.
- Self-management and Good health.

- Science of reincarnation.
- Equality, Nonviolence, Humility, Role of Women.
- All religions and same message.
- Mind your Mind, Self-control.
- Honesty, Studying effectively,,

#### **RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
1	Values and Ethics for organizations Theory and practice	Chakroborty, S.K.	Oxford University Press, New Delhi



<b>Course Code</b>	<b>LAW006</b>
<b>Course Title</b>	<b>CONSTITUTION OF INDIA</b>
<b>Type of Course</b>	Audit Course
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Nil
<b>Course Objectives (CO)</b>	<ol style="list-style-type: none"> <li>1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.</li> <li>2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.</li> <li>3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.</li> </ol>
<b>Course Output</b>	<p>The student will be able to</p> <ol style="list-style-type: none"> <li>1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.</li> <li>2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.</li> <li>3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.</li> <li>4. Discuss the passage of the Hindu Code Bill of 1956.</li> </ol>

### SYLLABUS

#### UNIT-I

- History of Making of the Indian Constitution:
- History
- Drafting Committee, (Composition & Working)

#### UNIT-II

- Philosophy of the Indian Constitution:
- Preamble Salient Features

#### UNIT-III

- Contours of Constitutional Rights & Duties:
- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

#### UNIT-IV

Organs of Governance:

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions

65 | Page Executive

- President
- Governor

- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

#### **UNIT-V**

##### Local Administration:

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative,
- CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: ZilaPachayat.
- Elected officials and their roles, CEO ZilaPachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

#### **UNIT-VI**

##### Election Commission:

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

#### **RECOMMENDED BOOKS**

<b>Sr. no.</b>	<b>Name</b>	<b>Author(s)</b>	<b>Publisher</b>
1	The Constitution of India, 1950 (Bare Act)		Government Publication.
2	Dr. B. R. Ambedkar framing of Indian Constitution	Dr. S. N. Busi	1st Edition, 2015
3	Indian Constitution Law	M. P. Jain	7th Edn., Lexis Nexis, 2014
4	Introduction to the Constitution of India	D.D. Basu	Lexis Nexis, 2015

<b>Course Code</b>	<b>EDU003</b>
<b>Course Title</b>	<b>PEDAGOGY STUDIES</b>
<b>Type of Course</b>	Audit Course
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Nil
<b>Course Objectives (CO)</b>	<ol style="list-style-type: none"> <li>1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.</li> <li>2. Identify critical evidence gaps to guide the development.</li> </ol>
<b>Course Output</b>	<p>The student will be able to understand:</p> <ol style="list-style-type: none"> <li>1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?</li> <li>2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?</li> <li>3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?</li> </ol>

### **SYLLABUS**

#### **UNIT-I**

Introduction and Methodology:

- Aims and rationale, Policy background, Conceptual framework and terminology
- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions.
- Overview of methodology and Searching.

#### **UNIT-II**

- Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
- Curriculum, Teacher education.

#### **UNIT-III**

- Evidence on the effectiveness of pedagogical practices
- Methodology for the in depth stage: quality assessment of included studies
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy
- Theory of change.
- Strength and nature of the body of evidence for effective pedagogical practices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.

#### **UNIT-IV**

- Professional development: alignment with classroom practices and follow-up support
- Peer support
- Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

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#### **UNIT-V**

Research gaps and future directions

- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact

### RECOMMENDED BOOKS

Sr. no.	Name	Author(s)	Publisher
1	Classroom interaction in Kenyan primary schools, Compare	Ackers J, Hardman F (2001)	
2	Curricular reform in schools: The importance of evaluation	Agrawal M (2004)	Journal of Curriculum Studies, 36 (3): 361-379
3	Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report	Akyeampong K (2003)	London: DFID
4	Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?	Akyeampong K, Lussier K, Pryor J, Westbrook J (2013)	International Journal of Educational Development, 33 (3): 272-282
5	Culture and pedagogy: International comparisons in primary education	Alexander RJ (2001)	Oxford and Boston: Blackwell

<b>Course Code</b>	<b>PED001</b>
<b>Course Title</b>	<b>STRESS MANAGEMENT BY YOGA</b>
<b>Type of Course</b>	Audit Course
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Nil
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To achieve overall health of body and mind</li> <li>2. To overcome stress</li> </ol>
<b>Course Outcome (CO)</b>	<p>Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Develop healthy mind in a healthy body thus improving social health also</li> <li>2. Improve efficiency.</li> </ol>

### **Syllabus**

#### **UNIT-I**

Definitions of Eight parts of yog. ( Ashtanga )

#### **UNIT-II**

Yam and Niyam.Do`s and Don`t`s in life.

- i) Ahinsa, satya, astheya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

#### **UNIT-III**

Asan and Pranayam

- i) Various yog poses and their benefits for mind & body.
- ii) Regularization of breathing techniques and its effects-Typesof pranayam

#### ***Suggested reading***

1. ‘Yogic Asanas for Group Tarining-Part-I’ :Janardan Swami Yogabhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama(Publication Department), Kolkata

<b>Course Code</b>	<b>EDU002</b>
<b>Course Title</b>	<b>PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS</b>
<b>Type of Course</b>	Audit Course
<b>L T P</b>	3 0 0
<b>Credits</b>	3
<b>Course Prerequisites</b>	Nil
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To learn to achieve the highest goal happily</li> <li>2. To become a person with stable mind, pleasing personality and determination</li> <li>3. To awaken wisdom in students</li> </ol>
<b>Course Outcome (CO)</b>	<p>Students will be able to</p> <ol style="list-style-type: none"> <li>1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life</li> <li>2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity</li> <li>3. Study of Neetishatakam will help in developing versatile personality of students.</li> </ol>

### Syllabus

#### UNIT-I

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (don't's)
- Verses- 71,73,75,78 (do's)

#### UNIT-II

- Approach to day to day work and duties.
- Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

#### UNIT-III

- Statements of basic knowledge.
- Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad BhagwadGeeta:Chapter2-Verses 17, Chapter3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

***Suggested reading:***

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication
2. Department), Kolkata
3. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
4. Rashtriya Sanskrit Sansthanam, New Del