



Curriculum for BE Degree Course in Civil Engineering

Regulation 2024

Document Version

Version Number	Date	Author	Major Updates	Approved by
1.0	30.04.2024	Mr.S.Karthikeyan	Maths syllabus all three semester, NCC syllabus and Design thinking syllabus updated	HOD, CIVIL
1.1	06.08.2024	Dr.P.Vasanthi	Project phase I and II - PCC category changed to EES category	HOD, CIVIL

Section 1: General Course Structure

A. Definition of Credit:

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit

B. Structure of Program

S. No.	Category	Credits
1	Humanities & Social Science Courses (HSMC)	13
2	Basic Science Courses (BSC)	28
3	Engineering Science Courses (ESC)	16
4	Program Core Courses (PCC)	66
5	Professional Elective Courses (PEC)	18
6	Open Elective Courses (OEC)	06
7	Employability Enhancement Skills (EEC)	17
8	Mandatory Course (MC)	-
	TOTAL	164

C. Course code and definition

Code	Definition
L	Lecture
T	Tutorial

P	Practical
C	Credits

- ❖ **Course level coding scheme:** Four-digit number used as suffix with the Course Code for identifying the level of the course. Thousand's place denotes regulation number (we use "3" for 2022-23 Regulation) Digit at hundred's place signifies the semester in which course is offered. Last two digits represent the serial order of course within the semester. For example, 3101, 3102, ... are courses offered during first semester?

D. Category-wise Courses

Humanities & Social Science Courses (HSMC)

S. No.	Course Title	Semester	L-T-P-C
1.	தமிழர் மரபு /Heritage of Tamils	I	1-0-0-1
2.	Communicative English - I	I	3-0-2-4
3.	Communicative English II	II	3-0-2-4
4.	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	II	1-0-0-1
5.	Total Quality Management	VII	3-0-0-3
Total Credits			13

Basic Science Courses (BSC)

S. No.	Course Title	Semester	L-T-P-C
1.	Mathematics – I Calculus and Linear Algebra	I	3-1-0-4
2.	Engineering Physics	I	3-0-2-4
3.	Mathematics – II Probability and Statistics	II	3-1-0-4
4.	Applied Physics for Civil Engineering	II	3-0-2-4
5.	Mathematics – III Mathematical Methods for Engineering	III	3-1-0-4
6.	Mathematics – IV Numerical Methods	IV	3-1-0-4
Total Credits			24

Engineering Science Courses (ESC)

S. No.	Course Title	Semester	L-T-P-C
1.	Engineering Graphics	I	2-0-4-4
2.	Problem Solving using C- Programing	I	3-0-2-4
3.	Engineering Mechanics	I	3-1-0-4
4.	Fundamentals of Electrical and Electronics Engineering	II	3-0-2-4
5.	Problem Solving using Python Programing	II	3-0-2-4
Total Credits			20

Program Core Courses (PCC)

S. No.	Course Title	Semester	L-T-P-C
1.	Applied Structural Mechanics	III	3-0-2-4
2.	Civil Engineering Materials and Construction	III	3-0-2-4
3.	Surveying and Levelling	III	3-0-2-4
4.	Fluid Mechanics	III	3-0-2-4
5.	Water Supply and Wastewater Engineering	III	3-0-2-4
6.	Core Course Project - I	III	0-0-2-1
7.	Theory of Structures -I	IV	3-0-0-3
8.	Design of Reinforced Concrete Structural Elements	IV	3-0-0-3
9.	Soil Mechanics	IV	3-0-2-4
10.	Applied Hydraulics Engineering	IV	3-0-2-4
11.	Core Course Project – II	IV	0-0-2-1
12.	Theory of Structures – II	V	3-0-0-3
13.	Design of Steel Structures	V	3-0-0-3
14.	Foundation Engineering	V	3-0-0-3
15.	Highway, Traffic and Railway Engineering	V	3-0-2-4
16.	Hydrology and Irrigation water Management (including Design and Drawing)	V	3-0-2-4
17.	Core Course Project- III	V	0-0-2-1
18.	Estimation, Costing and Valuation Engineering	VI	3-0-2-4
19.	Building Information Modelling	VI	3-0-2-4
20.	Core Course Project - IV	VI	0-0-2-1

21.	Prestressed Concrete Structures	VII	3-0-0-3
Total Credits			66

Professional Elective courses

S. No.	Course Title	Semester	L-T-P-C
1	Professional Elective – I	V	3-0-0-3
2	Professional Elective – II	V	3-0-0-3
3	Professional Elective – III	VI	3-0-0-3
4	Professional Elective – IV	VI	3-0-0-3
5	Professional Elective – V	VII	3-0-0-3
6	Professional Elective – VI	VII	3-0-0-3
Total Credits			18

Open Elective Courses (OEC)

S. No.	Course Title	Semester	L-T-P-C
1	Open Elective – I	VI	2-0-2-3
2	Open Elective – II	VII	2-0-2-3
Total Credits			6

Mandatory Course (MC)

S. No.	Course Title	Semester	L-T-P-C
01.	Introduction to Women and Gender Studies	III	2-0-0-0
02.	Elements of Literature	III	2-0-0-0
03.	Film Appreciation	III	2-0-0-0
04.	Disaster Management	III	2-0-0-0
05.	Design Thinking	III	2-0-0-0
01.	Environmental Science and Sustainability	IV	2-0-0-0
02	Well Being with Traditional Practices (Yoga, Ayurveda and Siddha)	IV	2-0-0-0

03.	History of Science and Technology in India	IV	2-0-0-0
04.	Political and Economic Thought for a Humane Society	IV	2-0-0-0
05.	State, Nation Building and Politics in India	IV	2-0-0-0
06.	Industrial Safety	IV	2-0-0-0
Total Credits			0

Employability Enhancement Courses (EEC)

S. No.	Course Title	Semester	L-T-P-C
1.	Employability Enhancement Skills I	I	0-0-2-1
2.	Employability Enhancement Skills II	II	0-0-2-1
3.	Employability Enhancement Skills III	III	0-0-2-1
4.	Employability Enhancement Skills IV	IV	0-0-2-1
5.	Employability Enhancement Skills V	V	0-0-2-1
6.	Project Work Phase-I	VII	0-0-2-2
7.	Project Work Phase-II	VIII	0-0-20-10
Total Credits			17

E. Induction Program

- **Catapult** is a dynamic week-long event designed for our incoming first-year students, offering an immersive introduction to the diverse array of clubs and activities across the college campus. In addition to familiarizing them with our labs and Centers of Excellence (COEs), Catapult aims to acclimate first-year students to college life, ensuring they feel at ease with the forthcoming experiences of their four-year journey.
- This initiative fosters meaningful connections between seniors and juniors, providing a platform for them to explore departmental projects and engage in collaborative activities, thereby enhancing camaraderie and knowledge sharing within the college community.

F. Evaluation Scheme

a. For Theory Courses:

The weightage of internal assessment is 40% and for End Semester Exam is 60%. The student has to obtain at least 50% marks individually both in internal assessment and end semester exams to pass

b. For Practical Courses:

The weightage of internal assessment is 60% and for End Semester Exam is 40%. For Theory cum Lab. The student has to obtain at least 50% marks individually both in internal assessment and end semester exams to pass.

c. For Theory Cum Practical Courses:

The weightage of internal assessment is 50% and for End Semester Exam is 50%. The student has to obtain at least 50% marks individually both in internal assessment and end semester exams to pass

Note: The internal assessment is based on the student's performance in 3 Internal Assessment (IA) exams, quizzes, assignments, class performance, attendance, etc.

d. For Project works:

Assessment of project works comprises three internal reviews and an end-of-semester evaluation. Internal reviews, worth 40 marks in total, encompass assessment criteria such as Project Synopsis/Proposal Evaluation, Methodology and Design of Existing System, Feasibility of Project Proposal, Planning of Project Work, and Team Work. At the conclusion of the semester, 20 marks are designated for assessing the quality of the report, while the remaining 40 marks are reserved for evaluating performance in viva-voce, demonstration of the work, and other relevant factors.

G. Learning Beyond Class Room

- a. Students should be encouraged to visit Centers of Excellence (COEs) in the campus and learn additional technical skills
- b. Students should be encouraged to participate in internal / external competitions, hackathons, etc. on a regular basis

Section 2: Semester wise Structure and Curriculum for UG Course in CIVIL ENGINEERING

Semester I							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T	IP4100	Induction Programme				
2.	T	MA4101	Mathematics – I Calculus and Linear Algebra	3	1	0	4
3.	T	ME4101	Engineering Mechanics	3	1	0	4
4.	T	HS4101	தமிழர் மரபு /Heritage of Tamils	1	0	0	1
5.	T & P	HS4102	Communicative English - I	3	0	2	4
6.	T & P	PH4101	Engineering Physics	3	0	2	4
7.	T & P	ME4107	Engineering Graphics	2	0	4	4
8.	T & P	CS4111	Problem Solving using C- Programing	3	0	2	4
9.	P	ES4101	Employability Enhancement Skills - I	0	0	2	1
Total							26

Semester II							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T	MA4201	Mathematics – II Probability and Statistics	3	1	0	4
2.	T	HS4201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	1	0	0	1
3.	T & P	EE4207	Fundamentals of Electrical and Electronics Engineering	3	0	2	4
4.	T & P	HS4202	Communicative English II	3	0	2	4
5.	T & P	CS4212	Problem Solving using Python Programing	3	0	2	4
6.	T & P	PH4202	Applied Physics for	3	0	2	4

			Civil Engineering				
7.	P	ES4201	Employability Enhancement Skills- II	0	0	2	1
8.			NCC Credit Course Level 1 ARMY WING #	2	0	2	2#
Total							22

#NCC Credit Course is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

Semester III							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T	MA4301	Mathematics – III Mathematical Methods for Engineering	3	1	0	4
2.	T	MC43**	Mandatory Course -I	1	0	0	0
3.	T&P	CE4301	Applied Structural Mechanics	3	0	2	4
4.	T&P	CE4302	Civil Engineering Materials and Construction	3	0	2	4
5.	T & P	CE4303	Surveying and Levelling	3	0	2	4
6.	T & P	CE4304	Fluid Mechanics	3	0	2	4
7.	T & P	CE4305	Water Supply and Wastewater Engineering	3	0	2	4
8.	P	ES4301	Employability Enhancement Skills -III	0	0	2	1
9.	P	CE4306	Core Course Project - I	0	0	2	1
10.	T	MC4305	Design Thinking	2	0	0	0
Total							26

Semester IV							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C

1.	T	MA4401	Mathematics – IV Numerical Methods	3	1	0	4
2.	T	CE4401	Theory of Structures -I	3	0	0	3
3.	T	CE4402	Design of Reinforced Concrete Structural Elements	3	0	0	3
4.	T	MC44**	Mandatory Course -II	1	0	0	0
5.	T & P	CE4403	Soil Mechanics	3	0	2	4
6.	T & P	CE4404	Applied Hydraulics Engineering	3	0	2	4
7.	P	ES4401	Employability Enhancement Skills IV	0	0	2	1
8.	P	CE4406	Core Course Project – II	0	0	2	1
9.			NCC Credit Course Level 2 NAVAL WING#	3	0	0	3#
Total							20

#NCC Credit Course is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

Semester V							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T	CE4501	Theory of Structures – II	3	0	0	3
2.	T	CE4502	Design of Steel Structures	3	0	0	3
3.	T	CE4503	Foundation Engineering	3	0	0	3
4.	T	CE4V**	Professional Elective -I	3	0	0	3
5.	T	CE4V**	Professional Elective -II	3	0	0	3
6.	T & P	CE4504	Highway, Traffic and Railway Engineering	3	0	2	4
7.	T & P	CE4505	Hydrology and Irrigation water Management (including Design and Drawing)	3	0	2	4

8.	P	ES4501	Employability Enhancement Skills V	0	0	2	1
9.	P	CE4506	Core Course Project- III	0	0	2	1
Total							25

Semester VI							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T & P	CE4601	Estimation, Costing and Valuation Engineering	3	0	2	4
2	T & P	CE4602	Building Information Modelling	3	0	2	4
3.	T	CE4V**	Professional Elective III	3	0	0	3
4.	T	CE4V**	Professional Elective IV	3	0	0	3
5.	T & P	CE460**	Open Elective - I	2	0	2	3
6.	P	CE4603	Core Course Project - IV	0	0	2	1
7.			NCC Credit Course Level 3 AIR FORCE WING #	3	0	0	3#
Total							18

#NCC Credit Course is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

Semester VII							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T	CE4701	Prestressed Concrete Structures	3	0	0	3
2.	T	HS4702	Total Quality Management	3	0	0	3
3.	T	CE4V**	Professional Elective V	3	0	0	3
4.	T	CE4V**	Professional Elective VI	3	0	0	3
5.	T	CE470*	Open Elective - II	2	0	2	3
6.	P	CE4702	Project Work Phase -I	0	0	2	2
Total							17

Semester VIII							
S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	P	CE4801	Project Work Phase-II	0	0	20	10
Total							10

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B.E. / B. TECH (COMMON TO ALL BRANCHES)

Course Code	Mathematics - I Calculus and Linear Algebra	L	T	P	C
MA4101		3	1	0	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Develop a thorough understanding of fundamental concepts in calculus, linear algebra, and differential equations.
- Enhance problem-solving skills by employing techniques such as differentiation, integration, matrix operations, and differential equations to analyze and solve complex problems.
- Explore advanced topics including Fourier series, multiple integration, differential equations, and linear algebra concepts such as vector spaces and transformations.

UNIT I: Foundations of Calculus

12

Functions of a Single Variable – Limits, Continuity, and Differentiability – Mean Value Theorem – Local Maxima and Minima – Integration – Theorems of Integral Calculus – Evaluation of Definite and Improper Integrals – Applications of Definite Integrals.

UNIT II: Advanced Calculus

12

Partial Derivatives – Maxima and Minima (Multivariable), Multiple Integrals: Line, Surface, and Volume Integrals.

UNIT III: Linear Algebra

12

Vector Space – Basis – Subspaces – Linear Dependence and Independence – Matrix Algebra – Matrices: Properties and Operations – Projection Matrix – Orthogonal Matrix – Idempotent Matrix – Partition Matrix – Quadratic Forms.

UNIT IV: Systems of Linear Equations

12

Systems of Linear Equations and Solutions – Gaussian Elimination, Eigenvalues and Eigenvectors, Determinants, Rank, LU Decomposition, Singular Value Decomposition



UNIT V: Vector Calculus

12

Vector Identities – Total Derivative – Gradient, Divergence, and Curl – Directional Derivatives – Taylor Series – Optimization involving a Single Variable – Stokes’ Theorem – Green’s Theorem – Gauss Divergence Theorem.

Assessments & Grading

Exercises / Assignments, Quizzes, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- C01: Apply differentiation techniques to analyze functions, identify extrema, and understand the properties of functions using differentiation theorems such as Rolle's theorem, mean value theorems, Taylor's and Maclaurin's theorems, and L'Hospital's rule.
- C02: Apply integration techniques to solve problems involving multiple integrals, change of variables, and understand the theorems of Green, Gauss, and Stokes, enabling them to calculate volumes, areas, and solve various physical problems.
- C03: Solve a variety of first-order and higher-order differential equations, including initial value problems and boundary value problems, using appropriate techniques such as separation of variables and understand the application of Cauchy's and Euler's equations
- C04: Understand and manipulate matrices, solve systems of linear equations using matrix methods, and comprehend the properties of determinants and inverse matrices, enabling them to analyze linear systems and transformations effectively.
- C05: Grasp the fundamental concepts of vector spaces, linear transformations, eigenvalues, and eigenvectors, enabling them to analyze linear maps, understand the structure of vector spaces, and apply these concepts in various mathematical contexts.

TEXT BOOKS:

1. Grewal, B.S., “Higher Engineering Mathematics”, 44th Edition, Khanna Publishers, 2023.
2. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, John Wiley & Sons, 2023.
3. Ramana, B.V., “Higher Engineering Mathematics”, Tata McGraw Hill, 2017.

REFERENCES:

1. Hass, J., Heil, C., and Weir, M.D., “Thomas' Calculus”, 14th Edition, Pearson Education, 2018.
2. Poole, D., “Linear Algebra: A Modern Introduction”, 4th Edition, Cengage Learning India, 2014.

TOTAL: 60 PERIODS

Course Code	ENGINEERING MECHANICS	L	T	P	C
ME4101		3	1	0	4

COURSE OBJECTIVES

- To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and to determine the apply the concepts of frictional forecast the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy.

COURSE DESCRIPTION

Engineering Mechanics is a foundational course that introduces students to the principles of mechanics and their application to engineering problems. The course covers topics such as statics, dynamics, kinematics, kinetics, and the behavior of particles and rigid bodies under various forces and constraints. Students will learn how to analyze and solve problems related to equilibrium, motion, and forces in engineering systems.

PREREQUISITES

- Basic knowledge of physics, mathematics (calculus, algebra), and engineering fundamentals is recommended for students enrolling in this course.
- Familiarity with vectors, forces, and basic kinematics concepts will be beneficial.

UNIT I **STATICS OF PARTICLES** **9**

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II **EQUILIBRIUM OF RIGID BODIES** **9**

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections. Trusses and frames; virtual work.

UNIT III **DISTRIBUTED FORCES** **9**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three- Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION

9

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT V DYNAMICS OF PARTICLES

9

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

TOTAL (THEORY): 45 HOURS

COURSE OUTCOMES

At the end of the course the students would be able to

CO1: Illustrate the vector and scalar representation of forces and moments

CO2: Analyse the rigid body in equilibrium

CO3: Evaluate the properties of distributed forces

CO4: Determine the friction and the effects by the laws of friction

CO5: Calculate dynamic forces exerted in rigid body

TEXT BOOKS

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12th Edition, 2019.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES

1. Boreasi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeler, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4th Edition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, 5th Edition, McGraw Hill Higher Education, 2013.

YOUTUBE RESOURCES

1. **Structure free** - This channel offers comprehensive tutorials on Engineering Mechanics, covering topics such as statics, dynamics, equilibrium, and forces.
2. **Learn Engineering** - provides animated video lectures and tutorials on various engineering subjects, including Engineering Mechanics.

3. **Mechanical Engineering** - This channel features lectures and tutorials on Engineering Mechanics, mechanics of materials, and other mechanical engineering topics.
4. **Statics the Easy Way** - Statics the Easy Way offers explanations and examples related to statics, equilibrium, and force analysis in Engineering Mechanics.

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B.E. / B. TECH (COMMON TO ALL BRANCHES)

Course Code	□ □ □ □ □ □ □ □ /HERITAGE OF TAMILS	L	T	P	C
HS4101		1	0	0	1

COURSE OBJECTIVES:

The main objectives of this course are to:

- To enhance Tamil.

Course Description

This course aims to enhance proficiency in the Tamil language, covering various aspects of Tamil grammar, vocabulary, writing, reading, and speaking.

Prerequisites

- Interest and enthusiasm to improve Tamil language skills
- Access to Tamil language resources (books, online materials, audio/video resources)

UNIT I LANGUAGE AND LITERATURE

3

Language Families in India – Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE ROCK ART PAINTINGS TO MODERN ART SCULPTURE

3

Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments – Mridhangam, Parai, Veenai, Yazh and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS

3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS

3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self – Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

C01: To use appropriate words in a professional context

C02: To gain an understanding of basic grammatical structures and use them in the right context.

C03: To communicate and write without syntax errors.

C04: To write recommendations, instructions, and product descriptions.

C05: To write summaries, articles, blogs, definitions, and essays.

TEXT CUM REFERENCE BOOKS:

1. Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi – Sangam City Civilization on the banks of river Vaigai (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL).

YouTube Resources:

1. <https://youtu.be/RKK7wGAYP6k?t=2>
2. <https://youtu.be/Ge7c7otG2mk?t=1>
3. <https://youtu.be/d0yGdNEWdn0?t=2>
4. https://youtu.be/Ti_gFEe1XNY?t=3
5. <https://youtu.be/RKK7wGAYP6k?t=2>

REGULATIONS 2024

B.E. / B. TECH (COMMON TO ALL BRANCHES)

Course Code	Communicative English -I	L	T	P	C
HS4102		3	0	2	4

COURSE OBJECTIVES

1. To improve the communication competency.
2. To learn basic grammatical structures in suitable contexts.
3. To build students English language skills through LSRW.
4. To enable the students to write in English precisely and effectively
5. To develop language proficiency in expressing their opinions.

Introduction to Effective Communication

1

What is effective communication? Why is communication critical for excellence during study, research, and work? What are the seven C's of effective communication?

Unit I - Integrals of Communication (Greetings & Introduction)

8

Listening – Listening comprehensions, listening to News

Speaking – Just A Minute, Introducing a friend

Reading – Reading Newspaper / Articles/ Magazines, Reading comprehension

Vocabulary – Synonyms& Antonyms, Acquaintance with Prefixes & suffixes from foreign languages in English to form derivatives and Word formation

Grammar – Parts of Speech, Mixed Tenses, Active & Passive Voice

Writing –Letter of Introduction, Developing the Hints

Unit II - Giving and Receiving Instructions

9

Listening – Listening to short stories, Narrations and Persuasive speech

Speaking – Giving Instructions to use the Product/ Presenting or summarizing about a product

Reading – Reading Advertisements / Biographies

Vocabulary – Abbreviation, Acronyms, One – word Substitutes

Grammar – WH Questions/Yes or No Questions, Imperatives

Writing – Instructions, Paragraph Writing

UNIT III - Describing People and Places

9

Listening – Listening to the description of a product

Speaking –Picture Description, Narrating personal experiences and events



Reading – Gadget Reviews, User Manuals
Vocabulary – Homonyms, Homophones, Compound Words
Grammar – Adjectives, Adverbs, Articles.
Writing –Recommendations, Product/ Process Description.

UNIT IV –Visualization and Classification 9

Listening – TED talks
Speaking – Interviewing a celebrity/Famous Personality
Reading – Company profiles, Business Letters
Vocabulary– Discourse Markers, Linking words and Phrases Collocation.
Grammar – Pronouns, Conjunction, Preposition
Writing – Interpretation of Charts and Graphs

UNIT V – Exposition 9

Listening – Watching Movies / Listening to Dialogues and Conversations
Speaking – Role play, Panel Discussion, Debate
Reading – Blogs, Novels, Short Stories
Vocabulary – Phrasal Verbs
Grammar– Simple/Compound/Complex Sentences, Error Spotting, Punctuation.
Writing – Descriptive Essay, Dialogue Writing

THEORY - 45

PERIODS

List of Exercises:

1. Extempore (Oral)
2. Conversation on asking directions
3. Picture Description, about purchasing a product.
4. Summarising a TED talk.
5. Role play.

PRACTICAL- 30 PERIODS

TOTAL - 75 PERIODS

COURSE OUTCOMES

After the completion of the course, students will be able to

- CO1. Use appropriate words in a professional context
- CO2. Gain an understanding of basic grammatical structures and use them in the right context.
- CO3. Write definitions, descriptions, narrations and essays on various topics



CO4. Speak fluently and accurately in formal and informal communicative contexts

CO5. Express their opinions effectively in both oral and written medium of communication.

TEXT BOOKS

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University.
3. Professional English-II, V.K. Publications, Dr.S.N. Mahalakshmi.

REFERENCES

1. Technical Communication – Principles and Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd. Learning to Communicate–Dr.V. Chellammal. Allied Publishers, New Delhi, 2003

REGULATIONS 2024

B.E. / B. TECH (COMMON TO ALL BRANCHES)

Course Code	Engineering Physics	L	T	P	C
PH4101		3	0	2	4

COURSE OBJECTIVES:

1. To enable students to understand the mechanics and properties of matter.
2. To provide an overview of sound and ultrasonic production, detection and applications.
3. To introduce the basics of lasers.
4. To enrich the basic knowledge of optical fiber
5. To understand quantum mechanical phenomena and apply them in computing fields.

UNIT I MECHANICS AND PROPERTIES OF MATTER

9

Center of mass (CM) – motion of the CM – moment of inertia – theorems of M. I – moment of inertia of continuous bodies (Ring, Disc) – gyroscope. Elasticity – Type of modulus: Young's Modulus, Bulk Modulus, Rigidity Modulus – Poisson ratio - Hooke's law – stress-strain diagram – Factors affecting



elasticity – bending of Beams – Young’s modulus by uniform bending and non–uniform bending – Torsional Pendulum – I – shaped girders.

UNIT II ACOUSTICS AND ULTRASONICS 9

Acoustics: Classification and characteristics of sound – decibel – Weber – Fechner law – Factors affecting acoustics of buildings and their remedies – Absorption Coefficient. -Doppler effect. Ultrasonic – Production of Ultrasonic by Magnetostriction and piezoelectric methods – acoustic grating – Non-destructive testing – Pulse-echo system through transmission and reflection modes – A, B and C – scan displays.

UNIT III LASER 9

Laser: Characteristics – Spontaneous and stimulated emission – Pumping methods – Optical Resonator – Active medium and Active center – Einstein’s coefficient – Principles of Laser – population inversion- Components Laser systems - Types of laser – Nd – YAG laser, CO2 laser, Semiconductor lasers: homojunction and heterojunction - Industrial and medical application.

UNIT IV FIBRE OPTICS 9

Fiber optics – Principle, Numerical aperture and acceptance angle – types of optical fibers (material, refractive index, mode) – Attenuation, Dispersion – Fiber Optical Communication system (Block diagram) – Displacement sensors- Temperature/Pressure sensors –Optical fibers in computers - Medical Applications: Endoscope.

UNIT V QUANTUM MECHANICS 9

Blackbody Radiation - Planck’s quantum theory – Compton effect – Particle properties of wave: Matter waves, wave function – The Schrodinger equation (Time-dependent and time-independent forms) – Particle in an infinite potential well: One Dimensional Box –Qubit- Quantum computing – the role of Quantum computing in advancing Artificial intelligence.

THEORY: 45 PERIODS

PRACTICAL EXERCISES (FIVE ONLY)

1. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
2. Simple harmonic oscillations of cantilever.
3. Uniform bending – Determination of Young’s modulus.
4. Laser – Determination of the wave length of the laser using grating.
5. Optical fibre – Determination of Numerical Aperture and acceptance angle.
6. Acoustic grating – Determination of velocity of ultrasonic waves in liquids.
7. Michelson Interferometer.

PRACTICAL: 30 PERIODS

TOTAL: 75 PERIODS

COURSE OUTCOMES

After the completion of the course, students will be able to

- C01. Understand the importance of mechanics and express their knowledge in properties of matter
- C02. Analyze the applications of acoustics and ultrasonic in engineering field.
- C03. Acquire knowledge in laser and its applications
- C04. Demonstrate a strong foundational knowledge in fiber optics
- C05. Comprehend and apply quantum mechanical principles.

TEXT BOOKS

1. D. Kleppner and R. Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw – Hill (Indian Edition), 2017.
3. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai publishers, 2009.
4. Kasap, Safa, Capper, “ Handbook of Electronic and Photonic Materials” 2nd edition, Springer, 2017.
5. Eleanor Rieffel and Wolfgang Polak, “Quantum computing a gentle introduction”, 1st edition, The MIT press, 2012.

REFERENCES

1. R. Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
3. D. Halliday, R. Resnick and J. Walker. Principles of Physics, Wiley (Indian Edition), 2015. Searls and Zemansky. University Physics, 2009.
4. David J. Griffiths, “Introduction to Quantum Mechanics”, 2nd edition, Cambridge university press, 2017.
5. Chris Bernhardt, “Quantum computing for everyone” The MIT press, 2019.

WEB REFERENCES

1. Advanced Quantum Mechanics With Applications – <https://nptel.ac.in/courses/115103104>
2. Quantum Mechanics And Molecular Spectroscopy – <https://nptel.ac.in/courses/104101126>
3. Fiber Optic Communication Technology – <https://nptel.ac.in/courses/108106167>

4. Introduction To Photonics – <https://nptel.ac.in/courses/108106135>
5. Introduction To Laser – <https://nptel.ac.in/courses/115102124>
6. Biomedical Ultrasound - <https://nptel.ac.in/courses/121108458>

Course Code	Engineering Graphics	L	T	P	C
ME4107		2	0	4	4

COURSE OBJECTIVES

The main learning objective of this course is to prepare the students for:

- Drawing engineering curves.
- Drawing freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT I PLANE CURVES 6+12

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS AND FREEHAND SKETCHING 6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. Practicing three



dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection — isometric scale - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

COURSE OUTCOMES

On successful completion of this course, the student will be able to

- CO 1: Use BIS conventions and specifications for engineering drawing.
- CO 2: Construct the conic curves, involutes and cycloid.
- CO 3: Solve practical problems involving projection of lines.
- CO 4: Draw the orthographic, isometric and perspective projections of simple solids
- CO 5: Draw the development of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar PublishingHouse, 53 Edition, 2019.
2. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, McGraw Hill, 2 nd Edition, 2019.
2. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, Edition, 2017.
3. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introductory Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 201
5. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

TOTAL : 75 PERIODS

Course Code	Fundamentals of C Programming	L	T	P	C
CS4111		3	0	2	4

COURSE OBJECTIVES



- To understand the constructs of C Language.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C

UNIT I BASICS OF C PROGRAMMING 9

Introduction to programming – Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements.

Lab Experiments:

1. Write programs to get some input, perform some operation and display the output using I/O statements
2. Write a program to execute some specific statements based on the test condition
3. Write programs to implement nested loop.

UNIT II ARRAYS AND STRINGS 9

Introduction to Arrays: One dimensional array: Declaration – Initialization – Accessing elements - Operations: Traversal, Insertion, Deletion, Searching – Two dimensional arrays: : Declaration - Initialization – Accessing elements – Operations: Read – Print – Sum – Transpose - Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Indexing – Deletion – Replacement.

Lab Experiments

1. One Dimensional array (Sorting, Searching)
2. Two-Dimensional array (Matrix Addition, Subtraction, Multiplication, Transpose)
3. Strings: operations.

UNIT III FUNCTIONS AND POINTERS 9

Introduction to Functions – Types - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions, math functions) – Recursion, – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers

Lab Experiments

1. Display all prime numbers between two intervals using functions.
2. Sum of digits, Factorial, Fibonacci series, Binary Search using recursion.
3. To store and print the array elements using pointer

UNIT IV STRUCTURES AND UNION

9

Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Pointer and Structures – typedef – Union – Storage classes and Visibility.

Lab Experiments

1. Write a C program to Store Student Information in Structure and Display it.
2. To read and print the employee details using array of structure.

To declare, initialize and access the union members

UNIT V FILE PROCESSING

9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

Lab Experiments

1. C program to read name and marks of n number of students and store them in a file.
2. Write a program in C to create and store information in a text file.
3. Write a program in C to Find the Number of Lines in a Text File.

COURSE OUTCOMES

After completion of the course, the students should be able to

- CO 1: Demonstrate knowledge on C Programming constructs
- CO 2: Develop simple applications in C using basic constructs
- CO 3: Design and implement applications using arrays and strings
- CO 4: Develop and implement modular applications in C using functions
- CO 5: Develop applications in C using structures and pointers.
- CO 6: Design applications using sequential and random-access file processing

TEXT BOOKS:

1. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.

REFERENCES:

1. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020
3. Byron S. Gottfried, “Schaum’s Outline of Theory and Problems of Programming with C”, McGraw-Hill Education, 1996
4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.

5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013

TOTAL: 45 PERIODS

REGULATIONS 2024

B.E. / B. TECH (COMMON TO ALL BRANCHES)

Course Code	Employability Enhancement Skills - I	L	T	P	C
ES4101		0	0	2	1

COURSE OBJECTIVES

1. To categorize, apply and use thought process to understand the concepts of Quantitative methods to enhance problem solving skills.
2. To prepare and explain the fundamentals related to various possibilities with numeric ability and probabilities related to quantitative aptitude.
3. To critically evaluate numerous possibilities related to puzzles

UNIT I NUMBERS

Introduction – Classification of numbers – Formation of Numbers (Small & Large) –Place Value – Face Value – Divisibility Rule – Prime, Composite Numbers – Prime Factorization – Number of factors – Number of factors (Odd & Even) – Sum of factors – Successors and Predecessors – Greatest Integer Value Vedic Mathematics – Trailing Zeroes – Unit Digits–Remainder Theorem – Real Number – Rational Numbers: Integers, Fractions – Comparison of Numbers – Operations on fractions – Scientific Notation

UNIT II PROBLEMS ON LETTERS, NUMBERS AND SYMBOLS

Factors and Multiples, LCM and HCF – Relationship between LCM and HCF – Factorial – Simplification – VBODMAS – Square, Square Root – Cube, Cube Root – Exponents & Powers (Surds and Indices) – Sequence & Series: Arithmetic Progression – Geometric Progression – Special Progression, Letter Series, Number Series, Alpha – Numeric Series, Continuous Pattern Series

UNIT III VERBAL AND NON – VERBAL REASONING

Verbal Reasoning – Analogy: Completing the Analogous pair, Direct Analogy, Choosing the Analogous pair, Double Analogy, Choosing a Similar Word, Detecting Analogies, Multiple word Analogy, Number Analogy, Alphabet Analogy – Classification: Odd Words and Numerals – Coding and Decoding: Letter, Number, Symbol, Matrix, Substitution, Deciphering Message Word, Number and Symbols. Non – Verbal Reasoning Figure Series – Missing figure, Incorrect figure – Analogy: Similarity Related Pair, Similarity Related figures, unrelated figures, Group of figures.

UNIT IV RATIO AND PROPORTION

Introduction – Ratio – Proportion: Direct and Indirect – Unitary Method – Problems on Ages – Chain Rule – Partnership – Mixture or Allegation – Time and Work: Individual, Group, Efficiency, Wages – Pipes and Cistern: Inlet, Outlet, and Leakage

UNIT V PERCENTAGE

Introduction – Percentages in real life – Profit and Loss – Discount – Simple Interest – Compound Interest – Relationship between Simple Interest and Compound Interest – Overhead Expenses and GST.

TOTAL: 30 PERIODS

COURSE OUTCOMES

After the completion of the course, students will be able to

- C01. Develop the arithmetic ability and properties of numbers that we use in day to day life,
- C02. Demonstrate the logic behind the formation of numbers, alphabets series.
- C03. Apply the reasoning methods logically and evaluate complex relationships between the variables and numbers.
- C04. Use the concept of ratios and proportion in ages and partnership problems.
- C05. Apply the short cuts of the mathematical tricks to reduce the time duration in problem solving

TEXT BOOKS

1. “Quantitative Aptitude for Competitive Examinations” by R.S. Aggarwal – 2022”
2. “Teach Yourself Quantitative Aptitude” by Arun Sharma – 2017
3. “A modern approach verbal and non – verbal reasoning” by R.S. Aggarwal – 2017

REFERENCES

1. “Shortcuts in Mathematics” by Akhilesh Khare – 2016
2. “Vedic maths for competitive exams” by Ravi Shankar – 2016
3. “Quantitative Aptitude for Competitive Examination” by Abhijit Guha – 2017

Semester II

REGULATIONS 2024

B.E./ B. TECH (CSE, IT, AI&DS, CS, CSBS & AIML)

Course Code	Mathematics – II Probability and Statistics	L	T	P	C
MA4201		3	1	0	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce students to fundamental concepts of probability and statistics.
- Enable students to understand and apply various probability distributions in engineering contexts.
- Familiarize students with descriptive statistics techniques for summarizing and interpreting data.
- Equip students with the knowledge of sampling theory and statistical inference methods.
- Provide students with the skills to perform hypothesis testing and regression analysis for engineering applications.

UNIT I: Basic Concepts of Probability

12

Counting Principles: Permutations and Combinations – Probability Axioms and Definitions – Sample Space and Events – Independent and Dependent Events – Mutually Exclusive Events – Marginal, Conditional, and Joint Probability – Bayes' Theorem.

UNIT II: Descriptive Statistics and Probability Distributions

12

Measures of Central Tendency: Mean, Median, Mode – Measures of Dispersion: Variance, Standard Deviation – Correlation and Covariance – Introduction to Random Variables – Discrete Random Variables and Probability Mass Functions – Common Discrete Distributions: Uniform, Bernoulli, Binomial – Continuous Random Variables and Probability Distribution Functions – Common Continuous Distributions: Uniform, Exponential, Poisson, Normal.

UNIT III: Advanced Probability Distributions and Sampling Theory

12

Standard Normal Distribution – t-Distribution – Chi-Squared Distribution – Cumulative Distribution Function – Conditional Probability Density Function – Central Limit Theorem – Confidence Intervals – Hypothesis Testing: z-Test, t-Test, Chi-Squared Test.

UNIT IV: Statistical Inference and Analysis

12

Tests of Significance – Statistical Power Analysis – Sample Size Estimation – Linear Regression and Correlation Analysis.

UNIT V: Random Processes and Markov Chains

12

Random Processes: Introduction and Classification – Stationary Processes – Markov Processes – Poisson Processes – Discrete Parameter Markov Chains – Chapman-Kolmogorov Equations (Statement only) – Limiting Distributions.

Assessments & Grading

Exercises / Assignments, Quizzes, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- C01: Understand and apply basic probability concepts and principles.
- C02: Identify and analyze different types of random variables and probability distributions.
- C03: Calculate and interpret descriptive statistics measures for engineering datasets.
- C04: Apply sampling techniques and understand the implications of sample size and variability. Conduct hypothesis tests and interpret the results in engineering contexts.
- C05: Perform regression analysis to model relationships between variables and make predictions.

TEXT BOOKS:

1. Johnson, R.A., "Miller & Freund's Probability and Statistics for Engineers", 9th Edition, Pearson Education, 2016.
2. Milton, J.S. & Arnold, J., "Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences", 4th Edition, McGraw Hill Education, 2017.
3. Oliver Ibe, "Fundamentals of Applied Probability and Random Processes", Academic Press, 2014.

REFERENCES:

1. J. Schiller & Spiegel, M.R., "Schaum's Easy Outline of Probability and Statistics", McGraw Hill, 2020.
2. Yates, R.D., "Probability and Stochastic Process", 2nd edition, Wiley India Pvt Ltd, 2011.
3. Ross, A., "A First Course in Probability", 10th edition, Pearson Education, 2022.

TOTAL: 60 PERIODS

REGULATIONS 2024

B.E. / B. TECH (COMMON TO ALL BRANCHES)

Course Code	தமிழ்நாடு தொழில்நுட்பமும் /Tamil Technology	L	T	P	C
HS4201		1	0	0	1

COURSE OBJECTIVES:

The main objectives of this course are to:

- To enhance Tamil.

Course Description

This course aims to enhance proficiency in the Tamil language, covering various aspects of Tamil grammar, vocabulary, writing, reading, and speaking.

Prerequisites

- Interest and enthusiasm to improve Tamil language skills
- Access to Tamil language resources (books, online materials, audio/video resources)

UNIT I WEAVING AND CERAMIC TECHNOLOGY

3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

3

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) –



Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel – Copper and gold Coins as source of history – Minting of Coins – Beads making – industries Stone beads – Glass beads – Terracotta beads – Shell beads/ bone beads – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoombu of Chola Period, Animal Husbandry– Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries– Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

C01: To use appropriate words in a professional context

C02: To gain an understanding of basic grammatical structures and use them in the right context.

C03: To communicate and write without syntax errors.

C04: To write recommendations, instructions, and product descriptions.

C05: To write summaries, articles, blogs, definitions, and essays.

TEXT CUM REFERENCE BOOKS:

1. English Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (inprint)
2. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

CO 2: Explain the working principle and applications of electrical machines

CO 3: Analyse the characteristics of analog electronic devices

CO 4: Explain the basic concepts of digital electronics

CO 5: Explain the operating principles of measuring instruments.

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020
2. S.K.Bhattacharya “Basic Electrical and Electronics Engineering”, Pearson Education, Second Edition, 2017
3. Sedha R.S., “A textbook book of Applied Electronics”, S. Chand & Co., 2008
4. James A .Svoboda, Richard C. Dorf, “Dorf’s Introduction to Electric Circuits”, Wiley, 2018
5. A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2015

REFERENCES:

1. Kothari DP and I.J Nagrath, “Basic Electrical Engineering”, Fourth Edition, McGraw Hill Education, 2019.
2. Thomas L. Floyd, ‘Digital Fundamentals’, 11th Edition, Pearson Education, 2017
3. Albert Malvino, David Bates, ‘Electronic Principles, McGraw Hill Education; 7th edition, 2017
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, 2002.
5. H.S. Kalsi, ‘Electronic Instrumentation’, Tata McGraw-Hill, New Delhi, 2010

TOTAL : 45 PERIODS

REGULATIONS 2024

(B.E/B. TECH – COMMON TO ALL BRANCHES)

Course Code	Communicative English –II	L	T	P	C
HS4202		3	0	2	4

COURSE OBJECTIVES

1. To engage learners in meaningful language activities to improve their LSRW skills
2. To enhance learners awareness of general rules of writing for specific audiences
3. To help learners understand the purpose, audience, contexts of different types of writing
4. To develop analytical thinking skills for problem solving in communicative contexts
5. To cultivate the learners to understand job applications and interviews for internship and placements.

UNIT I MAKING COMPARISONS

9

Listening – Evaluative Listening: Advertisements, Product Descriptions, – Audio/ video

Speaking–Marketing a product, Persuasive Speech Techniques.

Reading – Reading advertisements, user manuals, brochures

Writing – Letter to the editor; Compare and Contrast Essay

Grammar – Impersonal passive voice; Prepositional phrases

Vocabulary –Contextual meaning of words

UNIT II EXPRESSING CASUAL RELATIONS IN SPEAKING AND WRITING

9

Listening – Listening to longer technical talks and completing–gap filling exercises. Listening technical information from podcasts

Speaking –Describing and discussing the reasons of accidents or disasters based on news reports

Reading – Reading longer technical texts/Novels

Writing – Writing responses to complaints; Problem solution Essay

Grammar –Subject – Verb Agreement, Infinitive and Gerunds

Vocabulary – Adverbs.

UNIT III PROBLEM SOLVING

9

Listening–Watching movie scenes/documentaries depicting a technical problem and suggesting solutions.

Speaking – Group Discussion (based on case studies), – techniques and Strategies.

Reading – Case Studies, excerpts from literary texts, news reports etc.

Writing – Checklists, Argumentative Essay

Grammar –Error correction; If conditional sentences

Vocabulary – Compound Words, Sentence Completion.

UNIT IV REPORTING OF EVENTS AND RESEARCH

9

Listening – Listening Comprehension based on news reports and documentaries.

Speaking –Interviewing, Presenting an oral report, Mini presentations on select topics

Reading –Newspaper articles

Writing –Industrial visit Report, Accident Report, Survey Report

Grammar–Reported Speech, Modals

Vocabulary–Conjunctions, use of prepositions.

UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY

9

Listening – Listening to TED Talks, Presentations, Formal job interviews



Speaking – Mock Interview, Making presentations with visual aids
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals

Writing –Job / Internship application – Cover letter with Resume

Grammar – Numerical adjectives, Relative Clauses Vocabulary–Idioms.

THEORY: 45 PERIODS

List of Exercises:

1. Listening /Reading Comprehension
2. Introducing Oneself
3. Summary of a Podcast
4. Mini Presentation on General topic (ICT tools)
5. Autobiography of a famous Personality
6. Narrating an unforgettable event
7. Drafting an Email (printed format)
8. Developing a story using given Vocabulary
9. Group Discussion
10. Mock Interview

PRACTICAL: 30 PERIODS

TOTAL: 75 PERIODS

COURSE OUTCOMES

After the completion of the course, students will be able to

C01. Compare and contrast products and ideas in technical texts.

C02. Identify cause and effects in events, industrial processes through technical texts

C03. Analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.

C04. Report events and the processes of technical and industrial nature.

C05. Present their opinions in a planned and logical manner, and draft effective resumes in context of job search.

TEXT BOOKS

1. English for Engineers & Technologists (2020edition) Orient Blacks wan Private Ltd. Department of English, Anna University.

2. English for Science & Technology Cambridge University Press 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

3. Professional English-II, V.K.Publications, Dr.S.N. Mahalakshmi.



REFERENCES

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. Learning to Communicate–Dr.V. Chellammal. Allied Publishers, New Delhi,2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.

REGULATION 2024 (B.E. CIVIL ENGINEERING)

Course Code	Problem Solving Using Python	L	T	P	C
CS4212		3	0	2	4

COURSE OBJECTIVES

- To understand the basics of algorithmic problem statements.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures-lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Identification of Computational Thinking, Algorithms, building blocks of algorithms(statements, state, control flow, functions),Algorithmic representation (pseudocode, flowchart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode, debugging; values and types: int, float, Boolean, string and list; variables, expressions, statements, tuple assignment, Boolean values and operators, precedence of operators, comments

UNIT III CONTROLFLOW, FUNCTIONS, STRINGS 9

Conditionals: conditional (if), alternative (if-else),chained conditional(if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing-list comprehension, List as arrays

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, Modules, Packages.

LAB EXERCISES

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list &tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 30 PERIODS

TOTAL (THEORY AND PRACTICAL) : 75 PERIODS

COURSE OUTCOMES

On completion of the course, students will be able to:

- CO 1: Develop algorithmic solutions to simple computational problems
- CO 2: Develop and execute simple Python programs.
- CO 3: Implement programs in Python using conditionals loops and functions for solving problems..
- CO 4: Process compound data using Python data structures.
- CO 5: Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Reema Thareja “Python Programming Using Problem Solving Approach” 2 nd Edition, Oxford University Press,2017
2. KarlBeecher,“ComputationalThinking:ABeginner'sGuide to Problem Solving and Programming”,1st Edition, BCS Learning & Development Limited,2017.
3. AllenB.Downey,“ThinkPython:HowtoThinklikeaComputerScientist”,2ndEdition,O'ReillyPublishers, 2016.

REFERENCES:

1. JohnVGuttag,"Introduction to Computation and Programming Using Python:With Applications to Computational Modeling and Understanding Data”,ThirdEdition,MITPress,2021
2. Paul Deitel and HarveyDeitel,“Python for Programmers”,Pearson Education,1st Edition,2021.
3. GVenkatesh and Madhavan Mukund,“ Computational Thinking:A Primer for Programmers and Data Scientists”,1st Edition,Notion Press, 2021.
4. <https://www.python.org/> Martin C.Brown,“Python:The Complete Reference”,4th Edition,Mc-GrawHill,2018
5. Eric Matthes,“Python Crash Course,A Hands on Project Based Introduction to Programming”, 2nd Edition, No Starch Press,2019.

TOTAL: 45 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Applied Physics For Civil Engineering	L	T	P	C
PH4202		3	0	2	4

COURSE OBJECTIVES

1. To introduce the basics of heat transfer through different materials, thermal performance of building and various thermal applications
2. To impart knowledge on the ventilation and air conditioning of buildings
3. To introduce the concepts of sound insulation and lighting designs
4. To give an introduction to the processing and applications of new engineering materials
5. To create an awareness on natural disasters and safety measures

UNIT I THERMAL APPLICATIONS

9

Principles of heat transfer, steady state of heat flow, conduction through compound media – series and parallel – conductivity of rubber tube and powder materials – thermal insulation and its

benefits – heat gain and heat loss estimation – factors affecting the thermal performance of buildings, climate and design of solar radiation – central heating.

UNIT II VENTILATION AND REFRIGERATION 9

Requirements, principles of natural ventilation – ventilation measurements, design for natural ventilation – Window types and packaged air conditioners – chilled water plant – fan coil systems – water piping – cooling load – Air conditioning systems for different types of buildings.

UNIT III ACOUSTICS AND LIGHTING DESIGNS 9

Methods of sound absorptions – absorbing materials – noise and its measurements, impact of noise in multistored buildings. Visual field glare, colour – day light calculations – day light design of windows, measurement of day – light and use of models and artificial skies, principles of artificial lighting.

UNIT IV NEW ENGINEERING MATERIALS 9

Composites – Definition and Classification – Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) – Metallic glasses – Shape memory alloys – Ceramics – Classification – Crystalline – Non Crystalline – Bonded ceramics, Manufacturing methods – Slip casting – Isostatic pressing – Gas pressure bonding – Properties.

UNIT V NATURAL DISASTERS 9

Seismology and Seismic waves – Earth quake ground motion – Basic concepts and estimation techniques – site effects – Probabilistic and deterministic Seismic hazard analysis – Cyclone and flood hazards – Fire hazards and fire protection, fire safety regulations and fire fighting equipment

THEORY: 45 PERIODS

PRACTICAL EXERCISES (FIVE ONLY)

1. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Testing of material Hardness – Brinell method
3. Testing of material Hardness – Rockwell method
4. Determination of thermal conductivity of a bad conductor – Lee’s Disc method.
5. Non – uniform bending – Determination of Young’s modulus
6. Determination of Band gap of a semiconductor.
7. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge.
8. Determination of particle size using Laser and compact disc – width of the groove

COURSE OUTCOMES

After the completion of the course, students will be able to

CO1. Acquire knowledge about heat transfer through different materials, thermal performance of building and thermal insulation.

CO2. Gain knowledge on the ventilation and air conditioning of buildings

CO3. Understand the concepts of sound absorption, noise insulation and lighting designs

CO4. Know about the processing and applications of composites, metallic glasses, shape memory alloys and ceramics

CO5. Get an awareness on natural disasters such as earth quake, cyclone, fire and safety measures

TEXT BOOKS

1. K.G. Budinski and M.K. Budinski. Engineering Materials: Properties and Selection. Pearson Education, 2016.
2. Marko Pinteric, Building Physics, Springer 2017.
3. D.S. Mathur. Elements of Properties of Matter. S Chand & Company, 2010.
4. Hugo Hens, Building Physics: Heat, Air and Moisture, Wiley, 2017.

REFERENCES

1. W.R. Stevens. Building Physics: Lighting. Pergamon Press, 2013.
2. Hugo Hens, Applied Building Physics, Wiley, 2016
3. Peter A. Claisse, Civil Engineering Materials, Elsevier, 2016.
4. Patrick L. Abbott, Natural Disasters, McGraw – Hill, 2017.

REGULATIONS 2024

B.E. / B. TECH (COMMON TO ALL BRANCHES)

Course Code	Employability Enhancement Skills – II	L	T	P	C
ES4201		0	0	2	1

COURSE OBJECTIVES

1. To categorize, apply and use thought process to understand the concepts of Quantitative methods to enhance problem solving skills.



2. To prepare and explain the fundamentals related to various possibilities with numeric ability and probabilities related to quantitative aptitude.
3. To critically evaluate numerous possibilities related to puzzles.

UNIT I – TIME AND DISTANCE

Introduction – Speed: Late / Early / Usual Time – Average Speed – Chasing – Problems on Train: Crossing Pole, Crossing Platform, Train moving in same and different direction – Boats and Streams: Upstream, Downstream – Clock – Calendar.

UNIT II – PROBABILITY AND STATISTICS

Introduction – Algebra of Events – Addition theorem of Probability – Permutation and Combinations – Problems based on choosing the objects – Statistics: Range – frequency, Arithmetic Mean – Median – Mode – Variance – Standard Deviation – Measures of Dispersion – Coefficient of Variation.

UNIT III – ARITHMETIC AND LOGICAL REASONING

Introduction – Mathematical Operations – Blood Relations: Direct, Indirect, coded – Problems on Cubes and Dices: Face identification – Folding and cutting Images – Counting technique of figures – Distance & Direction

UNIT IV – APPLIED MATHEMATICS

Mensuration (2D&3D): Square, Rectangle, Triangle, Circle, Parallelogram, Rhombus, Trapezoid, Quadrilateral, Cube, Cuboid, Cylinder, Cone, Sphere, Miscellaneous – Trigonometry: Ratio, Identities, Heights and Distances – Algebra – Logarithm – Geometry.

UNIT V – VERBAL AND LOGICAL REASONING

Introduction – Venn diagram – Syllogism – Data Sufficiency – Decision Making – Puzzle: Number Puzzle, Letter Puzzle – Ranking Test – Data Arrangement: Linear, Circular, Miscellaneous – Critical Reasoning.

TOTAL: 30 PERIODS

COURSE OUTCOMES

After the completion of the course, students will be able to

- CO1. Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests.
- CO2. Solve questions related to Time etc. from company specific and other competitive tests.
- CO3. Illustrate and solve puzzle related questions from specific and other competitive tests

TEXT BOOKS:

1. “Quantitative Aptitude for Competitive Examinations” by R.S. Aggarwal – 2022”
2. “Teach Yourself Quantitative Aptitude” by Arun Sharma – 2017
3. “A modern approach verbal and non – verbal reasoning” by R.S. Aggarwal – 2017

REFERENCES:

1. “Shortcuts in Mathematics” by Akhilesh Khare – 2016
2. “Vedic maths for competitive exams” by Ravi Shankar – 2016
3. “Quantitative Aptitude for Competitive Examination” by Abhijit Guha – 2017

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	NCC Credit Course Level 1 (ARMY WING)	L	T	P	C
***		2	0	2	2

UNIT I NCC General 6

Aims, Objectives & Organization of NCC (1) – Incentives (2) – Duties of NCC Cadet (1) – NCC Camps: Types & Conduct (2)

UNIT II National Integration and Awareness 4

National Integration: Importance & Necessity (1) – Factors Affecting National Integration (1) – Unity in Diversity & Role of NCC in Nation Building (1) – Threats to National Security (1)

UNIT III Personality Development 7

Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving (2) – Communication Skills (3) – Group Discussion: Stress & Emotions (2)

UNIT IV Leadership 5

Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code (3) – Case Studies: Shivaji, Jhansi Ki Rani (2)

UNIT V Social Service and Community Development 8

Basics, Rural Development Programmes, NGOs, Contribution of Youth (3) – Protection of Children and Women Safety (1) Road/ Rail Travel Safety (1) – New Initiatives (2) – Cyber and Mobile Security Awareness (1)

TOTAL: 30 PERIODS

**Semester III
REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Mathematics – III Mathematical Methods for Engineering	L	T	P	C
MA4301		3	1	0	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the fundamental concepts of differential equations, including their classification, linearity, and order, and apply appropriate solution methods such as integrating factor, separation of variables, and substitution to solve first-order ordinary differential equations (ODEs).
- Explore higher-order linear ODEs with constant coefficients and their solution methods, including characteristic equations and undetermined coefficients, and apply these concepts to model real-world phenomena.
- Gain proficiency in solving partial differential equations (PDEs) using separation of variables, and understand the classification, linearity, and types of PDEs such as heat equation, wave equation, and Laplace's equation, along with their applications in engineering.
- Develop a strong foundation in transform methods, including Laplace, Fourier, and Z-transforms, and their applications in solving differential and difference equations, as well as understanding the significance of initial and final value theorems.
- Acquire essential skills in numerical methods for solving mathematical problems encountered in engineering, including error analysis, iterative methods for algebraic equations, interpolation techniques, approximation of derivatives using finite differences, numerical integration methods, and solving first-order differential equations using single-step and multi-step methods

UNIT I: Differential Equations and First order Ordinary Differential Equations (ODEs) 12

Definition of differential equations – Classification: ordinary vs. partial, order, linearity – Introduction to first order linear ODEs – Solution methods: integrating factor method – Introduction to nonlinear first order ODEs – Solution methods: separation of variables, substitution – Modelling real-world phenomena with first order ODEs – Applications and examples.

UNIT II: Higher Order ODEs and Partial Differential Equations (PDEs) 12

Introduction to higher order linear ODEs with constant coefficients – Solution methods: characteristic equation, method of undetermined coefficients – Introduction to partial differential equations – Classification: order, linearity, types (e.g., heat equation, wave equation, Laplace's equation) – Method of separation of variables for solving PDEs – Introduction to boundary value problems (BVPs) and initial value problems (IVPs) – Applications and examples

UNIT III: Transforms 12

Introduction to Laplace transform – Existence conditions and basic properties – Transforms of elementary functions and unit step function – Inverse Laplace transform and convolution theorem – Introduction to Fourier transform – Dirichlet's condition and general Fourier series – Fourier transform pair and properties – Convolution theorem and Parseval's identity – Introduction to Z-transform – Elementary properties and inverse Z-transform – Initial and final value theorems – Application to difference equations and solution methods;

UNIT IV: Complex Analysis 12

Analytic functions – Cauchy-Riemann Equations – Cauchy's integral theorem and Integral formula – Taylor's and Laurent's series – Residue theorem.

Error Analysis – Types of errors: absolute error, relative error, and round-off error – Error propagation and significance of error analysis in numerical methods – Introduction to numerical methods for solving algebraic equations – Iterative methods: bisection method, Newton-Raphson method – Newton's interpolating polynomial: derivation and application – Lagrange polynomial: formulation and use in approximation – Approximation of derivatives using finite differences – Forward, backward, and central difference formulas – Introduction to numerical integration methods – Trapezoidal rule: derivation and application – Simpson's rule: formulation and comparison with the trapezoidal rule – Numerical Solutions of First Order Differential Equations – Single-step methods: Euler's method, improved Euler method (Heun's method) – Multi-step methods: Adams-Bashforth and Adams-Moulton methods

Assessments & Grading

Exercises / Assignments, Quizzes, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- C01: Demonstrate proficiency in applying differential equations to model and analyze engineering problems, including the ability to classify equations, determine linearity, and employ appropriate solution techniques for both first-order and higher-order ordinary differential equations.
- C02: Apply knowledge of partial differential equations (PDEs) to analyze physical phenomena in engineering, including the classification of PDEs, methods for solving them, and the ability to formulate and solve boundary value problems (BVPs) and initial value problems (IVPs) relevant to engineering applications.
- C03: Utilize transform methods such as Laplace, Fourier, and Z-transforms to solve differential and difference equations encountered in engineering, including understanding the properties and applications of these transforms and their significance in engineering analysis.
- C04: Develop proficiency in numerical methods for solving mathematical problems encountered in engineering practice, including error analysis, iterative methods for solving algebraic equations, interpolation techniques, numerical differentiation and integration methods, and solving first-order differential equations using both single-step and multi-step numerical methods.
- C05: Apply complex analysis techniques to solve engineering problems, including understanding the properties of analytic functions, applying Cauchy's integral theorem and integral formula, constructing Taylor's and Laurent's series, and utilizing the residue theorem for evaluating complex integrals relevant to engineering applications.

TEXT BOOKS:

1. Arfken, G.B., Weber, H.J. and Harris, F.E., "Mathematical Methods for Physicists", 7th Edition, Elsevier, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, 2023.
3. Chapra, S.C. and Canale, R.P., "Numerical Methods for Engineers", 8th Edition, McGraw Hill.2021.

REFERENCES:

1. Weinberger, H.F., "A First Course in Partial Differential Equations with Complex Variables and Transform Methods", Dover Publications, 1995.



2. Brown, J.W. and Churchill, R.V., “Complex Variables and Applications”, 9th Edition, McGraw Hill, 2021.

TOTAL: 60 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Applied Structural Mechanics	L	T	P	C
CE4301		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- To learn the fundamental concepts of Stress in simple and complex states.
- To know the mechanism of load transfer in beams and the induced stresses due to simple bending.
- To determine the deformation in determinate beams.
- To know the basic concepts of analysis of indeterminate beams.
- To calculate the stresses due to Unsymmetrical bending of beams, how to locate the shear center, and study the various theories of failure.

Course Description

This course is designed to provide students with a comprehensive understanding of stress and deformation in various structural elements. It covers fundamental concepts of stress in both simple and complex states, mechanisms of load transfer in beams, induced stresses due to bending, deformation analysis in determinate beams, and basic concepts of analysis in indeterminate beams.

Prerequisites

- Physics.
- Mathematics course with ordinary differential equations.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method.

UNIT II BENDING OF BEAMS 9

Types of beams and transverse loadings– Shear force and bending moment for simply supported, cantilever and over-hanging beams - Theory of simple bending – Bending stress distribution – Shear stress distribution.

UNIT III DEFLECTION OF BEAMS 9



Double Integration method – Macaulay’s method – Area moment method – Conjugate beam method
- Strain energy method for determinate beams.

UNIT IV INDETERMINATE BEAMS

9

Propped Cantilever and Fixed Beams – Fixed end moments reactions, slope and deflection for standard cases of loading -- Continuous beams – support reactions and moments – Theorem of three moments – Shear Force and Bending Moment Diagrams.

UNIT V ADVANCED TOPICS

9

Unsymmetrical bending of beams - shear center applied - Thick and Thin cylinders - Theories of failure – Principal stress, principal strain, shear stress, strain energy and distortion energy theories – application problems.

List of Experiments

1. Tension test on steel rod - Investigation of Hook’s law that is the proportional relation between force and stretching in elastic deformation.
2. Bending tests on simply supported beam and Cantilever beam.
3. Impact test on metal specimen (Izod and Charpy).
4. Torsion test on mild steel rod.
5. Double shear test on metal.
6. Hardness test on metals (Rockwell and Brinell Hardness Tests).
7. Compression test on helical spring.

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination.

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

C01: Understand the concepts of stress and strain, principal stresses and principal planes.

C02: Determine Shear force and bending moment in beams and understand concept of theory of simple bending.

C03: Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.

C04: Analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements.

C05: Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and study the various theories of failure.

TEXT BOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2018.
2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures" (SMTS) Vol -II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
4. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016.
5. Vazirani.V.N, Ratwani.M.M, Duggal.S.K Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1, Khanna Publishers, New Delhi 2014.

REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2017.
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2017.
3. Singh. D.K., "Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2021.
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
5. Irwing H.Shames, James M.Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002.
6. Beer. F.P. &Johnston.E.R. "Mechanics of Materials", Tata McGraw Hill, Sixth Edition, New Delhi 2010.
7. James M.Gere., Mechanics of Materials, Thomas Canada Ltd., Canada, 2006.
8. Egor. P.Popov, Engineering Mechanics of Solids, Prentice Hall of India, Second Edition New Delhi 2015.

YouTube Resources:

1. **TutorialsPoint** - This channel provides the basic concepts that are fundamental to strength of materials.
2. **nptelhrd** - You can find recordings of **strength of materials full course on YouTube**, which includes lectures on relevant topics
3. **@gblions** - Best books for Civil Engineering.

4. **Civil & Environmental Engineering Classroom**, Each topic of the video, which can be useful for understanding the technical aspects.
5. **Ekeeda.com** - Strength of Materials (SOM) for GATE | SSC JE | ESE | IES | PSU – This channel provides the gate and PSU resources and related lectures in subjects.
6. **@RHKatti** – Strength of materials lab – All the videos related to the lab test explained the clear vision.
7. **@LalitSinghMehta** – Each experiment is explained in the practical aspect.

TOTAL: 75 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Civil Engineering Materials And Construction	L	T	P	C
CE4302		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- To introduce students about various construction materials and the techniques that are commonly practicing in civil engineering construction.

Course Description

This course provides an introduction to the theory and practical applications of materials used in construction. Students will learn the fundamental concepts and techniques that implemented in construction.

Prerequisites

- Basic knowledge of materials that used in construction.

UNIT I STONES - BRICKS - CONCRETE BLOCKS - LIME 9

Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive strength – Water Absorption – Efflorescence – Lime – Preparation of lime mortar – Concrete hollow blocks – Lightweight concrete blocks.

UNIT II CEMENT – AGGREGATES – MORTAR – CONCRETE 9

Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness – Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Concrete – Ingredients – Manufacturing Process.

UNIT III OTHER MATERIALS 9

Timber – Market forms – Plywood – Veneer – False ceiling materials – Steel – Mechanical treatment –

Aluminium – Uses – Market forms – Glass – Ceramics – Refractories – Composite Materials –Types and applications – FRP – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

UNIT IV CONSTRUCTION PRACTICES & SERVICE REQUIREMENTS 9

Types of Foundations – Shallow and Deep Foundations – Stone Masonry – Brick Masonry –Plastering and Pointing – Cavity Walls – Diaphragm Walls – Formwork – Centering and Shuttering – Shoring – Scaffolding – Underpinning – Roofing – Flooring – Joints in concrete – Contraction / Construction/Expansion joints - Damp Proofing

UNIT V CONSTRUCTION EQUIPMENTS 9

Selection of equipment for earthwork excavation, concreting, material handling and erection of structures – Dewatering and pumping equipment

LIST OF EXPERIMENTS

I. TESTS ON CEMENT

- a. Determination of fineness of cement
- b. Determination of consistency of cement
- c. Determination of specific gravity of cement
- d. Determination of initial and final setting time of cement

II. TESTS ON CONCRETE

- a. Determination of slump of concrete
- b. Determination of compressive strength of concrete

III. TESTS ON FINE AGGREGATE

- a. Determination of specific gravity and water absorption of fine aggregate
- b. Determination of grading of fine aggregate
- c. Determination of water absorption for fine aggregate

IV. TESTS ON COARSE AGGREGATE

- a. Determination of compacted and loose bulk density of coarse aggregate
- b. Determination of impact value of coarse aggregate
- c. Determination of elongation index of coarse aggregate
- d. Determination of flakiness index of coarse aggregate
- e. Determination of aggregate crushing value of coarse aggregate
- f. Determination of specific gravity and water absorption of coarse aggregate

V. TESTS ON BRICKS

- a. Determination of compressive strength of bricks



- b. Determination of water absorption of bricks
- c. Determination of efflorescence of bricks

Course Format

Lectures and discussions, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- CO 1:** Identify the good quality brick, stone and blocks for construction
- CO 2:** Recognize the market forms of timber, steel, aluminium and applications of various composite materials.
- CO 3:** Identify the best construction and service practices such as thermal insulations and air Conditioning of the building
- CO 4:** Select various equipment's for construction works conditioning of building
- CO 5:** Understand the construction planning and scheduling techniques

TEXT BOOKS:

- 1. Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015.
- 2. Arora S.P and Bindra S.P Building construction, Dhanpat Rai and sons, 2013.

REFERENCES:

- 1. Varghese.P.C, Building Construction, Second Edition PHI Learning Ltd., 2016.
- 2. Punmia, B.C Building construction, Laxmi publication (p) Ltd., 2008.
- 3. Peurifoy R.L., Schexnayder,C.J., Shapira A., Schmitt.R., Construction Planning Equipment Methods, Tata McGraw-hill, 2011
- 4. Srinath L.S., PERT and CPM -Principles and applications, Affiliated East West Press 2001

YouTube Resources:

- 1. **Engineers Blog** : Convey different materials used in construction and its strength ,weight ,durability.
- 2. **Engineering Institute of Technology:** Construction Material Trends and Testing
- 3. **Ahmed Sadoon** :Civil Engineering Materials Lecture 3.2 (Aggregates)
- 4. **Machinery Magazine** :Incredible Modern Construction Equipment Machines Technology. Ingenious Extreme Construction Workers

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	SURVEYING & LEVELLING	L	T	P	C
CE4304		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
- To introduce the concepts of Control Surveying
- To introduce the basics of Astronomical Surveying.
- To Introduce Modern Surveying Equipment's like Total Station and GPS.

Course Description

This course provides an introduction to the theory and practical applications of Surveying and Levelling. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using Surveying and Levelling instruments.

Prerequisites

- Basic knowledge of measurements
- Familiarity with selecting suitable surveying methods.

UNIT I Fundamentals of Conventional Surveying and Levelling 9

Classifications and basic principles of surveying-Equipment and accessories for ranging and chaining-Methods of ranging - Compass-Types of Compass - Basic Principles- Bearing -Types-True Bearing-Magnetic Bearing-Levelling-Principles and theory of Levelling-Datum - Bench Marks - Temporary and Permanent Adjustments- Methods of Levelling-Booking -Reduction- Sources of errors in Levelling- Curvature and refraction

UNIT II Theodolite and Tacheometric Surveying 9

Horizontal and vertical angle measurements-Temporary and permanent adjustments-Heights and distances-Tacheometer-Stadia Constants-Analytic Lens-Tangential and Stadia Tacheometry surveying-Contour- Contouring- Characteristics of contours- Methods of contouring-Tacheometric contouring-Contour gradient -Uses of contour plan and map

UNIT III Control Surveying and Adjustment 9

Horizontal and vertical control - Methods - specifications - triangulation- baseline - satellite stations - reduction to centre- trigonometrical levelling - single and reciprocal observations -

traversing–Gale’s table.–Errors Sources–precautions and corrections–classification of errors – true and most probable values - weighed observations – method of equal shifts – principle of least squares- normal equation–correlates-level nets- adjustment of simple triangulation networks

UNIT IV Advanced Topics in Surveying **9**

Hydrographic Surveying – Tides – MSL – Sounding methods – Three point problem – Strength of fix – astronomical Surveying – Field observations and determination of Azimuth by altitude and hour angle methods –.Astronomical terms and definitions-Motion of sun and stars-Celestial coordinate systems-different time systems-Nautical Almanac-Apparent altitude and corrections-Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method.

UNIT V Modern Surveying **9**

Total Station : Advantages - Fundamental quantities measured -Parts and accessories –working principle-On board calculations-Field procedure-Errors and Good practices in using Total Station
GPS Surveying : Different segments-space, control and user segments-satellite configuration -signal structure-Orbit determination and representation-Anti Spoofing and Selective Availability-Task of control segment-Hand Held and Geodetic receivers-data processing-Traversing and triangulation.

LIST OF EXPERIMENTS:

Chain Survey

- Study of chains and its accessories, Aligning, Ranging, Chaining and Marking
Perpendicular offset
- Setting out works – Foundation marking using tapes single Room and Double Room

Compass Survey

- Compass Traversing – Measuring Bearings & arriving included angles

Levelling - Study of levels and levelling staff

- Fly levelling using Dumpy level & Tilting level
- Check levelling

Theodolite - Study of Theodolite

- Measurements of horizontal angles by reiteration and repetition and vertical angles
- Determination of elevation of an object using single plane method
when base is Accessible/inaccessible.

Tacheometry – Tangential system – Stadia system

- Determination of Tacheometric Constants
- Heights and distances by stadia Tacheometry
- Heights and distances by Tangential Tacheometry

Total Station - Study of Total Station, Measuring Horizontal and vertical angles

- Traverse using Total station and Area of Traverse
- Determination of distance and difference in elevation between two inaccessible points using Total station

TOTAL: 35 PERIODS

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students should be able to:

C01: The use of various surveying instruments and mapping

C02: Measuring Horizontal angle and vertical angle using different instrument

C03: Methods of Levelling and setting Levels with different instruments

C04: Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth.

C05: Concept and principle of modern surveying.

TEXT BOOKS:

1. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling,Parts1&2,PuneVidyarthi Griha Prakashan,Pune,2008
2. Punmia.B.C.,Ashok K.Jain and Arun K Jain, Surveying Vol.I&II, Lakshmi Publications Pvt Ltd,NewDelhi,2005
3. James M.Anderson and EdwardM.Mikhail,"Surveying, Theory and Practice",7th Edition, Mc Graw Hill,2001.
4. BannisterandS.Raymond,"Surveying",7th Edition,Longman 2004
5. Laurila,S.H."Electronic Surveying in Practice", JohnWiley and SonsInc,1993
6. Venkatramaiah, "Text book of Surveying",Universitypress,NewDelhi,2014

REFERENCES:

1. Alfred Leick,"GPS satellite surveying", JohnWiley&Sons Inc.,3rd Edition,2004.
2. GuochengXu, "GPS Theory Algorithms and Applications" Springer–Berlin, 2003.
3. SatheeshGopi, Rasathishkumar, N.madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education,2007
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.
5. Arora K.R.," Surveying Vol I & II", Standard Bookhouse,10th Edition 2008

YouTube Resources:

1. **MachenLink** : Transforming Lecture into an Active Learning Experience. We are a team of passionate engineers who want to impart quality assistance to all the aspiring engineers out there. Our Motto: Be a quality Engineer and not just a degree holder with Engineering printed on it.
2. **IIT Kharagpur** : Your browser can't play this video. Learn ... Surveying and Levelling by Prof. Kousik Deb. 113K ... Go to channel · Lecture 1
3. **Unacademy GATE & ESE – Civil**: Unacademy GATE & ESE - Civil by Unacademy is your one-stop destination to crack GATE & ESE. We cover the complete syllabus for all subjects for GATE, ESE Prelims, and ESE Mains.
4. **Engineers Institute of India**: Eii- Engineers Institute of India, results oriented GATE & PSUs & JE/AEn coaching institute You can access our official videos, Study Materials, test Series at <https://www.engineersinstitute.com> Technical Lectures of Important topics for GATE, PSUs & JE/AE.

TOTAL : 75 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Fluid Mechanics	L	T	P	C
CE4304		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- To understand the basic properties of the fluid and fluid static.
- To formulate the different types of flow, equations and its applications
- To gain knowledge on dimensionless parameter, similitudes and model studies
- To enhance the knowledge of working principles of flow through pipes
- To learn the principles behind the boundary layer conditions

Course Description

This course discusses basic concepts of fluid mechanics, among others fluid types and classifications, the scope of fluid mechanics, fluid statics, and approaches by developing mathematical modeling in integral form for regulated volumes, and the analysis of dimensions, likenesses, and study model.

Prerequisites

- Basic knowledge of properties of fluid and its properties.
- Familiarity with fundamental dimension and dimensionless parameters
-

UNIT I Fluid Properties and Fluid Statics 9

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.

UNIT II Fluid Kinematics and Dynamics 9

Fluid Kinematics – Classification and types of flow - velocity field and acceleration - continuity equation (one- and three-dimensional differential forms)- stream line-streak line-path line- stream function - velocity potential function - flow net. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation – applications - venturi meter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

UNIT III Dimensional Analysis and Model Studies 9

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi- theorem - dimensionless parameters - similitudes and model studies - distorted models.

UNIT IV Flow Through Pipes 9

Reynold's experiment - laminar flow through circular pipe (Hagen Poiseuille's) - hydraulic and energy gradient – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor- Moody's diagram- major and minor losses of flow in pipes - pipes in series and in parallel.

UNIT V Boundary Layer 9

Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundary layer-displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate

List of Experiments

Fluid mechanics laboratory

1. Calibration of Rotameter
2. Determination of Coefficient of discharge for Venturimeter
3. Determination of Coefficient of discharge for Orifice meter
4. Determination of Coefficient of discharge for orifice
5. Determination of Coefficient of discharge for notches

6. Study of friction losses in pipes
7. Study of minor losses in pipes

TOTAL: 30 PERIODS

Course Format

Lectures and discussions, projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- CO1: Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- CO2: Understand and solve the problems related to equation of motion.
- CO3: Gain knowledge about dimensional and model analysis.
- CO4: Learn types of flow and losses of flow in pipes.
- CO5: Understand and solve the boundary layer problems

TEXT BOOKS:

1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
2. Jain.A.K., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
3. Subramanya.K " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
4. Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2013.

REFERENCES:

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw Hill, 2000.
2. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2013.
3. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2017.
4. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015.
5. Rajput.R.K. "Fluid Mechanics", S.Chand and Co, New Delhi, 2008.



YouTube Resources:

1. **CPPMechEng Tutorials** - Address the basic knowledge of Fluid mechanics and its properties.
2. **College Fluid Mechanics**- It gives knowledge on practical applications of Fluid mechanics concept in field level.
3. **Civil Engineering Exam** - This channel offers concise summaries of Fluid dynamics and fluid Kinematics in Civil Engineering numerical problems.
4. **Fluid Matters**- This channel provides tutorials on hydraulic energy gradient which can be useful for understanding the technical aspects of flow through pipes.
5. **Cambridge University Press**- An introduction of flow and application of Fluid mechanics is clearly explained in this channel
6. **Harvard school of Engineering** - Recordings of Harvard University's Fluid mechanics concepts and machinery on YouTube, which includes lectures on relevant topics can be found here.
7. **Ekeeda GATE & ESE** – Discuss previous year gate question and solution for all choice based and numerical problems.
8. **University of Washington** – In this channel a detailed demonstration of Fluid mechanics and Machinery laboratory is performed

45 PERIODS

TOTAL:75 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Water Supply And Wastewater Engineering	L	T	P	C
CE4305		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- To perform water characterization and to study the various water demand.
- To develop a student’s skill in the basic design of unit operations and processes involved in water and wastewater treatment.
- To understand the water distribution networks and plumbing system.
- To estimate the sewage weather flow conditions and hydraulics of sewers.
- To learn the various sewage treatment methods and sludge management.

Course Description

This course provides an in-depth study of the principles, technologies, and practices involved in the provision of clean water supply and the treatment of wastewater. Students will explore the entire

water cycle, from water sources and abstraction methods to treatment processes and distribution systems. Additionally, the course will cover the collection, conveyance, and treatment of wastewater to minimize environmental impact and ensure public health protection.

Prerequisites

- Strong foundation in fundamental engineering principles, including mathematics, physics, and chemistry.
- Skills in engineering design and analysis are necessary for designing water supply and wastewater treatment systems.

UNIT I Water Supply

8

Estimation of surface and subsurface water resources – Predicting demand for water- Impurities of water and their significance – Physical, chemical and bacteriological analysis -Waterborne diseases – Standards for potable water. Intake of water: Pumping and gravity schemes.

UNIT II Water Treatment

10

Objective's – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator – Plate and tube settlers – Pulsator clarifier – sand filters – Disinfection – softening, removal of iron and manganese – Defluoridation – Softening – Desalination process – Residue Management – Construction, Operation and Maintenance aspects.

UNIT III Water Storage

8

Storage and balancing reservoirs – types, location and capacity. Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations – House service connections.

UNIT IV PLANNING AND DESIGN OF SEWERAGE SYSTEM

9

Characteristics and composition of sewage – Population equivalent – Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage- Storm runoff estimation – Sewer appurtenances – Corrosion in sewers – Prevention and control – Sewage pumping-drainage in buildings – Plumbing systems for drainage.

UNIT V Sewage Treatment and Disposal

10

Objectives – Selection of Treatment Methods – Principles, Functions, – Activated Sludge Process and Extended aeration systems – Trickling filters – Sequencing Batch Reactor(SBR) – UASB –Waste Stabilization Ponds – Other treatment methods – Reclamation and Reuse of sewage – Recent

Advances in Sewage Treatment – Construction, Operation and Maintenance aspects. – Discharge standards-sludge treatment -Disposal of sludge.

PRACTICALS

LIST OF EXPERIMENTS (for Water & Wastewater)

- 1 Introduction to Standards, Collection, Preservation of samples and Sampling Techniques – A Study Experiment
- 2 Determination of Turbidity, Electrical conductivity and PH
- 3 Determination of Acidity
- 4 Determination of Alkalinity
- 5 Determination of Hardness
- 6 Determination of Optimum Coagulant Dosage
- 7 Determination of Chlorides
- 8 Determination of Suspended, Volatile and Fixed solids
- 9 Determination of DO for the Given Sample
- 10 Determination of COD for Given Sample
- 11 Determination of BOD for the Given Sample
- 12 Determination of Sludge Volume Index of Biological Sludge
- 13 Determination of Oil and Grease
- 14 Determination of MPN Index of given water sample (Demonstration only)

CONTENT BEYOND SYLLABUS

- 15 Determination of Residual Chlorine and Available Chlorine in water
- 16 Determination of Iron and Fluorides
- 17 Determination of Sulphates

PRACTICAL: 30 PERIODS

Course Format

Lectures and discussions, Hands-on practical exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

CO1: Plan and estimate public water supply system.

CO2: Examine the type and size of reactor required for various unit operations and processes.
involved in water and wastewater treatment.

CO3: Design water distribution networks and service supply to buildings.

C04: Estimate and design of sewage flow and plumbing system.

C05: Design the various components of Sewage treatment plants and sludge disposal methods.

TEXT BOOKS:

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016.
3. Garg, S.K., Environmental Engineering Vol.II, Khanna Publishers, New Delhi, 2015.
4. Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010
5. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. "Environmental Engineering", Mc-Graw – Hill Indian Editions, New York 1st Edition 2013.
6. Modi, P.N., Sewage Treatment disposal & Wastewater Engineering, Vol.II Standard Book House, New Delhi, 2020

REFERENCES:

1. Metcalf and Eddy – Wastewater Engineering – Treatment and Reuse, Tata Mc. Graw – Hill Company, New Delhi, 2010.
2. Gray N.F, "Water Technology", Elsevier India Pvt.Ltd. New Delhi, 2006.
3. "Manual on Water Supply and Treatment". Ministry of Urban Development, New Delhi, 3rd Edition 2013.
4. "Manual on Sewerage and Sewage Treatment Systems, Part A, B and C". Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, 3rd Edition. 2013.
5. "APHA, AWWA Standard methods for the Examination of Water and Wastewater", American Public Health Association, Washington, D.C, 22nd Edition, 2012.
6. G. L. Karia, R.A. Christian, wastewater Treatment: Concepts and Design Approach, PHI Learning Publishers, New Delhi, 2nd Edition, 2013.

YouTube Resources:

1. **Nptelhrd(Civil - Water & Wastewater Engineering)**- This channel focuses Lecture Series on Water & Waste Water Engineering by Prof C.Venkobachar, Prof. Ligy Philip, Prof. B. S. Murty, Department of Civil Engineering, IIT Madras.
2. **Environmental experts** - This channel is created to provide all the fundamental and rare industrial design calculations related to domestic and industrial water and wastewater treatment unit operations and processes, here animations of processes make things easier to understand.
3. **Environmental Engineering Lab Dr. Harish Kumar .S-** contain videos about demonstration of experiments in laboratory at Jyothy Institute of Technology, Bangalore.

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Employability Enhancement Skills III	L	T	P	C
ES4301	Professional Communication And Teamwork Skills	0	0	2	1

Course Objectives:

- To familiarize students with various forms of communication.
- To develop effective team communication skills.
- To enhance stakeholder communication skills.
- To cultivate ethical communication practices.
- To explore digital communication tools and trends.

Unit 1: Introduction to Communication - Verbal Communication Skills: - Written Communication Skills - Nonverbal Communication - Interpersonal Communication

Unit 2: Characteristics of Effective Teams - Team Building and Group Cohesion - Conflict Resolution - Decision Making in Teams - Cross-Cultural Communication

Unit 3: Stakeholder Communication - Presentation Skills - Effective Meetings - Feedback and Evaluation

Unit 4: Professional Codes of Conduct - Integrity in Communication - Addressing Ethical Challenges - Analyzing real-world ethical communication dilemmas

Unit 5: Digital Communication Tools - Social Media and Networking - Emerging Trends in Communication

Course Outcomes:

At the end of the course, students will be able to

- C01: Demonstrate proficiency in various forms of communication.
- C02: Exhibit strong team communication skills.
- C03: Display competence in stakeholder communication.
- C04: Apply ethical communication principles.
- C05: Utilize digital communication tools effectively.

Textbooks:

1. Sharon J. Gerson and Steven M. Gerson. "Technical Communication: Process and Product", Pearson, 2014
2. Karl A. Smith. "Teamwork and Project Management", McGraw-Hill Education, 2013
3. Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins. "Engineering Ethics: Concepts and Cases", Cengage Learning, 2012
4. Christoph Meinel and Harald Sack. "Digital Communication: Communication, Multimedia, Security", Springer, 2014

References

1. Katherine L. Adams and Gloria J. Galanes. "Communicating in Groups: Applications and Skills", McGraw Hill Education, 2018
2. Lawrence Holpp. "Managing Teams: Strategies for Success", McGraw Hill, 1998.
3. Caroline Whitbeck (ed) "Ethics in Engineering Practice and Research", Cambridge University Press, 2011

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Core Course Project – I	L	T	P	C
CE4306	(Computer Aided Building Design Project)	0	0	2	1

COURSE OBJECTIVES

- To Provide Knowledge on symbols and sign conventions used in building drawings
- To enable the students to create plan, Elevation and sectional views of buildings using software
- To impart knowledge on execution of plan in accordance with development and control rules safety orientation and functional requirements as per National Building code

INTRODUCTION:

Introduction to building Plan – Symbols, Sign Convention, Specification of a building – Introduction to bye laws – Study on AutoCAD Commands and annotations

LIST OF EXPERIMENTS: (Manual & Using AutoCAD)

- 1** Following drawings are to be prepared for the given data
 - I** Cross section of Foundation, Masonry Wall, RCC Columns with isolated & Combined footings
 - II** Different types of bonds in brick Masonry
 - III** Different types of staircases – Dog legged, Open Well
 - IV** Septic Tank

V Steel Roof Truss

- 2 Sketching the plan for a given area
- 3 Drafting of Plan, Elevation and sectional view for the given specification of a single storied residential building
- 4 Drafting of Plan, Elevation and sectional view for the given specification of buildings with masonry wall and sloped roof
- 5 Drafting of Plan, Elevation and sectional view for the given specification of RCC two storied building
- 6 Drafting of Plan, Elevation and sectional view for the given specification of a hospital building
- 7 Plotting of plan, Elevation and Sectional views for the given specification of a School building

TOTAL: 60 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, students should be able to:

- CO 1 Plan a building according to requirements of National Building Code
- CO 2 Prepare the layout and sectional views of a building manually
- CO 3 Familiarize in the usage of AUTOCAD
- CO 4 Draft the Plan, Elevation and Sectional Views of the given structure using AUTOCAD
- CO 5 Develop technical communication skills in the form of communicative drawing

TEXT BOOKS:

1. Sikka. V. B., A Course in Civil Engineering Drawing, 5th Edition, S. K. Kataria and sons, 2021
2. George Omura, Brian C. Benton, "Mastering AutoCAD 2019 and AutoCAD LT2019", Wiley – An Autodesk Official Press, 2019

REFERENCES:

1. Shah M.G. Kale C.M. & Patki S.Y., "Building Drawing with an Integrated Approach to Built Environment", 6th edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2019.
2. Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers, 11th edition 2016.
3. National Building Code (2016), BIS, New Delhi.

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Design Thinking	L	T	P	C
MC4111		2	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce students to the fundamental concepts and principles of design thinking.
- Develop students' ability to empathize with users and identify their needs.
- Equip students with skills for problem-solving and generating innovative solutions.
- Foster collaboration and interdisciplinary teamwork among students.
- Apply design thinking methodologies to real-world engineering challenges.

Course Description

This course offers an exploration of the principles and methodologies behind design thinking, emphasizing on a human-centered approach to innovation and problem-solving. Through a blend of lectures, hands-on exercises, and interactive workshops, participants learn to empathize with users, define problems, generate creative solutions, and iterate on prototypes.

UNIT I Introduction to Design Thinking

2

Definition and principles of design thinking – Importance and applications in engineering – Case studies of successful design thinking projects

UNIT II Empathize and Define

2

Understanding user needs and motivations – Techniques for empathetic research (interviews, observations, etc.) – Defining problem statements based on user insights

UNIT III Ideate and Prototype

2

Techniques for generating ideas (brainstorming, mind mapping, etc.) – Prototyping methods and tools – Iterative design process and feedback loops

UNIT IV Test and Iterate

2

User testing and feedback collection – Analyzing and interpreting feedback – Iterating on prototypes based on feedback

UNIT V Application and Workshop

2

Applying design thinking to engineering challenges – Workshop sessions for hands-on practice – Presentation (Posters / PPT / Demonstration) of final projects and reflection on the design process

Workshop Ideas:

1. Design Sprints: Conduct short, intensive workshops where students work collaboratively to solve a specific problem within a constrained timeframe.
2. Design Challenges: Pose open-ended design challenges to students and facilitate group work sessions where they brainstorm and prototype solutions.
3. User Persona Creation: Have students create user personas based on research findings and use them to guide the design process.
4. Prototyping Sessions: Provide materials and tools for students to create rapid prototypes of their ideas, encouraging experimentation and creativity.
5. Design Critiques: Organize sessions where students present their prototypes to peers for feedback and constructive criticism, fostering a culture of iteration and improvement.

Course Format

Lectures and discussions, Workshops, Group discussions and presentations,

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

CO1: Understand the principles and process of design thinking.

CO2: Identify user needs through empathetic research.

C03: Generate creative ideas and solutions through brainstorming and prototyping.

C04: Apply design thinking methodologies to solve engineering problems effectively.

C05: Work collaboratively in multidisciplinary teams to address complex challenges.

TEXT BOOKS:

2. Tim Brown, "Change by Design", Revised and Updated, Harper, 2019.
3. Christian Müller-Roterberg, "Handbook of Design Thinking: Tips & Tools for How to Design Thinking", Independently Published, 2018.
4. Jeanne Liedtka, and Tim Ogilvie, "Designing for Growth: A Design Thinking Tool Kit for Managers", Columbia University Press, 2011.

REFERENCES:

1. Don Norman, "The Design of Everyday Things", Basic Books, 2015.
2. Hasso Plattner, Christoph Meinel, and Larry Leife (editors), "Design Thinking: Understand – Improve – Apply", Springer-Verlag, 2013.
3. Richard Banfield, C. Todd Lombardo and Trace Wax, "Design Sprint: A Practical Guidebook for Building Great Digital Products", O'Reilly Media, 2015.

TOTAL 10 PERIODS

Semester IV
REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Mathematics – IV	L	T	P	C
MA4401	Numerical Methods (Common to B.E - CIVIL, MECH, MCT, EEE, ECE, EC(ACT) and EE(VLSI))	3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi’s method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton’s divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson’s 1/3 rule – Romberg’s Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson’s 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne’s and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to:

CO1: Understand the basic concepts and techniques of solving algebraic and transcendental equations.

CO2: Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.

CO3: Apply the numerical techniques of differentiation and integration for engineering problems.

CO4: Understand the knowledge of various techniques and methods for solving first and

second order ordinary differential equations.

CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014 47.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6 th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Theory of Structures – I	L	T	P	C
CE4401		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce the students, the basic theory and concepts of classical methods of structural analysis.

Course Description



This course introduces the theoretical concepts and basics on analysis of structural members. Students will learn the fundamental concepts and techniques related to analysis of truss members, structural members by classical and matrix methods.

Prerequisites

- Basic knowledge on bending properties of beams and columns.
- Familiarity on stiffness and deflection of different types of beams with different end conditions.

UNIT I Analysis of Trusses

9

Determinate and indeterminate trusses-analysis of determinate trusses-method of joints-method of sections - Deflections of pin-jointed plane frames - lack of fit - change in temperature method of tension coefficient- space trusses.

UNIT II Slope Deflection Method

9

Slope deflection equations –Equilibrium conditions –Analysis of continuous beams and rigid frames - Rigid frames with inclined members-Support settlements symmetric frames with symmetric and skew-symmetric loadings.

UNIT III Moment Distribution Method

9

Stiffness-distribution and carry over factors--Analysis of continuous Beams-Plane rigid frames with and without sway–Support settlement-symmetric frames with symmetric and skew-symmetric loadings.

UNIT IV Flexibility Method

9

Primary structures –Compatibility conditions– Formation flexibility matrices-Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.

UNIT V Stiffness Method

9

Restrained structure–Formation of stiffness matrices-equilibrium condition-Analysis of Continuous beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

Course Format

Lectures and discussions, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

CO1: Analyze the pin-jointed plane and space frames.

C02: Analyse the continuous beams and rigid frames by slope deflection method.

C03: Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.

C04: Analyse the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.

C05: Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

TEXT BOOKS:

1. Bhavikatti, S.S, Structural Analysis, Vol.1, &2, Vikas Publishing House Pvt. Ltd. NewDelhi-4, 2014.
2. Punmia.B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.

REFERENCES:

1. WilliamWeaver,Jrand James M.Gere, Matrix analysis of framed structures,CBS Publishers & Distributors,SecondEdition,Delhi,2004.
2. Reddy.C.S,“Basic Structural Analysis”,Tata Mc Graw Hill Publishing Company,2005.Alberto Chierici, “The Ethics of AI”, New Degree Press, 2021.
3. NegiL.S.and Jangid R.S.,Structural Analysis, Tata Mc Graw Hill Publishing.Co.Ltd.2004
4. Bhavikatti,S.S,Matrix Method of Structural Analysis, I.K. International Publishing House Pvt.Ltd.,New Delhi-4,2014.

YouTube Resources:

1. **The Efficient Engineer** - This channel aimed at mechanical and civil engineers. The mission is to simplify engineering concepts.
2. **All About Structural Analysis and Design** – This channel will be dealing with all aspects of Civil & Structural Engineering, with maximum efforts we shall try to make Civil & Structural Engineering easy to analyze. by Prof. Abhijeet Baikerikar, Former Head of Civil Engineering Department at KLS Shri Vasanttrao Potdar Polytechnic, Belgaum.
3. **Dr. Structure** - This channel offers classical method of analysis provided by EduTech.
4. **Ekeeda** - This channel provides Video Lectures, Courses, Tutorials & Study Materials for Degree courses, GATE courses, Professional and Career Track Program.

45 PERIODS

TOTAL:75 PERIODS

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Design of Reinforced Concrete Structural Elements	L	T	P	C
CE4402		3	0	0	3

COURSE OBJECTIVES

- To introduce the different design philosophy for reinforced concrete and discuss the limit state method of design of RC rectangular beams and to learn the concept in the design of RC flanged beams and design for shear and torsion and design of RC slabs and staircase, short RC columns, RC footing for walls, pad, sloped and combined rectangular footings.

Course Description

This course provides an introduction to the theory and practical applications of Design Of Reinforced Concrete Structures. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using Design Of Concrete Structures

Prerequisites

- Basic knowledge of Equipment operating and deep learning.
- Familiarity with a Basics of Design Of Reinforced Concrete Structures.

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES

9

Concept of Elastic method, ultimate load method and limit state method – Working stress method as detailed in IS code - Design of Singly Reinforced beam by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by limit State Method

UNIT II LIMIT STATE METHOD – FLANGED BEAM, SHEAR & TORSION

9

Analysis and design of flanged beams – Use of design aids for Flexure - Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending, shear and torsion - serviceability.

UNIT III LIMIT STATE DESIGN OF SLABS AND STAIRCASE

9

Analysis and design of cantilever, one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions- Types of Staircases – Design of dog-legged Staircase –Introduction to Flat Slab.



UNIT IV LIMIT STATE DESIGN OF COLUMNS

9

Types of columns – Design of short Rectangular and circular columns for axial, uniaxial and biaxial bending.

UNIT V LIMIT STATE DESIGN OF FOOTING

9

Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only.

TOTAL: 45 PERIODS

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES

Upon successful completion of the course, students should be able to:

C01 Know the various design concepts and design RC rectangular beams by working stress and limit state method

C02 Understand the design of flanged beams, design for shear and torsion, and anchorage and development length.

C03 Design a RC slabs and staircase and draw the reinforcement detailing.

C04 Design short columns for axial, uni-axial and bi-axial eccentric loadings

C05 Design wall footings, isolated footings and combined rectangular footing.

TEXT BOOKS:

1. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
2. Krishnaraju.N " Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.

REFERENCES:

1. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.
2. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2021

3. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2016

4. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publications, Pune, 2013.

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Soil Mechanics	L	T	P	C
CE4403		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- This course is aimed at teaching the students the concepts of soil engineering, including the science and technology of soils and their application to problems in Civil engineering
- The course emphasizes the fundamentals and relevant principles of soil mechanics, gives an overall picture of the behaviour of soils and describes the nature of some of the soil problems encountered in Civil engineering.

Course Description

This course provides an introduction to the theory and practical applications of Soil mechanics. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using Stabilization of soil .

Prerequisites

- Basic knowledge of Equipment operating and deep learning.
- Familiarity with a Basics of Soil mechanics.

UNIT I Introduction , Solids , Water ,Air Relations And Index Properties Of Soils 9

Preview of Geotechnical problems in civil Engineering and infrastructure Development - Historical development of soil mechanics - Soil formation and soil type- Phase diagram - Simple definitions and their relationships - Index properties of soils - Determinations of various index properties

UNIT II Soil Identifications And Classification, Soil Structure, Clay Minerals, Compaction 9

Introduction - Field Identification of soil- Soil classification-Textural, ISSCS, MIT, BSCS, USCS and AASHTO soil classification system - Application of soil classification system – Introduction- Clay minerals-Clay particle interaction-Soil structure and fabrics - Factors affecting compaction - Structure and Engineering behaviour of compacted cohesive soils - Compaction specification and field control.

UNIT III Principle Of Effective Stress, Capillarity And Permeability Seepage Through Soils 9

Principle of effective stress-Physical meaning of effective stresses-Capillarity in soils-Permeability of soils-Determinations of coefficient of permeability - field methods- Seepage forces and quick sand conditions-Two dimensional flow – Laplace equation-Seepage in Anisotropic soil condition-Seepage through an earth dam on an impervious base-Flow through non – homogeneous sections-Prevention of Erosion- Protective filters

UNIT IV Vertical Stresses Below Applied Loads And Compressibility Of Soil 9

Introduction-Boussinesq equation and Westergaard's equation-Vertical Stress Distribution Diagrams-Vertical stress beneath loaded Areas-New marks influence chart-Approximate stress distribution methods for Loaded Areas- Settlement profile-Fundamentals of Consolidation-One – Dimensional Laboratory consolidation Test- Pressure plots -Normally consolidated and over consolidated clay-Calculation of Settlement from One – Dimensional Primary Consolidation-Compression Index and Swell Index-Secondary Consolidation Settlement-Time Rate of Consolidation-Calculation of Consolidation Settlement under a Foundation -Method of Accelerating Consolidation Settlement.

UNIT V Shear Strength Of Soil And Stability Of Slopes 9

Mohr-Coulomb failure criterion-Inclination of the Plane of Failure caused by Shear-Laboratory Tests For Determination of shear strength Parameters-Consolidated drained Tri axial Test-Consolidated un drained Tri axial Test-Unconsolidated un drained Triaxial Test-Stress Path-Empirical Relations between undrained cohesion and effective overburden pressure-Shear strength of unsaturated Cohesive Soils-Shear Strength of Sands-Infinite slopes and Translation slides-Definition of factor of safety-Finite slopes- Forms of Slip surface- $\phi = 0$ Analysis (Total stress Analysis)- $c - \phi$ Analysis – Method of Slices-Location of the most Critical Circles-Friction Circle Method-Taylor's Stability Number-Bishop's method of Stability Analysis-Use of Stability Coefficients.

Total 45 Periods

1. Determination Of Index Properties

- a. Grain size distribution – Sieve analysis
- b. Grain size distribution - Hydrometer analysis
- c. Liquid limit and Plastic limit tests
- d. Shrinkage limit and Differential free swell tests
- e. Specific gravity of soil solids

2. Determination Of Insitu Density And Compaction Characteristics

- a. Field density Test (Sand replacement method)
- b. Determination of moisture – density relationship using standard proctor compaction test.

3. Determination Of Engineering Properties

- a. Permeability determination (constant head and falling head methods)
- b. One dimensional consolidation test (Determination of co-efficient of consolidation only)
- c. Direct shear test in cohesion less soil
- d. Unconfined compression test in cohesive soil
- e. Laboratory vane shear test in cohesive soil
- f. Tri-axial compression test in cohesion less soil (Demonstration only)
- g. California Bearing Ratio Test

Total Practical: 30 Periods

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon successful completion of the course, students should be able to:

- C01: Classify the soil and assess the engineering properties, based on index properties
- C02: Understand the stress concepts in soils.
- C03: Understand and identify the settlement in soils
- C04: Determine the shear strength of soil.
- C05: Analyze both finite and infinite slopes.

TEXT BOOKS:

1. V.N.S. Murthy "A Text Book of Soil Mechanics and Foundation Engineering in SI units" UBS Publishers Distributors Ltd. Fourth edition 1993..
2. K. R. Arora "Soil mechanics and foundation Engineering" Standard Publisher Distribution 2017, 7th edition (Reprint).
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th EDITION, 2017.

REFERENCES:

1. Terzaghi K and Peck.R. B. John Wiley "Soil mechanics in Engineering Practice", 2nd Edition, New York, 1967.



2. Braja M. Das “Principles of Geotechnical Engineering” Fifth edition. Thomson/Brookscole Joseph E Bowles “Physical and Geological properties of soils”, , Mc Graw Hill Co. Ltd 2nd Edition 1984.
3. S.R. Kaniraj “Design Aids in Soil Mechanics and Foundation Engineering “, Tata Mc Graw Hill Education Limited, 2018.
4. Dr. Sehgal “A text book of soil mechanics” S.B. CBS Publishers and distributors, New Delhi, 1988.

YouTube Resources:

1. **Nptelhrd:** Your favorite courses available for certification! study, write an exam and get a certificate from the IITs! Check <http://nptel.ac.in/noc> This channel provides technical lectures from seven Indian Institutes of Technology (IITs) and Indian Institute of Science (IISc) Bangalore. Please visit the NPTEL Channel List below to view the complete list of courses. (24 Channels)
2. **Elementary Engineering:** Elementary Engineering is trying to make engineering elementary, simple and easy to understand.
3. **Office Hours:** This is the Youtube channel for Dr. Kevin Franke and his geotechnical/earthquake engineering courses at Brigham Young University.
4. **Engineers Institute of India:** Eii- Engineers Institute of India, results oriented GATE & PSUs & JE/AEn coaching institute You can access our official videos, Study Materials, test Series at <https://www.engineersinstitute.com> Technical Lectures of Important topics for GATE, PSUs & JE/AE.
5. **Unacademy GATE & ESE – Civil:** Unacademy GATE & ESE - Civil by Unacademy is your one-stop destination to crack GATE & ESE. We cover the complete syllabus for all subjects for GATE, ESE Prelims, and ESE Mains.

TOTAL:75 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Applied Hydraulics Engineering	L	T	P	C
CE4404		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- To understand the concepts of fluid mechanics in addressing problems on open channels and uniform flow

- To formulate the different types of flow profiles and its computations
- To gain knowledge on RVF, its types and surges in flow
- To enhance the knowledge of working principles of turbine and its classification
- To learn the principles behind the working of pump and its classification

Course Description

This course provides an introduction to the theory and practical applications of open channel hydraulics. Students will learn the fundamental concepts and techniques related gradually varied flow and rapidly varied flow. to get exposure about the application of hydraulic engineering in the field by means of studying the various devices, equipment, machinery, and structures.

Prerequisites

- Basic knowledge of properties of fluid.
- Familiarity with a fluid machinery performance
-

UNIT I Uniform Flow 9

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel -Velocity distribution in open channel -Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow – Wide open channel - Specific energy and specific force –Critical flow.

UNIT II Gradually Varied Flow 9

Dynamic equations of gradually varied flows – Types of flow profiles - Classifications: Computation by Direct step method and Standard step method–Control section–Break in Grade–Computation.

UNIT III Rapidly Varied Flow 9

Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Celerity– Rapidly varied unsteady flows (positive and negative surges)

UNIT IV Turbines 9

Impact of Jet on flat, curved plates, Stationary and Moving –Classification of Turbines – Pelton wheel–Francis’s turbine–Kaplan Turbine-Specific speed–Characteristic Curves of Turbines-Draft tube and cavitation.

UNIT V Pumps 9

Classification of Pumps - Centrifugal pumps – Work done - Minimum speed to start the pump -NPSH - Multistage pumps – Characteristics curve - Reciprocating pumps - Negative slip – Indicator diagrams

and its variations – Air Vessels-Savings in work done.

45 PERIODS

Applied Hydraulic Engineering Laboratory (List of Experiments)

1. Study on Performance Characteristics of Pelton turbine
2. Study on Performance Characteristics of Francis turbine
3. Study on Performance Characteristics of Kaplan turbine
4. Study on Performance Characteristics of Centrifugal turbine
5. Study on Performance Characteristics of Gear Pump
6. Study on Performance Characteristics of Submersible pump
7. Study on Performance Characteristics of Reciprocating turbine

TOTAL : 30 PERIODS

Course Format

Lectures and discussions, projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- CO 1: Apply their knowledge of fluid mechanics in addressing problems in open channels.
- CO 2: Able to identify an effective section for flow in different cross sections.
- CO 3: To solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- CO 4: Understand the principles, working and application of turbines.
- CO 5: Understand the principles, working and application of pumps.

TEXT BOOKS:

1. Subramanya.K, "Flow in open channels", Tata Mc Graw Hill, New Delhi, 2000.
2. Modi P.N and Seth S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009
3. Chandramouli P.N., "Applied Hydraulic Engineering", Yes Dee Publishing Pvt.Ltd., 2017.

REFERENCES:

1. Ven Te Chow, "Open Channel Hydraulics", Mc Graw Hill, New York, 2009.
2. Hanif Chaudhry.M., "Open Channel Flow", Second Edition, Springer, 2007.
3. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
4. Jain.A.K., "Fluid Mechanics"(Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
5. Subramanya.K., "Fluid Mechanics and Hydraulic Machines", Tata Mc Graw Hill Education Private Limited, New Delhi, 2010.

YouTube Resources:

1. **Red line stands**- Address the knowledge of fluid mechanics problems in open channels.
2. **Practical Engineering**- It gives knowledge about one of the most interesting phenomena in open-channel flow: the hydraulic jump.
3. **Civil Engineering Exam** - This channel offers concise summaries of Applied Hydraulic Engineering and breakthroughs in Civil Engineering numerical problems.
4. **@harvardengineering**- This channel provides tutorials on hydraulics which can be useful for understanding the technical aspects of flow concepts.
5. **Civil Engineer FBH** – Most economical sections in Applied Hydraulic Engineering is well explained in the channel
6. **Harvard school of Engineering** - You can find recordings of Harvard University's Hydraulic flow concepts and machinery on YouTube, which includes lectures on relevant topics.
7. **UCI Engineering** - MAE 130A covers the following topics: fluid statics and fluid dynamics;
8. **Gate Wallab** – Discuss previous year gate question and solution for all choice based and numerical problems.

TOTAL:75 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Employability Enhancement Skills IV Leadership And Project Management Skills	L	T	P	C
ES4401		0	0	2	1

Course Objectives:

- To understand leadership within the context of project management.
- To differentiate between leadership and management roles.



- To learn project initiation processes and setting SMART objectives.
- To build high-performing teams through motivation, empowerment, and effective communication.
- To develop skills in project planning, estimation, resource allocation, risk management, and scheduling.

Unit 1: Understanding Leadership - Introduction to Project Management - Leadership vs. Management - Project Initiation - Setting SMART Objectives

Unit 2: Building High-Performing Teams - Motivation Theories - Empowering Team Members - Leadership Communication - Handling Team Conflicts

Unit 3: Work Breakdown Structure (WBS) - Estimation Techniques - Gantt Charts and Network Diagrams - Resource Allocation - Risk Management

Unit 4: Leading Project Teams - Monitoring and Controlling Progress - Change Management - Quality Management - Stakeholder Communication

Unit 5: Project Closure Activities - Lessons Learned - Celebrating Success - Transition Planning

Course Outcomes:

At the end of the course, students will be able to

C01: Apply leadership principles to project management scenarios.

C02: Distinguish between leadership and management functions in project environments.

C03: Initiate projects effectively by setting SMART objectives.

C04: Foster high-performing teams through motivation, empowerment, and conflict resolution.

C05: Proficiently plan, schedule, and manage project activities, resources, risks, and stakeholder communications.

Textbooks

1. Peter G. Northouse. "Leadership: Theory and Practice", SAGE Publications, 2021
2. Patrick Lencioni. "The Five Dysfunctions of a Team: A Leadership Fable", Jossey-Bass, 2011
3. Robert K. Wysocki. "Effective Project Management: Traditional, Agile, Extreme", Wiley, 2019
4. Clifford F. Gray and Erik W. Larson. "Project Management: The Managerial Process", McGraw-Hill Education, 2017
5. Harold Kerzner. "Project Management Case Studies", Wiley, 2008

References

1. Harold Kerzner. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", 10th edition, Wiley, 2009
2. Gregory P. Shea and Cassie A. Solomon. "Leading Successful Change: 8 Keys to Making Change Work", Gildan Media, LLC, 2013

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	NCC Credit Course Level 2 (NAVAL WING)	L	T	P	C
		3	0	0	3 #

UNIT I NCC General 6

Aims, Objectives & Organization of NCC (1) – Incentives (2) – Duties of NCC Cadet (1) – NCC Camps: Types & Conduct (2)

UNIT II National Integration and Awareness 4

National Integration: Importance & Necessity (1) – Factors Affecting National Integration (1) – Unity in Diversity & Role of NCC in Nation Building (1) – Threats to National Security (1)

UNIT III Personality Development 7

Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving (2) – Communication Skills (3) – Group Discussion: Stress & Emotions (2)

UNIT IV Leadership 5

Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code (3) – Case Studies: Shivaji, Jhansi Ki Rani (2)

UNIT V Social Service and Community Development 8

Basics, Rural Development Programmes, NGOs, Contribution of Youth (3) – Protection of Children and Women Safety (1) Road/ Rail Travel Safety (1) – New Initiatives (2) – Cyber and Mobile Security Awareness (1)

TOTAL: 30 PERIODS

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Core Course Project – II	L	T	P	C
CE3406		0	0	2	1

COURSE OBJECTIVES:

- To provide sufficient hands-on learning experience related to the development of design, development and analysis of suitable product / process to enhance the technical skill sets in the chosen field.

CONTENTS :

1. Project may be modelling & simulation, experimentation & analysis, prototype design, fabrication of new equipment, correlation and analysis of data, software development, applied research and any other related activities.
2. Project is done based on the knowledge gained from the core courses within the semester based on the completion of required number of credits as per the academic regulations.
3. Can be individual work or a group project, with a maximum of 3 students.
4. In case of group projects, the individual project report of each student should specify the individual contribution to the project.
5. Carried out inside or outside the university, in any relevant industry or research institution.
6. Publications in the peer reviewed journals / International Conferences will be an added advantage

MODE OF EVALUATION: Periodic reviews, Presentation, Final oral viva, Poster submission

COURSE OUTCOME:

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

- C01: Formulate specific problem statements for real life problems with reasonable assumptions and constraints.
- C02: Perform literature search and / or patent search in the area of interest.
- C03: Conduct experiments / Design and Analysis / solution iterations and document the results.
- C04: Perform error analysis / benchmarking / costing
- C05: Synthesise the results and arrive at scientific conclusions / products / solution
- C06: Document the results in the form of technical report / presentation

Semester V
REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Theory of Structures – II	L	T	P	C
CE4501		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Learn the method of drawing influence lines and its uses in various applications like beams, bridges and plane trusses and to analyse arches and suspension bridges.

Course Description

This course introduces the theoretical and approximate analysis of moving loads on the beam and trusses for axial, shear and horizontal loads.

Prerequisites

- Basic knowledge on bending properties of beams and columns.
- Familiarity on stiffness and deflection of different types of beams with different end conditions.
- Confidence in understanding the loads on arches, suspension bridges and space trusses

UNIT I Influence Lines for Determinate Structures 9

Introduction to moving loads, Concept of Influence Lines, Influence lines for reactions in statically determinate structures –Influence lines for shear force and bending moment in beam section – Calculation of critical stress resultants due to concentrated and distributed moving loads - Influence lines for member forces in pin jointed plane frames.

UNIT II Influence Lines for Indeterminate Beams 9

Muller Breslau's principle - Influence line for support reactions, shearing force and bending moments for indeterminate beams - propped cantilevers, fixed beams and continuous beams.

UNIT III Arches 9

Arches - Eddy's theorem - Types of arches – Analysis of three-hinged, two-hinged and fixed arches - Parabolic and circular arches - influence lines, rib shortening– Settlement and temperature effects.

UNIT IV Suspension Bridges and Space Trusses 9

Analysis of suspension bridges – Unstiffened cables and cables with three hinged stiffening girders
– Influence lines for three hinged stiffening girders - Introduction to analysis of space trusses using method of tension coefficients.

UNIT V Approximate Analysis of Frames

9

Approximate analysis for gravity loadings - substitute frame method for maximum moments in beams and columns - Approximate analysis for horizontal loads - portal method and cantilever method - assumptions - axial force, shearing force and bending moment diagrams.

Course Format

Lectures and discussions, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

C01: Draw influence lines for statically determinate structures and calculate critical stress resultants.

C02: Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.

C03: Analyse three hinged, two hinged and fixed arches.

C04: Analyse the suspension bridges with stiffening girders

C05: Evaluate Analyse rigid frames by approximate methods for gravity and horizontal loads.

TEXT BOOKS:

1. Bhavikatti, S.S, Structural Analysis, Vol.1, &2, Vikas Publishing House Pvt .Ltd. NewDelhi-4, 2014.
2. Punmia.B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.

REFERENCES:

1. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHI Learning Pvt. Ltd., 2011.
2. Reddy.C.S, "Basic Structural Analysis", Tata Mc Graw Hill Publishing Company, 2010.
3. Negi.L.S. and Jangid R.S., Structural Analysis, Tata Mc Graw Hill Publishing.Co.Ltd. 2004
4. Vazrani.V.N And Ratwani.M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.

YouTube Resources:

1. **The Efficient Engineer** - This channel aimed at mechanical and civil engineers. The mission is to simplify engineering concepts.
2. **All About Structural Analysis and Design** – This channel will be dealing with all aspects of Civil & Structural Engineering, with maximum efforts we shall try to make Civil & Structural Engineering easy to analyze. by Prof. Abhijeet Baikerikar, Former Head of Civil Engineering Department at KLS Shri Vasanttrao Potdar Polytechnic, Belgaum.
3. **Dr. Structure** - This channel offers classical method of analysis provided by EduTech.
4. **Ekeeda** - This channel provides Video Lectures, Courses, Tutorials & Study Materials for Degree courses, GATE courses, Professional and Career Track Program.
5. **APSEd – This channel provides** video lectures, live weekly quizzes, problem-solving, strategy and tips for GATE, ESE and other exams.

45 PERIODS

TOTAL:75 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Design of Steel Structural Elements	L	T	P	C
CE4502		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduction to limit state design philosophy and principles. Analysis and design of connections for steel structures.
- Design and analysis of tension and compression members.
- Design of structural steel members subjected to bending loads.
- Designing structural systems such as roof trusses and gantry girders as per provisions of current code (IS 800 - 2007) of practice.
- Understand the fundamental principles of plastic analysis and its application in structural design.

Course Description

The primary focus to introduce the theory of limit state design principles for structural steel members under various loading conditions, such as compression, tension, and bending, including considerations for connections. In accordance with the provisions outlined in the current code of practice, IS 800 - 2007.

Prerequisites

- Basic knowledge of Strong mathematical skills, material properties, structural analysis and mechanics of materials.
- Familiarity with relevant design codes and standards.

UNIT I Introduction to Structural Steel and Design of Connections 9

General -Types of Steel -Properties of structural steel - I.S. rolled sections - Concept of Limit State Design - Design of Simple and eccentric Bolted and welded connections - Types of failure and efficiency of joint – prying action - Introduction to HSFG bolts.

UNIT II Design of Tension and Compression Members 9

Behaviour and Design of simple and built-up members subjected to tension - Shear lag effect- Design of lug angles - tension splice - Behaviour of short and long columns - Euler's column theory- Design of simple and built-up compression members with lacings and battens - Design of column bases - slab base and gusseted base.

UNIT III Design of Beams 9

Design of laterally supported and unsupported beams - Design of built-up beams - Design of plate girders.

UNIT IV Industrial Structures 9

Design of roof trusses – loads on trusses – purlin design using angle and channel sections – truss design, Design of joints and end bearings–Design of gantry girder - Introduction to pre-engineered buildings.

UNIT V Plastic Analysis and Design 9

Introduction to plastic analysis - Theory of plastic Analysis - Design of continuous beams and portal frames using plastic design approach.

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, presentations, online resources and tutorials.

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:



CO1: Recognize the design philosophy of steel structures and identify the different failure modes of bolted and welded connections, and determine their design strengths.

CO2: Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria.

CO3: Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, columns, column bases and beams.

CO4: Identify and compute the design loads on Industrial structures, and gantry girder

CO5: Find out ultimate load of steel beams and portal frames using plastic analysis

TEXT BOOKS:

1. Duggal S.K., Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010.
2. Bhavikatti S.S, Design of Steel Structures, Iik International Publishing House, New Delhi, 2017.

REFERENCES:

1. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013
2. Jack C. McCormac and Stephen F Csernak, Structural Steel Design, Pearson Education Limited, 2013.
3. Sarwar Alam Raz, Structural Design in Steel, New Age International Publishers, 2014.
4. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016.

YouTube Resources:

1. **mitmysorecivil9178** - To make clear and understanding lectures to study the steel structural elements.
2. **civilengineeringtopics7766** - These videos cover structural elements of steel structures.
3. **civilengineering94** - Design concept explained clearly.
4. **simpleciviltamil7937** - This channel provides tutorials on steel structural elements analysis and design.
5. **Unacademy GATE Chemical** - YouTube channel provides tutorials and resources for learning of gate syllabus of steel structures.

TOTAL: 45 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Foundation Engineering	L	T	P	C
CE4503		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- To impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations.
- Also to familiarize the students for the geotechnical design of different type of foundations and retaining walls.

Course Description

This course provides an introduction to the theory and practical applications of Foundation Engineering. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using Foundation Engineering.

Prerequisites

- Basic knowledge of Foundation and deep learning.
- Familiarity with a Soil Condition and Selection of Foundation.

UNIT I Site Investigation And Selection Of Foundation

9

Introduction and Application of Foundation Engineering-Importance and purpose-Classification of Foundation - Soil Exploration- Scope and objectives – Methods of exploration Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods- Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation - Bore log report - Selection of foundation based on soil condition.

UNIT II Shallow Foundation

9

Introduction - Bearing capacity of shallow foundation on homogeneous deposits – Location and depth of foundation – Terzaghi's formula and BIS formula – Factors affecting bearing capacity – Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure - Strength parameters and Evaluation of Liquefaction potential - Seismic considerations in bearing capacity evaluation - Codal provisions.

UNIT III Footings And Settlement

9

Proportioning of foundations for conventional rigid behaviour – Minimum depth for rigid behaviour – Applications – Floating foundation – Special foundations – Seismic force consideration - Contact pressure and settlement distribution- Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements– Codal provision.

UNIT IV Deep Foundation

9

Types of Deep foundation-Classification of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT, SCPT) – Negative skin friction – Uplift capacity- Group capacity by different methods (Field’s rule, Converse – Labarra formula and block failure criterion) –Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Types of wells or caissons- Codal provision.

UNIT V Retaining Walls

9

Plastic equilibrium in soils – Active and passive states – Rankine’s theory – Cohesionless and cohesive soil – Coulomb’s wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provision.

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students should be able to:

C01: Graduate will demonstrate an ability to plan and execute a detailed site investigation to select geotechnical design parameters and type of foundation.

C02: Graduate will demonstrate an ability to design shallow foundations, its component or process as per the needs and specifications.

C03: Graduate will demonstrate an ability to design combined footings and raft foundations, its component or process as per the needs and specifications.

C04: Graduate will demonstrate an ability to design deep foundations, its component or process as per the needs and specifications.

C05: Graduate will demonstrate an ability to design retaining walls, its component or process as per the needs and specifications.

TEXT BOOKS:

1. V.N.S. Murthy “A Text Book of Soil Mechanics and Foundation Engineering in SI units”UBS Publishers Distributors Ltd. Fourth edition 1993..
2. K. R. Arora “Soil mechanics and foundation Engineering” Standard Publisher Distribution 2017, 7th edition (Reprint).

3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th EDITION, 2017.

REFERENCES:

1. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
2. Das, B.M. "Principles of Foundation Engineering" (Eighth edition), Thompson Asia Pvt. Ltd., Singapore, 2017..
3. S.R. Kaniraj "Design Aids in Soil Mechanics and Foundation Engineering ", Tata McGraw Hill Education Limited, 2018.
4. Varghese, P.C.,"Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2012..

YouTube Resources:

1. **MachenLink** : Transforming Lecture into an Active Learning Experience. We are a team of passionate engineers who want to impart quality assistance to all the aspiring engineers out there. Our Motto: Be a quality Engineer and not just a degree holder with Engineering printed on it.
2. **IIT Kharagpur** : Your browser can't play this video. Learn ... Foundation Engineering by Prof. Kousik Deb. 113K ... Go to channel · Lecture 1
3. **Unacademy GATE & ESE – Civil**: Unacademy GATE & ESE - Civil by Unacademy is your one-stop destination to crack GATE & ESE. We cover the complete syllabus for all subjects for GATE, ESE Prelims, and ESE Mains.
4. **Engineers Institute of India**: Eii- Engineers Institute of India, results oriented GATE & PSUs & JE/AEn coaching institute You can access our official videos, Study Materials, test Series at <https://www.engineersinstitute.com> Technical Lectures of Important topics for GATE, PSUs & JE/AE.
5. **Introduction to Geotechnical Engineering** Webcasts for an introductory course in Geotechnical engineering. These materials are designed to align with the text "Geotechnical Engineering: Principles and Practices" 3rd edition by Coduto, Yeung & Kitch (Pearson, 2011, ISBN: 0-13-236868-4). The webcasts were developed for CE 325/326: Geotechnical Engineering I & II at Cal Poly Pomona, and CENG 3341: Introduction to Geotechnical Engineering at Angelo State University but can be used for any introductory geotechnical engineering course. Playlists are organized by chapters in the text book which is abbreviated CYK (2011).

TOTAL :45 PERIODS



REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Highway, Traffic and Railway Engineering	L	T	P	C
CE4504		3	0	2	4

COURSE OBJECTIVES

The main objectives of this course are to:

- To Understand history, classification and key highway engineering terms.
- Recall the basic principles of geometric design in highways, such as sight distance requirements.
- To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.
- Summarize the principles of track design and their implications for efficient railway operation
- Investigate the effects of environmental factors on the construction, maintenance, and operation of railway tracks

Course Description

This course provides an overview of highways, traffic engineering and railway engineering. Students will learn the basics of highway engineering, traffic flows, railways engineering concepts and techniques related to design and construction pavements and railway tracks and gain hands-on experience with various test and properties of pavement materials.

Prerequisites

- Basic knowledge of construction and testing of various materials.
- Familiarity with a soil properties and surveying.

UNIT I Highway Engineering 9

Classification of highways – Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment –Typical cross sections of Urban and Rural roads – Engineering surveys for alignment- Highway drainage – Evaluation and Maintenance of pavements Conventional and Modern method

UNIT II Design of Highway Elements 9

Highway capacity , Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients– pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only).

UNIT III Traffic Engineering 9

Traffic studies on PIEV theory, flow and speed, peak hour factor, accident study, parking study, statistical analysis of traffic data; Microscopic and macroscopic parameters of traffic flow, fundamental relationships; Traffic signs; Signal design by Webster's method; Types of intersections

UNIT IV Railway Planning and Construction 9

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods-Geometric design of railway, gradient, super elevation, widening of gauge on curves (Problems)-Railway drainage- Level Crossings-Signalling

UNIT V Railway Track Construction Maintenance and Operation 9

Points and Crossings - Design of Turnouts, Working Principle-Track Circuiting - Construction & Maintenance – Conventional, Modern methods and Materials, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance - Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS Feasibility study, Planning and construction.

EXERCISES:

I TEST ON AGGREGATES

1. Specific gravity determination of the coarse aggregate sample
2. Determination of abrasion value of the coarse aggregate sample.
3. Determination of water absorption capacity of the coarse aggregate sample

II TEST ON BITUMEN

4. Specific gravity determination of the bitumen/asphalt sample.
5. Determination of consistency of the bituminous material.
6. Viscosity determination of bituminous binder.
7. Determination of softening point of the asphalt/bitumen sample
8. Determination of ductility value of the bitumen sample
9. Estimation of loss of bitumen on heating
10. Determination of optimum binder content by Marshall method

III BITUMINOUS MIXES

11. Determination of stripping value of the bituminous mix Demonstration
12. Determination of bitumen content in the bituminous mix by cold solvent extraction method

Course Format

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES

OUTCOMES: Upon completion of the course, the students will be able to:

- CO 1:** Plan a highway according to the principles and standards adopted in various institutions in India.
- CO 2:** Design the geometric features of road network and components of pavement
- CO 3:** Analyse traffic problems, Intersections and signals.
- CO 4:** Understand the methods of route alignment and design elements in railway planning and constructions
- CO 5:** Understand the construction techniques and maintenance of track laying and railway stations

TEXT BOOKS:

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai,2010
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 6th edition Delhi,2015.
4. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015

REFERENCES:

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC:37-2012
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC:58-2012
3. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi,2010
4. O'Flaherty.C.A "Highways, Butterworth – Heinemann, Oxford,2006
5. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia,2012
6. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA,2011

7. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi,2011
8. IRC-37-2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, NewDelhi
9. IRC 58-2012. The Indian Road Congress, Guideline for the Design of RigidPavements for Highways, NewDelhi
10. Saxena Subhash, C.and Satyapal Arora, A Course in Railway Engineering, Dhanapat Rai and Sons, Delhi, 1998.

45 PERIODS

TOTAL:75 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Hydrology and Irrigation water Management (including Design and Drawing)	L	T	P	C
CE4505		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Gain knowledge about rainfall pattern and its measurement
- Provide exposer to different types of storage structures and its performance
- Further they will be imparted required knowledge on runoff modelling
- Will be able to understand types of irrigation system and crop water requirement
- Acquire better knowledge on socio-economic aspects on water management

Course Description

Introduce the types of irrigation systems and the concepts of planning and design of irrigation systems. Understand design methods of erodible and non-erodible canals. Know the principles of design of hydraulic structures on permeable foundations. Know the concepts for analysis and design principles of storage and diversion works. Learn design principles of canal structures. Socio-economic aspects on water management.

Prerequisites

- Basic knowledge of hydrological aspects of irrigation system
- Familiarity with rainfall pattern and storage structures

Hydrological cycle – Precipitation-Meteorological measurements – Types and forms of precipitation – Rain gauges - Spatial analysis of rainfall data using Thiessen polygon and Iso-hyetal methods - Interception – Evaporation and Evapotranspiration: Measurement, Evaporation suppression methods – Infiltration: Horton"s equation - Double ring infiltrometer - Infiltration indices

UNIT II Storage Structures 9

Watershed, unit hydrographs, hydrograph analysis, reservoir capacity, flood estimation and routing, surface run-off models, ground water hydrology - steady state well hydraulics and aquifers; Application of Darcy's Law. Gravity Dams and Spillways; Lined and unlined canals, Design of weirs on permeable foundation; cross drainage structures.

UNIT III RUNOFF 9

Catchment: Definition, Morphological characteristics - Factors affecting runoff - Run off estimation using Strange's table and empirical methods - SCS-CN method – Stage discharge relationship - Flow measurements - Hydrograph – Unit Hydrograph – IUH.

UNIT IV Crop Water Management 9

Types of irrigation systems and methods – Crop Water Requirement - historical development and merits and demerits of irrigation-types of crops-crop season-duty, delta and base period-consumptive use of crops Evapo-transpiration

UNIT V Water Management in Irrigation 9

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On farm development works-Participatory irrigation management- Water resources associations- Changing paradigms in water management-Performance Evaluation-Economic aspects of irrigation

45 PERIODS

Hydrology and Irrigation water Management (Design and Drawing)

i) Tank Components

Fundamentals of design - Tank surplus weir – Tank sluice with tower head - Drawings showing foundation details, plan and elevation

ii) Impounding Structures

Design principles - Earth dam – Profile of Gravity Dam

iii) Cross Drainage Works

General design principles - Aqueducts – Syphon aqueduct (Type III) – Canal drop (Notch Type) – Drawing showing plan, elevation and foundation details.

iv) Canal Regulation Structures



Direct Sluice - Canal regulator - Drawing showing detailed plan, elevation and foundation details

30 PERIODS

TOTAL:75 PERIODS

Course Format

Lectures and discussions, projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: To Discuss the hydrological processes and their integrated behavior in catchments

CO2: Explain the concept of hydrological extremes and its management strategies. Gain knowledge on types of Impounding structures and its uses

CO3: Apply the knowledge of hydrological processes to address basin characteristics, runoff and hydrograph

CO4: Have knowledge and skills on crop water requirements

CO: Understand the methods and management of irrigation

TEXT BOOKS:

1. Subramanya K, "Engineering Hydrology"- Tata McGraw Hill, 2010
2. Jayarami Reddy P, "Hydrology", Tata McGraw Hill, 2008
3. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
4. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers,23rd Revised Edition, New Delhi, 2009

REFERENCES:

1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
3. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
4. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000

YouTube Resources:

1. **University of California Television (UCTV)** – This channel includes topic on plant water use and irrigation systems with case studies.
2. **National Water Mission** - It gives knowledge about government actions on water bodies restoration and its impacts.
3. **Africana Hills** - This channel offers concise summaries of dam and reservoir construction.
4. **University of Jaffna** - This channel provides tutorials on Irrigation Water Management and crop water requirement in detail.
5. **Department of Irrigation and Drainage**– Concept of hydrological extremes and its management strategies is well explained in the channel
6. **University of South Wales** -.Water resources Engineering and irrigation water management aspects of world wide scenario is discussed in detail.
7. **Guruji Engineering Drawing**- Design and Drawing of hydraulic structures is well explained in this channel
8. **Gate Academy**– Discuss previous year gate question and solution for all choice based and numerical problems.

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Employability Enhancement Skills –V	L	T	P	C
ES4501	Innovation And Entrepreneurship	0	0	2	1

Course Objectives:

- To understand the fundamentals of entrepreneurship and innovation.
- To explore the components of an innovation ecosystem.
- To learn the principles of the Lean Startup methodology and its application.
- To develop skills in identifying entrepreneurial opportunities.
- To cultivate creativity and ideation techniques for innovation

Unit 1: Understanding Innovation - Entrepreneurship Fundamentals - Innovation Ecosystem - The Lean Startup Methodology - Identifying Opportunities

Unit 2: Creativity and Ideation Techniques - Market Research and Validation - Customer Discovery - Prototype Development

Unit 3: Business Model Canvas - Revenue Models - Customer Acquisition and Retention - Pricing Strategies - Scalability and Growth



Unit 4: Financial Planning - Funding Options - Pitching Investors - Valuation Method - Financial Management

Unit 5: Go-to-Market Strategy - Building a Team - Scaling Operations - Managing Growth - Exit Strategies

Course Outcomes:

At the end of the course, students will be able to

C01: Demonstrate an understanding of entrepreneurship fundamentals and innovation principles.

C02: Analyze and navigate innovation ecosystems.

C03: Apply Lean Startup methodology to validate and iterate business ideas.

C04: Identify and evaluate entrepreneurial opportunities effectively.

C05: Generate creative ideas, conduct market research, validate concepts, and develop prototypes for entrepreneurial ventures.

Textbooks

1. Eric Ries. "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses", Random Housey, 2011
2. Alexander Osterwalder and Yves Pigneur. "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers", Wiley, 2010
3. Karen Berman and Joe Knight. "Financial Intelligence for Entrepreneurs: What You Really Need to Know About the Numbers" Harvard Business Review Press, 2008

References

1. Clayton M. Christensen. "The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail", Harvard Business Review Press, 2013
2. Steve Blank and Bob Dorf. "The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company" Wiley, 2020
3. Peter Thiel and Blake Masters. "Zero to One: Notes on Startups, or How to Build the Future" Virgin Digital, 2014

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Core Course Project – III	L	T	P	C
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CE4506		0	0	2	1
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COURSE OBJECTIVES:

- To provide sufficient hands-on learning experience related to the development of design, development and analysis of suitable product / process to enhance the technical skill sets in the chosen field.

CONTENTS:

- Project may be modelling & simulation, experimentation & analysis, prototype design, fabrication of new equipment, correlation and analysis of data, software development, applied research and any other related activities.
- Project is done based on the knowledge gained from the core courses within the semester based on the completion of required number of credits as per the academic regulations.
- Can be individual work or a group project, with a maximum of 3 students.
- In case of group projects, the individual project report of each student should specify the individual contribution to the project.
- Carried out inside or outside the university, in any relevant industry or research institution.
- Publications in the peer reviewed journals / International Conferences will be an added advantage

MODE OF EVALUATION: Periodic reviews, Presentation, Final oral viva, Poster submission

COURSE OUTCOME: At the end of the course the student will be able to

- C01: Formulate specific problem statements for real life problems with reasonable assumptions and constraints.
- C02: Perform literature search and / or patent search in the area of interest.
- C03: Conduct experiments / Design and Analysis / solution iterations and document the results.
- C04: Perform error analysis / benchmarking / costing
- C05: Synthesise the results and arrive at scientific conclusions / products / solution
- C06: Document the results in the form of technical report / presentation

Semester VI
REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	ESTIMATION, COSTING AND VALUATION ENGINEERING	L	T	P	C
CE4601		3	0	2	4

COURSE OBJECTIVES

The main objectives of this course are to:

- Estimation, tender practices, contract procedures, and valuation
- Preparing estimates, call for tenders and execute works.

Course Description:

This course provides an introduction to the theory and practical applications of Foundation Engineering. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using Foundation Engineering.

Prerequisites:

- Basic knowledge in measurement, units
- Familiarity with a tender, rate of all construction materials

UNIT I QUANTITY ESTIMATION

9

Philosophy – Purpose – Methods of estimation – Centre line method – Long and short wall method – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – Culverts (additional practice in class room using computer softwares- qE Pro)

UNIT II RATE ANALYSIS AND COSTING

9

Standard Data – Observed Data – Schedule of rates – Market rates – Materials and Labour – Standard Data for Man Hours and Machineries for common civil works – Rate Analysis for all Building works, canals, and Roads – Cost Estimates (additional practice in class room using Computer softwares) – (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper)

UNIT III SPECIFICATIONS, REPORTS AND TENDERS

9

Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model

tenders , E-tendering- e NOI – e NOT -Digital signature certificates – Encrypting -Decrypting – Reverse auctions.

UNIT IV CONTRACTS 9

Contract – Types of contracts – BOT – Types - Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration ,litigation and legal requirements

UNIT V VALUATION 9

Definitions – Various types of valuations – Valuation methods - Necessity –Year’s purchase-sinking fund- Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease - Types of lease

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS(Using Software)

1. Estimation of quantities for buildings,
2. Estimation of quantities for bituminous and cement concrete roads,
3. Estimation of quantities for septic tank & soak pit,
4. Estimation of quantities for retaining walls
5. Estimation of quantities for Culverts

TOTAL: 30 PERIODS
OVER ALL TOTAL: 75 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, students should be able to:

- CO 1** Gain knowledge on types of contracts.
- CO 2** Understand types of specifications, principles for report preparation, tender notices types.
- CO 3** Rate Analysis for all Building works, canals, and Roads and Cost Estimate.
- CO 4** Estimate the quantities for buildings
- CO 5** Evaluate valuation for building and land

TEXT BOOKS:

1. B.N Dutta ‘Estimating and Costing in Civil Engineering’, CBS Publishers & Distributors (P) Ltd, Twenty eighth revised edition, 2020.
2. B.S.Patil, ‘Civil Engineering Contracts and Estimates’, 7th edition, University Press, 2015
3. D.N. Banerjee, ‘Principles and Practices of Valuation’, V Edition, Eastern Law House, 2015

REFERENCES:

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD
2. Tamil Nadu Transparencies in Tenders Act, 1998 and rules 2000
3. Arbitration and Conciliation Act, 1996

4. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2019

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Building Information Modelling	L	T	P	C
CE4602		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- To provide students with a comprehensive understanding of BIM fundamentals, tools, benefits, challenges, and its significance in the AEC industry.
- To equip students with the knowledge and skills necessary to effectively apply BIM throughout the entire building lifecycle, from initial planning stages to construction and beyond.
- To equip students with the knowledge and skills necessary to leverage BIM across multiple dimensions to enhance the efficiency, effectiveness, and sustainability of building projects throughout their lifecycle.
- To equip students with the knowledge and skills necessary to design structurally sound, aesthetically pleasing, and environmentally responsive buildings that meet the functional and performance requirements of occupants while considering factors such as thermal comfort, lighting, acoustics, and weather resistance.
- To prepare students to effectively apply BIM methodologies and technologies in the planning, design, and management of infrastructure projects, thereby contributing to the development of sustainable, resilient, and efficient infrastructure systems to meet current and future societal needs.

Course Description

This course provides an introduction to the theory and practical applications of Building Information Modelling. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using Building Information Modelling.

Prerequisites

- Basic knowledge of Building Information Modelling and deep learning.
- Familiarity with a Building Information Modelling.

UNIT I Introduction to BIM 6

Definition - Guidelines - Different levels of BIM - BIM object - BIM model - Software's for BIM - Benefits - BIM challenges

UNIT II BIM workflow in Building Lifecycle: 6

Planning and 3D modelling - Model based cost estimating - Construction scheduling and 4D simulation - Design co-ordination - BIM to the field.

UNIT III Dimensional Aspects in BIM: 6

Visualization (3D) - Time (4D) - Cost (5D) - Operation (6D) - Sustainability (7D) - Safety (8D) - Advancements in various dimensions.

UNIT IV Building Structural System: 6

Building Enclosures - Functional Aesthetic System - Thermal Infiltration - Illumination - Acoustic Control - Weather Resistance

UNIT V Integrated Design Infrastructure using BIM: 6

Various Infrastructure Sectors - Highways - Railways - Ports and Aviation - Oil and Gas - Power - Telecom - Irrigation – Current Scenario and future needs.

30 PERIODS

LIST OF EXPERIMENTS

1. 3D Architectural Modelling of a residential home with floor plans using BIM Software
2. 3D Architectural Modelling of an Apartment building with floor plans using BIM Software
3. 3D Architectural Modelling of Interior Residential room with Sun light analysis using BIM Software
4. 3D Structural Modelling of a school building using BIM Software
5. 4D Simulation generation for clash detection using Navisworks
6. 5D Complete Estimate Calculation for the given building using BIM Software
7. Creating custom components using Model in Place

45 PERIODS

TOTAL:75 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: To understand the definition, guidelines, different levels, and benefits of Building Information

Modeling (BIM), as well as recognize challenges and software tools associated with its implementation

- CO2:** To effectively utilize Building Information Modeling (BIM) for planning and 3D modeling, model-based cost estimating, construction scheduling and 4D simulation, design coordination, and implementing BIM in the field
- CO3:** To be proficient in utilizing Building Information Modeling (BIM) for visualization (3D), time (4D), cost (5D), operation (6D), sustainability (7D), and safety (8D), as well as be aware of advancements in various dimensions within the BIM framework.
- CO4:** To analyze and design building enclosures, functional aesthetic systems, thermal infiltration solutions, illumination setups, acoustic control mechanisms, and weather resistance strategies within the context of structural systems, considering both functional and aesthetic requirements.
- CO5:** To analyze and apply Building Information Modeling (BIM) techniques to various infrastructure sectors such as highways, railways, ports and aviation, oil and gas, power, telecom, and irrigation, understanding both the current scenario and future needs in each sector.

REFERENCES:

1. Brad Hardin, Dave McCool , “BIM and Construction Management”, 2nd Edition, Wiley Publications, 2001.
2. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston “BIM Handbook”, 2nd Edition, Wiley Publications, 2008.
3. Ray Crotty, “The Impact of Building Information Modelling”, 1st Edition, SPON Press, USA, 2012.
4. Dominik Holzer, The BIM Manager’s Handbook: Guidance for Professionals in Architecture, Engineering, and Construction, Wiley, 2016.

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	Core Course Project -IV	L	T	P	C
CE4603		0	0	2	1

COURSE OBJECTIVES:

- To provide sufficient hands-on learning experience related to the development of design, development and analysis of suitable product / process to enhance the technical skill sets in the chosen field.

CONTENTS :

1. Project may be modelling & simulation, experimentation & analysis, prototype design, fabrication of new equipment, correlation and analysis of data, software development, applied research and any other related activities.
2. Project is done based on the knowledge gained from the core courses within the semester based on the completion of required number of credits as per the academic regulations.
3. Can be individual work or a group project, with a maximum of 3 students.
4. In case of group projects, the individual project report of each student should specify the individual contribution to the project.
5. Carried out inside or outside the university, in any relevant industry or research institution.
6. Publications in the peer reviewed journals / International Conferences will be an added advantage

MODE OF EVALUATION: Periodic reviews, Presentation, Final oral viva, Poster submission

COURSE OUTCOME: At the end of the course the student will be able to

CO1: Formulate specific problem statements for real life problems with reasonable assumptions and constraints.

CO2: Perform literature search and / or patent search in the area of interest.

CO3: Conduct experiments / Design and Analysis / solution iterations and document the results.

CO4: Perform error analysis / benchmarking / costing

CO5: Synthesise the results and arrive at scientific conclusions / products / solution

CO6: Document the results in the form of technical report / presentation

REGULATION 2024
(B.E. CIVIL ENGINEERING)

Course Code	NCC Credit Course Level 3 (AIR FORCE WING)	L	T	P	C
		3	0	0	3



UNIT I NCC General	6
Aims, Objectives & Organization of NCC (1) – Incentives (2) – Duties of NCC Cadet (1) – NCC Camps: Types & Conduct (2)	
UNIT II National Integration and Awareness	4
National Integration: Importance & Necessity (1) – Factors Affecting National Integration (1) – Unity in Diversity & Role of NCC in Nation Building (1) –Threats to National Security (1)	
UNIT III Personality Development	7
Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving (2) – Communication Skills (3) – Group Discussion: Stress & Emotions (2)	
UNIT IV Leadership	5
Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code (3) – Case Studies: Shivaji, Jhansi Ki Rani (2)	
UNIT V Social Service and Community Development	8
Basics, Rural Development Programmes, NGOs, Contribution of Youth (3) – Protection of Children and Women Safety (1) Road/ Rail Travel Safety (1) – New Initiatives (2) – Cyber and Mobile Security Awareness (1)	

TOTAL: 30 PERIODS

**Semester VII
REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	PRESTRESSED CONCRETE STRUCTURES	L	T	P	C
CE4701		3	0	0	3

COURSE OBJECTIVE

- To understand the methods and types of prestressing and to enable the students to design prestressed concrete structural elements and systems

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR

9

Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel, Lee-McCall and Gifford Udall anchorage systems – Analysis of sections of stresses by stress concept, strength concept and load balancing concept – Losses of prestress in post-tensioned and pre-tensioned members.

UNIT II DESIGN FOR FLEXURE AND SHEAR

9

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre-

tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE

9

Factors influencing deflections – Short-term deflections of uncracked members – Prediction of long-term deflections due to creep and shrinkage – Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and I.S. 1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams– design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS

9

Analysis and design of composite beams – Shrinkage strain and its importance – Differential shrinkage - Methods of achieving continuity in continuous beams – Analysis for secondary moments Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELANEOUS STRUCTURES

9

Role of prestressing in members subjected to Tensile forces and compressive forces – Design of Tension members and Compression members - Design of Tanks, Pipes, Sleepers and Poles – Partial prestressing – methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Students will be able to

C01 Design a prestressed concrete beam accounting for losses.

C02 Design for flexure and shear.

C03 Design the anchorage zone for post-tensioned members and estimate the deflection in beams.

C04 Design composite members and continuous beams.

C05 Design water tanks, pipes, poles and sleepers.

TEXTBOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta. S.P., "Prestressed Concrete", CBS Publishers and Distributers

REFERENCES:

1. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
2. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2017.
3. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2017
4. Sinha.N.C. And Roy.S.K. Fundamentals of Prestressed Concrete, S.Chand and Co. Ltd., 2011

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	TOTAL QUALITY MANAGEMENT	L	T	P	C
HS4702		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniques like QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization

Course Description

This course provides an introduction to the theory and practical applications of quality management in work. Students will learn the fundamental tools and techniques used in TQM.

Prerequisites

- Basic knowledge of leadership ,management .

UNIT I INTRODUCTION

9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality --Definition of TQM-- Basic concepts of TQM - Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM --Benefits of TQM.

UNIT II TQM PRINCIPLES

9



Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning- Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal-- Continuous process improvement –Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I **9**

The seven traditional tools of quality - New management tools - Six-sigma Process Capability- Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II **9**

Quality circles – Quality Function Deployment (QFD) - Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures- Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM **9**

Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation- Internal Audits-Registration-ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS

Course Format

Lectures and discussions and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

CO1: Ability to apply TQM concepts in a selected enterprise.

CO2: Ability to apply TQM principles in a selected enterprise.

CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.

CO4: Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.

CO5: Ability to apply QMS and EMS in any organization

TEXT BOOK:

1. Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe



and RashmiUrdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.

REFERENCES:

1. Joel.E. Ross, “Total Quality Management – Text and Cases”, Routledge.,2017.
2. Kiran.D.R, “Total Quality Management: Key concepts and case studies, Butterworth – Heinemann Ltd, 2016.
3. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition, 2003.
4. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .

YouTube Resources:

1. **Leaders Talk:** this channel focuses on introduction to total quality management.
2. **Digital E-Learning :** This channel provides tutorials on fundamentals of TQM.
3. **Educationleaves:** This channel provides basic principles of TQM.
4. **CQE Academy:** gives complete knowledge of tools used in TOM.

TOTAL:45 PERIODS

**REGULATION 2024
(B.E. CIVIL ENGINEERING)**

Course Code	Project Work Phase -I	L	T	P	C
CE4702		0	0	2	2

COURSE OBJECTIVES

- To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

TOTAL: 60 PERIODS

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

**Semester VIII
REGULATION 2024**



(B.E. CIVIL ENGINEERING)

Course Code	Project Work Phase-II	L	T	P	C
CE4801		0	0	20	10

COURSE OBJECTIVES

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

TOTAL: 300 PERIODS

STRATEGY

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner

OUTCOME

On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

APPENDIX A: PROFESSIONAL ELECTIVES

PROFESSIONAL ELECTIVE COURSE

STRUCTURES	CONSTRUCTION TECHNIQUES AND PRACTICES	GEOTECHNICAL
Concrete Structures	Formwork Engineering	Geo Environmental Engineering
Steel Structures	Construction Equipment and	Ground Improvement

	Machinery	Techniques
Prefabricated Structures	Sustainable Construction and Lean Construction	Soil Dynamics and Machine Foundations
Prestressed Concrete Structures	Digitalized Construction Lab	Rock Mechanics
Rehabilitation/ Heritage Restoration	Construction Management and Safety	Earth and Earth Retaining Structures
Dynamics and Earthquake Resistant Structures	Advanced Construction Techniques	Pile Foundation
Introduction to Finite Element Method	Energy Efficient Buildings	Tunnelling Engineering

GEO-INFORMATICS	TRANSPORTATION INFRASTRUCTURE	ENVIRONMENT
Total Station and GPS Surveying	Airports and Harbours	Climate Change Adaptation and Mitigation
Remote Sensing Concepts	Traffic Engineering and Management	Air and Noise Pollution Control Engineering
Satellite Image Processing	Urban Planning and Development	Environmental Impact Assessment
Cartography and GIS	Smart cities	Industrial Wastewater Management
Photogrammetry	Intelligent Transport Systems	Solid and Hazardous Waste Management
Airborne and Terrestrial laser mapping	Pavement Engineering	Environmental Policy and Legislations
Hydrographic Surveying	Transportation planning Process	Environment, Health and Safety

WATER RESOURCES
Participatory Water Resources Management
Groundwater Engineering
Water Resources Systems Engineering
Watershed Conservation and Management
Integrated Water Resources Management
Urban Water Infrastructure
Water Quality and Management
Coastal Zone Management

VERTICAL I- STRUCTURES

Course Code	CONCRETE STRUCTURES	L	T	P	C
CE4V11		3	0	0	3

COURSE OBJECTIVE:

- To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice using Computer Software Staad Pro, E-Tabs and any Structural design and analysis Software.

UNIT I INTRODUCTION AND CODES 9

Geometric Parameters, Grade of concrete and steel for different elements, Exposure and cover requirements, Fire rating, Load Combinations, Serviceability Requirements, Analysis tools. Indian & International Codes for Reinforced concrete Design, Design loads, National Building Code 2016, Practical building example, drawing sizes and scale.

UNIT II LOADS ACTING ON STRUCTURES 9

Introduction, Dead, Live loads, Wind loading and Calculations of - force coefficients, Wind pressure, storey forces and base shears. Earthquake loading and Calculations of - acceleration coefficient, Time period, Base shear. Scheme Design, Concrete floor systems, Sizing and design of various slab systems, Beams, Reinforced Concrete Columns - Location and Shape, Design Axial Load, sizing, Lateral Load Systems, IS 1893- Requirements.

UNIT III MODELLING OF BASIC STRUCTURAL ELEMENTS 9

Introduction to Analysis & Modelling, Modelling of Cantilever, Portal Frame, three bay Portal Frame, 3D structural models - Geometry, gravity loads, defining earthquake loads, defining wind loads, Modelling Shear walls, Practical Structural Model of building, Structural models of Floor System, Estimation of deflections

UNIT IV DESIGN OF STRUCTURAL ELEMENTS 9

Design of Beams- flexural reinforcement, shear reinforcement, Design of flat slabs- Flexural Reinforcement, shear reinforcement, Design of 2-way continuous slabs. Design of Reinforcements in Columns, Post processing, Design and arrangement of vertical reinforcement, horizontal reinforcement in the design of buildings. Design of shear walls - Sizing of elements based on Constructability aspects like formwork, concrete placement and compaction, rebar arrangement to satisfy economy and optimum utilization.

UNIT V DETAILING OF STRUCTURAL ELEMENTS 9

Development of Reinforcement, Typical details of- flat slabs, two-way continuous slabs, beams, columns and shear wall, detailing and documentation.

Case Studies : Structural analysis and design of a multi-storey building with load calculation (dead, live, wind and seismic) as per Indian standard codes using any Structural design and analysis Software.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the student will able to

- C01** Plan a layout of a structure
- C02** Calculate loads using IS codes and various computational tools
- C03** Analyse the structure for various loads and load combination according to the relevant IS codes
- C04** Design and Analysis of structures using computer software/tools
- C05** Prepare the complete structural drawings using computer software

REFERENCES:

1. Unnikrishna Pillai, S., Devdas Menon, “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., 2009.
2. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
3. Krishnaraju.N “ Design of Reinforced Concrete Structures “, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
4. Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
5. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”,Laxmi Publication Pvt. Ltd., New Delhi, 2007.

Course Code	STEEL STRUCTURES	L	T	P	C
CE4V12		3	0	0	3

COURSE OBJECTIVES

- To acquire hands on experience in design and preparation of structural drawings for steel structures like industrial buildings, steel framed buildings using structural design software and detailed drawing softwares
- To introduce the students to design of light gauge steel structures

UNIT I DESIGN ASPECTS AND LOADS ON A STEEL BUILDING

9

Inputs for the design of a steel building - Design basis report, covering Site Data, geometrical, functional and structural requirements for its end usage - material specifications - Methods of

designing a steel building. Calculating the various loads acting on a steel building - Vertical & Lateral loads - Effects of each loads separately and in combination – Dead, superimposed dead, live, temperature, MEP service loads - Lateral loads due to Wind and Seismic effects.

UNIT II SELECTION OF LOAD RESISTING SYSTEM AND MODELLING OF STRUCTURE 9

Studying the layout plans of the structure - Selection of load resisting systems - Load flow in each system - Satisfying Stability and strength of the structure - Vertical and Lateral load resisting systems -Analysis and design of Sway and non-sway frames - Manual and Computer aided modelling,analysis and design - Geometric and structural parameters of the structure - Loading the structure - Interpretation of the results of the software – Analysis and Design of a multi-storeyed building.

UNIT III DESIGN OF VARIOUS ELEMENTS OF A STEEL BUILDING 9

Manual and Software aided design – Beams, columns, floors, bracings, purlins/girts and facades, base plates and anchor bolts – Various loads, different conditions of supports, exposure, and purpose of use - Design of Connections between the members – bolted and welded, moment and shear connections

UNIT III DESIGN OF AN INDUSTRIAL BUILDING 9

Functional requirements - Serviceability Requirements - Structural Configurations - Selection of sections as per requirements - Configuration of the elements, connectivity - Analysis and design of different types of trusses -- Design of Gantry Girders – Design of gable frames – Design of steel columns for combined loading - Analysis and design of industrial buildings - Study of General assembly drawings - Fabrication processes - Fabrication, logistics & erection – Sequence of erection -Inspection of a completed structure.

UNIT V DESIGN OF LIGHT GAUGE STEEL STRUCTURES 9

Philosophy of design of light gauge steel members, Direct Strength Method (DSM) ,Effective width method (EWM) – Concept of buckling, local buckling and post-buckling strength - Analysis and design of Compression members– Analysis and design of flexural members, Lateral buckling of beams, Shear Lag, Flange Curling – Design of wall panels

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Students will be able to

C01 Plan the layout of the structure and calculate the loads of the steel structure.

C02 Select a load resisting system, model the structure and interpret the results.

C03 Design the various elements of a steel buildings

C04 Design a typical industrial building

C05 Design the various elements of a cold –formed steel buildings

TEXT BOOKS

1. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016
2. Negi L.S. "Design of steel structures" McGraw Hill Co., New Delhi, 2014
3. Duggal S.K., Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010

REFERENCES

1. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013
2. Jack C. McCormac and Stephen F Csernak, Structural Steel Design, Pearson Education Limited, 2013.
3. Sarwar Alam Raz, Structural Design in Steel, New Age International Publishers, 2014
4. Gaylord E H, Gaylord N C and Stallmeyer J E, "Design of Steel Structures", 3rd edition, McGraw Hill Publications, 1992.
5. Salmon, Johnson & Malhas," Steel Structures: Design and Behavior, 4th Edition, Harper Collins College Publisher, 1996
6. Bhavikatti S.S, Design of Steel Structures, Ik International Publishing House, New Delhi, 2017.
7. Wie Wen Yu, Design of Cold Formed Steel Structures, McGraw Hill Book Company, 1996
8. www.nptel.ac.in
9. http://www.steel-insdag.org/TM_Content.asp

INDIAN STANDARD CODES

1. IS: 800 – 2007, Code of Practice for general construction in steel, BIS, New Delhi
2. SP 6 (1) – Structural steel sections
3. IS 875 (1-5) - 1987 Code of practice for Design Loads (Other than Earthquake) for Buildings and Structures, BIS
4. IS 816 :1969 - Code of practice for Metal Arc Welding for general Construction in Mild Steel, BIS IS: 808 – 1989 Dimensions For Hot Rolled Steel Beam, Column, Channel and Angle Sections

Course Code	PREFABRICATED STRUCTURES	L	T	P	C
CE4V13		3	0	0	3

COURSE OBJECTIVE:

- To introduce the basic concepts of prefabrication
- To acquire the knowledge of prefabrication components and systems
- To understand the design principles in prefabrication
- To perceive the types of joints and connections in structural members



- To impart knowledge about the structural stability.

UNIT I INTRODUCTION 9

Need for prefabrication -Advantages and limitations – Principles of prefabrication – Modular coordination – Standardization– Loads and load combinations– Materials – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS AND SYSTEMS 9

Behaviour and types of structural components– roof and floor slabs – Walls panels - Shear walls - Beams - Columns – skeletal system- portal frame system-Large panel systems- block system

UNIT III DESIGN PRINCIPLES 9

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems- Design for stripping , stacking ,transportation and erection of elements

UNIT IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS 9

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction joints , contraction joints, expansion joints. Design of expansion joints -Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse - case study.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

C01 Understand concepts about principles of prefabrication, production, transportation, erection.

C02 Acquire knowledge about panel systems, slabs, beams, shear walls and columns used in precast construction.

C03 Acquire knowledge about design of cross section, joint flexibility.

C04 Acquire knowledge about joints and connection in precast construction.

C05 Acquire knowledge about structural stability.

TEXTBOOKS:

STRUCTURES

9

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage and earthquake - Restoration of Heritage structures- Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Students will be able to

- C01** Know the importance of inspection and maintenance.
- C02** Study the Impacts of cracks, corrosion and climate on structures.
- C03** Know about various special concretes
- C04** Understand the testing techniques and various protection measures
- C05** Know the Repair of structures and Restoration of Heritage structures

TEXT BOOKS:

- Shetty.M.S. Jain A K., Concrete Technology - Theory and Practice, S.Chand and Company, Eighth Edition, 2019.
- B.Vidivelli, Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2009.

REFERENCES:

- Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
- Hand Book on "Repair and Rehabilitation of RCC Buildings" – Director General works CPWD ,Govt of India , New Delhi – 2002
- P.C.Varghese, Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014.
- Dodge Woodson, Concrete Structures, Protection, Repair and Rehabilitation, Butterworth-Heinemann, Elsevier, New Delhi 2012

Course Code	DYNAMICS AND EARTHQUAKE RESISTANT STRUCTURES	L	T	P	C
CE4V15		3	0	0	3

COURSE OBJECTIVE

- To understand the behaviour of structures under dynamic, earthquake loading and design the structures as earthquake resistant as per codal provisions.

UNIT I INTRODUCTION TO DYNAMICS

9

Dynamics - Degree of freedom – Free and forced vibration - Idealization of structure as Single Degree of Freedom (SDOF) and Multi degree of freedom (MDOF) system – D’Alemberts Principles Formulation of equation of motion for SDOF system and MDOF system -- Evaluation of natural frequencies and modes - Effect of damping.

UNIT II SEISMOLOGY

9

Elements of Engineering Seismology – Seismic hazard - Earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters – Soil Structure Interaction – Liquefaction of soil - Seismic zone map – Response spectra

UNIT III EARTHQUAKE EFFECTS ON STRUCTURES

9

Inertia force on structures – load transfer path – Effect of architectural features on behavior of structures – Hysteretic Behaviour of RCC, steel and prestressed concrete - Pinching Effect – Bouchinger Effects - Energy dissipation - P-delta effect - storey drift - Behavior of brick masonry, stone masonry and reinforced concrete structures under past earthquakes – typical failures - Causes of damage -- Lessons learnt from past earthquakes.

UNIT IV EARTHQUAKE LOAD ANALYSIS

9

Design spectra – Codal provision – Different methods of earthquake analysis -- Analysis of structure by Equivalent static method – Analysis of structure by Response spectrum method – Introduction to time-history method of analysis

UNIT V EARTHQUAKE RESISTANT DESIGN

9

Philosophy of earthquake resistant design - Planning considerations and Architectural concepts - Design and detailing as per codal provisions - Design and detailing of typical flexural member and column member, Ductile detailing of beam-column joints and footing – Concept and principle of shear wall - Introduction to performance based seismic design - Seismic isolation principles and methods.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

CO1 Develop the equations of motion for SDOF and MDOF system and to evaluate the natural frequencies and mode shapes.

CO2 Explain the elements of engineering seismology, characteristics of earthquake and seismic instrumentation.

C03 Explain the behavior of various types of structures under earthquake

C04 Determine the forces in a structure due to earthquake

C05 Design earthquake resistant building structures

TEXTBOOKS:

1. Mario Paz, Structural Dynamics – Theory and Computations, Fifth Edition 2nd printing, CBS publishers, 2006.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2011.

REFERENCES:

1. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 1995.
2. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 1986.
3. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2007.
4. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.

Publication of Bureau of Indian Standards:

- a. IS 4326: 2013 Earthquake Resistant Design And Construction Of Buildings – Code of Practice
 - b. IS 1893: 2016 Criteria For Earthquake Resistant Design Of Structures – Part 1 General Provisions and Buildings.
- IS 13920:2016 Ductile Design And Detailing Of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice.

Course Code	INTRODUCTION TO FINITE ELEMENT METHOD	L	T	P	C
CE4V16		3	0	0	3

COURSE OBJECTIVE

- To develop a thorough understanding of the finite element analysis techniques with an ability to effectively use the tools of the analysis for solving practical problems arising in Civil Engineering.



Historical Background – Mathematical Modeling of field problems in Engineering –Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems– Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

UNIT II STIFFNESS MATRIX FORMULATION

9

Introduction to Discrete and Continua elements – Discrete Elements - Direct stiffness method - Special characteristics of stiffness matrix - Assemblage of elements – Boundary condition & reaction

- 2D – truss element - 2D - beam element - Analysis of framed Structures - Basic steps in finite element analysis - Differential equilibrium equations - strain displacement relation - linear constitutive relation - Numerical methods in finite element analysis- Gauss elimination method.

UNIT III ONE DIMENSIONAL PROBLEMS

9

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Continua Elements - Displacement models - convergence requirements. Natural coordinate systems - Shape function. Interpolation function. Linear and quadratic elements - Lagrange & Serendipity elements. Strain displacement matrix - element stiffness matrix and nodal load vector. Natural frequencies of longitudinal vibration and mode shapes.

UNIT IV TWO DIMENSIONAL PROBLEMS

9

Two dimensional isoparametric elements - Four noded quadrilateral elements - triangular elements. Computation of stiffness matrix for isoparametric elements - numerical integration (Gauss quadrature) Convergence criteria for isoparametric elements.

UNIT V ANALYSIS OF PLATES

9

Introduction to Plate Bending Problems - displacement functions – Analysis of Thin Plate - Analysis of Thick Plate - Analysis of Skew Plate, Finite Element Analysis of Shell, plane stress and plane strain analysis, Example problem using any general-purpose finite element software

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- C01** To understand the basics of finite element formulation.
- C02** To formulate the stiffness matrix for beam, truss and framed structures.
- C03** To apply finite element formulations to solve one-dimensional problems.
- C04** To apply finite element method to solve two dimensional problems.
- C05** To apply finite element method to analyze plate bending problems.

TEXT BOOKS:

1. Rao, S.S., “The Finite Element Method in Engineering”, 6th Edition, ButterworthHeinemann,2018.
2. Reddy,J.N. “Introduction to the Finite Element Method”, 4thEdition, Tata McGrawHill,2018.

REFERENCES

1. Krishnamoorthy, C. S, Finite Element Analysis - Theory and Programming, McGraw - Hill, 1995.
2. David Hutton, Fundamentals of Finite Element Analysis, Tata McGraw Hill Publishing Company Limited, New Delhi, 2005.
3. G.R. Liu and S.S.Quek, Finite Element Method: A Practical Course, Butterworth-Heinemann; 1st edition (21 February 2003)
4. Chennakesava R. Alavala Finite Element Methods: Basic Concepts and Applications, Prentice Hall Inc., 2010.
5. R. T. Chandrupatla and A. D. Belegundu, Introduction to Finite Elements in Engineering, PHI Learning Pvt Ltd, New Delhi, 1997 .S. S. Bhavikatti, Finite Element Analysis, New Age Publishers, 2007.

VERTICAL II: CONSTRUCTION TECHNIQUES AND PRACTICES

Course Code	FORM WORK ENGINEERING			
CE4V21	L	T	P	C
	3	0	0	3

COURSE OBJECTIVE:

- On completion of this course the students will be able to know the detailed planning of formwork, design of forms and erection of form work.

UNIT I INTRODUCTION TO FORM WORK

9

Introduction to Formwork and false work, Temporary work systems, Requirements, Construction planning and site constraints, Selection, and Classification (Types) of Formwork, General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples - Overall Planning - Detailed planning - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork.

UNIT II FORMWORK MATERIALS ASSESORIES & PRESSURES

9

Formwork Materials, Accessories and consumables – Application of tools, Reconstituted wood – Steel Aluminum Plywood - Types and grades Standard units - Corner units – Pass units, Calculation of labour constants - Formwork hours - Labour Requirement. Hardware and fasteners - Nails in

Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Finish - Sheathing boards working stresses - Repetitive member stress Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

UNIT III FORMWORK DESIGN

9

Concepts, Formwork Systems – components, assembly, De-shuttering, safety of work and Design for Tall Structures, Foundation Wall, Column, Slab and Beam formworks. Design of Decks and False works. Effects of various loads. Loading and moment of formwork, IS Code provisions.

UNIT IV FORMWORK FOR SPECIAL STRUCTURES

9

Formwork for Bridge Structures, Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclear Reactor, Tunnel, Lift Shaft, stairs and Formwork for Precast Concrete. Various climbing system, Table lifting system.

UNIT V CASE STUDIES

9

Formwork failures: Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping Errors in design – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – failure formwork issues in multi - story building construction – vertical and horizontal elements used in the industry.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- C01** To understand the overall and detailed planning of formwork.
- C02** To impart knowledge on formwork materials, accessories, pressures and labour requirement.
- C03** To develop the conceptual understanding of design, construction and erection of formwork.
- C04** To impart the knowledge about different types of form work used for special structures.
- C05** To understand the errors in design and judge the formwork failures through case studies.

TEXT BOOKS

1. Peurify R.L and Oberlender G.D , Formwork for Concrete Structures, , McGraw Hill Education India ,2015
2. Jha K N, Formwork for Concrete Structures, Tata McGraw Hill Education, 2012.

REFERENCES:

1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Michael P. Hurst, Construction Press, London and New York, 2003.
4. Christopher Souder , (2014), Temporary Structure Design, Wiley Publications, London.
5. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

Course Code	CONSTRUCTION EQUIPMENT AND MACHINERY	L	T	P	C
CE4V22		3	0	0	3

COURSE OBJECTIVE

- To train the students in field of construction equipment and machineries so as to have a first hand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems using construction equipment like bull dozer, concrete mixer, cranes and scraper etc.,

STRATEGY:

The students individually undertake training in reputed civil engineering equipment companies, ready mix concrete plants, precast/prefabricated companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

COURSE OUTCOMES:

At the end of the course the student will be able to understand the output of construction equipment and machineries:

CO1 To implement the textbook knowledge into practice.

CO2 To analyse the concepts of developments and implementation of new construction equipment

CO3 To analyse the concepts of developments and implementation of new construction equipment

CO4 To develop a user friendly construction equipment and machinery model.

CO5 To analyse the cost effectiveness of using construction equipment and machinery

Course Code	SUSTAINABLE CONSTRUCTION AND LEAN CONSTRUCTION	L	T	P	C
CE4V23		3	0	0	3

COURSE OBJECTIVE:

- To impart knowledge about sustainable construction and to understand the concepts of sustainable materials, energy calculations, green buildings and environmental effects.

UNIT I INTRODUCTION & MATERIALS USED IN SUSTAINABLE CONSTRUCTION 9

Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO₂ contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.

UNIT II ENERGY CALCULATIONS 9

Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use.

UNIT III GREEN BUILDINGS 9

Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling -Performance ratings of green buildings - Zero energy building'

UNIT IV CORE CONCEPTS IN LEAN 9

Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS).

UNIT V LEAN CONSTRUCTION TOOLS AND TECHNIQUES 9

Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping– 5S , Collaborative Planning System (CPS)/ Last Planner™ System (LPS) – Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

- C01** Describe the various sustainable materials used in construction.
- C02** Explain the method of estimating the amount of energy required for building.
- C03** Describe the features of LEED, TERI and GRIHA ratings of buildings.

C04 Explain the core concepts of lean construction tools and techniques and their importance in achieving better productivity.

C05 Apply lean tools & techniques to achieve sustainability in construction projects.

REFERENCES:

1. Charles J Kibert, Sustainable Construction : Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.
3. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
4. Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques, 2002.
5. Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005.

Course Code	DIGITALIZED CONSTRUCTION LAB	L	T	P	C
CE4V24		0	0	6	3

COURSE OBJECTIVE:

- To train the students in field of digitalization of construction. Students can be trained in the latest softwares relevant to construction industry

List of experiments:

To implement the digital knowledge in construction (use relevant softwares)

1. Introduction and understanding of Primavera project planner for construction
2. Using Primavera project planner, update the schedule of the project of a construction project.
3. Introduction and understanding of MS Project for a construction project
4. Using MS project, schedule the construction project planning
5. Introduction to BIM in construction projects
6. Development of BIM for small construction project
7. Progress the work flows in construction project using BIM
8. Development of bid management for a small firm construction industry using software.

TOTAL: 90 PERIODS

COURSE OUTCOMES:

At the end of the course the student will be able to understand the output of digitalization of construction

C01 To understand the importance of latest softwares in a construction industry.

C02 To plan a construction project using Primavera

C03 To plan a construction project using MS project

C04 To develop a BIM information model

C05 To analyse the bid management and its effectiveness using bid management software

Course Code	CONSTRUCTION MANAGEMENT AND SAFETY	L	T	P	C
CE4V25		2	0	2	3

COURSE OBJECTIVE

- To study and understand the formulation, costing of construction projects, scheduling and various safety concepts and its requirements applied to construction projects.

UNIT I GENERAL OVERVIEW AND PROJECT ORGANIZATION 6

Introduction - Interdisciplinary nature of modern construction projects – execution of project – evaluation of bids – resource management.

UNIT II ESTIMATION OF PROJECT COST & ECONOMICS 6

Estimating quantities – description of items – estimation of project cost – running account bills – decision making in construction projects – depreciation of construction equipment – case study.

UNIT III PLANNING AND SCHEDULING 6

Introduction – project scheduling – uncertainties in duration of activities using PERT – Project monitoring and control system – resource levelling and allocation – crashing of network.

UNIT IV SAFETY DURING CONSTRUCTION 6

Basic terminology in safety - types of injuries - safety pyramid - Accident patterns - Planning for safety budget, safety culture - Introduction to OSHA regulations - Site safety programs - Job hazard analysis, accident investigation & accident indices-violation, penalty.

UNIT V SAFE OPERATING PROCEDURES 6

Safety during alteration, demolition works – Earthwork, steel construction, temporary structures, masonry & concrete construction, cutting & welding - Construction equipment, materials handling- disposal & hand tools - Other hazards – fire, confined spaces, electrical safety.

TOTAL: 30 PERIODS

List of experiments:

Ex 1 Introduction to various construction management software

Ex 2 Planning and creating new project

Ex 3 Scheduling and constraints using PRIMAVERA

Ex 4 Project cost management using PRIMAVERA

Ex 5 Construction project safety management using BIM

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- CO1** Perform formulations of projects.
- CO2** Analyze project costing.
- CO3** Identify and estimate the activity in the construction.
- CO4** Develop the knowledge on accidents and their causes.
- CO5** Plan, assess, analyze and manage the construction project sites.

REFERENCES :

1. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992
3. Albert Lester, Project Management, Planning and Control, 7th Edition, Butterworth-Heinemann, USA , 2017 Patrick X.W. Zou ,Riza YosiaSunindijo, Strategic Safety Management in Construction and Engineering John Wiley & Sons, Ltd 2015

Course Code	ADVANCED CONSTRUCTION TECHNIQUES	L	T	P	C
CE4V26		3	0	0	3

COURSE OBJECTIVE:

- To study and understand the latest construction techniques applied to engineering construction for sub structure, super structure, special structures, rehabilitation and strengthening techniques and demolition techniques.

UNIT I SUB STRUCTURE CONSTRUCTION 9

Construction Methodology - Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam - cable anchoring and grouting - Driving diaphragm walls, Sheet piles - Laying operations for built up offshore system - Shoring for deep cutting - Large reservoir construction - well points - Dewatering for underground open excavation.

UNIT II SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS 9

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab- aerial transporting – Handling and erecting lightweight components on tall structures.

UNIT III CONSTRUCTION OF SPECIAL STRUCTURES 9

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries Erection of articulated structures and space decks.

UNIT IV REHABILITATION AND STRENGTHENING TECHNIQUES 9

Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques.

UNIT V DEMOLITION 9

Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1 Understand the modern construction techniques used in the sub structure construction.

CO2 Demonstrate knowledge and understanding of the principles and concepts relevant to super structure construction for buildings

CO3 Understand the concepts used in the construction of special structures

CO4 Knowledge on Various strengthening and repair methods for different cases.

CO5 Identify the suitable demolition technique for demolishing a building.

REFERENCES:

1. Jerry Irvine, Advanced Construction Techniques, CA Rocket, 1984
2. Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992.
3. Peter H.Emmons, "Concrete repair and maintenance illustrated", Galgotia Publications Pvt. Ltd., 2001.Press, 2008.
4. Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995.Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University, New Delhi, 2008

Course Code	ENERGY EFFICIENT BUILDINGS	L	T	P	C
CE4V27		3	0	0	3

COURSE OBJECTIVE

- To provide an understanding of the concept of energy consumption in buildings and design an energy efficient building

UNIT I INTRODUCTION

9

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT II PASSIVE SOLAR HEATING AND COOLING

9

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds– Cool Pools -Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III DAYLIGHTING AND ELECTRICAL LIGHTING

9

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts – Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings – Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors.

UNIT IV HEAT CONTROL AND VENTILATION

9

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation – Calculation of probable indoor wind speed.

UNIT V DESIGN FOR CLIMATIC ZONES

9

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Draft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On completion of this course, the student is expected to be able to

C01 Explain environmental energy supplies on buildings

C02 Explain the passives of a heating, cooling system

C03 Discuss the various aspects of day-lighting and electrical lighting in a building

C04 Predict and design building ventilation and heat control for indoor comfort

C05 Design a building for climatic zone and apply simulation programs of buildings to perform energy calculations

REFERENCES

1. Energy Conservation Building Code, Code of Energy Efficiency, New Delhi, 2018.
2. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995
3. Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and Chris Dorsi, Published by Saturn Resource Management, 2013.
4. Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John

Wiley and Sons Inc, 3rd Edition, 2014 Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009

VERTICAL III: GEOTECHNICAL

Course Code	GEOENVIRONMENTAL ENGINEERING	L	T	P	C
CE4V31		3	0	0	3

COURSE OBJECTIVE:

- The student acquires the knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques hereby protecting environment.

UNIT I SOIL – WASTE INTERACTION

9

Role of Geo-environmental Engineering – sources, generation and classification of wastes – causes and consequences of soil pollution – case studies in soil failure -factors influencing soilpollutant interaction – modification of index, chemical and engineering properties – physical and physio- chemical mechanisms.

UNIT II CONTAMINANT TRANSPORT AND SITE CHARACTERISATION

9

Transport of contaminant in subsurface – advection, diffusion, dispersion – chemical process – biological process, sorption, desorption, precipitation, dissolution, oxidation, complexation, ion exchange, Volatization, biodegradation – characterization of contaminated sites – soil and rock data
hydrological and chemical data – analysis and evaluation.

UNIT III WASTE CONTAINMENT AND REMEDIATION OF CONTAMINATED SITES

9

In-situ containment – vertical and horizontal barrier – surface cover – ground water pumping system on subsurface drain – soil remediation – Soil Vapour extraction, soil waste stabilization, solidification of soils, electrokinetic remediation, soil heating, vitrification, bio remediation, Phyto-remediation – ground water remediation – pump and treat , In-situ flushing, permeable reacting barrier, In-situ air sparging.

UNIT IV LANDFILLS AND SURFACE IMPOUNDMENTS

9

system – Source and characteristics of waste - site selection for landfills – components of landfills – liner soil, geomembrane, geosynthetic clay, geo-composite liner system – leachate

collection – final cover design – monitoring landfill - Environmental laws and regulations.

UNIT V STABILISATION OF WASTE

9

Evaluation of waste materials – flyash, municipal sludge, plastics, scrap tire, blast furnace slag, construction waste, wood waste and their physical, chemical and biological characteristics – potential reuse – utilization of waste and soil stabilization.

TOTAL:45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to;

CO1 Understand the various causes and consequences of waste interaction with soil and their modification.

CO2 Understand the various mechanism of transport of contaminants into the subsurface and characterization of contaminated sites and their risk analysis.

CO3 Understand on how to decontaminate the site so as to reuse the site for human settlement

CO4 Understand how to safely dispose the waste through different containment process.

CO5 Expose on how to convert the waste into a resource material through soil waste stabilization techniques with or without chemical stabilization.

REFERENCES:

1. Daniel B.E, Geotechnical Practice for waste disposal, Chapman & Hall, London, 1993.
2. Hari D. Sharma and Krishna R.Reddy, Geo-Environmental Engineering – John Wiley and Sons, INC, USA, 2004.
3. Westlake, K., Landfill Waste pollution and Control, Albion Publishing Ltd., England, 1995.
4. Wentz, C.A., Hazardous Waste Management, McGraw Hill, Singapore, 1989.
5. Proceedings of the International symposium of Environmental Geotechnology (Vol.I and II), Environmental Publishing Company, 1986 and 1989.
6. Ott, W.R., Environmental Indices, Theory and Practice, Ann Arbor, 1978.
7. Fried, J.J., Ground Water Pollution, Elsevier, 1975.
8. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.Lagrega, M.d., Buckingham, P.L., and Evans, J.C., Hazardous Waste Management, McGraw Hill, Inc. Singapore, 1994.

Course Code	GROUND IMPROVEMENT TECHNIQUES	L	T	P	C
CE4V32		3	0	0	3

COURSE OBJECTIVE:

- C03** Improve The Ground Characteristics By Physical Modifications Using Various Method And Design The System
- C04** Improve The Characteristics Of Soils By Various Reinforcement Techniques And Design
- C05** Analyse The Ground And Decide The Suitable Chemical Method For Improving Its Characteristics

REFERENCES:

1. Pappala, A.J.,Huang,J., Han, J., and Hoyos, L.R., Ground Improvement and Geosynthetics; Geotechnical special publication No.207, Geo Institute, ASCE, 2010
2. Cox, B.R., and Griffiths S.C., Practical Recommendation for Evaluation and mitigation of Soil Liquefaction in Arkansas, (Project Report), 2010.
3. Day, R.W., Foundation Engineering Handbook, McGraw – Hill Companies, Inc. 2006.
4. Rowe, R.K., Geotechnical and Geo-environmental Engineering Handbook, Kluwer Academic Publishers, 2001.
5. Das, B.M., Principles of Foundation Engineering, Fourth Edition, PWS Publishing, 1999.
6. Moseley, M.P., Ground Treatment, Blackie Academic and Professionals, 1998.
7. Koerner, R.M., Designing with Geosynthetics, Third Edition, Prentice Hall 1997.
8. Hehn, R.W., Practical Guide to Grouting of Underground Structures, ASCE, 1996.
9. Jewell, R.A., Soil Reinforcement with Geotextiles, CIRIA, London, 1996.
10. Koerner, R.M. and Welsh, J.P., Construction and Geotechnical Engineering using Synthetic Fabrics, John Wiley, 1990.
11. Han,J., Principles and Practice of Ground Improvement, John Wiley and Sons, New Jersey, Canada 2015.
12. Jones, J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1985.
13. Manfred R. Hausmann, Engineering Principles of Ground Modifications, McGraw-Hill Publishing Company, New York

Course Code	SOIL DYNAMICS AND MACHINE FOUNDATIONS	L	T	P	C
CE4V33		3	0	0	3

COURSE OBJECTIVE:

- To design different types of machine foundations based on the dynamic properties of soils and to get an exposure on vibration isolation techniques.

UNIT I THEORY OF VIBRATION

Introduction – Nature of dynamic loads – Basic definitions – Simple harmonic motion – Fundamentals of vibration – Single degree and multi degree of freedom systems – Free

REFERENCES:

1. KameswaraRao, N.S.V., Dynamics soil tests and applications, Wheeler Publishing, New Delhi, 2000.
2. Prakash, S and Puri, V.K., Foundations for machines, McGraw Hill, 1987.
3. Moore, P.J., Analysis and Design of Foundations for Vibrations, Oxford and IBH, 1985.
4. Vaidyanathan, C.V., and Srinivasalu, P., Handbook of Machine Foundations, McGraw Hill, 1995.
5. Arya, S., O'Nelt; S., Design of Structures and Foundations for Vibrating Machines, Prentice Hall, 1981.
6. Major, A., Vibration Analysis and Design of Foundations for Machines and Turbines, Vol. I. II and III Budapest, 1964.
7. Barkan, D.D., Dynamics of Basis of Foundation, McGraw Hill, 1974.
8. Swami Saran, Soil Dynamics and Machine Foundation, Galgotia publications Pvt. Ltd. New Delhi 2010.
9. Das B.M., Principles of Soil Dynamics, McGraw Hill, 1992.
10. Krammer S.L., Geotechnical Earthquake Engineering, Prentice Hall, International series, Pearson Education (Singapore) Pvt Ltd, 2004.
11. KameswaraRao, Vibration Analysis and Foundation Dynamics, Wheeler Publishing, New Delhi, 1998

Course Code	ROCK MECHANICS	L	T	P	C
CE4V34		3	0	0	3

COURSE OBJECTIVES:

- Students are expected to classify, understand stress-strain characteristics, failure criteria, and influence of in-situ stress in the stability of various structures and various technique to improve the in-situ strength of rocks.

UNIT I CLASSIFICATION OF ROCKS

9

Types of Rocks - Index properties and classification of rock masses, competent and incompetent rock - value of RMR and ratings in field estimations.

UNIT II STRENGTH CRITERIA OF ROCKS

9

Behaviour of rock under hydrostatic compression and deviatric loading - Modes of rock failure planes of weakness and joint characteristics - joint testing, Mohr - Coulomb failure

UNIT IV SUPPORTED EXCAVATIONS

9

Lateral pressure on sheeting in braced excavation, stability against piping and bottom heaving. Earth pressure around tunnel lining, shaft and silos – Soil anchors – Soil pinning –Basic design concepts.

UNIT V SLURRY SUPPORTED EXCAVATION

9

Slurry supported trenches-basic principles-slurry characteristics-specifications-diaphragm walls- bored pile walls-contiguous pile wall-secant piles-stability analysis.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

- C01** Analyse the earth pressure acting on retaining structures by applying classical theories considering all influencing parameters and suggest the earth pressure to be considered for the design of retaining structures.
- C02** Apply the knowledge of engineering and earth pressure to analyse and design rigid retaining structures considering effect of compaction, wall flexibility, pore water pressure and earth quake forces.
- C03** Apply the knowledge of engineering and earth pressure to analyse and design flexible earth retaining walls and also acquire the knowledge of design of anchors
- C04** Apply the knowledge on lateral earth pressure behind and around excavation to analyse and design braced excavations, slurry supported excavations and underground utilities.
- C05** To understand the role of slurry in supporting excavations and to perform stability analysis by considering the actual shape of slurry support

REFERENCES:

1. Clayton, C.R.I., Militisky, J. and Woods, R.I., Earth pressure and Earth-Retaining structures, Second Edition, Survey University Press, 1993.
2. Das, B.M., Principles of Geotechnical Engineering, Fourth Edition, The PWS series in Civil Engineering, 1998.
3. Militisky, J. and Woods, R., Earth and Earth retaining structures, Routledge,1992.
4. Winterkorn, H.F. and Fang, H.Y., Foundation Engineering Handbook, GalgotiaBooksource, 2000.
5. Rowe, R.K., Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic Publishers, 2001.
6. Koerner, R.M. Designing with Geosynthetics, Third Edition, Prentice Hall, 1997.
7. Day, R.W., Geotechnical and Foundation Engineering: Design and Construction,

McGraw Hill, 1999.

8. Mandal, J.N., Reinforced Soil and Geotextiles, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1993.
9. McCarthy, D.F., Essentials of Soil Mechanics and Foundations: Basic Geotechnics, Sixth Edition, Prentice Hall, 2002.
10. Hajnal, I., Marton, J. and Regele, Z., Construction of diaphragm walls, A Wiley – Interscience Publication, 1984.
11. Petros P. Xanthakos., Slurry walls as structural systems, McGraw-Hill, Inc., New York, 1994.
12. Bramhead, E.N., The Stability of Slopes, Blacky Academic and Professionals Publications, Glasgow, 1986.

Course Code	PILE FOUNDATION	L	T	P	C
CE4V36		3	0	0	3

COURSE OBJECTIVES:

- The student will be exposed to the design of piles, pile groups and caissons with respect to vertical and lateral loads for various field conditions.

UNIT I PILE CLASSIFICATIONS AND LOAD TRANSFER PRINCIPLE 9

Necessity of pile foundation – classification of piles – Factors governing choice of type of pile – Load transfer mechanism – piling equipments and methods – effect of pile installation on soil condition – pile raft system – basic interactive analysis - criteria for pile socketing.

UNIT II AXIAL LOAD CAPACITY OF PILES AND PILE GROUPS 9

Allowable load of piles and pile groups – Static and dynamic methods – for cohesive and cohesionless soil – negative skin friction – group efficiency – pile driving formulae - limitation – Wave equation application – evaluation of axial load capacity from field test results - Settlement of piles and pile group.

UNIT III LATERAL AND UPLIFT LOAD CAPACITIES OF PILES 9

Piles under Lateral loads – Broms method, elastic, p-y curve analyses – Batter piles – response to moment – piles under uplift loads – under reamed piles – Drilled shaft – Lateral and pull out capacity from load test.

UNIT IV STRUCTURAL DESIGN OF PILE AND PILE GROUPS 9

Structural design of pile – structural capacity – pile and pile cap connection – pile cap design – shape, depth, assessment and amount of steel – truss and bending theory- Reinforcement details of pile and pile caps -- pile subjected to vibration.

Necessity of caisson – type and shape - Stability of caissons – principles of analysis and design – tilting of caisson – construction - seismic influences.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1 Explain the importance of pile foundation and various functions and responsibilities of geotechnical engineer and contractor, in addition to the piling equipments.

CO2 Determine the vertical load carrying capacity of pile and pile group- keeping the settlement of pile as an important criteria based on field practices and codal provisions.

CO3 Apart from vertically loaded piles, the structures are exposed to the peculiar pile subjected to lateral and uplift load with reference to codal provision and case studies.

CO4 Understand the design of pile and pile caps, considering the wind and seismic loads.

CO5 Explain the importance of caisson foundation and checking the stability of caissons based on codal provisions.

REFERENCES:

1. Das, B.M., Principles of Foundation Engineering, Design and Construction, Fourth Edition, PWS Publishing, 1999.
2. Poulos, H.G., Davis, E.H., Pile foundation analysis and design, John Wiley and Sons, New York, 1980.
3. Tomlinson, M.J. Foundation engineering, ELBS, Longman Group, U.K. Ltd., England 1995.
4. Michael Tomlinson and John Woodward, Pile design and construction practice, Taylor & Francis Group, London & New York, 2008.
5. Cernica, J.N. Geotechnical Engineering Foundation Design, John Wiley and Sons, Inc. 1995.
6. Bowles, J.E., Foundation Analysis and Design, Fifth Edition, McGraw Hill, New York, 1996.
7. Donald, P., Coduto, Foundation Design Principles and Practices, Prentice Hall, Inc. Englewood Cliffs, New Jersey, 1996.
8. Varghese P.C., " Foundation Engineering", PHI Learning Private Limited, New Delhi, 2005.
9. Reese, L.C., Isenhowe, W.M. and Wang, S.T. Analysis and Design of Shallow and Deep Foundations, John Wiley and Sons, New York, 2005.
10. Varghese P.C., " Design of Reinforced Concrete Foundations", PHI Learning Private Limited, New Delhi, 2009.
11. Reese, L. C. and Van Impe, W. F., Single Piles and Pile Groups Under Lateral Loading, Taylor and Francis, London, 2011.

Course Code	TUNNELING ENGINEERING	L	T	P	C
CE4V37		3	0	0	3

COURSE OBJECTIVES:

- Students mainly focused in visualizing and critically analyzing the behavior of underground structures with reference to various supporting systems under different loading conditions due to induced earth pressure on the underground structures.
- To give idea about the equipment used in underground excavations

UNIT I TUNNELS AND UNDERGROUND SPACE APPLICATION 9

History-caves-tunnels for transport-water,power supply-storage of LPG –nuclear waste disposal-defence facilities-submerged tunnels-underground library,museums.

UNIT II EXCAVATION TECHNIQUES 9

Types and purpose of tunnels-choice of excavation methods-soft ground tunneling-hardrock tunneling-tunnel drilling-blasting-impact hammers-problems encountered and remedial measures.

UNIT III PLANNING AND GEOMETRIC DESIGN OF TUNNELS 9

Topographical –geological survey-rock sampling-testing-determination of location size shape and alignment-subsidence problem on soft ground –tunneling design in hard rock.

UNIT IV CONSTRUCTION OF TUNNEL 9

Advanced drilling techniques –TBM-cuttability assessment-shield tunneling-advantages-types of shield tunneling-factors affecting selection of shield-twin tunnel-NATM.

UNIT V DESIGN OF TUNNEL SUPPORTING SYSTEMS AND VENTILATION 9

Classification of supports-active –passive-permanent-temporary-excavation support-steel supports- lining-grouting-ground freezing-environment in underground-various methods of ventilation.

TOTAL: 45 PERIODS

COURSE OUTCOME:

On completion of the course, the student is expected to be able to

- C01** To Understand need of utilization of underground space for various applications.
- C02** To study various methods of excavations and tunneling methods.
- C03** Planning and design process of tunnels.

C04 To identify the suitable method of tunneling.

C05 To study various types of support system and its merit and demerits.

REFERENCES:

1. Underground infrastructure planning design construction-R.K.Goel, Bhavani singh, Jian Zhao, Butterworth heinemunn publishers.
2. Practical tunnel construction, Hemphill G.B 2012 Johnwileyand Son.

Introduction to tunnel construction, David chapran, Nicole metse and Alfred stark,Spor press

VERTICAL IV: GEO-INFORMATICS

Course Code	TOTAL STATION AND GPS SURVEYING	L	T	P	C
CE4V41		3	0	0	3

COURSE OBJECTIVE:

- To understand the working of Total Station and GPS and solve the surveying problems.

UNIT I FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES 9

Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying - Applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies – Refractive index (RI) – factors affecting RI -Computation of group for light and near infrared waves at standard and ambient conditions – Computation of RI for microwaves at ambient condition – Reference refractive index -Real-time application of first velocity correction. Measurement of atmospheric parameters - Mean refractive index – Second velocity correction -Total atmospheric correction - Use of temperature -pressure, transducers.

UNIT II ELECTRO-OPTICAL AND MICROWAVE 9

Electro - optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments.Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments.COGO functions: Area, Inverse / MLM, REM, Resection, offsets and stakeout - Land survey applications.

UNIT III SATELLITE SYSTEM 9

Basic concepts of GPS – Historical perspective and development – applications -Geoid and Ellipsoid – satellite orbital motion – Keplerian motion – Kepler’s Law – Perturbing forces -Geodetic satellite – Doppler effect – Positioning concept – GNSS and IRNSS – SBAS: GAGAN and WAAS

Different segments - space, control and user segments – satellite configuration – GPS signal structure – Orbit determination and representation – Anti Spoofing and Selective Availability
-Task of control segment GPS receivers.

UNIT IV GPS DATA PROCESSING

9

GPS observables – code and carrier phase observation – linear combination and derived observables concept of parameter estimation – downloading the data – RINEX Format–Differential data processing – software modules - solutions of cycle slips, ambiguities - Multi path and other observational errors – satellite geometry and accuracy measures – Continuously Operating Reference System (CORS)– long base line processing - use of different processing software’s: Open Source, Scientific and Commercial.

UNIT V SURVEYING METHODS AND APPLICATIONS

9

Total Station: Traversing and Trilateration measurement and adjustment –Planimetric map and Contour map and Topography Mapping. GNSS: Concepts of rapid, static, semi-Kinematic, pure Kinematic and RTK methods. Observation by Radiation, Lee frog and Trilateration measurement and processing -Topography mapping using PPK and RTK methods Total Station and GNSS applications

TOTAL:45 PERIODS

COURSE OUTCOMES:

- On completion of the course, the student is expected to

C01 Learn about the fundamental concept of Total station.

C02 Provide knowledge about electromagnetic waves and its usage in Total station and GNSS.

C03 Gain Knowledge on basic concepts of GNSS

C04 Understand the measuring and working principle of electro optical and Microwave Total station and GPS

C05 Gain knowledge about Total station and GNSS data processing and Mapping.

TEXTBOOKS:

1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th Edition,1996.
2. SatheeshGopi, rasathishkumar, N.madhu, – Advanced Surveying , Total Station GPS and Remote Sensing – Pearson education , 2nd Edition,2017. isbn: 978-81317 00679.
3. Gunter Seeber , Satellite Geodesy, Walter De Gruyter, Berlin, 2nd Edition, 2003

REFERENCES:

1. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin,

UNIT V DATA PRODUCTS AND INTERPRETATION

9

Photographic and digital products – Types, levels and open source satellite data products -- selection and procurement of data– Visual interpretation: basic elements and interpretation keys-Digital interpretation – Concepts of Image rectification, Image enhancement and Image classification

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

- C01** understand the concepts and laws related to remote sensing
- C02** understand the interaction of electromagnetic radiation with atmosphere and earth material
- C03** acquire knowledge about satellite orbits and different types of satellites
- C04** understand the different types of remote sensors
- C05** gain knowledge about the concepts of interpretation of satellite imagery

TEXTBOOKS:

1. Thomas M.Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York,2015.
2. George Joseph and C Jeganathan, Fundamentals of Remote Sensing,Third Edition Universities Press (India) Private limited, Hyderabad, 2018

REFERENCES:

1. Janza, F.Z., Blue H.M. and Johnson,J.E. Manual of Remote Sensing. Vol.I, AmericanSociety of Photogrametry, Virginia, USA, 2002.
2. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995
3. Paul Curran P.J. Principles of Remote Sensing. Longman, RLBS, 1988.
4. Introduction to Physics and Techniques of Remote Sensing , Charles Elachi and JacobVan Zyl, 2006 Edition II, Wiley Publication.Basudeb Bhatta, Remote Sensing and GIS, Oxford University Press, 2011

Course Code	SATELLITE IMAGE PROCESSING	L	T	P	C
CE4V43		3	0	0	3

COURSE OBJECTIVE

- To make the undergraduate Engineering Students understand the concepts, principles, processing of Satellite data in order to extract useful information from



Data, People, Methods – Introduction to data quality – Types of data – Spatial, Attribute data – types of attributes – scales/levels of measurements – spatial data models – Raster Data Structures – Raster Data Compression – Vector Data Structures – Raster Vs Vector Models – TIN and GRID data models.

UNIT IV DATA INPUT AND TOPOLOGY

9

Scanner – Raster Data Input – Raster Data File Formats – Georeferencing– Vector Data Input – Digitizer– Datum Projection and Reprojection – Coordinate Transformation – Topology - Adjacency, Connectivity and containment – Topological Consistency – Non topological file formats – Attribute Data Linking – Linking External Databases – GPS Data Integration – Raster to Vector and Vector to Raster Conversion.

UNIT V DATA QUALITY AND OUTPUT

9

Assessment of Data Quality - Basic Aspects - Completeness, Logical Consistency, Positional Accuracy, Temporal Accuracy, Thematic Accuracy and Lineage – Metadata – GIS Standards – Interoperability – OGC - Spatial Data Infrastructure – Data Output – Map Compilation – Chart / Graphs.

TOTAL:45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to

- C01** Be familiar with appropriate map projection and co-ordinate system for production of Maps and shall able to compile and design maps for their required purpose.
- C02** Be familiar with co-ordinate and Datum transformations
- C03** Understand the basic concepts and components of GIS, the techniques used for storage of spatial data and data compression
- C04** Understand the concepts of spatial data quality and data standard
- C05** Understand the concept of spatial data inputs

TEXTBOOKS:

1. Arthur H. Robinson et al, "Elements of Cartography", 7th Edition, Wiley, 2002.
2. Kang – Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, Fourth Edition, 2017.
3. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction to Geographical

Information Systems, Pearson Education, Fourth Edition, 2011.

REFERENCES:

1. John Campbell, "Introductory Cartography", Wm. C. Brown Publishers, 3rd Edition, 2004
2. Chor Pang LO, Albert K. W. Yeung, "Concepts and Techniques of Geographic Information Systems",

Pearson Education, 2nd Edition, November 2016. ISBN: 9789332581883

Course Code	PHOTOGRAMMETRY	L	T	P	C
CE4V45		3	0	0	3

COURSE OBJECTIVE:

- To introduce basics and concepts of optics, aerial photography acquisition and mapping from aerial photographs.

UNIT I PRINCIPLES AND PROPERTIES OF PHOTOGRAPHY 9

History - Definition, Applications – Types of Photographs, Classification – Photographic overlaps – Camera: metric vs. non-metric, Digital Aerial cameras – Multiple frame and Line cameras – Linear array scanner – Flight Planning – Crab & Drift– Computation of flight plan - Photogrammetry project Planning.

UNIT II GEOMETRIC PROPERTIES OF AERIAL PHOTOGRAPHS 9

Photo coordinate measurement – Vertical photographs -geometry, scale, Coordinate system, Relief displacement – Stereoscopes – Stereoscopic parallax – parallax equations -Geometry, Scale, Coordinate system – Relief displacement -- Photo Interpretation.

UNIT III STEREOPLOTTERS & ORIENTATION 9

Projection system, Viewing, Measuring and Tracing system Stereo plotters–Classification: Analog, semi analytical, Analytical and Digital systems – Interior orientation - Relative orientation – Absolute orientation - Collinearity condition and Coplanarity condition - Orientation: Two-dimensional coordinate transformations –Three-dimensional conformal coordinate transformation

UNIT IV AEROTRIANGULATION, TERRAIN MODELING, ORTHOPHOTO 9

model – Strip and blocks of photographs – Aerotriangulation: strip adjustment, independent model triangulation, Bundle block Adjustment and GPS Aerotriangulation (INS and GNSS integration) - feature collection – DTM generation and Contour mapping – ortho rectification - mono plotting – stereo plotting

UNIT V DIGITAL PHOTOGRAMMETRY 9

Photogrammetric Scanner – Digital Photogrammetry WorkStation – Work Station Basic system function – Storage System – Stereoscopic Viewing and Measuring System – Image properties - Image matching: template matching, feature based matching - DEM and DSM - Satellite photogrammetry principles

TOTAL:45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to

CO1 Understand and appreciate the importance of photography as means of mapping, functional and physical elements of photography.

CO2 Understand the need of the photogrammetric mapping and the relevance of accuracy standards and means to achieve them for precise large-scale maps with scientific methods.

CO3 Evaluate the standards of map based on the state-of-the-art tool and techniques and assess the production standards for photogrammetric map making.

CO4 Acquire knowledge on the current development, issues methods and solutions in map making and evaluate methods of production.

CO5 Analyze critically and evaluate methods by applying the knowledge gained and to be a part of innovation and integration of mapping technology.

TEXTBOOKS:

1. Paul. R Wolf., Bon A. De Witt, Elements of Photogrammetry with Application in GIS McGraw Hill International Book Co., 4thEdition, 2014.
2. E. M. Mikhail, J. S. Bethel, J. C. McGlone, Introduction to Modern Photogrammetry, Wiley Publisher, 2001.

REFERENCES:

1. Gollfried Konecny, Geoinformation: Remote Sensing, Photogrammetry and Geographical Information Systems, CRC Press, 2nd Edition, 2014.
2. Karl Kraus, Photogrammetry: Geometry from Images and Laser Scans, Walter de Gruyter GmbH & Co.2nd Edition, 2007.
3. Manual of Photogrammetry – American society of Photogrammetry & amp; R. S by Albert. D, 1980.
4. Digital Photogrammetry – A practical course by Wilfried Linder, 3rd edition, Springer, 2009.
5. Digital Photogrammetry by – Y. Egels& amp; Michel Kasser, Taylor & amp; Francis group, 2003.

Course Code	AIRBORNE AND TERRESTRIAL LASER MAPPING	L	T	P	C
CE4V46		3	0	0	3

COURSE OBJECTIVE:

- To introduce the concepts of Space Borne, Air Borne, Terrestrial and Bathymetric LASER Scanners for Topographic and Bathymetric Mapping

UNIT I SPACE BORNE RADAR AND LIDAR ALTIMETER 9

Principle and Properties of LASER- Production of Laser – Components of LASER – LiDAR – Types of LiDAR:Range Finder, DIAL and Doppler LiDAR - Platforms: Terrestrial, Airborne and Space borne LiDAR – Space Borne LiDAR Missions – Space Borne Radar Altimeter for mapping Sea Surface Topography , Moon Topography - Merits of ALS in comparison to Levelling, echo sounding, GPS leveling, Photogrammetry and Interferometry

UNIT II AIRBORNE LASER SCANNERS 9

Airborne Topographic Laser Scanner – Ranging Principle – Pulse Laser and Continuous Wave Laser –First Return and Last Return – Ellipsoidal and Geoidal Height - Typical parameters of Airborne Laser Scanner (ALS) – Specifications of Commercial ALS -- Components of ALS - GPS, IMU, LASER Scanner, Imaging Device, Hardware and Software - Various Scanning Mechanisms: Oscillating Mirror, Rotating Polygon, Nutating Mirror, Fibre Optic

UNIT III DATA ACQUISITION AND PRE-PROCESSING 9

Laser Classification – Class I to Class IV Laser – Eye Safety - Synchronization of GPS, IMU and ALS Data -Reflectivity of terrain objects -- Flight Planning – Determination of various data acquisition parameters – Swath Width, Point Density, No. of Strips, Area Covered, Point Spacing - Data Processing – Determination of optimal flight trajectory- Quality Assurance

UNIT IV POST PROCESSING of LIDAR Data 9

Post Processing – Geo location of Laser Foot Prints – Various Co-ordinate Transformations involved Filtering - Ground Point filtering – Digital Surface Model and Digital Elevation Model - LIDAR data file formats – LAS File format and other proprietary file formats – Post Processing Software: Open Source and COTS Software – Quality Control Measures – Error Budget - Overview of LIDAR Applications in various domains - 3D city models – Corridor Mapping Applications – Forestry Applications.

UNIT V TERRESTRIAL LASER SCANNERS 9

Terrestrial Laser Scanners (TLS) – Working Principle – Static TLS – Dynamic TLS -- Commercial TLS Specifications – Mobile Mapping Lasers :Vehicle Mounted TLS, Back Pack Wearable Laser



Scanners – Asset Management Studies – Highways and Railway Asset Management – Indoor Mapping : Laser Scanning of interior of buildings/monuments – Immersive Applications - BIM Model Applications in Tunnel Surveying, Forest Inventory, Open Cast Mine Surveying

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to

- CO1** Understand the components of laser and various platforms of laser scanning
- CO2** Summarize the components of Airborne Laser Scanner and concept of ranging principles
- CO3** Analyse the flight planning parameters and pre-processing of acquired data
- CO4** Post process the data to derive DSM and DEM and its applications
- CO5** Understand the components of TLS and its applications

TEXTBOOKS:

1. Jie Shan, Charles K. Toth, “Topographic Laser Ranging and Scanning – Principles and Processing”, 2nd Edition, CRC Press Publication, March 2018. ISBN: 9781498772273.

REFERENCES:

1. George Vosselman and Hans-Gerd Maas, Airborne and Terrestrial Laser Scanning, WhittlesPublishing, 2010
2. Matti Maltamo, Erik Næsset, JariVauhkonen, Forestry Applications of Airborne Laser Scanning-Concepts and Case Studies, Springer, Dordrecht , 2016,Reprint Edition. ISBN 978-94- 017-8662-1
3. Michael Renslow, Manual of Airborne Topographic LiDAR, The American Society for Photogrammetry and Remote Sensing, 2013

Course Code	HYDROGRAPHIC SURVEYING	L	T	P	C
CE4V47		3	0	0	3

COURSE OBJECTIVES

- To provide the necessary knowledge and practical instrument operational and data processing skills needed for them to confidently accomplish a bathymetric survey in the real world
- To develop students’ critical and creative thinking, as well as cooperative attitudes & behaviour of working with others.

2. Ingham, A. E. (1992), Hydrography for the Surveyor and Engineer, 3rd Edition revised by Abbott V. J., Blackwell Science.
3. International Hydrographic Organisation (1998), IHO Standards for Hydrographic Surveying (S- 44), IHB Monaco.
4. Loweth, R. P. (1997), Manual of Offshore Surveying for Geoscientists and Engineers Chapman & Hall.
5. Pugh, D. (2004), Changing Sea Levels – Effects of Tides, Weather and Climate, Cambridge University Press.
6. Sonnen berg, G. J. (1988), Radar and Electronic Navigation, Butter worths.

VERTICAL V: TRANSPORTATION INFRASTRUCTURE

Course Code	AIRPORTS AND HARBOURS	L	T	P	C
CE4V51		3	0	0	3

COURSE OBJECTIVE:

- To introduce the students about airport planning, design, construction and planning design principles of seaport

UNIT I AIRPORT PLANNING

7

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area

UNIT II AIRPORT COMPONENTS

9

Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hangar- Passenger Terminals- Geometric design of runway and taxiways-Runway pavement Design- Difference between Highway and airport pavements- Introduction to various design methods- Airport drainage.

UNIT III AIRPORT DESIGN

10

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Runway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings- Air Traffic Control Tower- Instrumental Landing.

UNIT IV SEAPORTS COMPONENTS AND CONSTRUCTION

10

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks- Dry and Floating Dock, Waves and Tides – Planning and Design of Harbors: Harbour Layout and Terminal Facilities – Coastal

Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins Floating Landing Stage – Navigational Aids-Inland Water Transport.

UNIT V SEAPORT REGULATIONS AND EIA

9

Wave action on Coastal Structures and Shore Protection and Reclamation – Coastal Regulation Zone, 2011-EIA – methods of impact analysis and its process

TOTAL: 45 PERIODS

COURSE OUTCOMES

- C01** Gain an insight on the planning and site selection of Airport Planning and design.
- C02** Knowledge on Design of various Airport components
- C03** Analyze and design the elements for orientation of runways and passenger facility systems.
- C04** Understand the various features in Harbours and Ports, their construction, coastal protection works
- C05** Knowledge on various Environmental Regulations and Acts

TEXTBOOKS:

1. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee,1994
2. Robert Honjeff and Francis X.Mckelvey, "Planning and Design of Airports", McGraw Hill, New York,1996 2. Richard De Neufille and Amedeo Odoni, "Airport Systems Planning and Design", McGraw Hill, New York,2003
3. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering,Scitech Publications (India), Chennai, 2010

REFERENCES:

1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013.

Course Code	TRAFFIC ENGINEERING AND MANAGEMENT	L	T	P	C
CE4V52		3	0	0	3

COURSE OBJECTIVE

- To give an overview of Traffic engineering, various surveys to be conducted, traffic

UNIT I	TRAFFIC SURVEYS AND ANALYSES	8
<p>Traffic characteristics: Human, vehicular, and Pavement Characteristics, Problems- presentation of traffic volume data, Annual Average Daily Traffic, Average Daily Traffic, Design hourly traffic volume; Speed- spot speed, presentation of spot speed data, speed and delay studies, methods of conducting spot-speed studies and Speed and Delay studies; Problems Origin and Destination – methods of conducting the survey and presentation of data; parking surveys, presentation of data and analyses, determination of parking demand; Accident studies and analyses; Different problems.</p>		
UNIT II	TRAFFIC FLOW AND ROADWAY CAPACITY	8
<p>Traffic Flow Characteristics – Basic traffic manoeuvres, Traffic stream flow characteristics, Speed- Flow- Density Relations; Passenger Car Units – Mixed traffic flow and related issues – Concept of PCU value- Factors affecting PCU values- Recommended PCU values for different conditions; Capacity and Level of Service – Factors affecting practical capacity – Design Service Volumes</p>		
UNIT III	COST – EFFECTIVE TRAFFIC MANAGEMENT TECHNIQUES	10
<p>Traffic System Management: Regulatory Techniques- one way street, Reversible Street, Reversible lane, Turning moment restrictions, closing streets; Traffic Control Devices – Traffic Signs – Road Markings, Traffic Signals, Miscellaneous traffic control devices; Traffic Segregation – Vehicle segregation, Pedestrian segregation, Traffic signals design; Bus Priority Techniques – Priority manoeuvres – With-flow bus lane and contra-flow bus lane; Self-Enforcing Techniques- Demand Management Techniques (TDM) Road pricing, parking control, Tolls, Staggering of office/educational institution hours.</p>		
UNIT IV	DESIGN OF ROAD INTERSECTIONS	10
<p>Importance and Classification; Intersections at-grade – uncontrolled, channelised; Rotary intersections (problems)- Signalised intersections (problems)- Grade Separated Intersections – merits and demerits, types, pattern of intersections with different types of interchanges- Capacity, Concept diagrams.</p>		
UNIT V	DESIGN OF PARKING AND PEDESTRIAN FACILITIES AND CYCLE TRACKS	9
<p>Parking: Need for parking studies and its ill effects- Parking Standards for different land uses, different types of parking - Conceptual plans for different types of parking; Pedestrians: Importance, Barriers, Behaviour, Pedestrian facilities – Principles of planning, Level of Service (LoS), Design standards.; Cycle Tracks: Principles of design, Design criteria, Design standards</p>		

for Rural Expressways.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- C01** Apply the knowledge of science and engineering fundamentals in conducting traffic surveys, analyze the problems and relating it with standards
- C02** Understand the principles of traffic flow characteristics and their relationships
- C03** Understand various traffic management measures in addressing the demand Pricing and ITS applications.
- C04** Designing various types of control and regulatory measures to meet an efficient traffic network.
- C05** Understand various type of facilities and plan for Non Motorised Transport

TEXT BOOKS:

1. Kadiyali. L.R. Traffic Engineering and Transport Planning, Khanna Publishers, Delhi, 2019.
2. Khanna .K and Justo C.E.G. and Veeraragavan, A Highway Engineering, Nem Chand Bros., Roorkee, Revised 10th Edition, 2014.
3. Srinivasa Kumar, "Introduction to Traffic Engineering", Universities Press, 2018
4. Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2011.
5. Papacosta.P.S and Prevedouros.P.D, " Transportation Engineering and Planning, third edition, 2015.

REFERENCES

1. Indian Roads Congress (IRC) Specifications: Guidelines and special publications on Traffic Planning and Management.
2. Khanna S. K, and others, Highway Engineering, Nam Chand & Bros, Roorkee, 2014, Pages 177 – 308.
3. C. JotinKhisty, Kent Lall, Transportation Engineering: An Introduction, Prentice Hall, 1998
4. Taylor MAP and Young W, Traffic Analysis – New Technology and New Solutions, Hargreen Publishing Company , 1998.
5. Salter. R.I and Hounsell N.B, Highway Traffic Analysis and design, Macmillan Press Ltd.1996.
6. Roger P.Roess, William R.Mcshane and Elena S.Prassas, Traffic Engineering-Second

Course Code	URBAN PLANNING AND DEVELOPMENT	L	T	P	C
CE4V53		3	0	0	3

COURSE OBJECTIVE:

- To enable students to have the knowledge on planning process and to introduce to the students about the regulations and laws related to Urban Planning.

UNIT I INTRODUCTION

7

Definition of Human settlement, Urban area, Town, City, Metropolitan City, Megalopolis, Urbanisation, Urbanism, Suburbanisation, Urban sprawl, Peri-urban areas, Central Business District (CBD), Urban Agglomeration, Census definition of urban settlements, Classification of urban areas

–Positive and negative impacts of urbanisation, - Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

UNIT II PLANNING PROCESS AND THEORIES

10

Principles of Planning –Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Draft Plans, Evaluation, Final Plan. Planning Theories - Garden City Concept, Geddesian Triad by Patrick Geddes, Modernism Concept by Le-Corbusier, Radburn Concept, Neighbourhoods, Theories of Ekistics, Bid-rent Theory by William Alonso, Green Belt Concept

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION

10

Types of plans – Regional Plan, Master Plan, Structure Plan, Detailed Development Plan, New Town/ Satellite town- Development Plan, urban nodes, Smart City Plan -Scope and Content of Regional Plan (RP), Master Plan (MP), and the Detailed Development Plan (DDP), Methodologies for the preparation of the RP, MP, and the DDP – Case Studies.

UNIT IV PLAN IMPLEMENTATION

10

Planning Standards, Project Formulation and evaluation; Project Report preparation and presentation; Legal, Financial and Institutional constraints – Problems due to multiple laws, rules and institutions; Financing of Urban Development Projects; Urban planning agencies and their functions in the plan formulation and implementation. –

UNIT V URBAN AND REGIONAL PLANNING LEGISLATIONS, REGULATIONS AND DESIGNS

8

Town and Country Planning, Local Bodies and Land Acquisition Acts, Development and

Building Rules, Site analyses, Layouts and Buildings Design.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- C01** Understand the basic issues and meaning of terminologies in urban planning
- C02** Understand the different types of theories of urban planning and city development.
- C03** Understand the different types of plan, their strategies and their preparation process.
- C04** Comprehend the planning standards, evaluate the constraints and the financial mechanism
- C05** Knowledge on various town and country planning acts and their functions.

TEXTBOOKS:

1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002
2. George Chadwick, A Systems view of planning, Pergamon press, Oxford 1978
3. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi, 2001
4. Edwin S.Mills and Charles M.Becker, Studies in Urban development, A World Bank publication, 1986

REFERENCES

1. Tamil Nadu Town and Country Planning Act 1971, and Rules made thereunder, Government of Tamil Nadu, Chennai
2. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005
3. Chennai City Municipal Corporation Act, 1919 and Tamil Nadu District Municipalities Act, 1920
4. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013
5. The Tamil Nadu Combined Development and Building Rules, 2019
6. Urban & Regional Development Plans Formulation & Implementation (URDPFI) Guidelines, Vol I & II, Jan 2015, Govt of India, Ministry of Urban Development <http://.moud.gov.in>

Course Code	SMART CITIES	L	T	P	C
CE4V54		3	0	0	3

COURSE OBJECTIVE:

- To help the leaners to understand the concepts of smart city and to introduce the



students about application of technologies in smart cities

UNIT I	INTRODUCTION	6
Urbanisation, need of focused development, role of Authorities, Smart city, Opportunity and Challenges- Smart infrastructures for city- Smart Cities Mission		
UNIT II	SMART PHYSICAL INFRASTRUCTURE	12
Infrastructure development in Smart Cities - Physical Infrastructure, Land Use - Compact/mixed-use development, Transit oriented development (TOD); Smart City Management-Transportation Unified governance structure (UMTA). Smart public transportation, Smart parking, Intelligent traffic management, Detour management; Low emission vehicles, Electric Mobility - Environmental projects etc		
UNIT III	SUSTAINABILITY AND SMART PLANNING	10
Relationship Between Sustainability and Smart planning - Place making project guidelines- Surveillance, Smart Street Lighting, Intelligent Emergency Services, Intelligent Disaster Forecasting and Management, GIS-based Spatial Decision Support Systems, Smart Communication Services;		
UNIT IV	APPLICATION OF TECHNOLOGIES IN SMART CITIES	8
Role of Technologies in Smart Cities - Integrated Command and Control Center (ICCC), Data Analytics, Data driven strategies implementation in smart cities		
UNIT V	SMART CITIES PROJECT MANAGEMENT	9
Need for project management, Philosophy and concepts; Project phasing and stages; Project organizational structuring: Planning and Scheduling: Project cost analysis; Procurement and Contracting: PPP: Project Monitoring and Evaluation: Risk Management; Case studies.		

TOTAL: 45 PERIODS

COURSE OUTCOMES

- CO1** Understand the basics of Urbanisation and the role of smart cities.
- CO2** Gain knowledge on implementation of smart physical infrastructure.
- CO3** Understand the role of smart planning for sustainable development.
- CO4** Comprehend the knowledge of Technologies in Smart City planning
- CO5** Reviewing the case studies of smart city projects.

REFERENCES

1. P Sharma , “Sustainable Smart cities in India, Challenges and Future Perspectives”, Springer Link, 2017

2. Sameer Sharma, "Smart Cities Unbounded- Ideas and Practice of Smart Cities in India", Bloomsbury India, 2018.
3. Binti Singh, Manoj Parmar, "Smart City in India Urban Laboratory, Paradigm or Trajectory?" Routledge India, 2019
4. <https://smartcities.gov.in/guidelines#block-habikon-content>
5. <https://smartnet.niua.org/learn/library>

Course Code	INTELLIGENT TRANSPORTATION SYSTEMS	L	T	P	C
CE4V55		3	0	0	3

COURSE OBJECTIVE:

- To learn the fundamentals of ITS.
- To study the ITS functional areas
- To have an overview of ITS implementation in developing countries

UNIT I	INTRODUCTION TO ITS	7
	Fundamentals of ITS: Definition of ITS, Challenges in ITS Development-Purpose of ITS Deployment- Benefits of ITS- Overview of application of ITS in Transportation Planning	
UNIT II	DATA COLLECTION THROUGH ITS	9
	Sensors & its application in traffic data collection - Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – vehicle Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, RFID, video data collection, Internet of Things (IOT)	
UNIT III	ITS IN TRAFFIC MANAGEMENT	10
	ITS User Needs and Services and Functional areas –Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS)- Autonomous Vehicles- Autonomous Intersections	
UNIT IV	ITS IN TRANSPORTATION PLANNING	10
	ITS and safety, ITS and security- Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-	



pricing.; Transportation network operations – public transportation applications- Weight –in Motion

UNIT V ITS APPLICATION IN LOGISTICS

9

Commercial vehicle operations and intermodal freight-Fleet Management- IT application in freight logistics-E commerce

TOTAL: 45 PERIODS

COURSE OUTCOMES

- CO1** Understand the fundamentals of ITS and its benefits.
- CO2** Gain knowledge on data collection using sensors and its applications.
- CO3** Acquainted with the knowledge of ITS in Traffic Management
- CO4** Application of ITS in Transportation Planning
- CO5** Able to gain knowledge on application of ITS in Logistics

TEXT BOOKS:

1. R. Srinivasa Kumar, "Intelligent Transportation Systems", Universities Press P Ltd, Telangana, 2022.

REFERENCES:

1. Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US,2001.
2. Henry F.Korth, and Abraham Siberschatz, Data Base System Concepts, McGraw Hill,1992.
3. TurbanE., "Decision Support and Export Systems Management Support Systems", Maxwell Macmillan,1998.
4. Sitausu S. Mittra, "Decision Support Systems–Tools and Techniques", John Wiley, New York,1986.
5. Cycle W.Halsapple and Andrew B.Winston, "Decision Support Systems–Theory and Application", Springer Verlog, New York, 1987
6. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.

Course Code	PAVEMENT ENGINEERING	L	T	P	C
CE4V56		3	0	0	3

COURSE OBJECTIVE:

- Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and

serviceability conditions of roads.

UNIT I	PAVEMENT MATERIALS AND SUBGRADE ANALYSIS	8
Introduction – Pavement as layered structure – Pavement types -rigid and flexible-Subgrade analysis- Stress and deflections in pavements- Pavement Materials and Testing- Modified Binders.		
UNIT II	DESIGN OF FLEXIBLE PAVEMENTS	10
Flexible pavement design – Advantages and disadvantages -Factors influencing design of flexible pavement, Empirical – Mechanistic empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.		
UNIT III	DESIGN OF RIGID PAVEMENTS	9
Cement concrete pavements Factors influencing CC pavements – Modified Westergaard approach Design procedure as per IRC guidelines – Concrete roads and their scope in India.		
UNIT IV	PAVEMENT CONSTRUCTION, EVALUATION AND MAINTENANCE	10
Construction Techniques practice of flexible and concrete pavement Pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index, - Pavement maintenance (IRC Recommendations only).		
UNIT V	STABILIZATION OF PAVEMENTS	8
Stabilization with special reference to highway pavements – Choice of stabilizers – Testing and field control - Stabilization for rural roads in India – Use of Geosynthetics in roads.		

TOTAL: 45 PERIODS

COURSE OUTCOMES

- C01** Get knowledge about types of rigid and flexible pavements.
- C02** Able to design of rigid pavements
- C03** Able to design of flexible pavements.
- C04** Determine the causes of distress in rigid and flexible pavements.
- C05** Understand stabilization of pavements, testing and field control.

TEXTBOOKS:

1. Khanna, S.K. and Justo C.E.G.and Veeraragavan, A, “Highway Engineering”, New Chand and Brothers, Revised 10th Edition,2014.
2. Kadiyali, L.R., “Principles and Practice of Highway Engineering”, Khannatech.

UNIT V TRAFFIC ASSIGNMENT STAGE

9

Meaning and objective; General principles; Assignment Techniques- all-or-nothing assignments, multiple route assignment, capacity restraint, diversion curves, Trip assignment route selection; Mode-wise trip matrices; element of transportation network, nodes and links, speed flow curves, minimum path trees

TOTAL: 45 PERIODS

COURSE OUTCOMES

- C01** Understand the principles of the transportation planning process and methods of data collection.
- C02** Acquainted with the trip production, trip attraction models and calibration.
- C03** Acquainted with the trip production, trip attraction models and calibration.
- C04** Able to understand trip distribution models and its application.
- C05** Gain knowledge on the mode choice behaviour and mode split models.

TEXTBOOKS:

1. Kadiyali. L.R., Traffic Engineering and Transport Planning, Khanna Publishers, Delhi, 2019.
2. C.S. Papacostas and P.D. Prevedouros, Transportation Engineering and Planning, Prentice Hall of India Pvt. Ltd., 2009.
3. Michael J.Bruton, Introduction to Transportation Planning, Hutchinson, London, 1995.

REFERENCES

1. J D Ortuzar and L G Willumnsen. Modeling Transport. John Wiley and Sons, New York, 2011.
2. John W. Dickey, Metropolitan Transportation Planning, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1990.
3. C. JotinKhisty, Kent Lall, Transportation Engineering: An Introduction, Prentice Hall, 1998
4. Juan de Dios Ort zar and Luis G. Willumsen, Modelling Transport, John Wiley & Sons 2001
5. Chennai Comprehensive Traffic Study, Chennai Metropolitan Development Authority, 2007.
6. James H.Banks, Introduction to Transportation Engineering, Tata McGraw Hill Education Pvt Ltd, 2010

VERTICAL VI: ENVIRONMENT

Course Code	CLIMATE CHANGE ADAPTATION AND MITIGATION	L	T	P	C
CE4V61		3	0	0	3

COURSE OBJECTIVE:

- To impart knowledge on the global warming, the impact of climate change on society and the adaptation and mitigation measures to the students

UNIT I	INTRODUCTION	9
Atmosphere – weather and Climate - climate parameters – Temperature, Rainfall, Humidity, Wind Global ocean circulation – El Nino and its effect - Carbon cycle		
UNIT II	ELEMENTS RELATED TO CLIMATE CHANGE	7
Greenh ouse gases - Total carbon dioxide emissions by energy sector – industrial, commercial, transportation, residential – Impacts – air quality, hydrology, green space - Causes of global and regional climate change – Changes in patterns of temperature, precipitation and sea level rise – Greenhouse effect		
UNIT III	IMPACTS OF CLIMATE CHANGE	10
Effects of Climate Changes on living things – health effects, malnutrition, human migration, socioeconomic impacts- tourism, industry and business, vulnerability assessment- infrastructure, population and sector – Agriculture, forestry, human health, coastal areas		
UNIT IV	MITIGATING CLIMATE CHANGE	9
IPCC Technical Guidelines for Assessing Climate Change Impact and Adaptation -Identifying adaption options – designing and implementing adaption measures – surface albedo environment- reflective roofing and reflective paving – enhancement of evapotranspiration - tree planting programme – green roofing strategies – energy conservation in buildings – energy efficiencies – carbon sequestration.		
UNIT V	ALTERNATE FUELS AND RENEWABLE ENERGY	10
Energy source – coal, natural gas – wind energy, hydropower, solar energy, nuclear energy, geothermal energy – biofuels – Energy policies for a cool future - Energy Audit.		

TOTAL: 45 PERIODS

COURSE OUTCOMES

The students completing the course will have

- C01** An Insight Into Carbon Cycle, Physical Basis Of The Natural Greenhouse Effect, Including The Meaning Of The Term Radiative Forcing, Climate Change, Global Warming And Measures To Adapt And To Mitigate The Impacts Of Climate Change
- C02** Understanding On The Growing Scientific Consensus Established Through The IPCC As Well As The Complexities And Uncertainties
- C03** Ability To Plan Climate Change Mitigation And Adaptation Projects Including The Use Of Alternate Fuels And Renewable Energy
- C04** Gain in-depth knowledge on climate models
- C05** Post process the model outputs for climate impact assessment, know about adaptation strategies

TEXTBOOKS:

1. Ruddiman W.F, freeman W.H. and Company, “Earth’s Climate Past and Future”, 2001
2. Velma. I. Grover “Global Warming and Climate” Change. Vol I an II. Science Publishers, 2005.
3. Dash Sushil Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2007

EFERENCES:

1. IPCC Fourth Assessment Report, Cambridge University Press, Cambridge, UK, 2007
2. Thomas E, Lovejoy and Lee Hannah “Climate Change and Biodiversity”, TERI Publishers, 2005
3. Jan C. van Dam, Impacts of “Climate Change and Climate Variability on Hydrological Regimes”, Cambridge University Press, 2003.

Course Code	AIR AND NOISE POLLUTION CONTROL ENGINEERING	L	T	P	C
CE4V62		3	0	0	3

COURSE OBJECTIVE:

- To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

UNIT I GENERAL

Atmosphere as a place of disposal of pollutants – Air Pollution – Definition - Air Pollution and Global Climate - Units of measurements of pollutants - Air quality criteria - emission standards - National ambient air quality standards - Air pollution indices - Air quality management in India.

UNIT II SOURCES, CLASSIFICATION AND EFFECTS 9

Sources and classification of air pollutants - Man made - Natural sources - Type of air pollutants- Pollution due to automobiles - Analysis of air pollutants - Chemical, Instrumental and biological methods. Air pollution and its effects on human beings, plants and animals - Economic effects of air pollution - Effect of air pollution on meteorological conditions - Changes on the Meso scale, Micro scale and Macro scale.

UNIT III SAMPLING, METEOROLOGY AND AIR QUALITY MODELLING 9

Sampling and measurement of particulate and gaseous pollutants - Ambient air sampling - Stack sampling. Environmental factors - Meteorology - temperature lapse rate and stability - Adiabatic lapse rate - Wind Rose - Inversion - Wind velocity and turbulence - Plume behavior - Dispersion of air pollutants- Air Quality Modeling.

UNIT IV AIR POLLUTION CONTROL MEASURES 9

Control - Source correction methods - Control equipments - Particulate control methods - Bag house filter - Settling chamber - cyclone separators - inertial devices - Electrostatic precipitator - scrubbers - Control of gaseous emissions - Absorption - Absorption equipments - adsorption and combustion devices (Theory and working of equipments only).

UNIT V NOISE POLLUTION AND ITS CONTROL 9

Sources of noise - Units and Measurements of Noise - Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise - General Control Measures - Effects of noise pollution - auditory effects, non-auditory effects. Noise Menace- Prevention and Control of Noise Pollution - Control of noise at source, control of transmission, protection of exposed person - Control of other types of Noise Sound Absorbent

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to

- C01** Understand various types and sources of air pollution and its effects
- C02** Know the dispersion of air pollutants and their modeling
- C03** Know about the principles and design of control of particulate pollutants
- C04** Understand the principles and design of control of gaseous pollutant
- C05** Know the sources, effects and control of vehicular, indoor air and noise pollution

TEXTBOOKS:

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited, 2006.
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt Ltd, New Delhi, 2017

3. Dr. Y. Anjaneyulu, “Air Pollution and Control Technologies”, Allied publishers Pvt. Ltd., 2019.

REFERENCES:

1. Noel De Nevers, "Air pollution control Engineering", McGraw Hill International Edition, McGraw Hill Inc, New Delhi, 2000.
2. Air Pollution act, India, 1987
3. Peterson and E.Gross Jr., “Hand Book of Noise Measurement”, 7th Edition, 1974
4. Mukherjee, "Environmental Pollution and Health Hazards", causes and effects, 1986
5. Antony Milne, “Noise Pollution: Impact and Counter Measures”, David & Charles PLC, 1979.
6. Kenneth wark, Cecil F.Warner, “Air Pollution its Origin and Control”, Harper and Row Publishers, New York, 1998.

Course Code	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	C
CE4V63		3	0	0	3

COURSE OBJECTIVES:

- To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment and to develop the skill to prepare environmental management plan.
- To provide knowledge related to the broad field of environmental risk assessment, important processes that control contaminant transport and tools that can be used in predicting and managing human health risks.

UNIT I INTRODUCTION 9

Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA in project cycle. legal and regulatory aspects in India – types and limitations of EIA –EIA process screening – scoping - terms of reference in EIA- setting – analysis – mitigation. Cross sectoral issues –public hearing in EIA- EIA consultant accreditation.

UNIT II IMPACT IDENTIFICATION AND PREDICTION 10

Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modelling for impact prediction – assessment of impacts – air – water – soil – noise – biological -- cumulative impact assessment

UNIT III SOCIO-ECONOMIC IMPACT ASSESSMENT 8

Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. factors and methodologies- individual and family level impacts.

communities in transition-rehabilitation

UNIT IV EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN 9

Environmental management plan - preparation, implementation and review – mitigation and rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project audit – documentation of EIA findings – ethical and quality aspects of environmental impact assessment

UNIT V CASE STUDIES 9

Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- C01** Apply the principle of limit state design for concrete pipe design
- C02** Do structural design of Water tanks
- C03** Design the water treatment plant Structures.
- C04** Design the components of wastewater treatment plant structures.
- C05** Apply the knowledge of structural design to various environmental engineering structures.

REFERENCES:

1. Canter, L.W., "Environmental Impact Assessment", McGraw Hill, New York. 1996
2. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Interscience, New Jersey. 2003
3. World Bank –Source book on EIA
4. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
5. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York,1996.
6. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.
7. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

Course Code	INDUSTRIAL WASTEWATER MANAGEMENT	L	T	P	C
CE4V64		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on the concept and application of Industrial pollution prevention, cleaner technologies, industrial wastewater treatment and residue management.
- Understand principles of various processes applicable to industrial wastewater treatment
- Identify the best applicable technologies for wastewater treatment from the perspective of yield production.

UNIT I INTRODUCTION

8

Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling – generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

UNIT II INDUSTRIAL POLLUTION PREVENTION & WASTE MINIMISATION

8

Prevention vis a vis Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution Prevention Programs in Industries.

UNIT III INDUSTRIAL WASTEWATER TREATMENT

10

Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation- Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Electro dialysis & Evaporation –Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies.

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT

9

Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening,

digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

UNIT V CASE STUDIES

10

Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Sugar and Distilleries

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of this course, the students is expected to be able to,

- C01** Explain the source and types of industrial wastewater and their environmental impacts and choose the regulatory laws pertaining to environmental protection
- C02** Identify industrial wastewater pollution and implement pollution prevention, waste minimization in industries
- C03** Apply knowledge and skills to design industrial wastewater treatment schemes
- C04** Audit and analyze environmental performance of industries to internal, external client, regulatory bodies and design water reuse management techniques
- C05** Conduct research to develop effective management systems for industrial wastewater that are technically sound, economically feasible and socially acceptable

REFERENCES:

1. "Industrial wastewater management, Treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition, 2008.
2. Lawrence K. Wang, Yung Tse Hung, Howard H. Lo and Constantine Yapijakis "Handbook of Industrial and Hazardous Waste Treatment", Second Edition, 2004.
3. Metcalf & Eddy, Inc., George Tchobanoglous, Franklin L. Burton and H. David Stensel, Wastewater engineering, treatment and reuse, Fourth Edition, McGraw-Hill, 2017
4. Nelson Leonard Nemerow, "Industrial Waste Treatment", Elsevier, 2007.
5. Wesley Eckenfelder W., "Industrial Water Pollution Control", Second Edition, McGraw Hill, 2000.
6. Paul L. Bishop, Pollution Prevention: - Fundamentals and Practice", McGraw Hill International, Boston, 2000.
7. Waste water Treatment for pollution control and reuse by Soli. J. Arceivala, Shyam. R. Asolekar, Tata McGraw Hill, 2007

Course Code	SOLID AND HAZARDOUS WASTE MANAGEMENT	L	T	P	C
CE4V65		3	0	0	3

COURSE OBJECTIVE

- To impart knowledge and skills relevant to minimization, storage, collection, transport, recycling, processing and disposal of solid and hazardous wastes including the related regulations, engineering principles, design criteria, methods and equipment.

UNIT I WASTE CLASSIFICATION AND REGULATORY REQUIREMENTS

9

Sources and types of solid and hazardous wastes - need for solid and hazardous waste management- salient features of latest Indian legislations on management and handling of solid wastes, hazardous wastes, biomedical wastes, electronic wastes, construction and demolition wastes, plastics and discarded lead acid batteries – elements of integrated waste management and roles of stakeholders - seven elements and seven step approach to integrated solid waste management planning.

UNIT II WASTE CHARACTERIZATION SOURCE REDUCTION AND RECYCLING

9

Waste sampling and characterization plan - waste generation rates and variation – physical composition, chemical and biological properties – hazardous characteristics – ignitability, corrosivity and TCLP tests –source reduction, segregation and onsite storage of wastes – waste exchange - extended producer responsibility - recycling of plastics, C&D wastes and E wastes.

UNIT III WASTE COLLECTION TRANSPORT AND MATERIAL RECOVERY

9

Door to door collection of segregated solid wastes - analysis of hauled container and stationery container collection systems - compatibility, storage, labeling and handling of hazardous wastes – principles and design of transfer and transport facilities - hazardous waste transport and manifests - mechanical processing and material separation technologies – Size reduction – size separation - density separation - magnetic separation – compaction – principles and design of material recovery facilities – physico chemical treatment of hazardous wastes - solidification and stabilization – case studies on waste collection and material recovery

UNIT IV BIOLOGICAL AND THERMAL PROCESSING OF WASTES

9

Biological and thermos-chemical conversion technologies – composting – biomethanation – incineration – pyrolysis- plasma arc gasification –principles and design of biological and

thermal treatment facilities - MSW processes to energy with high-value products and specialty By-products

- operation of facilities and environmental controls - treatment of biomedical wastes – case studies and emerging waste processing technologies.

UNIT V WASTE DISPOSAL

9

Sanitary and secure landfills - components and configuration- site selection - liner and cover systems - geo synthetic clay liners and geo membranes - design of sanitary landfills and secure landfills- leachate collection, treatment and landfill gas management – landfill construction and operational controls - landfill closure and environmental monitoring – landfill bioreactors – rehabilitation of open dumps and biomining of dumpsites-remediation of contaminated sites- Case studies

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

- C01** Explain the various functional elements of solid and hazardous waste management including the associated legal, health, safety, and cultural issues as well as responsibilities of different stakeholders
- C02** Apply the knowledge of science and engineering fundamentals to characterize different types of solid and hazardous wastes, assess the factors affecting variation and assess performance of waste treatment and disposal systems
- C03** Design of systems and processes to meet specified needs of waste minimization, storage, collection, transport, recycling, processing and disposal.
- C04** Select appropriate methods for processing and disposal of solid and hazardous wastes, taking into account the impact of the solutions in a sustainability context
- C05** Conduct research pertinent to solid and hazardous waste management and communicate effectively to different stakeholders as well as engage in independent lifelong learning

REFERENCES:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, “Integrated Solid Waste Management, Mc-Graw Hill India, First edition, 2015.
2. CPHEEO, “Manual on Municipal Solid waste management, Vol I, II and III, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2016.
3. William A. Worrell, P. Aarne Vesilind, Christian Ludwig, Solid Waste Engineering – A Global erspective, 3rd Edition, Cengage Learning, 2017.

4. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and "Environmental Resources Management, Hazardous waste Management", Mc-Graw Hill International edition, New York,2010.
5. John Pichtel,Waste Management Practices, CRC Press,Taylor and Francis Group,2014.
6. Gary C. Young, Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Wiley, 2010
7. Cherry P M, Solid and Hazardous Waste Management, CBS publishers and distributors Pvt Ltd, 2018.
8. Rao M.N, Razia Sultana, Sri Harsha Kota, solid and hazardous waste management – Science and Engineering , Butterworth-Heinemann, 2016

Course Code	ENVIRONMENTAL POLICY AND LEGISLATIONS	L	T	P	C
CE4V66		3	0	0	3

COURSE OBJECTIVES:

- The course will analyze the legislative and judicial responses to environmental problems and the administrative system of environment related laws such as air, water, land, and hazardous substances etc. Environment advocacy and approaches for using litigation in environment protection will receive special attention

UNIT I INTRODUCTION TO ENVIRONMENTAL LEGISLATIONS AND INTERNATIONAL SCENARIO

9

Significance of Environmental Law -International Environmental Law -Development of International Environmental Law -Source and General principals of International Environmental Law -General rights and obligations of States -General Issues of the international law related to environmental protection -Stockholm Declaration-Rio Declaration on Environment and Development-Basel Convention on the Control of Trans boundary Movement of Hazardous Wastes and their disposal- Convention of Biological Diversity-U.N Frame Work Convention on Climate Change-Montreal Protocol on Substances that deplete Ozone Layer-Kyoto Protocol

UNIT II INDIAN CONSTITUTIONS AND ENVIRONMENTAL PROTECTION

9

Indian Constitution and Environmental Protection -Constitutional provisions concerning Environment Articles 14,15,(2) (b) 19 (e),21,31,32,38,39,42,47, 48-A,49,51,51-A: Indian Environmental Policy 2006 Administrative machinery for pollution control Common Law & Criminal Law Nuisance, Negligence, Strict liability and Absolute liability, Provisions of IPC relating to environmental problems (public nuisance u/s 268 and others (Sections

269,270,277,284,285,286,425 to 440) Section 133 of Cr.P.C.

UNIT III REMEDIES FOR ENVIRONMENTAL POLLUTION

9

Common Law Remedies/Remedies under Law of Tort – Penal Remedies – Indian Penal Code and Code of Criminal Procedure – Remedies under Constitutional Law – Writs – Public Interest Litigation - Public Liability Insurance Act, 1991 – The National Green Tribunal Act 2010

UNIT IV MAJOR INDIAN LEGISLATIONS

9

Water Act (1974) Air Act (1981) Environmental Protection Act (1986) Major Notifications, The Municipal solid Wastes (Management and Handling) Rules 2000-Bio Medical Wastes (Management and Handling) Rules 1998- Hazardous Wastes (Management and Handling) Rules 1989- Environment Impact Assessment Notifications- Coastal Regulation Zone Notification- Public Hearing Notifications

UNIT V ENVIRONMENT AND DEVELOPMENT CASE LAWS

9

Meaning and concept of development - Its impact on environment; conflict between environment and development, Concept of Sustainable Development., Polluter Pay Principle, Precautionary Principle, Public Trust Doctrine. Landmark Judgments - Oilium gas leakage case, Rural Litigation and Entitlement Kendra, Dehradun, (1985) Supp SCC 487) Vellore Citizen Welfare Forum v. Union of India, (1996) 5SCC 647) Ganga Pollution case (1988) I SCC) S. Jagannath v. UOI (1997) SCC867) Vellore Citizens welfare forum case M.C. Mehta V. Kamalnath (1997) I SCC 388)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

- C01** Understand origins and sources of environmental laws, and understand how and by whom environmental laws are made and interpreted
- C02** Understand the key principles of, and actors within, environmental laws
- C03** Understand the National Environmental Policy and Various Legislations enacted in line with Policy
- C04** Critically analyze environmental laws within various contexts and to evaluate laws against procedural and substantive criteria.
- C05** Understand and the Legal system operating in India and will be in a position to prepare compliance reports for getting environmental clearance.

REFERENCES

1. Leelakrishnan P., Environmental Law in India, Butterworths,1998
2. Leelakrishnan P., Environmental Case Book, Lexis Nexis, 2000
3. Shanthakumar S. , Environmental Law – An Introduction, Butterworths,2004
4. Shyam Diwan and Armin Rosencranz, Enviromental Law and Policy in India, Oxford, 2001

Course Code	ENVIRONMENTAL HEALTH AND SAFETY	L	T	P	C
CE4V67		3	0	0	3

COURSE OBJECTIVE:

- To educate overview of EHS in industries and related Indian regulations, types of Health hazards, effect, assessment and control methods and EHS Management System

UNIT I INTRODUCTION

9

Need for developing Environment, Health and Safety systems in work places- International initiatives, National Policy and Legislations on EHS in India - Regulations and Codes of Practice - Role of trade union safety representatives - Ergonomics.

UNIT II OCCUPATIONAL HEALTH AND HYGIENE

10

Definition of occupational health and hygiene - Categories of health hazards – Exposure pathways and human responses–Exposure Assessment-occupational exposure limits - Hierarchy of control measures - Role of personal protective equipment and the selection criteria

UNIT III WORKPLACE SAFETY AND SAFETY SYSTEMS

11

Features of Satisfactory and Safe design of work premises – good housekeeping - lighting and color, Ventilation and Heat Control, Noise, Chemical and Radiation Safety – Electrical Safety – Fire Safety Safety at Construction sites, ETP – Machine guarding – Process Safety, Working at different levels

UNIT IV HAZARDS AND RISK MANAGEMENT

8

Safety appraisal – Job Safety Analysis-Control techniques – plant safety inspection – Accident investigation - Analysis and Reporting – Hazard and Risk Management Techniques –Onsite and Offsite emergency Plans. Employee Participation- Education and Training- Case Studies

UNIT V ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT

7



Concept of Environmental Health and Safety Management – Elements of Environmental Health and Safety Management Policy and implementation and review – ISO 45001-Structure and Clauses-Case Studies

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of this course, the students are expected to be able to understand:

- C01** Need for EHS in industries and related Indian regulations
- C02** Various types of Health hazards, effect, assessment and control methods
- C03** Various safety systems in working environments
- C04** The methodology for preparation of Emergency Plans and Accident investigation
- C05** EHS Management System and its elements

REFERENCES

1. Industrial Health and Safety Acts and Amendments, by Ministry of Labour and Employment, Government of India
2. Fundamentals of Industrial Safety and Health by Dr.K.U.Mistry, Siddharth Prakashan, 2012
3. The Facility Manager's Guide to Environmental Health and Safety by Brian Gallant, Government Inst Publ., 2007.
4. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services, 2005.
5. Environmental and Health and Safety Management by Nicholas P.Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995

VERTICAL VII: WATER RESOURCES

Course Code	PARTICIPATORY WATER RESOURCES MANAGEMENT	L	T	P	C
CE4V71		3	0	0	3

COURSE OBJECTIVES:

- To enable the students to understand the regional and global experiences of participatory ideology in irrigation water management
- To help students acquire knowledge on paradigms shifts and reorientations with regard to stakeholder participation in water management in general and in irrigation management in particular.

UNIT I	FUNDAMENTALS OF SOCIOLOGY AND PARTICIPATORY APPROACH	6
Basic Sociological concepts and Definitions - Objectives – Perspectives- Social stratification – Sociological understanding - Irrigation as a Sociotechnical Process - paradigm shift and Participatory approach		
UNIT II	UNDERSTANDING FARMERS PARTICIPATION	12
Need of farmers participation –Benefits of farmers participation – Comparisons of cost and benefit Water User Association -- Membership - Kinds of participation – National and International Experiences -Activities on Water towards Organization and Structure - Context of participation- factors in the environment.		
UNIT III	ROLE OF STAKEHOLDERS AND THE UNDERLYING ISSUES	12
Multiple use of water – Issues in sectoral Water Allocation - Domestic, Irrigation, Industrial sectors Woman as a water user –Constraints and Opportunities. Role of Community Organisers – Constraints in Organising farmers Organisation.		
UNIT IV	IMPROVING AGENCY RELATIONS AND INSTITUTIONAL REFORMS	10
Supporting farmer organization and participation -Decision Making- Leadership and responsibilities Development strategy – Channels for implementation -- Equity and Equality- AgencyIncentives- Technical co-operation – Special roles – Agency Roles- Institutional Reforms		
UNIT V	POLICY CONSIDERATIONS AND EMERGING CHALLENGES	5
Water Policy-Irrigation Governance-Building from Below-Non-political Associations- Bureaucratic Reorientation- Policy options and Alternatives and Sustainability.		
TOTAL: 45 PERIODS		

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

C01 Capture to fundamental concepts and terms which are to be applied and understood all through the study.

C02 Acquire a clear insight into the subject matter of participatory ideology with its rudiments under the light of both national and international illustrative cases.

C03 Comprehend the roles of different players as stakeholders with the ground reality of the underlying issues in farm community.

C04 Articulate as how reforms can help build up institutional and irrigation agencies with the support obtained from the existing farm network in irrigation Management

C05 Gain an overarching understanding of recommendation for improved

irrigation management with a vision to transform the existing governance and policies with the novel approach of sustainability.

TEXT BOOKS

1. Desai A.R., Rural sociology in India, Popular Prakashan, Bombay, 1969.
2. Michael C.M., Putting people first, Sociology variables in Rural Development, Oxford University press, London 1985.
3. Uphoff. N., Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and management, New West - View press, Boulder and London, 1986.
4. Chambers R., Managing canal irrigation, Oxford IBM publishing Co. Pvt. Ltd., New Delhi, 1998.
5. Korten F.F and Robert Y. Siy, Jr. Transforming a Bureaucracy – The experience of the Philippines National Irrigation Administration, Ateneo De Manila University Press, Manila, 1989.

REFERENCES:

1. Sivasubramaniam K., Water Management SIMRES Publication, Chennai 2009.
2. <http://irapindia.org/IMTInIndia-Pa>
3. <http://mowr.gov.in/writereaddata/mainlinkFile/File421.pdf>

Course Code	GROUNDWATER ENGINEERING	L	T	P	C
CE4V72		3	0	0	3

COURSE OBJECTIVE:

- The objective of this course is enable the student to understand the principles of Groundwater governing Equations, Characteristics of different aquifers and techniques of groundwater model development and management.

UNIT I HYDROGEOLOGICAL PARAMETERS

9

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation – GEC norms - Steady state flow - Darcy’s Law - Groundwater Velocity -- Dupuit Forchheimer assumption Steady Radial Flow into a Well.

UNIT II WELL HYDRAULICS

9



Unsteady state flow - Theis method - Jacob method – Chow’s method – Law of Times – Theis Recovery – Bailer method – Slug method - tests - Image well theory – Partial penetrations of wells - Well losses – Specific Capacity and Safe yield - Collector well and Infiltration gallery

UNIT III GROUNDWATER MANAGEMENT

9

Need for Management Model – Database for Groundwater Management – Groundwater balance study – Introduction to Mathematical model – Model Conceptualization – Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model

UNIT IV GROUNDWATER QUALITY

9

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water Industrial water – Irrigation water - Groundwater Pollution and legislation - Environmental Regulatory requirements

UNIT V GROUNDWATER CONSERVATION

9

Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to:

- C01** Define the groundwater system basic, types of aquifers, aquifer parameters, movement and its potential for confined and unconfined aquifers
- C02** Apply the knowledge of groundwater flow in steady and unsteady flow characteristics of well hydraulics
- C03** Explain the concept of groundwater model development and data base management for groundwater management
- C04** Describe the importance of artificial recharge and groundwater quality concepts
- C05** Apply the creative and innovative technique on conservation of groundwater

Course Code	WATER RESOURCES SYSTEMS ENGINEERING	L	T	P	C
CE4V73		3	0	0	3

COURSE OBJECTIVE:

- To introduce the student to the concept of Mathematical approaches for managing

the water resources system and apply to operate a water resource system optimally.

UNIT I	SYSTEM APPROACH	9
Definition, classification, and characteristics of systems - Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – steps in systems engineering.		
UNIT II	LINEAR PROGRAMMING	9
Introduction to Operation research - Linear programming Problem Formulation-graphical solution Simplex method –Sensitivity analysis - application to operation of single purpose reservoir		
UNIT III	DYNAMIC PROGRAMMING	9
Bellman’s optimality criteria, problem formulation and solutions – Water Allocation for three state (user), Forward and Backward Recursion techniques in Dynamic Programming - Shortest pipe line route problem - Application to reservoirs capacity expansion		
UNIT IV	SIMULATION	9
Basic principles and concepts – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic simulation – Rule Curve development for reservoir.		
UNIT V	ADVANCED OPTIMIZATION TECHNIQUES	9
Integer and parametric linear programming – Goal programming types – Applications to reservoir release optimization – application of evolutionary algorithms like Genetic algorithm, Particle swarm, Simulated Annealing to reservoir release optimization		

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to:

- C01** Define the economic aspects and analysis of water resources systems for comprehensive and integrated planning of a water resources project.
- C02** Apply the concept of linear programming for optimisation of water resources problems.
- C03** Explain the concept of dynamic programming and apply in water resource system.
- C04** Develop the simulation model based on deterministic and stochastic simulation for reservoir operating policy
- C05** Apply advance optimisation techniques like goal programming, heuristic algorithm in the field of water resources planning and management.



Support System – Conceptual Models and Case Studies.

UNIT V WATERSHED MANAGEMENT

9

Project Proposal Formulation - Watershed Development Plan – Entry Point Activities – Watershed Economics - Agroforestry – Grassland Management – Wasteland Management – Watershed Approach in Government Programmes – People’s Participation – Evaluation of Watershed Management Programmes – Integrated Watershed Management – Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOME :

- On Completion of the course the student is expected to
- C01** Recognize and Interpret the morphological features of a watershed.
- C02** State, design and sketch the soil conservation structures.
- C03** Describe the micro catchment and apply the concepts to design the small water harvesting structures.
- C04** Illustrate the application of modern tools and technology in the management of watershed.
- C05** Classify the management activities and to develop an integrated watershed development plan.

Course Code	INTEGRATED WATER RESOURCES MANAGEMENT	L	T	P	C
CE4V75		3	0	0	3

COURSE OBJECTIVE

- Students will be introduced to the concepts and principles of IWRM, which is inclusive of the economics, public-private partnership, water & health, water & food security and legal & regulatory settings.

UNIT I CONTEXT FOR IWRM

9

Water as a global issue: Key challenges – Definition of IWRM within the broader context of development – Key elements of IWRM - Principles – Paradigm shift in water management - Complexity of the IWRM process – UN World Water Assessment - SDGs.

UNIT II WATER ECONOMICS

9

Economic view of water issues: Economic characteristics of water good and services – Non-market monetary valuation – Water economic instruments – Private sector involvement in water resources management: PPP objectives, PPP models, PPP processes, PPP experiences through case studies.

UNIT III LEGAL AND REGULATORY SETTINGS

9



Basic notion of law and governance: Principles of International and National law in the area of water management - Understanding UN law on non-navigable uses of International water courses- International law for groundwater management – World Water Forums – Global Water Partnerships Development of IWRM in line with legal and regulatory framework: Case Studies.

UNIT IV WATER AND HEALTH WITHIN THE IWRMCONTEXT 9

Links between water and health: Options to include water management interventions for health – Health protection and promotion in the context of IWRM – Global burden of Diseases - Health impact assessment of water resources development projects – Case studies.

UNIT V AGRICULTURE IN THE CONCEPT OF IWRM 9

Water for food production: ‘blue’ versus ‘green’ water debate – Water foot print - Virtual water trade for achieving global water and food security - Climate Smart Agriculture - Current water pricing policy– Scope to relook pricing.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On completion of the course, the student is expected to

- C01** Describe the context and principles of IWRM; Compare the conventional and integrated ways of water management.
- C02** Select the best economic option among the alternatives; illustrate the pros and cons of PPP through case studies.
- C03** Apply law and governance in the context of IWRM.
- C04** Discuss the linkages between water-health; develop a HIA framework.
- C05** Analyse how the virtual water concept pave way to alternate policy options.

TEXTBOOKS:

1. Cech Thomas V., Principles of water resources: history, development, management and policy. John Wiley and Sons Inc., New York. Fourth Edition 2018.
2. Mollinga.P. etal “Integrated Water Resources Management”, Water in South Asia Volume I,Sage Publications, 2006.

REFERENCES:

1. Technical Advisory Committee, Dublin principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management, Technical Advisory Committee Background Paper



systems – Newer trends in storm water management (Green infrastructure) – installation – operation and maintenance.

UNIT IV WATER CONSERVATION AND REUSE 9

Trends in supply and demand – indoor conservation – outdoor conservation – water reuse – Rainwater harvesting – public education.

UNIT V WATER GOVERNANCE 9

Challenges in water sector - Institutional setting, Supply Management, Demand Management, Waste water management – Private sector participation, urban service delivery, customer satisfaction, financial resource management – case studies of best practices in cities across the world.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

- C01** Explain various functional elements of urban ecosystem.
- C02** Calculate urban runoff, compute supply and demand of water, draw hydrograph
- C03** Compare advantages of Newer techniques of green infrastructure and illustrate benefits
- C04** Assess the Operation and Maintenance needs of urban water systems
- C05** Propose best management practices for Indian context

TEXT BOOKS:

1. AnandChiplunkar, K Seetharam and CheonKheong (ed) (2012), "Good Practices in urban water management" ADB, National University Singapore.
2. Marina Alberti (2008), "Advances in Urban Ecology", SpringerR
3. Mohammad Karamouz, Ali Moridi, Sara Nazif (2010), Urban Water Engineering and Management, 1st Edition, CRC Press
4. Monzur A. Imteaz , (2019), Urban Water Resources, CRC Press

REFERENCES:

1. HormozPazwash (2016), "Urban storm water management", CRC Press
2. Larry W. Mays, (2004), Urban Stormwater Management Tools, McGraw-Hill Companies
3. J Parkinson, O Mark (2005) Urban Stormwater Management in Developing Countries, IWA Publishing

Course Code	WATER QUALITY AND MANAGEMENT	L	T	P	C
CE4V77		3	0	0	3

- C01** Know about the principles of water quality modelling.
- C02** Understand the pollutant transport phenomena in surface and groundwater.
- C03** Apply the knowledge of surface water quality modelling to predict the water quality of rivers, lakes and estuary.
- C04** Predict the groundwater contamination transport.
- C05** Predict water quality of surface and sub surface water using numerical solution.

REFERENCES:

1. Steven C. Chapra, "Surface Water Quality Modelling", Tata McGraw-Hill Companies, Inc., New Delhi 2018.
2. "Water Quality Modelling for Rivers and Streams" Authors: Benedini, Marcello, Tsakiris, George, Springer Netherlands 2017.
3. "Hydrodynamics and Water Quality: Modelling Rivers, Lakes, and Estuaries", Zhen-Gang Ji, John Wiley & Sons, 2018.
4. "Modelling Groundwater Flow and Contaminant Transport By Jacob Bear, A. H.-D. Cheng, Springer Science & Business Media, 2010.
5. "Mathematical Modelling of Groundwater Pollution" Ne-Zheng Sun, Alexander Sun, Springer New York, 2012

APPENDIX B: OPEN ELECTIVES

Sub code	Open Elective - I	Sem	Sub code	Open Elective - II	Sem
EC3601	Consumer Electronics	VI	EC3701	Electronic Measurements and Instrumentation	VII
EC3602	PCB Design and Fabrication	VI	EC3702	Cellular and Mobile Communications	VII
EC3603	Basics of Biomedical Instrumentation	VI	EC3703	Wireless Sensor Networks	VII
EC3604	Digital Image Processing	VI	EC3704	Telecommunications and Switching Networks	VII
EC3605	Sensors and Transducers	VI	EC3705	Internet of Things	VII
EC3606	Medical Electronics	VI	EC3706	Neural Networks	VII
EE4601	Design Techniques for SMPS	VI	EE4701	Applications of Reverse Engineering	VII
EE4602	Remote Sensing Concepts	VI	EE4702	Sustainable Manufacturing	VII
EE4603	Urban Agriculture	VI	EE4703	Aviation and Space	VII

	Techniques			Engineering	
EE4604	Drinking water supply and treatment	VI	EE4704	Industrial Management Techniques	VII
EE4605	Power Station Practices	VI	EE4705	Process Control and Quality Engineering	VII
EE4606	Introduction to PLC Programming	VI	EE4706	Advanced Data Base Management Systems	VII
EE4607	Energy Management and Auditing	VI	EE4707	Solar Power Batteries	VII
EE4608	Operations Research	VI	EE4708	Design Techniques of Electrical Machines	VII
CS4601	Introduction to R Programming	VI	CS4701	Business Strategy	VII
CS4602	User Interface Design	VI	CS4702	Introduction to Cybersecurity	VII
CS4603	Internet Marketing and E-Commerce	VI	CS4703	Green Computing	VII
CS4604	Cognitive Science	VI	CS4704	E-Business Management	VII
CS4605	Emotional Intelligence	VI	CS4705	Multicore Architecture and Programming	VII
CS4606	Design Thinking	VI	CS4706	Augmented Reality and Virtual Reality	VII
CS4607	Electronic Waste Management - Issues and Challenges	VI	CS4707	Internet of Things	VII
CS4608	Fundamentals of GIS	VI	CS4708	Cyber Law	VII
CS4609	Bioinformatics	VI	CS4709	Tamil Computing	VII
BM3601	Biomedical Instrumentation	VI	BM3701	Biosensors Technology	VII
BM3602	Medical Imaging Systems	VI	BM3702	Artificial Organs and Implants	VII
BM3603	Biomaterials	VI	BM3703	Biomechanics	VII
BM3604	Telehealth Care and Communication	VI	BM3704	Biomedical Optics and Photonics	VII
BM3605	Healthcare Analytics	VI	BM3705	Wearable Devices	VII
CE3601	Green Building Design	VI	CE3701	Water Society and Sustainability	VII
CE3602	Plastic Waste Management	VI	CE3702	Civil Infrastructure for Smart City Development	VII
CE3603	Environmental Impact Assessment	VI	CE3703	Testing of Materials	VII
CE3604	Air and Water Quality Modelling	VI	CE3704	Air Pollution and Control Engineering	VII
CE3605	Geo Environmental Engineering	VI	CE3705	Waste Water Treatment	VII

ME2601	Lean Concepts, Tools and Practices	VI	ME2701	Technical Writing	VII
ME2602	Reverse Engineering	VI	ME2702	Production and Operations Management for Entrepreneurs	VII
ME2603	Fire Safety Engineering	VI	ME4703	Nanomaterials and Applications	VII
ME2604	Fundamentals of Aeronautical Engineering	VI	ME2704	Concepts in Mobile Robotics	VII
ME2605	Nanotechnology	VI	ME2705	Renewable Energy	VII
ME2606	Functional Materials	VI	ME2706	Energy Technology	VII
ME2607	Solar Energy Conversion Systems	VI	ME2707	Plastic Materials for Engineers	VII
ME2608	Basics of Plastics Processing	VI	ME2708	Properties and Testing of Plastics	VII
ME2609	Machine Learning for Smart Manufacturing	VI	ME2709	Professional Ethics in Engineering	VII
MT3601	Product Design and Development	VI	MT3701	Avionics	VII
MT3602	Fundamentals of Aeronautical Engineering	VI	MT3702	Design of UAV Systems	VII
MT3603	Introduction to Aerial Robotics	VI	MT3703	Machine Learning for Intelligent Systems	VII
MT3604	Wearable Devices	VI	MT3704	Aircraft Mechatronics	VII
MT3605	Medical Mechatronics	VI	MT3705	Agricultural Robotics and Automation	VII
MT3606	Industrial Internet of Things	VI	MT3706	Underwater Robotics	VII
CZ3601	Security Principles	VI	CZ3701	Cloud Security	VII
CZ3602	Network Security	VI	CZ3702	Cyber crime	VII
CZ3603	Security Operations	VI	CZ3703	Digital Forensics	VII
CZ3604	Introduction to R Programming	VI	CZ3704	Operational Technology Security	VII
CY4601	Engineering Chemistry	VI			

Open Elective - I:

Course Code	NANO TECHNOLOGY	L	T	P	C
ME4605		3	0	0	3

COURSE OBJECTIVES:

- The course emphasis on the molecular safe assembly and materials for polymer electronics

UNIT I Introduction

3. Ivor Brodie and Julius J. Muray, 'The physics of Micro/Nano – Fabrication', Springer International Edition, 2010

Open Elective – II:

Course Code	RENEWABLE ENERGY	L	T	P	C
ME2705		3	0	0	3

COURSE OBJECTIVES:

- To know the Indian and global energy scenario
- To learn the various solar energy technologies and its applications.
- To educate the various wind energy technologies.
- To explore the various bio-energy technologies.
- To study the ocean and geothermal technologies.

UNIT I Energy Scenario

9

Indian energy scenario in various sectors – domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status. Potential of various renewable energy sources-Global energy status-Per capita energy consumption - Future energy plans.

UNIT II Solar Energy

9

Solar radiation – Measurements of solar radiation and sunshine – Solar spectrum - Solar thermal collectors – Flat plate and concentrating collectors – Solar thermal applications – Solar thermal energy storage – Fundamentals of solar photo voltaic conversion – Solar cells – Solar PV Systems – Solar PV applications

UNIT III Wind Energy

9

Wind data and energy estimation – Betz limit - Site selection for windfarms – characteristics - Wind resource assessment - Horizontal axis wind turbine – components - Vertical axis wind turbine – Wind turbine generators and its performance – Hybrid systems – Environmental issues – Applications.

UNIT IV Bio-Energy

9

Bio resources – Biomass direct combustion – thermochemical conversion - biochemical conversion mechanical conversion - Biomass gasifier - Types of biomass gasifiers - Cogeneration -- Carbonisation – Pyrolysis - Biogas plants – Digesters – Biodiesel production – Ethanol production – Applications

UNIT V Ocean and geothermal energy

9

Small hydro - Tidal energy – Wave energy – Open and closed OTEC Cycles – Limitations – Geothermal energy – Geothermal energy sources - Types of geothermal power plants – Applications - Environmental impact

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to
CO1: Discuss the Indian and global energy scenario.



- C02: Describe the various solar energy technologies and its applications.
- C03: Explain the various wind energy technologies.
- C04: Explore the various bio-energy technologies.
- C05: Discuss the ocean and geothermal technologies.

TEXT BOOKS:

1. Fundamentals and Applications of Renewable Energy | Indian Edition, by Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, cGraw Hill; First edition (10 December 2020), ISBN-10 : 9390385636
2. Renewable Energy Sources and Emerging Technologies, by Kothari, Prentice Hall India Learning Private Limited; 2nd edition (1 January 2011), ISBN-10 : 812034470

REFERENCES:

1. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 2012.
2. Rai.G.D., "Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 2014.
3. Sukhatme.S.P., "Solar Energy: Principles of Thermal Collection and Storage", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
4. Tiwari G.N., "Solar Energy – Fundamentals Design, Modelling and applications", Alpha Science Intl Ltd, 2015.
5. Twidell, J.W. & Weir A., "Renewable Energy Resources", EFNSpon Ltd., UK, 2015

APPENDIX C: MANDATORY COURSES

MANDATORY COURSE I

S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T	MC4301	Universal Human Values	3	0	0	0
2.	T	MC4302	Introduction to Women and Gender Studies	3	0	0	0
3.	T	MC4303	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	3	0	0	0
4.	T	MC4304	Elements of Literature	3	0	0	0
5.	T	MC4305	Film Appreciation	3	0	0	0

MANDATORY COURSE II

S. No	Theory/ Practical / T&P	Course Code	Course Title	L	T	P	C
1.	T	MC4401	History of Science and Technology in India	3	0	0	0
2.	T	MC4402	Political and Economic Thought for a Human Society	3	0	0	0
3.	T	MC4403	State, Nation Building and Politics in India	3	0	0	0
4.	T	MC4404	Industrial Safety	3	0	0	0
5.	T	MC4405	Disaster Risk Reduction and Management	3	0	0	0

Course Code	UNIVERSAL HUMAN VALUES	L	T	P	C
MC4301		3	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Description

This course offers a comprehensive exploration of the fundamental principles and beliefs that underpin human behaviour and societal harmony across diverse cultures and contexts. Through interdisciplinary perspectives from psychology, philosophy, sociology, anthropology, and ethics, students will examine the core values that transcend geographical, cultural, and historical boundaries.

Prerequisites

There are no specific prerequisites for this course, although a basic understanding of social sciences and cultural studies would be beneficial.

UNIT I INTRODUCTION TO VALUE EDUCATION 6+3

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)-Understanding Value Education-Practice Session PS1 Sharing about Oneself-Self-exploration as the Process for Value Education-Continuous Happiness and Prosperity – the Basic Human Aspirations-Practice Session PS2 Exploring Human Consciousness-Happiness and Prosperity – Current Scenario-Method to Fulfil the Basic Human Aspirations-Practice Session PS3 Exploring Natural Acceptance.

UNIT II HARMONY IN THE HUMAN BEING 6+3

Understanding Human being as the Co-existence of the Self and the Body-Distinguishing between the Needs of the Self and the Body-Practice Session PS4 Exploring the difference of Needs of Self and Body-The Body as an Instrument of the Self=Understanding Harmony in the Self- Exploring Sources of Imagination in the Self-Harmony of the Self with the Body-Programme to ensure self-regulation and Health- Exploring Harmony of Self with the Body.

UNIT III HARMONY IN THE FAMILY AND SOCIETY 6+3

Harmony in the Family – the Basic Unit of Human Interaction-'Trust' – the Foundational Value in Relationship-Exploring the Feeling of Trust- 'Respect' – as the Right Evaluation- Exploring the Feeling of Respect-Other Feelings, Justice in Human-to-Human Relationship- Understanding Harmony in the Society-Vision for the Universal Human Order-Exploring Systems to fulfil Human Goal potential and program to ensure a happy and prosperous life for them and for others.

UNIT IV **HARMONY IN THE NATURE/EXISTENCE** **6+3**

Understanding Harmony in the Nature-Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature-Exploring the Four Orders of Nature-Realizing Existence as Co-existence at All Levels=The Holistic Perception of Harmony in Existence=Exploring Co-existence in Existence.

UNIT V **IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHICS** **6+3**

Natural Acceptance of Human Values-Definitiveness of (Ethical) Human Conduct Exploring Ethical Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order -Competence in Professional Ethics-Exploring Humanistic Models in Education- Holistic Technologies, Production Systems and Management Models-Typical-Case Studies-Strategies for Transition towards Value-based Life and Profession-Exploring Steps of Transition towards Universal Human Order.

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to:

- CO 1: The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course
- CO 2: The students are able to see that all physical facilities they use are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.
- CO 3: The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them.
- CO 4: Understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature.
- CO 5: Grasp the right utilization of their knowledge in their streams of Technology/Engineering/ Management to ensure mutually enriching and recyclable productions systems.

TEXT BOOKS:

- 1 A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd . Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
- 2 The Teacher's Manual Teachers" Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2



REFERENCES:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamch and Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

YouTube Resources:

1. TED Talks: The TED platform hosts numerous talks by experts from various fields discussing topics related to human values, empathy, compassion, and social justice.
2. The School of Life: This channel explores philosophical and psychological concepts relevant to everyday life, including videos on empathy, gratitude, forgiveness, and personal growth.
3. Big Think: Big Think features interviews and discussions with leading thinkers, scientists, and philosophers addressing topics such as ethics, morality, and the human condition.

TOTAL :45 PERIODS

Course Code	INTRODUCTION TO WOMEN AND GENDER STUDIES	L	T	P	C
MC4302		3	0	0	0

COURSE OBJECTIVES:



The main objectives of this course are to:

- Understand the distinction between sex and gender, and critically analyze the concepts of masculinity, femininity, and gender roles within various social contexts.
- Explore the mechanisms of socialization and the role of patriarchy in shaping gender relations and hierarchies.
- Examine key feminist theories including liberal, Marxist, socialist, radical, psychoanalytic, postmodernist, and ecofeminist perspectives, and critically evaluate their contributions to understanding gender issues.
- Analyze the global, national, and local dynamics of women's movements, tracing their historical development, key actors, and major achievements.
- Investigate the relationship between gender and language, exploring linguistic forms, narratives, and how language both reflects and constructs gender identities and power dynamics.

Course Description

This course delves into the interdisciplinary field of gender studies, examining key concepts, feminist theories, women's movements, and the intersection of gender with language and representation in media

Prerequisites

- There are no specific prerequisites for this course, although a basic understanding of social sciences and cultural studies would be beneficial.

UNIT I CONCEPTS

9

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour

UNIT II FEMINIST THEORY

9

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.

UNIT III WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL

9

Rise of Feminism in Europe and America. Women's Movement in India

UNIT IV GENDER AND LANGUAGE

9

Linguistic Forms and Gender. Gender and narratives

UNIT V GENDER AND REPRESENTATION

9

Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.

Course Format

The course will be delivered through a combination of lectures, discussions, multimedia presentations, case studies, and hands-on activities. Guest lectures from industry experts and field visits may also be included to provide real-world perspectives.



Assessments & Grading

Quizzes / Assignments, Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- C01: Critically analyze key concepts in gender studies, including sex vs. gender, patriarchy, power dynamics, and gender roles.
- C02: Evaluate diverse feminist theories and their contributions to understanding gender inequality and social change.
- C03: Examine the historical development and contemporary dynamics of women's movements globally and locally..
- C04: Analyze the relationship between gender and language, including linguistic forms, narratives, and discourses..
- C05: Evaluate the representation of gender in various media forms, including advertising, visual media, alternative media, and social media, and assess their impact on shaping perceptions and reinforcing or challenging gender norms.

TEXT BOOKS:

1. "Gender: Ideas, Interactions, Institutions" by Lisa Wade and Myra Marx Ferree

REFERENCES:

1. "Feminist Theory: From Margin to Center" by bell hooks
2. Gender Trouble: Feminism and the Subversion of Identity" by Judith Butler

YouTube Resources:

1. TED-Ed: Environmental Studies Playlist
2. CrashCourse: Sociology Series covering topics related to gender and feminism

TOTAL: 45 PERIODS

Course Code	WELL-BEING WITH TRADITIONAL PRACTICES-YOGA, AYURVEDA SIDDHA	L	T	P	C
MC4303		3	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

- To enjoy life happily with fun filled new style activities that help to maintain health also
- To adapt a few lifestyle changes that will prevent many health disorders

- To be cool and handbill every emotion very smoothly in every walk of life
- To learn to eat cost effective but healthy foods that are rich in essential nutrients
- To develop immunity naturally that will improve resistance against many health disorders.

Course Description

This course provides an introduction to the theory and practical applications of Generative Artificial Intelligence. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using generative AI systems.

Prerequisites

There are no specific prerequisites for this course, although a basic understanding of human biology and physiology would be beneficial.

UNIT I HEALTH AND ITS IMPORTANCE

9

Health: Definition - Importance of maintaining health - More importance on prevention than Treatment - Ten types of health one has to maintain - Physical health - Mental health - Social health - Financial health - Emotional health - Spiritual health - Intellectual health - Relationship health - Environmental health - Occupational/Professional health.

Present health status - The life expectancy-present status - mortality rate - dreadful diseases - Non-communicable diseases (NCDs) the leading cause of death - 60% - heart disease - cancer - diabetes - chronic pulmonary diseases - risk factors - tobacco - alcohol - unhealthy diet - lack of physical activities.

Types of diseases and disorders - Lifestyle disorders - Obesity - Diabetes - Cardiovascular diseases - Cancer - Strokes - COPD - Arthritis - Mental health issues.

Causes of the above diseases / disorders - Importance of prevention of illness - Takes care of health - Improves quality of life - Reduces absenteeism - Increase satisfaction - Saves time

Simple lifestyle modifications to maintain health - Healthy Eating habits (Balanced diet according to age) Physical Activities (Stretching exercise, aerobics, resisting exercise) - Maintaining BMI-Importance and actions to be taken

UNIT II DIET

9

Role of diet in maintaining health - energy one needs to keep active throughout the day - nutrients one needs for growth and repair - helps one to stay strong and healthy - helps to prevent diet-related illness, such as some cancers - keeps active and - helps one to maintain a healthy weight - helps to reduce risk of developing lifestyle disorders like diabetes - arthritis - hypertension - PCOD - infertility - ADHD - sleeplessness -helps to reduce the risk of heart diseases - keeps the teeth and bones strong.

Balanced Diet and its 7 Components - Carbohydrates - Proteins - Fats - Vitamins - Minerals - Fibre and Water.

Food additives and their merits & demerits - Effects of food additives - Types of food additives - Food additives and processed foods - Food additives and their reactions

Definition of BMI and maintaining it with diet



Importance - Consequences of not maintaining BMI - different steps to maintain optimal BMI
Common cooking mistakes Different cooking methods, merits and demerits of each method

UNIT III ROLE OF AYURVEDA & SIDDHA SYSTEMS IN MAINTAINING HEALTH 9

AYUSH systems and their role in maintaining health - preventive aspect of AYUSH – AYUSH as a soft therapy.

Secrets of traditional healthy living - Traditional Diet and Nutrition - Regimen of Personal and Social Hygiene - Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation and healthy living environment - Sadvritta (good conduct) - for conducive social life.

Principles of Siddha & Ayurveda systems - Macrocosm and Microcosm theory - Pancheekarana Theory / (Five Element Theory) 96 fundamental Principles - Uyir Thathukkal (Tri-Dosha Theory) - Udal Thathukkal

Prevention of illness with our traditional system of medicine

Primary Prevention - To decrease the number of new cases of a disorder or illness – Health promotion/education, and - Specific protective measures - Secondary Prevention - To lower the rate of established cases of a disorder or illness in the population (prevalence) – Tertiary Prevention - To decrease the amount of disability associated with an existing disorder.

UNIT IV MENTAL WELLNESS 9

Emotional health - Definition and types - Three key elements: the subjective experience – the physiological response - the behavioral response - Importance of maintaining emotional health - Role of emotions in daily life -Short term and long term effects of emotional disturbances – Leading a healthy life with emotions - Practices for emotional health - Recognize how thoughts influence emotions - Cultivate positive thoughts - Practice self-compassion - Expressing a full range of emotions.

Stress management - Stress definition - Stress in daily life - How stress affects one's life - Identifying the cause of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help) - Complications of stress mismanagement.

Sleep - Sleep and its importance for mental wellness - Sleep and digestion.

Immunity - Types and importance - Ways to develop immunity

UNIT V YOGA 9

Definition and importance of yoga - Types of yoga - How to Choose the Right Kind for individuals according to their age - The Eight Limbs of Yoga - Simple yogasanas for cure and prevention of health disorders - What yoga can bring to our life

Course Format

The course will be delivered through a combination of lectures, discussions, practical demonstrations, and experiential learning activities. Students will engage with theoretical concepts and practical applications related to health and wellness.

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

C01: Learn the importance of different components of health

C02: Gain confidence to lead a healthy life

C03: Learn new techniques to prevent lifestyle health disorders.

C04: Understand the importance of diet and workouts in maintaining health

C05: Apply practical techniques and lifestyle modifications to enhance personal health and well-being.

TEXT BOOKS:

1. Nutrition and Dietetics - Ashley Martin, Published by White Word Publications, New York, NY 10001,

USA

2. Yoga for Beginners_ 35 Simple Yoga Poses to Calm Your Mind and Strengthen Your Body, by Cory Martin, Copyright © 2015 by Althea Press, Berkeley, California

REFERENCES:

1. WHAT WE KNOW ABOUT EMOTIONAL INTELLIGENCE How It Affects Learning, Work, Relationships, and Our Mental Health, by Moshe Zeidner, Gerald Matthews, and Richard D.Roberts

2. A Bradford Book, The MIT Press, Cambridge, Massachusetts, London, England The Mindful Self-Compassion Workbook, Kristin Neff, Ph.D Christopher Germer, Ph.D, Published by The Guilford Press A Division of Guilford Publications, Inc.370 Seventh Avenue, Suite 1200, New York, NY 10001

YouTube Resources:

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4799645/>

2. Simple lifestyle modifications to maintain health <https://www.niddk.nih.gov/health-information/diet-nutrition/changing-habits-betterhealth#:~:text=Make%20your%20new%20healthy%20habit,t%20have%20time%20to%20cook.>

3. **Read more:** <https://www.legit.ng/1163909-classes-food-examples-functions.html>

4. <https://www.yaclass.in/p/science-state-board/class-9/nutrition-and-health-5926>

5. **Benefits of healthy eating** <https://www.cdc.gov/nutrition/resources-publications/benefitsof-healthy-eating.html>

6. Food additives <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/foodadditi>

7. **BMI** <https://www.hsph.harvard.edu/nutritionsource/healthy-weight/>

<https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle-whorecommendatlon>

8. Yoga <https://www.healthifyme.com/blog/types-of-yoga/>

<https://yogamedicine.com/guide-types-yoga-styles/>

Ayurveda: <https://vikaspedia.in/health/ayush/ayurveda-1/concept-of-healthy-living-inayurveda>

9. **Siddha :** http://www.tkdil.res.in/tkdil/langdefault/Siddha/Sid_Siddha_Concepts.asp

10. **CAM :** <https://www.hindawi.com/journals/ecam/2013/376327/>

Total: 45 PERIODS

Course Code	ELEMENTS OF LITERATURE	L	T	P	C
MC4304			3	0	0

COURSE OBJECTIVES:

To make the students aware about the finer sensibilities of human existence through an art form. The students will learn to appreciate different forms of literature as suitable modes of expressing human experience.

Course Description

The "Introduction to Elements of Literature" course provides students with an overview of the fundamental components and genres of literature. Through the exploration of fiction, poetry, and drama, students will analyze key elements such as plot, character, perspective, emotions, figurative language, and theatrical performance

Prerequisites

- There are no specific prerequisites for this course, although a basic understanding of literature and language would be beneficial

I COURSE CONTENTS

Introduction to Elements of Literature

1. Relevance of literature
 - ✓ Enhances Reading, thinking, discussing and writing skills.
 - ✓ Develops finer sensibility for better human relationship.
 - ✓ Increases understanding of the problem of humanity without bias.
 - ✓ Providing space to reconcile and get a cathartic effect.
2. Elements of fiction
 - ✓ Fiction, fact and literary truth.
 - ✓ Fictional modes and patterns.
 - ✓ Plot character and perspective.
3. Elements of poetry
 - ✓ Emotions and imaginations.
 - ✓ Figurative language.
 - ✓ (Simile, metaphor, conceit, symbol, pun and irony).
 - ✓ Personification and animation.
 - ✓ Rhetoric and trend.
4. Elements of drama
 - ✓ Drama as representational art.
 - ✓ Content mode and elements.



- ✓ Theatrical performance.
- ✓ Drama as narration, mediation and persuasion.
- ✓ Features of tragedy, comedy and satire.

II READING

1. An Introduction to the Study of English Literature, W.H. Hudson, Atlantic, 2007.
2. An Introduction to Literary Studies, Mario Klarer, Routledge, 2013.
3. The Experience of Poetry, Graham Mode, Open college of Arts with Open Univ Press, 1991.
4. The Elements of Fiction: A Survey, Ulf Wolf (ed), Wolfstuff, 2114.
5. The Elements of Drama, J.L.Styan, Literary Licensing, 2011.

III OTHER SESSIONS

1. *Tutorials:
2. *Laboratory:
3. *Project: The students will write a term paper to show their understanding of a particular piece of literature

IV *ASSESSMENT

1. HA:
2. Quizzes-HA:
3. Periodical Examination: one
4. Project/Lab: one (under the guidance of the teachers the students will take a volume of poetry, fiction or drama and write a term paper to show their understanding of it in a given context; sociological, psychological, historical, autobiographical etc.
5. Final Exam

Course Format

The course will be delivered through a combination of lectures, discussions, readings, multimedia presentations, and hands-on activities. Students will engage with literary texts through close reading, analysis, and interpretation

Assessments & Grading

Quizzes / Assignments, Internal Assessments, Final Examination

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to:

Students will be able to understand the relevance of literature in human life and appreciate its aspects in developing finer sensibilities.

TEXT BOOKS:

- 1."An Introduction to the Study of English Literature" by W.H. Hudson, Atlantic, 2007.

REFERENCE BOOKS:

1. "An Introduction to Literary Studies" by Mario Klarer, Routledge, 2013.



2. "The Experience of Poetry" by Graham Mode, Open College of Arts with Open University Press, 1991.

YouTube Resources:

- CrashCourse: Literature and Writing

TOTAL: 30 PERIODS

Course Code	FILM APPRECIATION	L	T	P	C
MC4305		3	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

In this course on film appreciation, the students will be introduced broadly to the development of film as an art and entertainment form. It will also discuss the language of cinema as it evolved over a century. The students will be taught as to how to read a film and appreciate the various nuances of a film as a text. The students will be guided to study film joyfully.

Course Description

This course provides an introduction to the theory and practical applications of Generative Artificial Intelligence. Students will learn the fundamental concepts and techniques related to generative models and gain hands-on experience with creating and using generative AI systems.

Prerequisites

- There are no specific prerequisites for this course, although a basic understanding of literature and language would be beneficial

Theme - A: The Component of Films

- ✓ A-1: The material and equipment
- ✓ A-2: The story, screenplay and script
- ✓ A-3: The actors, crew members, and the director
- ✓ A-4: The process of film making... structure of a film

Theme - B: Evolution of Film Language

- ✓ B-1: Film language, form, movement etc.
- ✓ B-2: Early cinema... silent film (Particularly French)
- ✓ B-3: The emergence of feature films: Birth of a Nation
- ✓ B-4: Talkies

Theme - C: Film Theories and Criticism/Appreciation

- ✓ C-1: Realist theory; Auteurists
- ✓ C-2: Psychoanalytic, Ideological, Feminists
- ✓ C-3: How to read films?
- ✓ C-4: Film Criticism / Appreciation

Theme - D: Development of Films

- ✓ D-1: Representative Soviet films
- ✓ D-2: Representative Japanese films



- ✓ D-3: Representative Italian films
- ✓ D-4: Representative Hollywood film and the studio system

Theme - E: Indian Films

- ✓ E-1: The early era
- ✓ E-2: The important films made by the directors
- ✓ E-3: The regional films
- ✓ E-4: The documentaries in India

READING:

A Reader containing important articles on films will be prepared and given to the students. The students must read them and present in the class and have discussion on these

Course Format

Guest speakers, including filmmakers and scholars, may be invited to provide insights into specific topics.

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- CO1: Understand the various components of filmmaking, including material and equipment, story development, casting, crew roles, and the filmmaking process.
- CO2: Analyze the evolution of film language, from early cinema to the emergence of talkies and beyond.
- CO3: Explore different film theories and criticism, including realist theory, auteurism, psychoanalytic theory, ideological criticism, and feminist theory
- CO4: Develop the skills to critically analyze and interpret films, including understanding film form, narrative structure, and visual language
- CO5: Examine the development of films in different cultural contexts, including representative films from Soviet, Japanese, Italian, and Hollywood cinema.

TEXT BOOKS:

1. "Understanding Movies" by Louis Giannetti

REFERENCES:

1. "Film Art: An Introduction" by David Bordwell and Kristin Thompson

YouTube Resources:

- CrashCourse: Film History and Analysis

TOTAL :30 PERIODS

Course Code	DISASTER RISK REDUCTION AND MANAGEMENT	L	T	P	C
MC4401		3	0	0	0

COURSE OBJECTIVE

- To impart knowledge on concepts related to disaster, disaster risk reduction, disaster management
- To acquaint with the skills for planning and organizing disaster response

UNIT I HAZARDS, VULNERABILITY AND DISASTER RISKS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, -
-, Inter relations between Disasters and Sustainable development Goals

UNIT II DISASTER RISK REDUCTION (DRR) 9

Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies.- Relevance of indigenous Knowledge, appropriate technology and Local resources.

UNIT III DISASTER MANAGEMENT 9

Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmes and legislation - Institutional Processes and Framework at State and Central Level- (NDMA –SDMA- DDMA-NRDF- Civic Volunteers)

UNIT IV TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT 9

Early warning systems -Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment. - Elements of Climate Resilient Development –Standard operation Procedure for disaster response – Financial planning for disaster Management

UNIT V DISASTER MANAGEMENT: CASE STUDIES 9

Discussion on selected case studies to analyse the potential impacts and actions in the context of disasters-Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.- Field work-Mock drill -

TEXT BOOKS:

1. Taimpo (2016), Disaster Management and Preparedness, CRC Publications
2. Singh R (2017), Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications
3. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423



4. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]

REFERENCES

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
2. Government of India, National Disaster Management Policy, 2009.
3. Shaw R (2016), Community based Disaster risk reduction, Oxford University Press

COURSE OUTCOME:

- CO1: To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)
- CO2: To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction
- CO3: To develop disaster response skills by adopting relevant tools and technology
- CO4: Enhance awareness of institutional processes for Disaster response in the country and
- CO5: Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity

YouTube Resources:

1. National Geographic: National Geographic's YouTube channel covers natural disasters, climate change impacts, and efforts to mitigate risk through scientific exploration, documentaries, and educational content.
2. GFDRR - Global Facility for Disaster Reduction and Recovery: GFDRR's YouTube channel features videos on disaster risk management projects, innovations, and partnerships around the world, as well as expert interviews and discussions.

TOTAL : 45 PERIODS

Course Code	HISTORY OF SCIENCE AND TECHNOLOGY IN INDIA	L	T	P	C
MC4402		3	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

- To understand the historical development of science and technology in India, spanning from ancient civilizations to the post-independent era.
- To analyze key concepts and perspectives in the study of history, including objectivity, determinism, causation, and moral judgment, as applied to the field of science and technology
- To explore the impact of historical events, interactions, and cultural exchanges on the evolution of science and technology in India.



- To develop critical thinking, research, and analytical skills through the study of historical perspectives on science and technology in India.
- To foster an appreciation for the rich heritage and legacy of scientific knowledge and technological innovations in India, and their relevance to contemporary issues and challenges.

Course Description

This course delves into the historical perspectives and developments of science and technology in India, spanning from ancient times to the post-independent era. Through an exploration of key concepts, historiography, and significant historical periods, students will gain insights into the evolution of scientific thought, technological advancements, and their societal impacts.

Prerequisites

- There are no specific prerequisites for this course, although a basic understanding of history, science, and technology would be beneficial.

UNIT I CONCEPTS AND PERSPECTIVES 6

Meaning of History

Objectivity, Determinism, Relativism, Causation, Generalization in History; Moral judgment in history Extent of subjectivity, contrast with physical sciences, interpretation and speculation, causation verses evidence, concept of historical inevitability, Historical Positivism. Science and Technology-Meaning, Scope and Importance, Interaction of science, technology & society, Sources of history on science and technology in India

UNIT II HISTORIOGRAPHY OF SCIENCE AND TECHNOLOGY IN INDIA 6

Introduction to the works of D.D. Kosambi, Dharmpal, Debiprasad Chattopadhyay, Rehman, S.Irfan Habib, Deepak Kumar, Dhruv Raina, and others

UNIT III SCIENCE AND TECHNOLOGY IN ANCIENT INDIA 6

Technology in pre-historic period-Beginning of agriculture and its impact on technology-Science and Technology during Vedic and Later Vedic times-Science and technology from 1st century AD to C-1200

UNIT IV SCIENCE AND TECHNOLOGY IN MEDIEVAL INDIA 6

Legacy of technology in Medieval India, Interactions with Arabs-Development in medical knowledge, interaction between Unani and Ayurveda and alchemy-Astronomy and Mathematics: interaction with Arabic Sciences-Science and Technology on the eve of British conquest.

UNIT V GENDER AND REPRESENTATION 6

Science and the Empire-Indian response to Western Science-Growth of techno-scientific institutions

UNIT VI SCIENCE AND TECHNOLOGY IN A POST-INDEPENDENT INDIA 6

Science, Technology and Development discourse-Shaping of the Science and Technology PolicyDevelopments in the field of Science and Technology-Science and technology in globalizing India-Social implications of new technologies like the Information Technology and Biotechnology



Course Format

The course will be delivered through a combination of lectures, readings, discussions, and presentations. Students will engage with primary and secondary sources, including works by prominent historians and scholars in the field.

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

- CO1: Understand the meaning, scope, and importance of history, with a focus on the historiography of science and technology in India.
- CO2: Analyze key concepts and perspectives in the study of history, including objectivity, determinism, causation, and moral judgment.
- CO3: Examine the evolution of science and technology in ancient and medieval India, including technological advancements, interactions with other cultures, and the legacy of knowledge.
- CO4: Evaluate the impact of colonialism on science and technology in India, including responses to Western science and the establishment of techno-scientific institutions.
- CO5: Explore the role of gender in science and technology representation, and its implications for societal development.

TEXT BOOKS:

1. Explore the role of gender in science and technology representation, and its implications for societal development.

REFERENCES:

1. "The Illustrated History of Science and Invention in India" by A.K. Bag
2. "Science and Technology in Medieval India" by S. M. Ali
3. "Modern Indian History and Culture" by Raghavan Iyer

YouTube Resources:

1. Indian Institute of Science: Lectures on the history of science and technology in India
2. National Institute of Science, Technology and Development Studies (NISTADS): Webinars on science and technology policy in India
3. Centre for Studies in Social Sciences, Calcutta (CSSSC): Videos on gender representation in science and technology

TOTAL:30 PERIODS

Course Code	POLITICAL AND ECONOMIC THOUGHT FOR A HUMANE SOCIETY	L	T	P	C
MC4403		3	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

This course will begin with a short overview of human needs and desires and how different political-economic systems try to fulfill them. In the process, we will end with a critique of different systems and their implementations in the past, with possible future directions.

Course Description

This course offers an in-depth exploration of various socio-political and economic ideologies and systems that have shaped human societies throughout history. Through lectures, readings, and discussions, students will examine the fundamental principles, historical contexts, and key figures associated with capitalism, liberalism, fascism, communism, the welfare state, Gandhian thought, and essential elements of Indian civilization.

Course Topics

Considerations for humane society, holistic thought, human being's desires, harmony in self, harmony in relationships, society, and nature, societal systems. (9 lectures, 1 hour each)

(Refs: A Nagaraj, M K Gandhi, JC Kumarappa)

Prerequisites

There are no specific prerequisites for this course, although a basic understanding of history, political science, and economics would be beneficial.

Capitalism – Free markets, demand-supply, perfect competition, laissez-faire, monopolies, imperialism. Liberal democracy. **(5 lectures)**

(Refs: Adam Smith, J S Mill)

Fascism and totalitarianism. World War I and II. Cold War. **(2 lectures)**

Communism – Mode of production, theory of labour, surplus value, class struggle, dialectical materialism, historical materialism, Russian and Chinese models.

(Refs: Marx, Lenin, Mao, M N Roy) **(5 lectures)**

Welfare state. Relation with human desires. Empowered human beings, satisfaction. **(3 lectures)**

Gandhian thought. Swaraj, Decentralized economy & polity, Community. Control over one's lives. Relationship with nature. **(6 lectures)**

(Refs: M K Gandhi, Schumacher, Kumarappa)

Essential elements of Indian civilization. **(3 lectures)**

(Refs: Pt Sundarlal, R C Mazumdar, Dharampal)

Technology as driver of society, Role of education in shaping of society. Future directions. **(4 lectures)**

(Refs: Nandkishore Acharya, David Dixon, Lewis Mumford)

Conclusion (2 lectures)

Total lectures: 39

GRADING:

Mid sems	30
End sem	20
Home Assign	10
Term paper	40

Course Format

The course will be delivered through a series of lectures, readings, discussions, and assignments. Each lecture will focus on a specific topic, providing historical background, key concepts, and critical analysis

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

The students will get an understanding of how societies are shaped by philosophy, political and economic system, how they relate to fulfilling human goals & desires with some case studies of how different attempts have been made in the past and how they have fared.

TEXT BOOKS:

Authors mentioned along with topics above. Detailed reading list will be provided.

TOTAL: 30 PERIODS

Course Code	STATE, NATION BUILDING AND POLITICS IN INDIA	L	T	P	C
MC4404		3	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

The objective of the course is to provide an understanding of the state, how it works through its main organs, primacy of politics and political process, the concept of sovereignty and its changing contours in a globalized world. In the light of this, an attempt will be made to acquaint the students with the main development and legacies of national movement and constitutional development in India, reasons for adopting a Parliamentary-federal system, the broad philosophy of the Constitution of India and the changing nature of Indian Political System. Challenges/ problems and issues concerning national integration and nation-building will also be discussed in the contemporary context with the aim of developing a future vision for a better India.

Course Description



This course provides an in-depth understanding of the political landscape of India, focusing on the development of the nation-state, the role of the state and politics, the organs of the state, and the challenges of nation-building and national integration

Prerequisites

There are no specific prerequisites for this course, although a basic understanding of political science, history, and sociology would be beneficial.

Course Topics

Understanding the need and role of State and politics.

Development of Nation-State, sovereignty, sovereignty in a globalized world.

Organs of State – Executive, Legislature, Judiciary. Separation of powers, forms of government unitary - federal, Presidential-Parliamentary,

The idea of India.

1857 and the national awakening.

1885 Indian National Congress and development of national movement – its legacies. Constitution making and the Constitution of India.

Goals, objective and philosophy.

Why a federal system?

National integration and nation-building.

Challenges of nation-building – State against democracy (Kothari)

New social movements.

The changing nature of Indian Political System, the future scenario. What can we do?

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

It is expected that this course will make students aware of the theoretical aspect of the state, its organs, its operationalization aspect, the background and philosophy behind the founding of the present political system, broad streams and challenges of national integration and nation-building in India. It will equip the students with the real understanding of our political system/ process in correct perspective and make them sit up and think for devising ways for better participation in the system with a view to making the governance and delivery system better for the common man who is often left unheard and unattended in our democratic setup besides generating a lot of dissatisfaction and difficulties for the system.

Course Format

The course will be delivered through a combination of lectures, readings, discussions, and assignments.



TEXT BOOKS:

1. "Indian Polity" by M. Laxmikanth

You tube Resources:

1. https://youtu.be/q4oyQ_Yse-M?t=6
2. https://youtu.be/q4oyQ_Yse-M?t=6
3. https://youtu.be/q4oyQ_Yse-M?t=6
4. https://youtu.be/q4oyQ_Yse-M?t=6
5. https://youtu.be/q4oyQ_Yse-M?t=6

TOTAL: 30 PERIODS

Course Code	INDUSTRIAL SAFETY	L	T	P	C
MC4405		3	0	0	0

COURSE OBJECTIVES:

The main objectives of this course are to:

- To Understand the Introduction and basic Terminologies safety.
- To enable the students to learn about the Important Statutory Regulations and standards.
- To enable students to Conduct and participate the various Safety activities in the Industry.
- To have knowledge about Workplace Exposures and Hazards.
- To assess the various Hazards and consequences through various Risk Assessment Techniques

Course Description

This course focuses on workplace safety and health, covering various safety terminologies, standards, regulations, safety activities, and hazard identification techniques. Students will learn about hazards, risks, control measures, safety standards, regulations, safety activities, and techniques for identifying and assessing workplace hazards.

Prerequisites

There are no specific prerequisites for this course, although a basic understanding of workplace safety concepts and regulations would be beneficial.

UNIT I SAFETY TERMINOLOGIES

9

Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Threshold Limit Value (TLV) - Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects- Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS

UNIT II STANDARDS AND REGULATIONS

9

Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006.



UNIT III SAFETY ACTIVITIES

9

Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment

UNIT IV WORKPLACE HEALTH AND SAFETY

9

Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane Safety-Toxic gas Release

UNIT V HAZARD IDENTIFICATION TECHNIQUES

9

Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment- Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment

Course Format

The course will be delivered through a combination of lectures, workshops, case studies, discussions, and practical exercises. Each session will focus on specific topics related to workplace safety, providing theoretical knowledge, practical insights, and hands-on training.

Assessments & Grading

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

COURSE OUTCOMES:

OUTCOMES: Upon completion of the course, the students will be able to:

C01: Understand key safety terminologies, including hazards, risks, control measures, and safety standards.

C02: Identify and assess various workplace hazards, including chemical, physical, ergonomic, and environmental hazards

C03: Interpret and comply with relevant safety regulations and standards, such as the Indian Factories Act and ISO 45001:2018.

C04: Demonstrate knowledge of safety activities, including toolbox talks, safety committees, safety training, and emergency action plans

C05: Analyze and mitigate workplace health and safety risks, such as noise hazards, musculoskeletal disorders, and electrical hazards.

TEXT BOOKS:

1. "Occupational Health and Safety Management: A Practical Approach" by Charles D. Reese

REFERENCES:

1. "Safety and Health for Engineers" by Roger L. Brauer

2. "Industrial Safety and Health Management" by C. Ray Asfahl and David W. Rieske.

3. "Introduction to Occupational Health and Safety" by Matthew Granger.



YouTube Resources:

1. National Safety Council: Videos on workplace safety tips and best practices
2. OSHA: Occupational Safety and Health Administration's training videos on various safety topics

TOTAL: 45 PERIODS