Kolhapur Institute of Technology's

COLLEGE OF ENGINEERING
(AUTONOMOUS)

Gokul Shirgaon, Kolhapur

KOLHAPUR INSTITUTE OF TECHNOLOGY'S COLLEGE OF ENGINEERING (AUTONOMOUS), KOLHAPUR

Curriculum Structure

For

B. Tech. Civil Engineering

Academic Year 2024-2025

Under Graduate Programme

Approved in BoS on ***15.05.2024***

Approved in Academic Council on ***25.05.2024***

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S. Y. B. Tech
Semester - III

Academic Year 2024-2025

Title of the Course:	**MATHEMATICS AND NUMERICAL ANALYSIS**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0301**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic terminologies of differential equations, basic knowledge of probability, differential and integral calculus and vector algebra.

Course Description:

This course contains linear differential equations and its applications, numerical methods, Laplace transform statistics and probability distributions.

Course Learning Objectives:

1. A To make familiar the prospective civil engineers with techniques in ordinary differential equations, Laplace transform, complex analysis, probability distributions and statistics.
2. To enable students to use mathematical techniques learned for the analysis, modeling and solution of realistic engineering problems.
3. To develop abstract, logical and critical thinking and the ability to reflect critically upon their work.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand various terminologies in differential equations, probability and statistics, properties of Laplace transform and vector calculus.	2	Understanding
CO2	Solve LDE with constants coefficients using analytical and numerical methods, problems of Laplace transform and problems on vector differentiation.	3	Applying
CO3	Apply the knowledge of probability distributions and statistical techniques to the given data and Laplace transform method to solve differential equations.	3	Applying
CO4	Analyze and interpret the solutions obtained of problems on deflection of beams and in statistical techniques.	4	Analyzing

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	2
CO2	3	2	-	1	-	-	-	-	-	-	-	2
CO3	3	2	-	2	-	-	-	-	-	-	-	2
CO4	3	2	-	2	-	-	-	-	-	-	-	2

CO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- **ISE 1** and **ISE 2** are based on Assignment / Declared test / Quiz / Seminar / Group discussions / presentation, etc.
- **MSE** is based on 50% of course content (first three units).
- **ESE** is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

Course Contents:			
Unit: 1	**CO: 1,2**		
Linear Differential Equations with Constant Coefficients 1. Definition, general form, complete solution 2. Rules for finding complementary function 3. Short methods for finding particular integral 4. General rule for finding particular integral 5. Cauchy's homogeneous equation			**8 Hrs.**
Unit: 2	**CO: 2,4**		
Numerical Solution of Differential Equations and Applications of Linear Differential Equations 1. Numerical solution of second order ordinary differential equations using a) Picard's method b) Runge-Kutta fourth order method c) Milne's method 2. Applications of Linear Differential Equations to deflection of beams and columns (strut and cantilever problems)			**7 Hrs.**
Unit: 3	**CO: 1,2,3**		
Laplace Transform 1. Definition, transforms of elementary functions, properties of Laplace transform 2. Transforms of derivative and integral 3. Inverse Laplace transform 4. Inverse Laplace transforms by using partial fractions and convolution theorem. **5.** Solution of linear differential equations with constant coefficients by Laplace transform method			**8 Hrs.**
Unit: 4	**CO: 1,3,4**		

Curve Fitting 1. Fitting of curves by Least – square method d) Fitting of Straight lines e) Fitting of Parabola f) Fitting of Exponential curves. 2. Correlation coefficient of bivariate data 3. Lines of Regression of bivariate data	**7 Hrs.**
Unit: 5 **CO: 2,3**	
Probability Distributions 1. Random variable 2. Probability mass function and probability density function 3. Binomial distribution 4. Poisson distribution 5. Normal distribution	**8 Hrs.**
Unit: 6 **CO: 1,2**	
Vector Differentiation 1. Scalar and vector point functions 2. Gradient, Divergence and Curl 3. Directional Derivative, Angle between two surfaces 4. Solenoidal and Irrotational Vector Field.	**8 Hrs.**

Recommended Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1.	Higher Engineering Mathematics	**42**	Dr. B. S. Grewal	Khanna Publishers, Delhi	**2012**
2.	A Text Book of Applied Mathematics Vol. II & III	**6**	P. N. Wartikar & J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	**Reprint 2007**

References Books:

SN	Title	Edition	Author/s	Publisher	Year
1.	Advanced Engineering Mathematics	**10**	Erwin Kreyszig	John Wiley & Sons	**2011**
2.	Advanced Engineering Mathematics	**21**	H. K. Dass	S. Chand & Company Pvt. Ltd, New Delhi	**2014**
3.	A text book of Engineering Mathematics		N. P. Bali, Iyengar	Laxmi Publications (P) Ltd., New Delhi	
4.	Engineering Mathematics		Ravish R Singh and Mukul Bhatt	McGraw Hill Education (India) Private Limited, Chennai.	**2017**
5.	Engineering Mathematics-III (For Civil Engg)		G. V. Kumbhojkar	C. Jamnadas & Co	

Title of the Course:	**MECHANICS OF SOLIDS**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0302**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Engineering Mechanics, Engineering Mathematics

Course Description:

This course offers a complete introduction to solid mechanics, with a focus on the behavior of materials and structures under stress and strain. Students will receive a complete grasp of fundamental concepts such as stress, strain, and material properties, as well as their applications in beam, shaft, and other solid element analysis, through lectures, tutorials, and problem-solving sessions.

Course Learning Objectives:

1. Define and differentiate between stress, strain, and material properties.
2. Solve problems involving stress and strain.
3. Analyze the behavior of circular shafts under torsional loading using the torsion formula.
4. Construct shear force and bending moment diagrams for various beam configurations.
5. Apply SFD and BMD to solve problems involving beam deflections.
6. Derive the flexural formula and calculate bending stress in beams.
7. Analyze the distribution of shear stress in different beam shapes.
8. Apply the work-energy principle to calculate strain energy in various loading scenarios.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Apply fundamental concepts of stress, strain, and material properties to analyze the behavior of solids under various loading conditions.	III	Apply
CO2	Utilize the torsion formula and shear force & bending moment diagrams to design and analyze circular shafts and statically determinate beams.	IV	Analyze
CO3	Determine bending and shear stresses in beams of different cross-sections	V	Evaluate
CO4	Apply the work-energy principle to calculate strain energy stored in materials due to axial and bending loads.	III	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	0	1	0	0	1	1	3
CO2	3	2	3	3	3	0	1	0	0	1	1	3
CO3	3	2	3	3	3	0	1	0	0	1	1	3
CO4	3	0	3	3	3	0	0	0	0	1	1	3

CO	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial / Assignment /Declared test / Quiz / Seminar / Open Book Test / Surprise Test etc.
- MSE: Assessment is based on 50% of course content
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit: 1	**CO: 1**	

Unit 1: Simple Stress and Strain — **10 Hrs.**

- Understanding mechanical properties of materials.
- Concepts of stress and strain.
- Hooke's Law
- Different types of stresses: shear stress, temperature stress.
- Elastic constants defining a material's elastic behavior.
- Stress-strain behavior of mild steel, tor steel.
- Various structural sections (simple, compound, composite) under loading.

Unit: 2	**CO: 2**	

Unit 2: Analyzing Twisted Shafts — **06 Hrs.**

- Behaviour of circular shafts (solid / hollow) under twisting force (torque).
- Torsion formula
- Calculating power transmission through shafts.

▪ Comparing designs of different shafts			
Unit: 3	**CO: 2**		

Unit 3: Understanding Beams under Static Loads
• Concepts of shear force diagrams (SFD) and bending moment diagrams (BMD) for beams under static loads.
• Analyzing beams with concentrated forces, couples, distributed loads.
• Applying SFD and BMD to solve problems involving various beam configurations:
  o Simply supported beams
  o Cantilever beams
  o Overhanging beams
  o Compound beams
			08 Hrs.

Unit: 4	**CO: 3**	**PO:**	**PSO:**
Unit 4: Bending Stress in Beams • Concept of Pure bending • Flexural formula • Moment of resistance • Problems for bending stress analysis in different beam shapes.			**08 Hrs.**
Unit: 5	**CO: 3**		
Unit 5: Shear Stress in Beams • Concept of Shear stress • Formula for shear stress in beams. • Understanding shear stress distribution in different beam shapes • Relationship between maximum and average shear stress for various shapes. • Problems for shear stress analysis in different beam shapes.			**07 Hrs.**
Unit: 6	**CO: 4**		

Unit 6: Strain Energy Concepts	**06 Hrs.**
• Work-energy principle • Strain energy stored in a material due to different axial loading (gradual, sudden, impact). • Strain energy caused by axial stresses and bending moments.	

Recommended Textbooks:

1. Mechanics of Structure (Vol. I and II), Dr. H. J. Shaha and Junnarkar S.B., Charotar Publication.
2. Strength of Materials, S Ramamrutham, Dhanapat Rai Publications.
3. Strength of Materials, Bhavikatti S.S., New Age Publications.
4. Strength of Materials, R. K. Rajput., S. Chand Publications.
5. Strength of Materials, R. K. Bansal., Laxmi Publications

References Books:

1. Strength of Material, F. L. Singer and Pytel, Harper and Row publication.
2. Introduction to Mechanics of Solids, J.B. Popov, Prentice – Hall publication.
3. Mechanics of Materials, Gere and Timoshenko, CBS publishers.
4. Mechanics of Materials, R.C. Hibbler, Pearson Education.

Title of the Course:	**MODERN SURVEYING**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0303**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic Civil Engineering, Geometry and trigonometry.

Course Description:

The course mainly deals with the initial work in Construction of any work, Surveying. It involves in finding the Horizontal Positions and vertical positions of objects on the surface of the Earth. The Course builds on the principles of Traditional methods and uses modern tools and Techniques for Surveying.

Course Learning Objectives:

1. To learn Direct and indirect methods of Surveying for distance and elevation calculations.
2. To determine surveying of larger Area by method of triangulation, as in geodetic Surveying.
3. To perceive higher methods of surveying using digital technology such as total station, DGPS and GIS and other contemporary Techniques.

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Use basic principles of Survey to classify and conduct survey & Levelling work using traditional and modern instruments.	1	Cognitive
CO2	Apply Theodolite, Tacheometer & Total station Instrument knowledge for various direct and indirect measurements and Traversing.	3	Cognitive
CO3	Acquire Knowledge of traditional Survey of the G.T.S for large Area Survey using Triangulation.	2	Cognitive
CO4	Apply modern tools of RS, GIS, GNSS, drone for Surveying measurements	3	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	2	-	-	-	-	-	-	2
CO2	1	2	-	-	2	-	-	-	-	-	-	2
CO3	3	-	-	-	-	-	-	-	-	-	-	2
CO4	1	2	-		2	-	-	-	-	-	-	2

CO	PSO1	PSO2	PSO3
CO1	-	1	-
CO2	-	1	-
CO3	-	1	-
CO4	-	1	-

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Assignment/Declared test etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit: 1	**CO: 1**		

Surveying & Levelling: **8 Hrs.**

Introduction, Basic Principle of Surveying, Classification of Survey-based on Instrument, Scale, purpose and place.
Types of levels- components, working and use of dumpy, tilting, auto, digital and laser level.

Types of leveling, balancing of D.L, Reciprocal Levelling, objectives and applications, Temporary Adjustments.
Contouring- Definition, characteristics contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring.

Unit 2:	**CO: 2**		

Theodolite Surveying & Traversing: Theodolite- parts and technical terms, temporary and permanent of a transit Theodolite, Electronic Theodolite. Uses of Theodolite- measurement of horizontal angle-direct angle, methods of repetition and reiteration, vertical angle, prolongation of a straight line, extending a line, measuring magnetic bearing of a line, Theodolite Traversing. Trigonometrically levelling using theodolite-Problems on single-plane and double plane.			**8 Hrs.**
Unit: 3	**CO: 2**		
Tacheometry: Principles, suitability, methods of Tachometry to determine horizontal distances and elevations of points. Contouring by Tachometry. Electronic distance measurements – Principle, evolution and use of EDM's and Total station.			**7 Hrs.**
Unit: 4	**CO: 3**		
Geodetic Surveying: History of Great Trigonometric Survey, Triangulation Principle, Classification of system, Selection of station, Base line Measurement. Signals and towers, Phase correction, Satellite station, Reduction to center, angular observations.			**7 Hrs.**
Unit: 5	**CO: 4**		
Aerial Photogrammetry: Technical Terms, Types of photogrammetry, Scale of vertical photographs, Flight planning and mosaic. Use of UAV (drones) in aerial mapping. Stereoscopy and photo Mosaicing and Visual interpretations.			**6 Hrs.**
Unit: 6	**CO: 4**		
RS, GIS and GNSS: Remote sensing- Definition, relevance, types, electromagnetic radiation and spectrum, energy sources and its characteristics, image acquisition, applications. GNSS- Basic principles, GNSS systems of different countries, GPS segments, receivers, Types of GNSS systems, applications, DGPS -basic fundamentals, principle and working. GIS- Terminology, advantages, basic components of GIS, data types, applications.			**6 Hrs.**

Recommended Textbooks:

1. N.N.Basak, Surveying and Leveling, Tata McGraw Hill Publications, 1st Edition.
2. B C Punmia, Surveying and Leveling, Vol I & II, Laxmi Publications.
3. Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.

References Books:

1. Surveying for Engineers-John Uren & Bill Price—Palgrave Macmillan
2. Plane Surveying----A.M. Chandra---- New Age International Publishers
3. Surveying Vol. I ---- Dr.K. R. Arora
4. Surveying: Theory and Practice --- James M. Anderson, Edward M. Mikhail
5. Plane and Geodetic surveying for Engineers. Vol. I -- David Clark

Title of the Course:	**BUILDING CONSTRUCTION AND SERVICES**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0304**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic Civil Engineering

Course Description:

Students will have knowledge about building Construction and its components with respect to climate, Planning principles, Bye laws, materials, services and finishes

Course Learning Objectives:

1. To study Building construction and statutory provisions
2. To apply National Building Code Provisions for Buildings

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Describe building construction components and material with reference to climate and bye laws	2	Understand
CO2	Apply provisions of national building code for building Services	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	1	-	-	-	2	2
CO2	2	1	-	-	-	3	2	2	-	-	2	2

CO	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	2	-	3

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE1and ISE 2 is based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% weight age for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit: 1	**CO: 1**	
Building site selection criteria and ergonomics. Indian Climate and building orientation based on sun path comfort parameters. General Principles of planning and related bye laws (UDCPR 2020)		**8 Hrs.**
Unit: 2	**CO: 2**	
Building Components and its Construction Process Types of building structure: Load bearing, Framed and composite. Building Construction Stage wise process. Building Components and types: Foundation, Floors, Door and window, Roof, Stair case, masonry, Partition wall.		**8 Hrs.**
Unit: 3	**CO: 1**	

Building Materials Following building materials with its use and physical, thermal properties to suit comfort conditions: stone, aggregate fine and coarse, bricks and blocks, wood, glass, steel and its types, concrete and mortar, floor, roofing and miscellaneous-aluminum, composite material, plastic and admixtures.		**5 Hrs.**
Unit: 4	**CO: 2**	
Building ventilation and electrification (as per national building code) Types of ventilations: passive and active systems, air change per hour. Air-conditioning, Principle, types, components. Types of electrification system, flow diagram from source to end user, Earthling.		**8 Hrs.**
Unit: 5	**CO: 2**	
Plumbing and Sanitation Services (as per national building code) Plumbing systems for potable, hot and cold water. types of traps, fittings, chambers, septic tank and soak pit, concept of plumbing layout, Design of water tank and septic tank. Rain water harvesting (storage and groundwater recharge), Introduction to firefighting and fire hydrant system (Internal and External).		**8 Hrs.**
Unit: 6	**CO: 2**	
Building Finishes and Design Plastering, Pointing and its various techniques, types of wall cladding and its properties (glazing and stone claddings), skirting, dado work, POP, gypsum plaster, fall ceilings, paints etc. Waterproofing treatment (Sunk slabs, walls, balcony and terrace), Anti-termite treatment.		**8 Hrs.**

Recommended Textbooks:

6. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
7. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
8. Civil Engineering Drawing – M. Chakraborty.
9. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)

10. A Course in Civil Engineering Drawing – V.B. Sikka (S.K. Kataria and Sons)
11. Engineering Materials – R.K. Rajput (S. Chand)
12. A to Z of Practical Building Construction and Its Management- Sandeep Mantri. (Satya Prakashan, New Delhi)

References Books:

5. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
6. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
7. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P)ltd.
8. Unified Development Control Promotion Regulation (UDCPR), 2020

Title of the Course:	**ENVIRONMENTAL STUDIES**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVVE0305**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Students must have basic idea about Environmental Problems .

Course Description:

This course will help the students to understand the importance and seriousness of environmental problems.

Course Learning Objectives:

At the end of the course, students will

1. Understand the importance of Ecology, Environment, Environmental Ethics and role of humans.
2. Understand the Natural Resources and Associated Problems.
3. Describe the importance of environmental resources and its conservation.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Explain the importance of Ecology, Environment and role of humans.	2	Understand
CO2	Discuss how Natural Resources and Associated Problems are.	2	Understand
CO3	Identify the measures for Environmental resources management.	3	Apply
CO4	Identify and give engineering solution to social issues and the environment	4	Analyze

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	2	-	-	1	1	2
CO2	-	-	-	-	-	2	2	-	-	1	1	2
CO3	-	-	-	-	-	3	3	-	-	1	1	2
CO4	-	-	-	-	-	2	2	-	-	1	-	2

CO	PSO1	PSO2	PSO3
CO1	-	1	1
CO2	-	-	1
CO3	-	-	1
CO4	-	1	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), having 40 %, 60% weights respectively.

Assessment	Marks
Component 1	10
Component 2	15

- Component 1 - is based on Lab/Experiment/Practical performed
- Component 2 - is a Survey Field Project based on problem statement and Office Work.

Course Contents:

Unit: 1	**CO:1**	
Nature of Environmental Studies: Definition, scope and importance. Multidisciplinary nature of environmental studies. Need for public awareness.		**5 Hrs.**

Unit: 2	**CO: 1,2**	
Natural Resources and Associated Problems: a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and non-		**5 Hrs.**

renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. f) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. g) Role of individuals in conservation of natural resources			
Unit: 3	**CO: 1,3**		
Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Types, characteristics features, structure and function of **any one** of the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).			**4 Hrs.**
Unit: 4	**CO: 1**		
Introduction and Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation. Ghat as a biodiversity region. Hot-spot of biodiversity. Threats to biodiversity. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.			**5 Hrs.**
Unit: 5	**CO: 1,3,4**		
Environmental Pollution: Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Role of a individual in prevention of pollution			**5 Hrs.**
Unit: 6	**CO: 2,3,4**		

Social Issues and the Environment: Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions.	**6 Hrs.**

Recommended Textbooks:

1. Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net (R)
3. Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4. Clank R.S. Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
6. De A.K., Environmental Chemistry, Wiley Wastern Ltd.
7. Down to Earth , Centre for Science and Environment , New Delhi.(R)
8. Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H.& Watson, R.T.1995, Global Biodiversity Assessment, Cmbridge Univ. Press 1140p.
11. Jadhav, H.and Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
12. Mickinney, M.L.and School. R.M.1196, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
13. Miller T.G. Jr., Environmental Science. Wadsworth Publications Co.(TB).
14. Odum, E.P.1971, Fundamentals of Ecology, W.B.Saunders Co. USA, 574p.

References Books:

1. Rao M.N.and Datta, A.K.1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd., 345p
2. Sharma B.K., 2001, Environmental Chemistry, Gokel Publ. Hkouse, Meerut
3. Survey of the Environment, The Hindu (M)
4. Townsend C., Harper, J. and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
5. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I and II, Environmental Media (R)
6. Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science

Publications (TB)
7. Wagner K.D.,1998, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p.
8. Paryavaran shastra – Gholap T.N. 23. Paryavaran Sahastra – Gharapure (M) Magazine (R) Reference (TB) Textbook

Title of the Course:	**ENGINEERING ECONOMICS**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVEM0306**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Basic engineering concepts, Engineering Management, Basic mathematics

Course Description:

This course provides a comprehensive introduction to the principles of engineering economics and management, equipping students with essential skills for making informed decisions in engineering projects. The curriculum covers fundamental concepts such as time value of money, cash flow analysis, and cost estimation. Students will explore various economic evaluation techniques, including net present value and internal rate of return, to assess the financial viability of engineering projects.

Course Learning Objectives:

1. Apply time value of money concepts to economic analysis.
2. Select the appropriate economic comparison method for different scenarios.
3. Apply the rate of return method to economic comparisons.
4. Apply inventory control techniques to engineering projects.
5. Apply statistical methods for quality control.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand economic principles and time value of money concepts to identify the most feasible option for engineering projects.	2	Understand
CO2	Assess inventory control effectiveness for optimized resource management in engineering applications	3	Apply
CO3	Critically evaluate and select the most appropriate economic comparison method for various engineering project scenarios.	5	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	--	--	1	--	--	--	--	--	2	1
CO2	2	2	--	--	1	--	--	--	--	--	2	1
CO3	3	2	--	--	1	--	--	--	--	--	2	1

CO	PSO1	PSO2	PSO3
CO1	--	--	1
CO2	1	1	2
CO3	-	-	1

Assessments:

Teacher Assessment:

Assessment	Marks
ESE	50

ESE: Assessment is based on 100% course content

Course Contents:

Unit: 1	**CO: 1**	
Engineering Economics: Introduction, Importance, Time value of Money, Mathematics of Interest – present worth, future sum, uniform series factors		**04 Hrs.**
Unit: 2	**CO: 3**	
Economic Comparisons: Equivalent Annual Cost Method, Present Worth Method,		**08 Hrs.**
Unit: 3	**CO: 3**	
Economic Comparisons: Future Worth Method, Capitalized Cost Method, Net Present Value.		**06 Hrs.**

Unit: 4	**CO: 3**	
Economic Comparisons: A.Rate of Return Method, Pat-Back Method, Benefit Cost Ratio B. Break Even Analysis		**06 Hrs.**
Unit: 5	**CO: 2**	
Resource Management: Material Management – Objectives, Functions Inventory Control – Necessity, Techniques such as ABC, EOQ, Safety Stocks.		**06 Hrs.**

Recommended Textbooks:

1. Quantitative Techniques in Management – Vol. I, L.C.Zhamb
2. Material Management – Gopal Krishnan, Sdueshan
3. Executive Decisions & Operation Research by Miller and Stars, Prentice Hall of India, Publisher.
4. Principles of Construction Management by Roy Pilcher.
5. Project Cost Control in Construction by Roy Pilcher.
6. Projects by Prasanna Chandra
7. Management and Engineering Economics by G.A.Taylor.
8. Engineering Economics – Layland Blank and Torquin.
9. Engineering Economics by Pannerselvam

References Books:

1. John L.Ashford, "The Management of Quality in Construction ", E & F.N Spon, New York, 1989.
2. Juran Frank, J.M. and Gryna, F.M. " Quality planning and Analysis ", Tata McGraw Hill, 1982.
3. James, J.O Brian, "Construction Inspection Handbook - Quality Assurance and Quality Control ", Van Nostrand, New York, 1989.

Title of the Course:	**MODERN SURVEYING LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0331**		**-**	**2**	**1**

Course Pre-Requisite:

Basic maths, trigonometry, basic sciences, Basic Civil Engineering.

Course Description:

The course mainly deals with Experiments, field work, methods and instruments for the Surveying work with focus on finding the positions of objects on the surface of the Earth using direct & indirect methods of surveying. Significance of Great Trigonometric Survey performed 200 years is also learnt & acknowledged. The course lays emphasis on modern/Digital methods and techniques.

Course Learning Objectives:

1. To learn direct and indirect and speedy method for distance and elevation measurements and calculations.
2. To prepare for use of modern Engineering Tools for small and for Larger Areas as well.
3. To perceive higher methods of surveying using contemporary Techniques.

Course Outcomes:

CO	After the completion of the course the student should be able to:	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Utilize different Leveling Instruments to prepare Contours and Office Drawing work.	3	Cognitive
CO2	Carry out Traversing by Theodolite and DGPS and Angle Measuring Instruments	3	Cognitive
CO3	Handle Advanced Digital Instrument Tacheometer & Total station for precise work.	3	Cognitive
CO4	Apply advanced technology & technique of DGPS/Drone and satellite data tool of small and Large Area measurement.	3	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	-	-	-	2	2	-	2
CO2	3	2	2	2	3	-	-	-	2	2	-	2

CO3	3	2	-	-	3	-	-	-	-	-	-	2
CO4	3	2			3	-	-	-	-	-	-	2

CO	PSO1	PSO2	PSO3
CO1	1	2	-
CO2	1	2	-
CO3	1	2	-
CO4	1	2	-

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), having 30%, 70% weights respectively.

Assessment	Marks
Component 1	10
Component 2	15

- Component 1 - is based on Lab/Experiment/Practical's performed
- Component 2 - is a Survey Field Project based on problem statement and Office Work of calculations and Drawings.

Course Contents:

Expt. No.	**Component 1: LAB based Experiments (30% weightage)**	**CO:**
1	Differential Levelling	CO1
2	Theodolite Angle measurement –Horizontal, Vertical angles.	CO2
3	Tacheometry- Determination of grade of a given line	CO3
4	Total station - Measuring distance, angle, vertical Intercept & R.L	CO3
5	Total station – Crating Job & Measuring Coordinates – N,E & Z	CO3
6	Use of GNSS system to measure and map waypoints and integrate in Google earth.	CO4

No		Component 2: Survey Project (70% weightage)	CO:
1a	Field Work	Road Project (500 m to 1 km. Length) (using Auto Level & Total station) **(15%)**	CO1, CO3
1b	Office Work	Longitudinal Section & Cross Section Drawing **(20%)**	CO1
2a	Field Work	Closed Traverse & Radial Tachometry Project (using Theodolite, DGPS & Total station) **(15%)**	CO2, CO4
2b	Office Work	Contour & Traverse Sheet **(20%)**	CO1

Recommended Textbooks:

1. Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.
2. B C Punmia, Surveying and Leveling, Vol I & II, Laxmi Publications.
3. N.N. Basak, Surveying and Leveling, Tata McGraw Hill Publications, 1st Edition

References Books:

1. Surveying for Engineers-John Uren & Bill Price—Palgrave Macmillan
2. Plane Surveying----A.M. Chandra---- New Age International Publishers
3. Surveying Vol. I & II ---- Dr.K. R. Arora
4. Surveying: Theory and Practice --- James M. Anderson, Edward M. Mikhail

Title of the Course:	**MECHANICS OF SOLIDS LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0332**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Engineering Mechanics, Engineering Mathematics

Course Description:

This course gives students hands-on experience with the mechanical behavior of diverse materials using laboratory experiments. Students will obtain practical experience with material qualities and testing processes utilized in engineering applications.

Course Learning Objectives:

1. Explain the principles and methodologies behind various mechanical tests used to characterize material properties.
2. Safely operate and perform calibrations on the Universal Testing Machine (UTM) and other laboratory equipment.
3. Analyze and interpret experimental data to determine mechanical properties of materials like tensile strength, Young's modulus, and hardness.
4. Correlate the observed mechanical properties of materials with their suitability for various engineering applications.
5. Communicate experimental findings and interpretations effectively through written lab reports and presentations.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Demonstrate proficiency in operating the Universal Testing Machine (UTM) and other relevant lab equipment.	III	Apply
CO2	Analyze experimental data to determine key mechanical properties of various materials.	IV	Analyze
CO3	Relate the observed mechanical properties of materials to their suitability for different engineering applications.	V	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	0	0	2	3	0	1	0	0	1	2	0
CO2	3	3	0	2	2	0	2	0	0	2	2	3
CO3	1	1	3	1	2	3	3	1	3	3	1	3

CO	PSO1	PSO2	PSO3
CO1	3	1	2
CO2	3	3	2
CO3	3	3	3

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE)

Assessment	Marks
ISE	25
ESE OE	25

- ISE: Assessment is based on Experiment Performance/ Assignment /Quiz/ Group Discussions etc.
- ESE: Assessment is based on the oral examination in front of an external examiner.

Course Contents:

Attempt any Eight Experiments

1. Study of Universal Testing Machine
2. Tensile test on Mild steel and Tor steel.
3. Compression test on M.S. and Cast Iron.
4. Compression test on timber.
5. Direct shear test on different metals.
6. Charpy or Izod Impact test on different metals.
7. Bending test on M.S. bar.
8. Water absorption and compression test on burnt bricks.
9. Hardness test on metals.
10. Torsion test Mild steel.

Recommended Textbooks:

1. Mechanics of Structure (Vol. I and II), Dr. H. J. Shaha and Junnarkar S.B., Charotar Publication.
2. Strength of Materials, S Ramamrutham, Dhanapat Rai Publications.
3. Strength of Materials, Bhavikatti S.S., New Age Publications.
4. Strength of Materials, R. K. Rajput., S. Chand Publications.
5. Strength of Materials, R. K. Bansal., Laxmi Publications

References Books:

1. Strength of Material, F. L. Singer and Pytel, Harper and Row publication.
2. Introduction to Mechanics of Solids, J.B. Popov, Prentice – Hall publication.
3. Mechanics of Materials, Gere and Timoshenko, CBS publishers.
4. Mechanics of Materials, R.C. Hibbler, Pearson Education.

Title of the Course:	**COMPUTER AIDED DRAFTING LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0333**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Basic Civil Engineering

Course Description:

This course aims to develop drafting skills on Computer aided platform for developing Construction drawings to be issued for execution

Course Learning Objectives:

Objectives is to draft construction components with industry standard templates

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Demonstrate ability to use Computer aided application for drafting Civil engineering components	2	Understand
CO2	Develop Construction drawings that will be released for execution	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	1	1	1	3	2	0	1	0	2	0	2
CO2	1	2	2	1	3	3	0	1	2	3	0	3

CO	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	3	2	2

Assessments:

Teacher Assessment:

ISE 50 Marks

Assessment will be done on the basis of drawings assigned during practical hours. Rubrics of ISE shall include

1. Drafting skill
2. Timely completion
3. Engineering details from drawing
4. Presentation skills

Course Contents:

The students need to complete the drafting assignment listed below on the Computer Aided Applications

1. Group Site Visit to study construction of different building components (All components in the substructure and superstructure mentioned in report: photograph, shuttering and scaffolding details, reinforcement, materials used, construction process and standard sizes.
2. Types of Footings: Isolated, Combined, Raft, Pile with Reinforcement details.
3. Types of Staircases: design and drawing of dog-legged, Open Well, Bifurcated, quarter-turn, and fire escape with reinforcement details.
4. Openings: wooden Panelled door and window, other door types.
5. Plumbing fittings and fixtures: types of water closet, types of traps, their use according to location/fixture (P,Q and S trap, bottle trap, nahani trap, gully trap , inspection chambers manhole), UGWT and OHWT tanks, septic tank Conventions, piping system(one pipe and two pipe system).
6. Lift duct, lift pit and machine room with cross section.
7. Prepare a submission **drawing** for a G+1 residential building, including site plans, floor plans, section and elevation plumbing layouts. Submit the drawings in CAD submission drawing format along with a written report explaining the process, the planning principle used as per UDCPR .

Title of the Course:	**INNOVATIVE PRACTICES & LEARNING –I LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVEL0371**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

A willingness to learn and experiment with new tools and techniques.

Course Description:

This course introduces students to design thinking and prototyping fundamentals, focusing on idea generation, problem-solving, and hands-on prototyping techniques. Through practical exercises, students develop skills in generating and validating ideas, understanding user needs, and utilizing prototyping tools such as 3D printing and laser cutting to create innovative solutions.

Course Learning Objectives:

1. To learn idea generation and testing techniques.
2. To understand problem-solving methods from a design perspective.
3. To gain practical experience in building prototypes using various tools and technologies.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	To illustrate an ability to explore innovative thinking	2	Understand
CO2	To demonstrate a prototype based on innovative learnings	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	--	--	2	--	--	--	--	2	--	--
CO2	1	2	1	2	2	--	--	1	2	1	--	--

CO	PSO1	PSO2	PSO3
CO1	3	1	--
CO2	1	2	--

Assessments :

Teacher Assessment:

1. One component of In Semester Evaluation (ISE)

Assessment	Marks
ISE	50

2. ISE: Assessment is based on Experiment Performance/ Assignment /Quiz/ Group Discussions etc

Course Contents:

Activity: 1			
Assignment on introduction to ideation, idea validation, design thinking concept & human cantered design.			**8 Hrs.**
Activity: 2			
Prepare a sample component to understand handling various equipments & software to develop prototype.			**10 Hrs.**
Activity: 3			
Develop physical prototype using technologies such as 3D printing, laser cutting machine, CNC router , 3D scanner etc.			**12 Hrs.**

Title of the Course:	**BASICS OF PROJECT AND AUTOMATION**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVMM0341**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Basic Civil Engineering

Course Description:

Course is designed to understand the basics of engineering project and role of automation in processes.

Course Learning Objectives:

Objective of this course is to identify opportunities to automate processes in Projects at various phases from concept to operations.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Characterize basics of a project phases and Life cycle	II	Understand
CO2	Associate opportunities for automation in project phases	II	Understand

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	2	1	3	0	3	3	2	3	3
CO2	2	2	3	3	3	0	1	3	3	3	1	0

CO	PSO1	PSO2	PSO3
CO1	3	2	3
CO2	3	3	3

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE1and ISE 2 are based on assignments/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first two Units), It may include drawings and Multi choice questions
- ESE: Assessment is based on 100% course content with 60-70% weight age for course content (Normally two Units) covered after MSE. It may include drawings and Multi choice questions

Course Contents:

Unit: 1	**CO: 1**	
Project Basics: Definition, Characteristics, Parameters affecting Project, lifecycle Phases of Project, Project Stakeholders, Resources, Scope & Responsibility matrix		**Hrs. 06**
Unit: 2	**CO: 1**	
Project Components and its Workflow Types of Projects, Work breakdown structure of Project, , Introduction to project cost , Value stream, Project sustainability, Financial statements (balance sheet, Cash flow) in Projects		**Hrs. 10**
Unit: 3	**CO: 2**	
Need for Automation SWAT analysis for a project, Activity-Resource allocations analysis, Value stream mapping, Productivity measurement, Reason for automation, Impact of automation		**Hrs. 08**
Unit: 4	**CO: 2**	

Automation strategies Technology strategy, Competitive strategy, scope of strategy, dept of technology, organizational fit, Introduction to digitization, IoT, Integrate systems, BIM, Prefab, robotics, AI and ML, Hyperutomation	**Hrs.** **06**

References Books:

1. Modern Construction Management by Frank Harris , Ronald Mccaffer
2. Modern Construction Lean Project Delivery and integrated Practices (Industrial Innovation) by Lincoln H. Forbes & Syed M. Ahmed.
3. Mahbub, R. Automation and robotics in construction. Manchester: UMIST
4. Warszawski, Abraham. Application of robotics to building construction. Rotterdam, The Netherlands: International Council for Building Research Studies and Documentation

Title of the Course:	**INTRODUCTION TO DATA SCIENCE**	**L**	**T**	**P**	**Credit**
Course Code:	**UCEMM0341**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Students shall have the knowledge of:

- Python
- Ms-Office

Course Description:

This syllabus covers the fundamentals of Data Science, including its purpose in various sectors and the role of Python. It delves into data collection, analytics processes, exploratory analysis, feature generation and selection, visualization principles, ethical considerations, and applications in environmental engineering. Practical exercises and industry examples are included.

Course Learning Objectives:

1. To interpret Python's role and components in Data Science applications.
2. To interpret conclusions and predictions derived from data analytics effectively..
3. To explain user retention concepts and feature roles in applications.
4. To analyze ethical implications, including privacy and security, in data science.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand the purpose of Data Science.	II	Understand
CO2	Interpret the conclusions based on data analytics.	II	Understand
CO3	Summarize the methods of data extraction	II	Understand
CO4	Identify the impact and potential of data science in solving real-world problems.	III	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1										1
CO2		1		2						1		
CO3		1			2					1		1
CO4					2			1		1		2

CO	PSO1	PSO2	PSO3
CO1			
CO2		1	
CO3			
CO4		1	

Assessments:

Teacher Assessment:

Assessment	Marks
ESE	100

- ESE: Assessment is based on 100% course content.

Course Contents:

Unit: 1		
Introduction: Introduction to Data Science, Different Sectors using Data science, Purpose and Components of Data Science. Data collection from different sources		**Hrs. 07**
Unit: 2		
Data Analytics Data Analytics Process, Knowledge Check, Exploratory Data Analysis (EDA), EDA Quantitative technique, EDA- Graphical Technique, Data Analytics Conclusion and Predictions		**Hrs. 07**
Unit: 3		
Data Extraction Feature Generation and Feature Selection (Extracting Meaning from Data)- Motivating application: user (customer) retention- Feature Generation (brainstorming, role of domain expertise, and place for imagination)- Feature Selection algorithm		**Hrs. 07**
Unit: 4		

Data Visualization: Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects- Exercise: create your own visualization of a complex dataset. Applications of Data Science, Data Science and Ethical Issues- Discussions on privacy, security, ethics- A look back at Data Science- Next-generation data scientists. Applications in environmental engineering	**Hrs.** **09**

Text Books:

1. Joel Grus, Data Science from Scratch, Shroff Publisher Publisher /O'Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Numsense! Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly Publisher Media.

References Books:

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.
2. Jake VanderPlas, Python Data Science Handbook, Shroff Publisher Publisher /O'Reilly Publisher Media
3. Philipp Janert, Data Analysis with Open Source Tools, Shroff Publisher Publisher /O'Reilly Publisher Media

Title of the Course:	**INTRODUCTION TO MANAGEMENT**	**L**	**T**	**P**	**Credit**
Course Code:	**UCEMM0342**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Students shall have the knowledge of Basics of Communication Skills

Course Description:

This course provides basic understanding of management and organizational behavior. It covers the basic concepts, scope, and importance of management, examining various management schools of thought and the contributions of key thinkers like Taylor and Fayol. It covers the functions of management, leadership concepts, decision-making processes, and organizational behavior models. Additionally, it delves into personality development, motivation theories, group dynamics, stress management, and maintaining work-life balance.

Course Learning Objectives:

1. To learn management functions' concept, nature, and significance accurately.
2. To understand decision-making's importance, process, and associated methodologies thoroughly.
3. To explain Organizational Behavior's definition, significance, and core concepts comprehensively.
4. To relate motivation theories such as Maslow's and Herzberg's.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand the concept, nature, and importance of management functions	II	Understand
CO2	Outline the importance and process of decision-making	II	Understand
CO3	Illustrate the definition, importance, and scope of Organizational Behavior (OB) and its fundamental concepts	II	Understand
CO4	Explain motivation theories like Maslow's hierarchy and Herzberg's theory	II	Understand

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1		1								1	3	
CO2		1							1		3	
CO3		1				1	1		1		3	
CO4		1					1				3	

CO	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Assessments:

Teacher Assessment:

Assessment	Marks
ESE	100

- ESE: Assessment is based on 100% course content.

Course Contents:

Unit: 1		

Introduction: Basic concepts of management- Definition, Need and Scope Different schools of management thought- Behavioral, Scientific, Systems, and Contingency Contribution of Management Thinkers- Taylor, Fayol, Elton Mayo Functions of Management – Concept, Nature, Importance, Steps and Limitations.	**Hrs.** **07**

Unit: 2		

Leadership: Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid. Decision making: Concept, Nature, Importance, and Process. Types of	**Hrs.** **07**

decisions. Problems in decision making.		
Unit: 3		
Introduction to Organizational Behaviour: Definition, Importance, Scope, Fundamental Concepts of OB, Different models of OB - autocratic, custodial, supportive, collegial and SOBC Personality & Attitudes: Meaning of personality, attitude - Development of personality – Attributes of personality- Transactional Analysis – Ego states – Johari window - Nature and dimensions of attitude – Developing the right attitude		**Hrs. 07**
Unit: 4		
Motivation: Definition, Importance, Motives, Characteristics Classification of motives - Primary & Secondary motives. Theories of Motivation - Maslow's Theory of need hierarchy - Herzberg's theory. Morale - Definition and relationship with productivity - Morale Indicators. Group Dynamics and Team building: Concept of Group & Team. Theories of Group Formation - Formal and Informal Groups. Importance of Team building. Stress management: Definition, Causes, Managing stress, Stress as a motivator. Work life balance		**Hrs. 09**

Text Books:

1. Organizational Behaviour, 9th Ed. - Stephen Robbins
2. Essentials of Management – Koontz – TMGH –
3. Principles & Practices of Management – Saxena
4. Management Concepts & Practices – Hannagan

References Books:

1. Kotter, J. P. (1999). "What Effective General Managers Really Do," Harvard Business Review, March–April 1999, pp. 145–159.,
2. Hannaway, J. (1989). Managers Managing: The Workings of an Administrative System. New York: Oxford University Press, P. 39.,
5. Eccles, R. G. & Nohria, N. (1992). Beyond the Hype: Rediscovering the Essence of Management. Boston: The Harvard Business School Press, p. 47.

S. Y. B. Tech
Semester - IV

Academic Year 2024-2025

Title of the Course:	**CONCRETE TECHNOLOGY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0401**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Basic Civil Engineering

Course Description:

This course broadly encompasses the study of properties of ingredients of concrete, design of concrete mix, production of concrete and various concreting operations. Cementing material is the vital component of the concrete, hence study of process of manufacturing of cement, types of cement and their properties are covered in this course. Study of properties of aggregates and water also finds their due coverage in the course. Process of concrete production and concreting operations also forms an essential component of the course.

Course Learning Objectives:

1. To explain the important engineering properties of Concrete materials.
2. To explain the behavior of Fresh and harden concrete.
3. To explain the behavior of special concrete
4. To explain the Concrete mix design

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Identify the functional role of ingredients of concrete and apply fundamental knowledge in the fresh and hardened properties of concrete.	3	Identify/ Apply
CO2	Evaluate the effect on concrete by its service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non-Destructive Testing of concrete structure	5	Evaluate
CO3	Develop an awareness of the utilization of different materials as novel innovative materials for use in special concrete	6	Develop
CO4	Design the concrete mix which fulfills the required properties for fresh and hardened concrete	6	Design

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	2	2	-	-	-	1	-	-	2
CO2	2	2	3	-	3	-	-	-	1	2	-	-
CO3	-	2	-	2	3	-	-	-	2	3	-	2
CO4	-	2	-	-	3	-	2	-	2	2	-	-

CO	PSO1	PSO2	PSO3
CO1	1	2	2
CO2	1	2	2
CO3	1	2	2
CO4	1	2	2

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and One End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% Weightage for course content (Normally last three Units) covered after MSE

Course Contents:

Unit: 1	**CO:1**	
Concrete Materials **Cement** - Ordinary Portland, Portland Pozzolana, chemical composition,		**05 Hrs.**

grade of cement, hydration, tests for cement, fineness, soundness, compressive strength, setting time **Aggregates** - Classification, requirements, size, shape, texture, Tests for coarse aggregates: specific gravity, grading of aggregate, Flakiness index, Elongation Index, Impact value, abrasion value, crushing value, alkali aggregate reaction. **Tests for fine aggregates** - specific gravity, sieve analysis, fineness modulus, bulking of sand, Manufactured sand **Water** - General requirements, quality of water			
Unit: 2	**CO:1**		
Fresh Concrete: Workability, factors affecting, measurement of workability, different tests for workability, segregation, bleeding, process of manufacture of concrete - batching, mixing, transportation, compaction, curing of concrete, curing methods, **Admixtures in concrete**: Air entraining agents, plasticizer and super plasticizer, accelerators, retarders, workability agents. Mineral admixtures: fly ash, silica flumes, Ground Glass Blast Furnace Slag, Metakoline			**05 Hrs.**
Unit: 3	**CO: 1,2**		
Hardened Concrete - Strength of concrete, w/c ratio, gel/space ratio, gain of strength with age, maturity concept of concrete, effect of maximum size of aggregate on strength, relation between compressive and tensile strength, factors affecting modulus of elasticity, definition and factors affecting creep and shrinkage.			**05 Hrs.**
Unit: 4	**CO: 2**		
Durability of concrete – Strength and durability relationship, effect of w/c on durability, different exposure condition as per IS 456 minimum and maximum cement content, effect of permeability, sulfate attack, methods of controlling sulfate attack. Durability of concrete in sea water, Test on hardened concrete - flexural strength, comparison of cube test and cylinder test, Schmidt's rebound hammer, Ultrasonic pulse velocity method			**05 Hrs.**
Unit: 5	**CO: 3**		

Special Concrete – Light weight concrete, no-fines concrete, high density concrete, fiber reinforced concrete, self-compacting concrete, high strength concrete, high performance concrete, manufacturing of ready mix concrete, cold weather concreting, hot weather concreting, pavement quality concrete, Green concrete, Testing of special concrete for various properties	**03 Hrs.**
Unit: 6 **CO: 4**	
Concrete Mix Design - Objectives of mix design, different methods of mix design, factors affecting mix proportions, quality control of concrete, statistical methods, acceptance criteria as per IS 456, Numerical on mix design by ACI 211.1-91, IS 10262- 2009. Mix design of fly ash concrete by IS 10262 – 2009. Introduction of design mix for high performance concrete.	**07 Hrs.**

Recommended Textbooks:

1. Naville, A.M., Concrete Technology, Pearson Education.
2. Santakumar, A.R., Concrete Technology, Oxford University Press.
3. Shetty, M.S., Concrete Technology, S. Chand Publication.
4. Gambhir, M.L., Concrete Technology, Tata McGraw Hill

IS codes:

1. IS: 10262-2009, Recommended guidelines for Concrete Mix Design
2. IS: 456-2000, Indian Standard Plain and Reinforced Concrete

References Books:

1. Properties of concrete by A. M. Neville, Longman Publishers.
2. Concrete Technology by R.S. Varshney, Oxford and IBH.
3. Concrete technology by A. M. Neville, J.J. Brooks, Pearson.
4. Concrete Mix Design by A. P. Remideos, Himalaya Publishing House

Title of the Course:	**STRUCTURAL ANALYSIS**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0402**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Engineering Mechanics, Engineering Mathematics, Mechanics of Solids

Course Description:

This course covers the fundamental principles and methods for studying the behavior of structures under varying loads. Students will learn how to calculate internal stresses, deformations, and the stability of structural elements.

Course Learning Objectives:

1. Analyze the combined effects of axial loads (tension/compression) and bending moments on stresses in structural members.
2. Understand and determine principal planes and stresses in two-dimensional stress states using analytical methods and Mohr's circle. Apply this knowledge to analyze stress distribution in beams.
3. Analyze the behavior of long columns under axial loads using Euler's and Rankine's theories, considering different end conditions
4. Employ various methods (double integration, Macaulay's method, moment-area method, conjugate beam method) to calculate slopes and deflections in determinate beams.
5. Comprehend the concept of influence lines and their application in structural analysis. Construct influence lines for determinate beams (including compound beams) and bridge trusses (through and deck type) to identify critical load positions.
6. Analyze three-hinged arches, including both parabolic and semi-circular shapes, with supports at the same and different levels.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Analyze the behavior of structural members under combined loading	4	Analyze
CO2	Analyze stresses in various structural components including plane sections, long columns, and three-hinged arches.	4	Analyze
CO3	Analyze deformations in simple structures by conventional methods.	4	Analyze
CO4	Evaluate influence line diagrams for various determinate structures to determine critical load positions.	5	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	0	0	3	3	0	0	0	0	2	1	3
CO2	3	0	0	3	3	0	0	0	0	2	1	3
CO3	3	0	0	3	3	0	0	0	0	2	1	3
CO4	3	0	0	3	3	0	0	0	0	2	1	3

CO	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial / Assignment /Declared test / Quiz / Seminar / Open Book Test / Surprise Test etc.
- MSE: Assessment is based on 50% of course content
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit: 1	**CO: 1**	

Unit 1: Combined Direct and Bending Stresses — **10 Hrs.**

- Deals with situations where a structural member experiences both axial tension/compression (direct stress) and bending moment.
- Analysis of columns under eccentric loading
- Covers design considerations for structures like chimneys, retaining walls, and masonry dams, including stability analysis of dam.

Unit: 2	**CO: 2**	

Unit 2: Principal Planes and Stresses — **07 Hrs.**

- Introduces the concept of principal planes and stresses in two-dimensional stress states.
- Explains analytical methods and Mohr's circle method for determining principal stresses.
- Applies the concept of principal stresses to analyze beams.

Unit: 3	**CO: 2**	
Unit 3: Analysis of Long Columns • Defines columns and struts, differentiating them based on slenderness ratio. • Discusses various end conditions for columns (pinned, fixed, etc.). • Analyzes the behavior of long columns under axial loads using Euler's theory and Rankine's theory.		**06 Hrs.**
Unit: 4	**CO: 3**	
Unit 4: Slope and Deflection of Determinate Beams • Explores methods to calculate slopes and deflections of determinate beams. • Covers various approaches like double integration, Macaulay's method, moment-area method, and conjugate beam method.		**10 Hrs.**
Unit: 5	**CO: 4**	
Unit 5: Influence Line Diagrams • Explains the concept of influence lines, which represent the variation in a specific reaction, shear force, or bending moment at a point in a structure due to a moving unit load. • Covers influence lines for determinate beams, including compound beams. • Analyzes influence lines for bridge trusses (both through and deck type) to determine critical load positions.		**06 Hrs.**
Unit: 6	**CO: 2**	
Unit 6: Three-Hinged Arches • Analysis of three-hinged arches, exploring both parabolic and semi-circular shapes. • Analyzes these arches with supports at the same and different levels.		**06 Hrs.**

Recommended Textbooks:

1. Mechanics of Structure (Vol. I and II), Dr. H. J. Shaha and Junnarkar S.B., Charotar Publication.
2. Strength of Materials, S Ramamrutham, Dhanapat Rai Publications.

3. Strength of Materials, Bhavikatti S.S., New Age Publications.
4. Strength of Materials, R. K. Rajput., S. Chand Publications.
5. Strength of Materials, R. K. Bansal., Laxmi Publications

References Books:

1. Strength of Material, F. L. Singer and Pytel, Harper and Row publication.
2. Introduction to Mechanics of Solids, J.B. Popov, Prentice – Hall publication.
3. Mechanics of Materials, Gere and Timoshenko, CBS publishers.
4. Mechanics of Materials, R.C. Hibbler, Pearson Education.

Title of the Course:	**WATER TREATMENT AND SUPPLY SYSTEMS**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0403**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Students must have basic idea about Environmental Problems and issues regarding the application of knowledge of the concepts which are essential for understanding correlation of Engineering and Environmental Issues like water pollution and disposal problems

Course Description:

This course will help the students to understand the importance and seriousness about pollution of drinking water and water treatment facilities. As Civil Engineer it will also give idea about water supply network and its design with various techniques.

Course Learning Objectives:

1. To provide the pertinent knowledge on water supply and treatment systems.
2. To impart necessary skill for the design and operation of water treatment units.
3. To prepare students for higher studies and research in the field of water treatment technology.
4. To familiarize the students with latest trends in water treatment.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Assess the quality and carry out quantification of the given source of water for drinking purpose as per standards of I.S.10500.	2	Understand
CO2	Design the water treatment units for various qualities of water depending on water source as per mentioned design parameters	4	Create
CO3	Analyze the water distribution system numerically and computationally with respect to water quality, water pressure and pipe quality.	5	Solve

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	2	2	0	3	2	2	1	1
CO2	2	1	1	1	1	0	1	0	1	2	1	1

CO3	2	3	1	2	2	0	0	1	1	2	2	1

CO	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	1	1	2
CO3	1	1	2

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Assignment/Declared test/Quiz/Seminar/ Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit: 1	**CO:1**	
Water: Sources of water, quantity & quality of sources, demand of water, factors affecting demand, fluctuations in demand, rate of water consumption, design period & population forecast. Water quality parameters: Characteristics & significance in water treatment, drinking water quality standards- BIS, WHO. Intake Works: Concepts of Intake well, Jack well and Rising main. Design of Intake well. Reservoirs: necessity and types		**10 Hrs.**
Unit: 2	**CO: 1,2**	

Concept of water treatment process. **Aeration-** Types of aerators, design of cascade aerator **Coagulation & Flocculation**: Theory of coagulation and flocculation, destabilization of colloidal particles, factors affecting coagulation, types of coagulants, methods of dosing of coagulants, Jar tests, design of rapid mixer & flocculator. **Sedimentation-** Theory, types of settling, types of sedimentation tanks. Design of vertical flow sedimentation tank. Concept and design of clariflocculator. Concept of tube & plate settler.			**10 Hrs.**
Unit: 3	**CO: 1,2**		
Filtration- Mechanism, head loss development, negative head loss. **Types of filters-** Slow sand, Rapid sand, Multimedia & Pressure filters. Operation & design of rapid sand filter. **Disinfection-** Mechanism, factors affecting disinfection, methods of disinfection, chemistry of chlorination, Forms of chlorination and practices.			**06 Hrs.**
Unit: 4	**CO: 1**		
Water softening processes - lime-soda process, ion exchange **Demineralization -** Reverse osmosis, electro dialysis. Layout of water treatment units as per source.			**04 Hrs.**
Unit: 5	**CO: 2,3**		
Transmission of water: pumping & gravity mains, choice of pipe materials, forces acting on pressure pipes, design of thrust block, corrosion types & control measures. Leakage & pressure testing of pipes.			**07 Hrs.**
Unit: 6	**CO: 2,3**		
Water Distribution System: basic requirements, methods of distribution, layout patterns **Methods of network analysis:** Equivalent pipe method, Hardy-Cross method, design problems. Water appurtenances			**08 Hrs.**
Recommended Textbooks:			

1. Water and Waste water Technology by Mark J. Hammer, John Wiely and Sons.
2. Introduction to Environmental Engineering by M. L. Davis and Davis A.
3. Cornwell, Mc Graw Hill.
4. Environmental Engineering: A design approach by A.P. Sincero and G.A. Sincero.
5. Prentice Hall of India.
6. Environmental Engineering by H.S. Peavy, D.R. Rowe. McGraw Hill
7. Water Supply Engineering by Dr. P. N. Modi, Standard Book House, New Delhi.
8. Water Supply Engineering by S. K. Garg, Khanna Publishers, New Delhi
9. Water Supply Engineering by Dr. B. C. Punmia, Laxmi Publishers, New Delhi
10. Raju, B.S.N., "Water Supply and Wastewater Engineering" Tata McGraw Hill Private limited, New Delhi, 2nd Edition, 2000.

References Books:

1. "Manual on Water Supply and Treatment", CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 1999.
2. Hammer M, J and Hammer M, J, "Water and Wastewater Technology", PHI learning private limited, 7 Th Edition, 2018.
3. Davis, M, L, and Cornwell, D, A, "Introduction to Environmental Engineering", Tata McGraw Hill Publishing Company, Special Indian Edition, 2010.
4. Nathanson, J. A., "Basic Environmental Technology", PHI Learning private limited, 5th Edition, 2009

Title of the Course:	**BUILDING PLANNING AND DESIGN**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0404**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Building science and services

Course Description:

Student will able to functionally plan residential and public buildings with all comfort, services and regulatory aspects

Course Learning Objectives:

1. To select suitable sites as per requirements of occupants of buildings with study of General bye law requirements for planning all types of buildings.
2. To acquire knowledge of procedure to sanction a building proposal from the local town planning authority.
3. To apply knowledge of public building principles to develop a plan.
4. To develop elevation and aesthetics of proposed building based architectural concepts.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Summarize occupant's requirements and study ergonomics to plan all types of buildings.	2	Understand
CO2	Apply principles of planning and building regulations and guidelines to create building plans	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	1	1	2	2	3	2	2	1	2
CO2	2	3	3	2	1	3	3	3	2	3	2	2

CO	PSO1	PSO2	PSO3
CO1	1	2	2
CO2	2	2	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE1and ISE 2 are based on role play/drawing assignments/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first two Units), It shall include hand drawings and Multi choice questions on bye laws and provisions from standards
- ESE: Assessment is based on 100% course content with 60-70% weight age for course content (Normally last three Units) covered after MSE. It shall include hand drawings and Multi choice questions as described for MSE

Course Contents:

Unit: 1	**CO: 1,2**	
Types of residential building, planning components of residential buildings, component's geometrical design based on ergonomics for residential building, Bye laws and NBC 2016 provisions for planning and services (lighting, ventilation, acoustics, plumbing, electrification, sustainability, fire fighting, spatial)		**Hrs. 08**
Unit: 2	**CO: 1,2**	
Introduction educational and institutional building, planning components of Institutional buildings, component's geometrical design based on ergonomics for building, Bye laws and NBC 2016 and relevant provisions for planning and services (lighting, ventilation, acoustics, plumbing, electrification, sustainability, firefighting, spatial)		**Hrs. 04**
Unit: 3	**CO: 1,2**	

Introduction Health care building, planning components of health care buildings, component's geometrical design based on ergonomics for building, Bye laws and NBC 2016, WHO provisions for planning and services(lighting , ventilation, acoustics, plumbing, electrification, sustainability , firefighting, spatial		**Hrs. 04**
Unit: 4	**CO: 1,2**	
Introduction Hotel building, planning components of hotel buildings, component's geometrical design based on ergonomics for building, Bye laws and NBC 2016, Star rating system provisions for planning and services(lighting , ventilation, acoustics, plumbing, electrification, sustainability , firefighting, spatial)		**Hrs. 04**
Unit: 5	**CO: 1,2**	
Introduction transportation facility, planning components of terminus buildings, component's geometrical design based on ergonomics for building, Bye laws and NBC 2016, public transport and related provisions for planning and services(lighting , ventilation, acoustics, plumbing, electrification, sustainability , firefighting, spatial)		**Hrs. 06**
Unit: 6	**CO: 1,2**	
Introduction recreational facility , planning components of recreational buildings, component's geometrical design based on ergonomics for building, Bye laws and NBC 2016, public transport and related provisions for planning and services(lighting , ventilation, acoustics, plumbing, electrification, sustainability , firefighting, spatial)		**Hrs. 04**

Recommended Textbooks:

1. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
2. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
3. Civil Engineering Drawing – M. Chakraborty.
4. A Course in Civil Engineering Drawing – V.B. Sikka (S.K. Kataria and Sons)

References Books:

1. NBC 2016 volume I and II
2. A to Z of Practical Building Construction and Its Management- Sandeep Mantri (Satya Prakashan, New Delhi)
3. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
4. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
5. Time Saver Standard.
6. Neuferts Data

Title of the Course:	**ENGINEERING HYDRAULICS**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0405**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

A Student should undergone a course and understanding in subject's viz. Applied Mechanics, Physics, and Mathematics.

Course Description:

The material in this course will provide the student with a fundamental background in the statics and dynamics of fluids, laws of fluid mechanics and energy relationships. The basic conservation laws of mass, momentum and energy are analyzed in control volume and differential form. The student will learn how to choose the right formulation for fluid flow problems. The student will also learn how to analyze practical fluid flow phenomenon and apply basic principles / concepts in fluid mechanics to solve real life situations.

Course Learning Objectives:

1. To know the classification of fluids / flows and understand fluid properties and their importance in fluid flow phenomenon.
2. To understand the basic principles of fluid flow phenomenon and flow measurements through pipe.
3. To Apply principles of hydrostatics and hydrodynamics in the analysis of fluid flow phenomenon
4. To identify, formulate, and solve engineering problems related to fluid mechanics

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Classify the various types of fluids / flows and their characteristics by taking into consideration fundamental concepts of fluid mechanics.	02	Understand
CO2	Analyze problems to compute forces on fluid in steady state and in motion through numerical problems.	04	Analyze
CO3	Demonstrate the use of basic laws and equations to derive functional relationships between various flow parameters	05	Evaluate
CO4	Adapt appropriate methods to work out practical fluid flow problems using analytical and computational methods.	06	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	3	-	-	-	-	-	-	-	2
CO2	2	3	1	2	-	2	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2
CO4	2	3	2	2	-	2	-	-	-	-	-	2

CO	PSO1	PSO2	PSO3
CO1	2	3	-
CO2	1	3	-
CO3	2	3	-
CO4	3	3	-

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three modules)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit: 1	**Introduction**	
Physical Properties of Fluids (Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity: Dynamic and Kinematic Viscosity, Compressibility, Surface tension, Capillary Effect), Newton's law of		**Hrs. (06 Hrs)**

viscosity, Types of Fluids.		
Unit: 2	**Fluid statics**	
Hydrostatic Law, concept of pressure head, Measurement of pressure datum (Absolute, Gauge), Piezometers, Simple and differential manometers, Total pressure, Center of pressure for plane and curved surfaces, Pressure Diagrams. Principle of floatation and Buoyancy: Equilibrium of floating bodies, Stability of Floating bodies, metacenter, metacentric height and its determination.		**Hrs. (08 Hrs)**
Unit: 3	**Fluid Kinematics**	
Types of Flows, Streamlines, Equipotential lines, Steak Line, Path Line, Stream Tube, Stream Bundle, Stream Function and Velocity Potential Function, Flow Net- (Properties and Uses), Continuity Equation		**Hrs. (07 Hrs)**
Unit: 4	**Fluid Dynamics**	
Forces Acting on Fluid in Motion, Euler's Equation along a Streamline, Bernoulli's Theorem, Limitations, Bernoulli's Applications: Venturimeter (Horizontal and Vertical), Orifice meter, Nozzle meter and pitot tube, Time required for Emptying the Tank, Concept of HGL and TEL.		**Hrs. (08 Hrs)**
Unit: 5	**Flow through Pipes**	
Friction Equations for Viscous Flow through Circular Pipes, Major and Minor Losses, Concept of Equivalent Pipe, Dupit's Equation, Pipes in Series, Parallel and Syphon, Water Hammer. Introduction to computation of turbulent flow.		**Hrs. (08 Hrs)**
Unit: 6	**Dimensional Analysis & Model Studies**	
Dimensions of physical quantities, Dimensional homogeneity, Dimensional analysis use, important dimensionless parameters and their significance. Geometric; Kinematic and Dynamic similitude; Model laws, Type of models, Applications of dimensional analysis and studies to fluid flow problems. Introduction to Distorted Model		**Hrs. (08 Hrs)**

Recommended Textbooks:

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics and Hydraulic Machines by Dr. R. K. BANSAL
3. Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi/Seth – Standard Book House, Delhi
4. Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi

5. Fluid Mechanics – Arora
6. Dr. Jain A.K (2010); "Fluid Mechanics" Khanna Publishers.
7. E. John Finnemore, Joseph Franzini,, Fluid Mechanics with Engineering Applications, 10th Edition

References Books:

1. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
2. Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo
3. Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland

Title of the Course:	**CONSTITUTION OF INDIA**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVVE0406**	**2**	**-**	**-**	**2**

Course Pre-Requisite:

Basics of Indian History, Independence Movement, Fundamentals of Civics.

Course Description:

This Course is an introduction of Indian Constitution and basic concepts highlighted in this course for understanding the Constitution of India. This course is structured to give a deeper in sight for making the nexus between the other laws objects.

Course Learning Objectives:

At the end of the course the student is expected to have acquired:

1. A basic understanding of Constitution of India.
2. Builds the ability to apply the knowledge gained from the course to current social legal issues.
3. Ability to understand and solve the contemporary challenges.

Understanding constitution a remedies.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** the significance of Indian Constitutions the fundamental law of the land	2	Cognitive (Understand)
CO2	Exercise his fundamental rights in proper sense at the same time **Identifies** his responsibilities in national building.	2	Cognitive (Applying)
CO3	**Analyze** the Indian political system, the power sand functions of the Union, State and Local Government in detail	2	Cognitive (Understand)
CO4	**Underset and** Electoral Process, Emergency provision sand Amendment procedure.	2	Cognitive (Understand)

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3		3				3
CO2						3		3	3	3		3
CO3						3			3			3
CO4						3			3			3

Assessments:

Teacher Assessment:

- One End Semester Examination (ESE) having 100% weights respectively.

Assessment	Marks
ESE	100

- ESE: Assessment is based on100%coursecontent

Course Contents:

Unit: 1	**CO:**	
Constitution–Structure and Principles 1.1: Meaning and importance of Constitution1.2: Making of Indian Constitution – Sources1.3:Salient features of Indian Constitution		**3 Hrs.**
Unit: 2	**CO:**	
Fundamental Rights and Directive Principles 2.1: Fundamental Rights & Fundamental Duties2.2:Directive Principles of State Policy		**10 Hrs.**
Unit: 3	**CO:**	
Union Government & Executive **3.1**: President of India –Qualification, Powers and Impeachment : Lok Sabha & Rajya Sabha- Composition, Powers & Functions, Scope to a amendment in Constitution		**4 Hrs.**

Unit: 4	**CO:**	
State Government & Executive 4.1 : Governor–Qualification, Appointment, Powers & Functions :Legislative Assembly & Legislative Council –Composition, Powers & Functions		**3 Hrs.**
Unit: 5	**CO:**	
The Judiciary 5.1 : Features of Judicial System in India:Hierarchy of Courts ,Composition and Jurisdiction		**3 Hrs.**
Unit: 6	**CO:**	
Local Self Government and other constitutional Organizations 6.1 :73rd and 74th Constitutional Amendments :Public Service Commission ,Election Commission ,CAG ,National Commissions for SC,ST etc.		**3 Hrs.**

Recommended Textbooks:

1. M.P.Jain, Indian Constitutional Law
2. M.P.Singh(ed.),V.N.Shukla ,Constitutional LawofIndia
3. D.D.Basu, Comment aryon the Constitution of India
4. S.S.Desai ,Constitutional Law--I&II 3

References Books:

1. Durga Das Basu, Introduction to the Constitution of India, Gurgaon; Lexis Nexis, 2018(23rdedn.)
2. J.N.Pandey,The Constitutional Law of India, All ahabad; Central Law Agency, 2018 (55thedn.)
3. Shripad Shridhar Desai, Constitutional Law--I,S.S.LawPublication,2021
4. Shripad Shridhar Desai, Constitutional Law--II,S.S.LawPublication,2021
5. ConstitutionofIndia(FullText),India.gov.in.,NationalPortalofIndia,https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf
6. DurgaDasBasu,BharatadaSamvidhanaParichaya,Gurgaon;LexisNexisButterworths Wadhwa, 2015

Title of the Course:	**ENGINEERING HYDRAULICS LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0431**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Knowledge of Fluid Mechanics and Basic Mathematics

Course Description:

The course explores the principles of fluid mechanics through laboratory experiments and verifies various hydraulic phenomena on laboratory setups.

Course Learning Objectives:

1. To provide hands-on practice for determining various properties of fluids and conduct experiments to study pipe flow.
2. To develop the analytical skills required for interpretation and analysis.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Read and follow directions for laboratory experiments.	02	Understand
CO2	Collect and analyze data using fluid mechanics principles and experimentation methods.	03	Apply
CO3	Prepare reports following accepted writing and graphical techniques.	04	Analyze
CO4	Perform exercises in small teams.	05	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	1	-	-	-	-	-	-	-
CO2	-	-	3	-	-	2	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-

CO4	-	-	-	-	-	-	-	-	2	-	-	-

CO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	2	2	-
CO3	1	2	2
CO4	3	2	-

Assessments:

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE POE	25

- ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- ESE POE: Assessment is based on Oral Examination.

Course Contents:

List of Experiments / Lab Activities/Topics

1) Determination of Metacentric Height for a ship model.
2) Determination the total energy of flow at different section in a test conduit.
3) Determination of hydraulic Coefficients of orifice and their interrelationship.
4) Determination of Coefficients of discharge, analytically and graphically.
5) Determination of Friction Factor for Given Pipe.
6) To find the critical Reynolds Number for pipe flow.
7) Study of Hydraulic jump
8) Flow visualization by using Hele-Shaw apparatus.
9) Coefficients of discharge for V-Notches and Rectangular Notch.

Recommended Textbooks:

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi
3. Fluid Mechanics – Arora
4. Modi P.M. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House Standard Book House Since; 21St Edition , 2018.
5. Garde- Mirajgaonkar, "Engineering Fluid Mechanics", SCITECH Publication,1st Edition, 2010.
6. Bansal R.K., "A textbook of Fluid mechanics and hydraulic machines", Laxmi Publications (P) Ltd., New Delhi, 9th Edition, 2010.

References Books:

7. Kumar D.S., "Fluid Mechanics and Fluid Power Engineering", Kataria S K and Sons, 2th Edition, 2010.
8. Jain A.K., "Fluid Mechanics Including Hydraulic Machines", Khanna Publishers, New Delhi, 8th Edition, 2003.
9. Streeter, V.L. and Wylie E.B. "Fluid Mechanics", McGraw Hill, New York, 8th Edition,1985.

Title of the Course:	**COMPUTER AIDED DESIGN AND DRAFTING LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVVS0432**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Building construction and services, CAD lab I, Building planning and design

Course Description:

Course is designed to create CAD of Building types for Municipal submission and project construction phase

Course Learning Objectives:

To develop ability of Civil Engineering students to create computer aided drawings for municipal submission and construction phase so that to work as consulting civil engineer for building projects

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Preparing Computer aided drawings for municipal submission	3	Apply
CO2	Preparing Computer aided working drawings for construction phase	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	2	3	3	2	3	2	3	1	2
CO2	1	3	2	2	3	1	2	3	2	3	1	2

CO	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	2	2

Assessments:

Teacher Assessment:

ISE: 25 Marks

ESE(OE): 25 Marks

ISE will be based on CAD prepared and presented in hard format as per scale and sheet size requirements with effective detailing and in timely completion

Course Content:

All drawings to be prepared on computer aided drawing platforms

Students need to prepare a group of maximum 4 candidates for completing a project assignment as described below

1. Choose any one type of building type from Building Planning & design subject's 6 units (If residential building selected it shall be multistoried apartment) and identify problem statements from practicing engineer /architects or Faculty consultation
2. Prepare detail Site Layout, floor plans, elevations, sections as per planning principles, bye law's provisions, aesthetics.
3. Prepare computer aided submission drawing of project assignment with reference to BPMS (Online submission) requirements
4. Prepare Foundation/Center line plan
5. Prepare wall and opening layout and working drawing at each floor level
6. Prepare furniture, electrification layout and working drawing
7. Prepare plumbing/piping working drawing

Title of the Course:	**CONCRETE TECHNOLOGY LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0433**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Basic Civil Engineering

Course Description:

The course includes experiments related to physical properties of concrete ingredients, properties of fresh concrete, properties of hardened concrete and durability properties of concrete. It also includes experiments based on non-destructive testing of concrete.

Course Learning Objectives:

1. To explain the important engineering properties of Concrete materials.
2. To explain the behavior of Fresh and harden concrete.
3. To explain the Concrete mix design.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Identify the properties of different cement, aggregates fresh concrete.	3	Identify
CO2	Evaluate the effect on hardened concrete by using destructive Non Destructive Testing	5	Evaluate
CO3	Demonstrate the knowledge of concrete mix design	6	Design

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	2	2	-	-	-	1	-	-	2
CO2	2	2	3	-	3	-	-	-	1	2	-	-
CO3	-	2	-	2	3	-	-	-	2	2	-	2

CO	PSO1	PSO2	PSO3
CO1	1	2	2
CO2	1	2	2
CO3	1	2	2

Assessments :

Teacher Assessment:

- One components of In Semester Evaluation (ISE),

Assessment	Marks
ISE	25

- ISE based on Experiment

Course Contents:

1. To determine the standard consistency, initial and final setting time of cement using Vicat's apparatus.
2. Determination of soundness of cement by Le-Chatelier's apparatus.
3. To determine compressive strength of cement.
4. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate) of Natural Aggregates and Manufactured Sand.
5. Determination of specific gravity and water absorption of aggregates of Natural Aggregates and Manufactured Sand.
7. To determine flakiness and elongation index of coarse aggregates.
8. To determine Workability of concrete by slump test, compaction factor, Vee Bee Consistometer test, effect of admixture and retarders on setting time concrete.
9. Non destructive test on concrete by:
   a) Rebound Hammer Test
   b) Ultrasonic Pulse Velocity Test
10. Mix design and compressive strength of concrete cubes for M20 or M30 (ACI 211.1- 91, IS 10262- 2009)
11. Mix design and compressive strength of self compacting concrete and High performance concrete

Recommended Textbooks:

1. Naville, A.M., Concrete Technology, Pearson Education.
2. Santakumar, A.R., Concrete Technology, Oxford University Press.
3. Shetty, M.S., Concrete Technology, S. Chand Publication.

4. Gambhir, M.L., Concrete Technology, Tata McGraw Hill.

IS codes:

1. IS: 10262-2009, Recommended guidelines for Concrete Mix Design
2. IS: 456-2000, Indian Standard Plain and Reinforced Concrete

References Books:

1. Properties of concrete by A. M. Neville, Longman Publishers.
2. Concrete Technology by R.S. Varshney, Oxford and IBH.
3. Concrete technology by A. M. Neville, J.J. Brooks, Pearson.
4. Concrete Mix Design by A. P. Remideos, Himalaya Publishing House

Title of the Course:	**INNOVATIVE PRACTICES & LEARNING –II LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVEL0471**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

A willingness to learn and experiment with new tools and techniques.

Course Description:

This course introduces students to design thinking and prototyping fundamentals, focusing on idea generation, problem-solving, and hands-on prototyping techniques. Through practical exercises, students develop skills in generating and validating ideas, understanding user needs, and utilizing prototyping tools such as 3D printing and laser cutting to create innovative solutions.

Course Learning Objectives:

1. To equip students with proficiency in various multidisciplinary technologies IoT through completion of relevant certifications.
2. To enable students to integrate programming and electronic devices from different disciplines to develop functional working models that address real-world challenges.
3. To teach students how to plan, execute, and present proof of concepts for their multidisciplinary working models, demonstrating their understanding and application of the learned technologies and concepts.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	To interpret multi disciplinary technologies in connection with innovation.	2	Understand
CO2	To generate working prototype using multi disciplinary technologies.	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	--	--	3	--	--	--	--	2	1	--
CO2	1	2	1	2	3	--	--	1	2	1	2	--

CO	PSO1	PSO2	PSO3
CO1	3	1	--
CO2	1	2	--

Assessments:

Teacher Assessment:

- One component of In Semester Evaluation (ISE)

Assessment	Marks
ISE	25

- ISE: Assessment is based on Experiment Performance/ Assignment /Quiz/ Group Discussions etc.

Course Contents:

Activity: 1			
Complete certification on multidisciplinary technologies such as Arduino programming , data log sensors, raspberry pi, IOT etc.			**8 Hrs.**
Activity: 2			
Develop multi disciplinary working model using programming & electronic devices.			**14 Hrs.**
Activity: 3			
Prepare proof of concept for above working model.			**8 Hrs.**

Title of the Course:	**DATA SCIENCE & INSTRUMENTATION**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVMM0441**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basics of Project and Automation

Course Description:

Course is designed for understanding multidisciplinary application and instrumentation required for infrastructure projects

Course Learning Objectives:

Students will identify scenarios in project where instrumentation will be used for accurate and efficient workflow and data management

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Identify need for data science in projects	I	Remember
CO2	Characterize instrumentation requirement for a project	II	Understand

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3	3	2	2	1	1	2	2	2
CO2			3	2	3	2	2	1	2	3	2	2

CO	PSO1	PSO2	PSO3
CO1		3	
CO2	2	3	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE1and ISE 2 are based on assignments/Declared test/Quiz/Seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first two Units), It may include drawings and Multi choice questions

ESE: Assessment is based on 100% course content with 60-70% weight age for course content (Normally two Units) covered after MSE. It may include drawings and Multi choice questions

Course Contents:

Unit: 1	**CO: 1**	
Introduction to data science , benefits, challenges, and applications of data science, life cycle of data science, components of data science, Role of data scientist		**Hrs. 06**
Unit: 2	**CO: 1**	
Data Basics: Concept of data , variable types, basic structure used in data analytics, data categories Data Manipulation: import, store and export data, clean data, Organize data, aggregate data		**Hrs. 08**
Unit: 3	**CO: 1**	

Data analysis: Describe and differentiate between types of data analysis Describe and differentiate between data aggregation and interpretation metrics Evaluate and explain the results of data analysis	**Hrs. 08**

Unit: 4	**CO:2**	
Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm & piezoelectric sensor		**Hrs. 08**
Unit: 5	**CO: 2**	
Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs, Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.		**Hrs. 08**
Unit: 6	**CO: 2**	
General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.		**Hrs. 08**

Reference Books:

1. Measurements And Instrumentation by U.A Bakshi , A.V Bakshi
2. Handbook of Construction Management for Instrumentation and Controls by K. Srinivasan, T. V. Vasudevan, S. Kannan, D. Ramesh Kumar
3. Strong Motion Instrumentation for Civil Engineering Structures by M. Erdik, M. Cilebi and N. Apyadin
4. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
5. Data Science for Civil Engineering: A Beginner's Guide Hardcover –R. K. Jain, Prashant Shantaram Dhotre , Deepak Tatyasaheb Mane, Parikshit Narendra Mahalle
6. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.

Title of the Course:	**STATISTICS FOR DATA SCIENCE**	**L**	**T**	**P**	**Credit**
Course Code:	**UCEMM0441**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Students shall have knowledge of

- Mathematics, Algebra and Statistics.
- Computer and Microsoft office tools.

Course Description:

The objective of the course is to introduce students to computational methods for solving problems in Environmental Engineering (both for modeling and experimental work). The idea has been to impart insight into various statistical tools, that too without resort to undue technicality and verbosity. The course provides students with the necessary background to enable them to implement various statistical inferential approaches. It also helps them to develop an ability to analyze and apply some basic stochastic processes for solving real life situations through systematic logical thought process.

Course Learning Objectives:

1. Impart the fundamental understanding of the methods based on concepts previously acquired in mathematics and algebra.
2. Make students familiar with the computer as an engineering tool and to improve logical and analytical skills.
3. Encourage students to focus on the core ideas of the traditional statistical techniques used to solve engineering problems.
4. Train students with essential tools for statistical analyses to foster understanding through real-world statistical applications.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive Level	Bloom's Cognitive Descriptor
CO1	Summarize patterns and trends in data including outliers and anomalies to visualize and interpret data distribution.	II	Understand
CO2	Apply appropriate statistical measures, data collection and data analysis techniques for grouped and ungrouped data cases.	III	Apply
CO3	Examine the results of bivariate and multivariate regression and correlation analysis for linear and non-linear models.	IV	Analyze
CO4	Analyze the probability concepts to statistical inference to solve variety of problems.	IV	Analyze

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		2	2					1		1
CO2	3	2		2	3					1		1
CO3	3	2		2	2							
CO4	2			2	1							

CO	PSO1	PSO2	PSO3
CO1			
CO2		1	
CO3		1	
CO4		1	

Assessments :

Teacher Assessment:

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:		
Unit: 1		
Meaning and Scope of Statistics Introduction, Definitions – Statistics as data, statistics as a method, subject matter of statistics, Laws of statistics, functions of statistics, importance of statistics, limitations of statistics, distrust of statistics, fallacies in statistics.		**Hrs. 07**
Unit: 2		
Statistical Survey and Data Collection Introduction, Planning of a statistical survey, Collection of data, Primary and secondary data, Methods of collecting primary data, Sources of secondary data, Unit of inquiry, Ways of collection of data, Processing of data.		**Hrs. 07**
Unit: 3		
Database Design and Presentation Spreadsheet tools, features and functions, formulas and functions, data storing, data analysis, types of charts, graphs and other features, classification, objectives, rules, modes of classification, tabulation, objectives, components of table, requisites of a good statistical table, types of tables.		**Hrs. 07**
Unit: 4		
Statistical Techniques Frequency distribution, grouped frequency distribution, cumulative frequency distribution, bivariate frequency distribution, measure of central tendency, mean, median, mode, geometric mean, harmonic mean, measure of dispersion, range, quartile deviation, mean deviation, standard deviation, variance, coefficient of dispersion, coefficient of variation.		**Hrs. 08**
Unit: 5		
Regional Statistical Analysis Joint and marginal distribution, curve fitting, least-square method, covariance, correlation, regression, simple correlation, linear and non-linear correlation, multiple regression analysis, stepwise regression		**Hrs. 08**

analysis, use of computers in correlation and regression analysis.		
Unit: 6		
Probability Concepts for Statistics Introduction, random experiments, sample space, events and algebra of events, definitions of probability – classical, statistical, and axiomatic, conditional probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.		**Hrs.** **08**

Text Books:

1. Grewal, B. S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 2008.
2. Gupta, S. C., and Kapoor, V. K., "Fundamentals of Applied Statistics", Sultan Chand and Sons, New Delhi.
3. Sancheti, D. C., and Kapoor, V. K., "Statistics (Theory, Methods and Applications", Sultan Chand & Sons, New Delhi.

Reference Books:

1. Freund, J., "John E. Freund's Mathematical Statistical with Applications" Pearson Education, Asia.
2. Freund, J.E., and Miller, I.R., "Probability and Statistics for Engineers", Prentice – Hall of India, New Delhi.
3. Holder, R. L., "Multiple Regression in Hydrology", A Book by Institute of Hydrology.
4. Montgomery, D. C., and Runger, G. C., "Applied Statistics and Probability for Engineers", Wiley.
5. Mood, A.M. Graybill, F.A. and Boes, D.C., "Introduction to the Theory of Statistics", 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
6. Mukhopadhyay, P., "Applied Statistics", New Central Book Agency.

Title of the Course:	**INTRODUCTION TO HUMAN RESOURCE**	**L**	**T**	**P**	**Credit**
Course Code:	**UCEMM0442**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Students shall have knowledge of Basics of Management

Course Description:

This course covers the fundamentals of Human Resources Management (HRM). It includes strategic HRM, HR planning, recruitment, training, career and succession planning, performance management, compensation, productivity management, and industrial relations.

Course Learning Objectives:

1. To Comprehend HRM fundamentals, importance, evolution, and differences from Personnel Management.
2. To Summarize training, career planning, and succession planning importance and methods..
3. To Identify and understand various performance appraisal methods.
4. To explain concepts, components, and practices in compensation management.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand HRM, importance, evolution and difference from Personnel Management	II	Understand
CO2	Summarize the importance and methods of training, career planning and succession planning	II	Understand
CO3	Explain compensation management concepts, components, job evaluation, incentives, and benefits.	II	Understand
CO4	Identify performance appraisal methods	III	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1							3		3	

CO2		1									3	
CO3		1				2					3	
CO4		1									3	

CO	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

Assessments :

Teacher Assessment:

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content

Course Contents:

Unit: 1		

Introduction: Human resources Management-Introduction and Importance-Evolution – difference between Personnel Management and HRM- Strategic HRM- role of a HR Manager.	**Hrs. 08**

Unit: 2		

Human Resources Planning: Objectives-Importance-HRP Process- Manpower Estimation-Job analysis-Job Description-Job Specification Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees.	**Hrs. 08**

Unit: 3		

Training and Development: Objectives and Needs-Training Process-Methods of Training –Tools and Aids-Evaluation of Training Programs Career Planning- Succession Planning	**Hrs. 07**
Unit: 4	
Performance Management System: Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating Errors-Competency management	**Hrs. 07**
Unit: 5	
Compensation Management: Concepts and Components-Job Evaluation- Incentives and Benefits. Productivity Management-Concepts-TQM-Kaizen-Quality Circles	**Hrs. 08**
Unit: 6	
Industrial relations-Grievance Procedure: Collective Bargaining-Settlement of Disputes. Retirement/Separation-Superannuation-Voluntary Retirement Schemes-Resignation-Discharge-Dismissal-Suspension-Layoff	**Hrs. 07**

Text Books:

1. Managing Human Resources - R.S. Dwiwedi
2. Human Resources Management- Gary Dessler
3. Personnel Management – C.B Mamoria
4. Human Resources Management-V.P.Michael

Reference Books:

1. Human Resources Management – L.M.Prasad 8. Human Resources Management - Ashwathappa
2. Managing Human Resources - Arun MonppaKotter, J. P. (1999). "What Effective General Managers Really Do," Harvard Business Review, March–April 1999, pp. 145–159.,
3. Organizational Behaviour - Fred LuthansHannaway, J. (1989). Managers Managing: The Workings of an Administrative System. New York: Oxford University Press, P. 39.,
4. Eccles, R. G. & Nohria, N. (1992). Beyond the Hype: Rediscovering the Essence of Management. Boston: The Harvard Business School Press, p. 47.