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

Syllabus for

S. Y. B. Tech in
Civil and Environmental Engineering

Department of Civil and Environmental Engineering

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur,
Maharashtra, INDIA

VISION AND MISSION OF INSTITUTE

VISION:

- To be the Centre of Excellence in technical education and preferred choice of Faculty, Students, Industry and Society.

MISSION:

- To empower the faculty, staff and aspiring Engineers with essential technical knowledge and skills.
- To develop competence towards serving the ever changing needs of industry and society.
- To inculcate social and ethical values amongst the Students and Employees.
- To strengthen collaborative Research and Consulting Environment with industry and other institutions.

VISION AND MISSION OF DEPARTMENT

VISION

- To develop as a center of excellence in Civil and Environmental Engineering Education.

MISSION

- To impart essential technical knowledge, skills and Environmental ethics.
- To develop professional capabilities to meet changing societal and industrial needs.
- To build up base for Research and Consultancy activities.

PROGRAM EDUCATION OBJECTIVES (PEOs)

PEO 1: Solve Civil and Environmental Engineering problems and pursue higher studies using solid foundation in mathematics, science and technology.

PEO2: Design, execute and operate various Civil and Environmental Systems in related fields through participative education.

PEO3: Develop skills to communicate effectively and work in a team in multidisciplinary areas.

PEO4: Respond to the challenges of issues of Civil and Environmental Engineering through research and development.

PROGRAM OUTCOMES (POs)

Civil and Environmental Engineering Graduates will be able to:

1. Apply the knowledge of mathematics, Science and Engineering fundamentals for solution of problems of Civil and Environmental Engineering.
2. Identify, formulate, review research literature and analyze Civil and Environmental Engineering problems using fundamentals of mathematics, sciences and engineering.
3. Develop solutions for Civil and Environmental Engineering problems and design system components and processes to meet the specified needs with appropriate consideration for the public health and safety.
4. Make use of their knowledge to interpret the data by experimental analysis to provide valid conclusions.
5. Select and apply various engineering and IT tools and models to solve Civil and Environmental Engineering problems.
6. Assess societal, health, safety and legal issues by applying Civil and Environmental Engineering knowledge.
7. Assess the impact of Civil and Environmental Engineering solutions in Societal and Environmental context for Sustainable Development.
8. Practice ethical principles to fulfill responsibilities as Civil and Environmental Engineer**.**
9. Function effectively as an individual, and as member or leader in multidisciplinary areas.
10. Discuss effectively issues of Civil and Environmental Engineering and solutions through written and oral presentations to engineering communities and society.
11. Demonstrate knowledge and understanding of the engineering and management principles to manage Civil and Environmental Engineering projects.
12. Practice the need of lifelong learning through updating technical knowledge in the context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Identify and analyze the pollution related problems generated due to urbanization and industrialization.
2. Interpret the data using various tools and techniques to provide effective and applicable solutions.

MAPPING OF PROGRAM OUTCOMES TO PROGRAM EDUCATION OBJECTIVES

PEO	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
PEO 1	3	1	2			1		1			1	2	1	3
PEO 2	2	1	3	2	1	2	1	1					2	3
PEO 3									2	3	2			2
PEO 4	2	3	2				2					2	1	3

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for

Second Year B. Tech. Program in Civil and Environmental Engineering Semester-III

Course Code	Course Name	Curriculum Component	Hours/Week				Evaluation Scheme			
			L	T	P	Credits	Component	Marks		
								Max	Min for passing	
UCEE0301	Applied Mathematics	BS	3	1	-	**4**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0302	Surveying	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0303	Fluid Mechanics	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0304	Solid Mechanics	PC	4	-	-	**4**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0305	Building Materials and Concrete Technology	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0361	Audit Course I: Environmental Studies	BS	2	-	-	-	ESE	100	40	40
UCEE0331	Surveying Laboratory	PC	-	-	2	**1**	ISE	50	20	
							ESE(OE)	50	20	
UCEE0332	Fluid Mechanics Laboratory	PC	-	-	2	**1**	ISE	25	10	
							ESE(OE)	25	10	
UCEE0333	Strength of Materials Laboratory	PC	-	-	2	**1**	ISE	50	20	
UCEE0334	Concrete Technology Laboratory	PC	-	-	2	**1**	ISE	25	10	
							ESE(OE)	25	10	
UCEE0335	Building Drawing Laboratory	PC	-	-	2	**1**	ISE	50	20	
			18	**1**	**10**	**22**	**500 + 300 = 800 + Audit Course**			

Total Credits - 22, Total Contact hours – 29

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for

Second Year B. Tech. Program in Civil and Environmental Engineering Semester - IV

Course Code	Course Name	Curriculum Component	Hours/Week				Evaluation Scheme			
			L	T	P	Credits	Component	Marks		
								Max	Min for passing	
UCEE0401	Environmental Chemistry and Microbiology	BS	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0402	Hydrology and Water Resources Engineering	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0403	Structural Analysis	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE*	50	20	
UCEE0404	Hydraulics	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE04**	Professional Elective I	PE	3	1	-	**4**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0462	Audit Course II: Surveying and Geospatial Technology	PC	2	-	-	-	ESE	100	40	40
UCEE0431	Environmental Chemistry and Microbiology Laboratory	BS	-	-	2	**1**	ISE	25	10	
							ESE (OE)	25	10	
UCEE0432	Building Planning and Design Laboratory	PC	-	-	4	**2**	ISE	50	20	
							ESE (OE)	50	20	
UCEE0433	Open Channel Hydraulics Laboratory	PC	-	-	2	**1**	ISE	25	10	
							ESE (OE)	25	10	
UCEE0434	Spreadsheets Laboratory	PC	-	-	2	**1**	ISE	50	20	
UCEE0435	Geospatial Laboratory	PC	-	-	2	**1**	ISE	50	20	
			17	**1**	**12**	**22**	**500 + 300 = 800 + Audit Course**			

Total Credits - 22, Total Contact hours – 30

Professional Elective – I	
UCEE0421	Ecology and Environmental Sanitation
UCEE0422	Green Buildings
UCEE0423	Construction Practices

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for

Third Year B. Tech. Program in Civil and Environmental Engineering Semester - V

Course Code	Course Name	Curriculum Component	Hrs/Week				Evaluation Scheme			
			L	T	P	Credits	Component	Marks		
								Max	Min for passing	
UCEE0501	Water Supply Engineering	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0502	Highway and Traffic Engineering	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0503	Solid and Hazardous Waste Management	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0504	Geotechnical Engineering	PC	3	1	-	**4**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE05**	Professional Elective II	PE	3	1	-	**4**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0563	Audit Course III: Engineering Management and Economics	HS	2	-	-	-	ESE	100	40	40
UCEE0531	Water Treatment Laboratory	PC	-	-	2	**1**	ISE	50	20	
							ESE (OE)	50	20	
UCEE0532	Transportation Engineering Laboratory	PC	-	-	2	**1**	ISE	25	10	
							ESE (OE)	25	10	
UCEE0533	Geotechnical Engineering Laboratory	PC	-	-	2	**1**	ISE	25	10	
							ESE (OE)	25	10	
UCEE0534	Solid Waste Analysis Laboratory	PC	-	-	2	**1**	ISE	50	20	
UCEE0541	Mini Project	MC	-	-	2	**1**	ISE	50	20	
			17	**2**	**10**	**22**	**500 + 300 = 800 + Audit Course**			

Total Credits - 22, Total Contact hours – 29

Professional Elective – II	
UCEE0521	Renewable Energy Resources
UCEE0522	Irrigation and Hydraulic Structures
UCEE0523	Noise Pollution and Control
UCEE0524	Design of Steel Structures

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for

Third Year B. Tech. Program in Civil and Environmental Engineering Semester - VI

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Credits	Components	Marks		
								Max	Min for passing	
UCEE0601	Wastewater Engineering	PC	3	-	-	**3**	ISE-I	10		40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UCEE0602	Air Pollution and Control	PC	3	-	-	**3**	ISE-I	10		40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UCEE0603	Design of Concrete Structures	PC	4	-	-	**4**	ISE-I	10		40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UCEE06**	Professional Elective III	PE	3	1	-	**4**	ISE-I	10		40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UOEL06**	Open Elective I	OE	3	-	-	**3**	ISE-I	10		40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UCEE0664	Audit Course IV: Transportation Infrastructure	PC	2	-	-	**-**	ESE	100	40	40
UCEE0631	Wastewater Engineering Laboratory	PC	-	-	2	**1**	ISE	50	20	
							ESE (OE)	50	20	
UCEE0632	Air Pollution and Control Laboratory	PC	-	-	2	**1**	ISE	25	10	
							ESE (OE)	25	10	
UCEE0633	Design of Concrete Structures Laboratory	PC	-	-	2	**1**	ISE	50	20	
UCEE0634	Design and Drawing of Environmental Systems	PC	-	-	4	**2**	ISE	50	20	
							ESE (OE)	50	20	
			18	**1**	**10**	**22**	**500 + 300 = 800 + Audit Course**			

Total Credits - 22, Total Contact hours - 29

Professional Elective – III		**Open Elective I**	
UCEE0621	Environmental Geotechnology	UOEL0631	Environmental Laws and Policies
UCEE0622	Optimization Techniques	UOEL0632	Occupational Safety and Health
UCEE0623	Operation and Maintenance of Environmental Facilities	UOEL0633	Water Conservation and Management

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for

Final Year B. Tech. Program in Civil and Environmental Engineering Semester-VII

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Credits	Components	Marks		
								Max	Min for passing	
UCEE0701	Environment, Health and Safety	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0702	Advanced Water and Wastewater Treatment	PC	3	1	-	**4**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0703	Quantity Surveying and Valuation	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE *	50	20	
UCEE0704	Environmental Impact Assessment and Environmental Legislation	PC	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UOEL07**	Open Elective II	OE	3	-	-	**3**	ISE I	10		40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UCEE0765	Audit Course V: Foundation Engineering	PC	2	-	-	-	ESE	100	40	40
UCEE0731	Treatability Studies Laboratory	PC	-	-	2	**1**	ISE	50	20	
							ESE (OE)	50	20	
UCEE0732	Quantity Surveying and Valuation Laboratory	PC	-	-	2	**1**	ISE	50	20	
							ESE (OE)	50	20	
UCEE0741	Seminar	MC	-	-	2	**1**	ISE	50	20	
UCEE0751	Project Phase I	MC	-	-	2	**1**	ISE	50	20	
			17	**1**	**08**	**20**	**500 + 300 = 800 + Audit Course**			

Total Credits – 20, Total Contact hours – 26

Sr. No.	Open Elective II
UOEL0731	Disaster Management and Risk Analysis
UOEL0732	Waste Management

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for

Final Year B. Tech. Program in Civil and Environmental Engineering Semester-VIII

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme		
			L	T	P	Credits	Components	Marks	
								Max	Min for passing
UCEE0852	Internship and Project Phase II	MC	-	-	12	**6**	ISE I	75	30
							ISE II	75	30
							ESE (OE)	150	60
UCEE08**	Professional Elective IV	PE	3	-	-	**3**	ISE-I	10	20
							ISE-II	10	
							MSE	30	
							ESE	50	20
UCEE08**	Professional Elective V	PE	3	-	-	**3**	ISE-I	10	20
							ISE-II	10	
							MSE	30	
							ESE	50	20
			6	**-**	**12**	**12**	**300 + 100 + 100 = 500**		

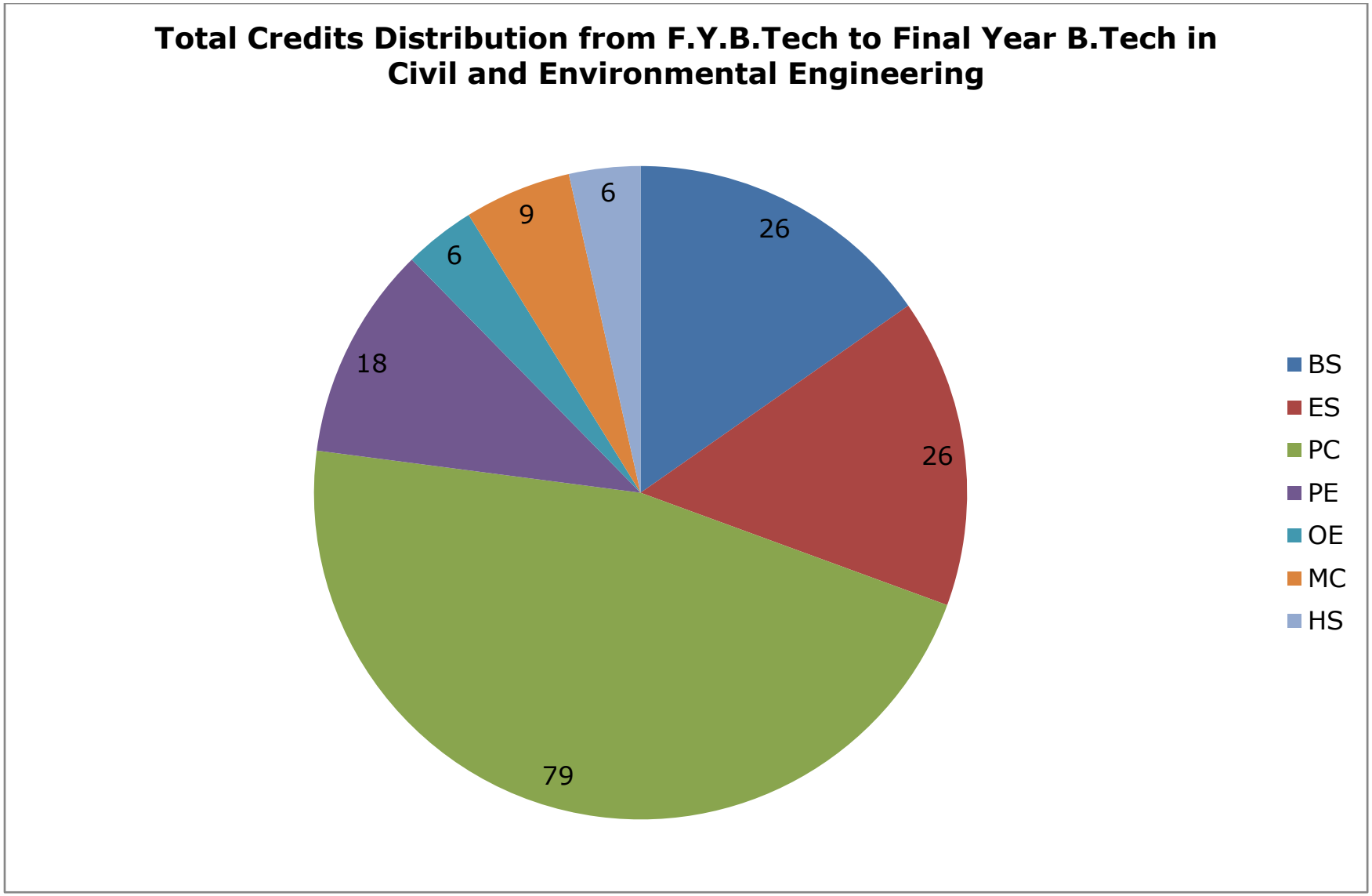
Total Credits - 12, Total Contact hours – 18

Professional Elective – IV		**Professional Elective – V**	
UCEE0821	Industrial Wastewater Treatment	UCEE0824	Environmental Management System
UCEE0822	Project Management	UCEE0825	Advanced Construction Technology
UCEE0823	Urban Infrastructure and Smart Cities	UCEE0826	Environmental Sustainability

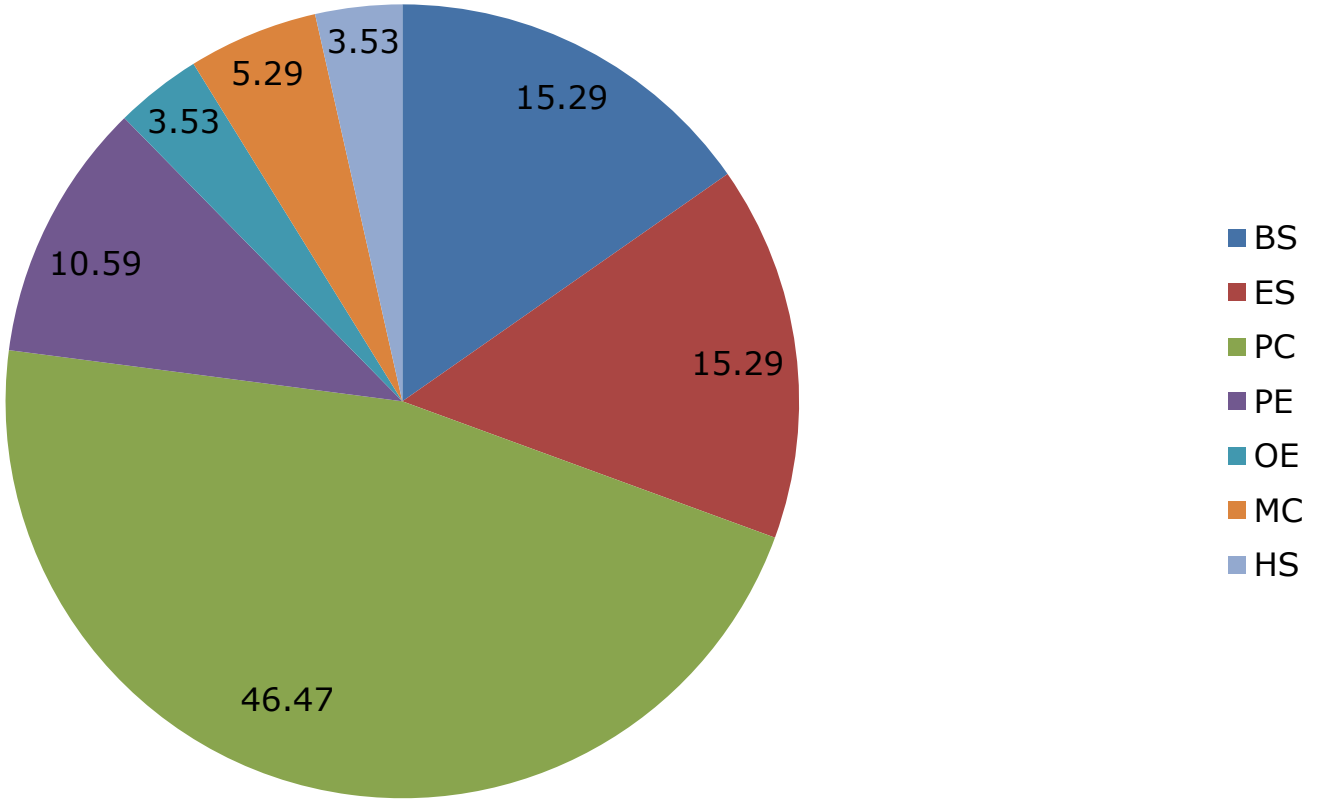
Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
B. Tech. Program in Civil and Environmental Engineering

Total Credits Distribution from F.Y.B.Tech to Final Year B.Tech in Civil and Environmental Engineering

Component	F.Y.B.Tech		S.Y.B.Tech		T.Y.B.Tech		Final Year B.Tech		Total	% age
	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Sem VII	Sem VIII		
Basic Sciences (BS)	9	9	4	4	-	-	-	-	26	15.29
Engineering Sciences (ES)	13	13	-	-	-	-	-	-	26	15.29
Program Core (PC)	-	-	18	14	17	15	15	-	79	46.47
Professional Elective (PE)	-	-	-	4	4	4	-	6	18	10.59
Open Elective (OE)	-	-	-	-	-	3	3	-	6	3.53
Mandatory Course (MC)	-	-	-	-	1	-	2	6	9	5.29
Humanities (HS)	3	3	-	-	-	-	-	-	6	3.53
Total	**25**	**25**	**22**	**22**	**22**	**22**	**20**	**12**	**170**	**100**


Total Credits Distribution from F.Y.B.Tech to Final Year B.Tech in Civil and Environmental Engineering
26
26
79
18
6
9
6
BS
ES
PC
PE
OE
MC
HS

Total Credits (%) Distribution from F.Y.B.Tech to Final Year B.Tech in Civil and Environmental Engineering



SYLLABUS

S. Y. B. Tech

Civil and Environmental Engineering

SEMESTER - III

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Applied Mathematics **Course Code:** UCEE0301	**L**	**T**	**P**	**Credits**
	03 hours per week	1	---	4

Course Pre-Requisite:

- Basic terminologies of differential equations
- Vector algebra
- Concepts of probability
- Differential and integral calculus

Course Description:

This course contains linear differential equations, vector calculus, Complex calculus, statistics and probability.

Course Learning Objectives:

1. To make familiar the prospective engineers with techniques in differential equations, vector calculus, complex analysis, probability and statistics.
2. The students must be able to tackle more advanced level of mathematics and its applications that they would find useful in their disciplines.
3. To develop abstract, logical and critical thinking and the ability to reflect critically upon their work.

Course Outcomes:

COs	**After the completion of the course the student will be able to**	**Bloom's Taxonomy Descriptor**
CO1	Understand various concepts and meaning of terms in differential equations, vector calculus, complex analysis, probability and statistics.	Understanding L2
CO2	Solve LDE with constants coefficients and problems in vector calculus and complex analysis.	Applying L3
CO3	Apply the knowledge of probability distributions and statistical techniques to the given data.	Applying L3
CO4	Analyze and interpret the solutions obtained of various mathematical problems in vector algebra, statistical techniques, functions of complex variable.	Analyzing L4

CO-PO Mapping:

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

Assessments :

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**: Assessments 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 with60-70% weightage for course content (normally last three units) covered after MSE.

Course Contents:	
Unit 1: Linear Differential Equations with Constant Coefficients 1.1 Definition, general form, complete solution 1.2 Rules for finding complementary function 1.3 Short methods for finding particular integral 1.4 General Rule for finding particular integral 1.5 Applications to bending of beams	8 Hours
Unit 2: Vector Differential Calculus 2.1 Differentiation of vectors 2.2 Velocity and acceleration 2.3 Gradient of scalar point function and directional derivative 2.4 Divergence of vector point function 2.5 Curl of a vector point function 2.6 Solenoidal and irrotational vector fields	7 Hours
Unit 3: Statistical Techniques for Environmental Engineering 3.1 Correlation and Coefficient of correlation 3.2 Lines of regression of bivariate data 3.3 Fitting of curves by method of least-squares 3.3.1 Fitting of straight lines 3.3.2 Fitting of exponential curves. 3.4 Applications of statistical techniques for Civil and Environmental Engineering.	7 Hours
Unit 4: Probability Distributions 4.1 Random variable 4.2 Probability mass function and probability density function 4.3 Binomial distribution 4.4 Poisson distribution 4.5 Normal distribution 4.6 Civil and Environmental Engineering related problems	7 Hours
Unit 5: Test of Significance 5.1 Sampling distribution of mean and standard error 5.2 Large sample tests: Test for an assumed mean and equality of two population means. 5.3 Small sample tests : t-test for an assumed mean and equality of means of two populations, Paired t-test. 5.4 Test by using Chi – square distribution. 5.4.1 Goodness of fit test. 5.4.2 Test for independence of attributes Yates's Correction. 5.5 Civil and Environmental Engineering related problems	8 Hours
Unit 6: Calculus of Complex Functions 6.1 Functions of complex variable 6.2 Analytic function, necessary and sufficient condition for f(z) to be analytic 6.3 Milne – Thomson method to determine analytic function f(z) 6.4 Harmonic function 6.5 Complex integration, Cauchy's theorem and Cauchy's integral formula.	7 Hours
Text Books: 1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi. 2. A Text Book of Applied Mathematics, Vol. I and vol. II by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.	
Reference Books: 1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.	

2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi.
4. Mathematics for Engineers Vol-I and Vol-II by Rakesh Dube, Narosa Publishing House.

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Surveying **Course No.:** UCEE0302	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

Students shall have the basic knowledge of:

- Basic Civil Engineering

Course Description:

The course will help the students to understand the importance of the Surveying, Leveling in Environmental engineering works. They can get all the knowledge of conventional and advanced instruments used in Surveying for construction of Civil engineering works. They can solve the field problems and will give solutions for it.

Course Learning Objectives:

1. To introduce the principles of various surveying and levelling methods and applications in Civil and Environmental engineering projects.
2. To use the given surveying equipments, prepare contour maps and carryout surveying works related to land and civil engineering projects and to perform various area and volume calculations.
3. To use the various surveying methods to prepare topographical map as a conventional method.
4. To introduce the students to theodolite as an effective Surveying instruments.
5. To learn the principles of curves and hydrographic survey and its applications.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Apply basic knowledge of principles of surveying and levelling to conduct land survey.	Cognitive (Applying) L3
CO.2	Apply knowledge of contouring to read, prepare topographic maps including contours of any site and compute the areas and volumes of it.	Cognitive (Applying) L3
CO.3	Make use of skills for collection of field data using conventional and surveying instruments, and analyze the same.	Cognitive (Applying) L3
CO.4	Analyze the use of modern surveying instruments for collection of the field data	Cognitive (Analyzing) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	-	-	3	2	-	-	-	-	-	-	-	-
CO.2	-	-	-	3	2	-	-	-	-	-	-	-
CO.3	-	-	2	1	-	-	-	-	-	-	-	-
CO.4	-	-	-	-	-	-	2	-	-	-	-	-

COs	PSO1	PSO2
CO.1	-	-
CO.2	-	2
CO.3	-	-
CO.4	-	-

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignments/Unit Tests/Quiz/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units).
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weight age for course content covered after MSE.

Course Contents:

Unit 1: Introduction and Basics of Surveying Introduction –Basic Principle of Surveying, Types of surveying, Classification of Survey-based on Instrument, Scale, purpose and place, Errors in Surveying, applications of Surveying	04 Hours
Unit 2: Levelling Introduction of Leveling, Study and use of various levels Dumpy level, Wye Level, Cookes Reversible Level, Cushings level, Modern tilting level, Auto level, field procedure in leveling, types of leveling, source and errors in leveling, difficulties in levelling, precautions and difficulties faced in leveling. Temporary and Permanent adjustment of dumpy level, various corrections used in leveling such as curvature correction, refraction correction, combined correction, visible horizon correction, dip of horizon, sensitivitiveness of the bubble, Determination of sensitiveness, problems on reciprocal levelling.	08 Hours
Unit 3: Contouring and Computations of Areas and Volumes Contours: Contour intervals, characteristics of contours, methods of contouring, Interpolation of contours, drawing contours, uses of contour maps, Interpretation of typical contour sheet. Area- Trapezoidal, Simpson's rule, mechanical and digital planimeter, Volume – Trapezoidal and Prismoidal rule for Earthwork,	07 Hours
Unit 4: Plane Table Surveying Principle, Accessories of plane table surveying, orientation, procedure of setting up plane table surveying over a station, methods of plane tabling, errors and precautions, applications , advantages and disadvantages.	06 Hours
Unit 5: Theodolite Surveying: Various parts and axis of transit, technical terms, temporary and permanent adjustments of a transit, horizontal and vertical angles, methods of repetition and reiteration. Precautions in using theodolite, sources of errors in theodolite	08 Hours

survey, Use of Theodolite for various works such as prolongation of a straight line, setting out an angle, trigonometric levelling to find out the height of object. **Tacheometry:** Principle, Uses of tacheometry, Instruments used in tacheometry, Determination of tacheometric constants, Systems of tacheometric surveying - stadia system fixed hair method, Errors.	
Unit 6: Introduction to Curves and Hydrographic Surveying **Curves:** Significance of curves and curve setting, Classification of curves, Elements of simple, compound, reverse, transition, combined curve, lemniscates and vertical curves, Introduction to setting out of curves. **Hydrographic Surveying:** Introduction, Purpose of hydrographic survey, Methods of hydrographic survey, mean sea-level, tide gauges, location of soundings, equipments for taking soundings.	07 Hours
Text Books: 1. A Text book of Advanced Surveying by R. Agor 2. Surveying and Leveling by Basak – Second Edition	
Reference Books: 1. Surveying Vol.I, II and III by Dr. B.C. Punamia 2. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni 3. Surveying Vol. I, II and III by Dr. K.R. Arora 4. Surveying Vol. I and II by S. K. Duggal 5. Surveying and Levelling by N.N. Basak 6. Surveying and Levelling by R. Agor 7. Surveying and Leveling by S.S. Bhavikatti 8. Surveying by S.K.DuggaL- Vol. I, Vol. II 9. Plane Surveying – Dr. Alok De, S. Chand Publications	
Unit wise Measurable Students Learning Outcomes: **Unit Learning Objectives (ULO):** **Unit1:** Demonstrate basic knowledge of principles of surveying and field procedures to conduct the Land survey. **Unit-2**: Demonstrate basic knowledge of principles of leveling and field procedures to conduct the Land survey. **Unit-3**: Develop skills for developing various contour maps and read contour maps along with calculate various areas and volumes by using standard formulae. **Unit-4**: Study and use the plane table survey for determining topography of the site can be directly recorded on the drawing as elevations. Distances to the objects can be measured directly the **Unit-5**: Develop skills for collection of field data using traditional surveying equipments such as Levels, theodolite and tacheometry. **Unit-6:** Explain the various types of curves and its application also to get to know about hydrographic survey and its principles for civil and environmental engineering works. **Unit Outcomes (UO):** After completion of the unit, students will be able to, 1. Understand the importance surveying in various civil and environmental engineering works**. (CO1, CO3)** 2. Understand the importance levelling and various types of levels in various civil and	

environmental engineering works**. (CO1, CO3)**

3. Understand, develop and read various types of contour maps along with areas and volume calculations. **(CO1, CO3)**
4. Develop and determine topography of the sites as well as distances of various objects by using plane table survey.**(CO2)**
5. Apply surveying instruments like theodolite and tachometer for surveying and leveling skillfully. **(CO2)**
6. Apply the principles of Curves and hydrographic survey for environmental engineering works**.(CO4)**

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Fluid Mechanics **Course No.:** UCEE0303	**L**	**T**	**P**	**Credits**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students shall have the basic knowledge of:

- Mathematics
- Engineering Physics
- Engineering Mechanics

Course Description:

The course provides a comprehensive knowledge and insight into the study of Fluid Mechanics. Students will learn different types of fluids, their properties and functional relationships between them. The course will also impart fundamental background in the statics, kinematics and dynamics of fluid flow system, laws of fluid mechanics and energy relationships. Students will understand the principles of conservation of mass, momentum and energy as applied to fluids in motion, recognize these principles written in the form of mathematical equations. They will apply these equations to analyze problems by making good assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.

Course Learning Objectives:

1. To understand importance of fluid mechanics from engineering point of view.
2. To study the types and behavior of fluids and their corresponding engineering properties.
3. To learn the rational approaches consistent with general laws of basic and engineering sciences, experimental evidences, scientific and fundamentals of fluid statics, kinematics and dynamics.
4. To recognize the physical description and hydraulic illustrations of flow systems.
5. To acquire the principles of fluid mechanics for correlating parameters of various phenomenon of fluid behavior.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Explain the fundamental concepts of fluid mechanics by taking into account the basic sciences, processes and characteristics of fluids.	Cognitive (Understanding) L2
CO.2	Analyze problems to determine pressure forces acting on surfaces, stability conditions, flow systems and losses in pipes using theoretical and analytical expressions.	Cognitive (Analyzing) L4
CO.3	Appraise the procedure to derive functional relationships between various parameters in a phenomenon using principles of fluid mechanics.	Cognitive (Evaluating) L5
CO.4	Interpret the use of basic laws and equations in instrumentation through theoretical and standard laboratory procedures.	Cognitive (Evaluating) L5

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	3	2	1	-	-	-	-	-	-	-	-	-
CO.2	3	2	-	2	-	-	-	-	-	-	-	-
CO.3	-	-	-	3	2	-	-	-	-	-	-	-
CO.4	-	-	2	2	1	-	-	-	-	-	-	-

COs	PSO1	PSO2
CO.1	-	-
CO.2	-	1
CO.3	-	-
CO.4	-	-

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three modules).
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: **Introduction:** Physical Properties of Fluids (Mass Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity: Dynamic and Kinematic Viscosity, Compressibility, Surface Tension, Capillary Effect, Vapour Pressure and Cavitation), Effect of Temperature on Viscosity, Newton's Law of Viscosity, Types of Fluids. **Dimensional Analysis:** Dimensions and Dimensional Homogeneity, Importance and Use of Dimension Analysis, Buckingham Pi (π) Theorem, Dimensionless Numbers, Similitude, Types of Similarities	07 Hours
Unit 2: **Fluid Statics:** Types of Pressure, Pascal's Law, Hydrostatic Law, Pressure Measurement Devices, Concept of Pressure Diagram, Centre of Pressure, Forces on Plane and Curved Surfaces. **Buoyancy and Floatation:** Archimedes's Principle, Metacentre, Problems, Stability of Submerged and Floating Bodies.	08 Hours
Unit 3: **Fluid Kinematics:** Description of Fluid Motion, Velocity and Acceleration of Fluid Particles, Types of Flows, Stream lines, Equipotential lines, Steak Line, Path Line, Stream Tube, Stream Function and Velocity Potential Function, Flow Net, Properties and Uses, Continuity Equation in 3-D Cartesian Form.	05 Hours
Unit 4: **Fluid Dynamics:** Forces Acting on Fluid in Motion, Euler's Equation along a Streamline, Bernoulli's Theorem, Assumptions and Limitations, Bernoulli's Applications: Venturimeter (Horizontal and Vertical), Orificemeter, Discharge Derivation, Orifices, Time required for Emptying the Tank, Hydraulic Coefficients of Orifices, Concept of HGL and TEL, Velocity Measurement using Pitot Tube, Pitot Static Tube.	07 Hours
Unit 5: **Laminar Flow and Turbulent Flow:** Reynolds Experiment, Critical Reynolds Number, Hazen Poisulle's Equation for Viscous Flow through Circular Pipes, Introduction to Moody's Chart. **Boundary Layer Theory:** Concept, Boundary Layer along a Thin Plate, Various Thicknesses (Nominal, Displacement, Momentum, Energy), Hydraulically Smooth and Rough Boundaries, Separation of Boundary Layer, Control of Separation.	07 Hours

Unit 6: **Losses in Pipes:** Major and Minor Losses, Darcy-Weisbach Equation, Short and Long Pipe, Concept of Equivalent Pipe, Dupit's Equation. **Flow through Pipes:** Pipes in Series, Parallel and Siphon, Two Reservoir Problems, Concept of Water hammer, Surge Tanks (Function, Location and Uses).	06 Hours

Text Books:

1. Fluid Mechanics: Including Hydraulic Machines, A. K. Jain, Khanna Publishers, New Delhi.
2. Hydraulics and *Fluid Mechanics*, P. N. Modi and S. M. Seth, Standard Book House, New Delhi.
3. A Textbook of Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, Laxmi Publications, New Delhi, 2013.
4. A Textbook of Fluid Mechanics, R. K. Rajput, S. Chand and Company Pvt. Ltd., New Delhi.
5. Fluid Mechanics – I, M. M. Mujumdar and Akshay R. Thorvat, Electrotech Publications.

Reference Books:

1. Fluid Mechanics, Frank .M. White, McGraw Hill Publishing Company Ltd, New Delhi.
2. Fluid Mechanics: Fundamentals and Applications, Yunus, A. Cengel and John M. Cimbala Adapted by S. Bhattacharya, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som, Gautam Biswas, Suman Chakraborty, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

Unit wise Measurable Students Learning Outcomes:

Unit Learning Objectives (ULO):

1. To **learn** the fundamentals of fluid mechanics and use of dimensional analysis to find out the functional relationships.
2. To **develop** the understanding of types of pressure, fluid statics, hydrostatic law and principle of buoyancy and floatation.
3. To **interpret** different flows with relevant equations.
4. To **imbibe** basic laws and equations used for analysis of dynamic fluids and their applications.
5. To **study** the characteristics of viscous flow, boundary layer theory and effects of boundary layer resistance.
6. To **determine** the losses in flow system and flow through pipes.

Unit Outcomes (UO):

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

1. **Differentiate** between various types of fluids and their behavior under action of forces and **Find** the functional relationships in order to describe the unknown phenomenon. **(CO.1, CO.2, CO.3)**
2. **Compute** the pressure forces acting on plane and curved surfaces and **Analyze** the stability conditions of a floating body. **(CO.2, CO.3)**
3. **Distinguish** velocity potential function and stream function and **Solve** for velocity and acceleration of a fluid at a given location in a fluid flow. **(CO.1, CO.2)**
4. **Derive** Euler's Equation of motion and **Deduce** Bernoulli's equation to solve problems on dynamics of fluid flow system. **(CO.2, CO.3, CO.4)**
5. **Compare** laminar and turbulent flow characteristics and **Explain** the boundary layer concept. **(CO.1, CO.4)**
6. **Interpret** different pipe fittings and **Evaluate** the fluid velocity considering major and minor losses. **(CO2, CO.4)**

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Solid Mechanics **Course Code:** UCEE0304	**L**	**T**	**P**	**Credit**
	04 hours per week	-	-	04

Course Pre-Requisite:

Students must know basic concepts

- Physics
- Engineering Mechanics
- Applied Mathematics

Course Description:

Analysis of statically determinate structures. Studies of stress and strain Section properties, principal axis, torsion of circular shafts. Shear stresses in solid and thin-walled sections. Deflection in beams, double integration, moment-area and unit-load methods.

Course Learning Objectives:

- Study the basic behavior of material when subjected to loading.
- Understand various patterns of loading on structural members and corresponding resistive mechanisms of structural members.
- Study the various straining actions and its effect when present individually on a member.
- Understand the basic principles and concepts of structural mechanics to solve problems.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain Properties and behavior of different materials when subjected to loading.	Cognitive (Explain) L2
CO.2	Identify various forms of loads and effects on structural members.	Cognitive (Identify) L4
CO.3	Interpret properties and behavior of materials by experimental analysis.	Cognitive (Analyze) L4
CO.4	Evaluate structural members subjected to torsion and compressive load conditions.	Cognitive (Compare) L6

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	2	-	-	1	-	-	-	-	-	-	-	-
CO.2	2	2	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	1	3	-	-	-	-	-	-	-	-
CO.4	3	2	-	-	-		-	-	-	-	-	-

COs	**PSO1**	**PSO2**
CO.1	-	-
CO.2	-	-
CO.3	-	-
CO.4	-	1

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Simple Stresses and Strains Engineering properties of different materials, St. Venant's principle, Hooke's law, Behavior of matter subjected to uni-axial loading – Simple Bars, Compound Bars and Composite Bars with respect to Stresses, strains, change in dimensions and change in volume. Behavior of simple bars subjected to Shear Force, concept of complimentary shear stresses. Behavior of simple bars subjected to multi-axial loading, elastic constants, strain in three dimensions, Temperature stresses.	08 Hours
Unit 2: SFD and BMD of Statically Determinate Beams Analysis of statically determinate beams, Shear force diagrams and bending moment diagrams for concentrated loads, couples, uniformly distributed loading and uniformly varying loading in Simply supported beams, cantilever beams, overhanging beams, compound beams.	06 Hours
Unit 3: Stresses in Beams **Bending Stress in Beams** Concept of pure bending, Derivation of flexural formula, Section modulus, Moment of resistance, Lever arm, Simple design Problems for rectangular and flanged Sections. S**hear Stress in Beams** Derivation of shear stress formula, Stress distribution diagrams for Standard shapes, Relation between maximum and average shear stresses for rectangular, triangular, diamond and circular sections, simple design problems for rectangular, flanged and composite shapes.	07 Hours
Unit 4: Thin Cylinders and Strain Energy **Thin Cylinders** Behavior of thin walled cylinders subjected to net internal pressure, study of stresses, strains, change in dimensions and change in volume. **Strain Energy in Elastic Bodies** Concept of strain Energy or Resilience, Proof Resilience, Modulus of Resilience, Work Energy Principle, Strain energy due to different types of axial loadings: Gradual, Sudden and Impact; Strain Energy due to different types of Stresses, Strain energy due to different types of actions	08 Hours
Unit 5: Analysis of Circular Shafts Subjected to Torsion Solid and Hollow circular shafts, Torsion formula, Polar modulus of Shaft, Power Transmitted through Shaft, Comparison of shafts.	06 Hours
Unit 6: Analysis of long columns Definition of column and strut, End conditions of columns, Analysis of long columns, Euler's theory and Rankine's theory.	07 Hours

Textbooks:

1. "Strength of Materials"- S. Ramamrutham, Dhanapat Rai Publications.
2. "Strength of Materials"- R. K. Bansal, Laxmi Publications.
3. Mechanics of Structure (Vol.I and II) - Dr. H. J. Shaha and Junnarkar S. B., Charotar Publication.
4. Mechanics of Materials Vol. I and II - B. C. Punmia and Jain, Laxmi Publications.
5. Strength of Materials - S. Ramamrutham, Dhanapat Rai Publications.
6. Strength of Materials - R. K. Bansal, Laxmi Publications.
7. Strength of Material – Debabrata Nag, A. Chanda, 2nd Edition, Wiley India publication.

Reference Books:

1. "Mechanics of Structure" (Vol. I and II) – Junnarkar S. B. and Advi, Charotar Publication.
2. "Mechanics of Materials" - R. C. Hibbler, Pearson Education.
3. "Mechanics of Materials" – Gere and Timoshenko, CBS publishers.
4. "Mechanics of Materials" Vol. I and II - Punmia, Jain, Laxmi Publications.
5. "Strength of Materials" – Bhavikatti S. S., New Age Publications.
6. "Strength of Materials" - R. K. Rajput, S. Chand Publications.
7. "Structural Analysis" – Bhavikatti S. S, Vikas Publications house New Dehli.
8. "Introduction to Mechanics of Solids" - J. B. Popov, Prentice–Hall publication.
9. "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
10. "Mechanics of Material" - Beer and Johnston, M.
11. "Strength of Materials" - R. S. Khurmi and N. Khurmi, S. Chand Publications.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Building Materials and Concrete Technology **Course No.:** UCEE0305	**L**	**T**	**P**	**Credit**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Engineering Chemistry

Course Description:

- The course comprises of engineering properties of various construction materials
- The course includes details of concrete technology
- The course also deals with various application construction materials

Course Learning Objectives:

1. To provide the knowledge about a wide range of building materials, their properties and its use in construction.
2. To explain the fundamentals and basics of concrete technology.
3. To give the details of methods of construction and quality required for concrete works.
4. To develop a practical approach in choosing construction materials based on use, desired results, durability, availability and cost.
5. To make students aware about Green Materials.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	List the various building materials and their properties.	Analyzing (L4)
CO.2	Illustrate green building materials.	Understanding (L2)
CO.3	Design concrete mix as per the field requirement using various codes	Applying (L4)
CO.4	Analyze various factors affecting quality of fresh and hardened concrete	Analyzing (L4)

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1		2										
CO.2		2				1	2			1		1
CO.3	2	2		2		1	1				1	
CO.4				2		1						1

COs	**PSO1**	**PSO2**
CO.1		
CO.2	1	1
CO.3		1
CO.4		1

Assessments :

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction: (A) Importance of building materials. (B) Stone masonry – principal terms and its types (C) Brick: -Manufacturing, Characteristics of good building bricks, IS specifications, types of bricks- Types (clay bricks, fly ash, cellular light weight concrete brick, aerated cement concrete brick or autoclave brick)Brick work – terms,Types of bonds – English, Flemish, Stretcher, Header	06 Hours
Unit 2: Building Materials-I (A) Materials of doors and windows, types, glazing, method of fixing doors and windows, fixtures and fastenings. (B) Flooring materials tests and IS specifications: Ground and upper floors; Flooring- functional requirements of flooring material, varieties of floor finishes and their suitability, construction details for concrete, tiles and stone flooring.	07 Hours
Unit 3: Building Materials-II (A) ROOF: Introduction, types of roof-Flat roof, Pitched Roof: -Components and It's Types. (B) Roofing materials: different types of roofing materials. (C) Plumbing and Drainage Materials. (D)Green building materials	07 Hours
Unit 4: Ingredients of Concrete (A) Cement: -Manufacture of Portland cement, Chemical composition, Hydration of cement, Classification and types of cement, Tests on cement. (B) Aggregate: -Classification, Mechanical and Physical properties, Deleterious Materials, Soundness, Alkali aggregate reaction, Grading of Aggregates, Tests on aggregate, Artificial and Recycled aggregate. (C) Admixtures in Concrete: types and its function	08 Hours
Unit 5: Fresh Concrete (A) Workability:- Factors affecting workability, measurement of workability, cohesion and segregation, bleeding, Mixing, Transporting, Placing, and Compaction of concrete Curing, Methods of curing, Influence of temperature, Maturity rule, Steam curing (B) Concrete mix design:-Factors to be considered, Statistical quality control, Methods of Mix Design, High strength concrete, Acceptance criteria for concrete as per IS specifications.	08 Hours
Unit 6: Special Concretes Special Concretes: Light weight concrete, Polymer concrete, Fiber reinforced concrete, High performance concrete, Pumped concrete, Ready mixed concrete, Roller compacted concrete, Ferro- cement, Green Concrete	06 Hours

Textbooks:

1. Neville M., Brooks J. J., "Concrete Technology", Pearson Education India, third edition,
2. M. S. Shetty, "Concrete Technology", S. Chand Publications, 2005
3. M. L. Gambhir, "Concrete Technology", Tata McGraw Hill Publications, Fifth edition 2013
4. Punmia B C " Building Construction

Reference Books:

1. R.S. Varshney, "Concrete Technology", Oxford and IBH.

2. P. Kumar Mehta, “Microstructure and properties of concrete”, Prentice Hall. Tata McGraw Hill
3. IS codes :- IS 10262:2009, IS 456:2000
4. Schild E, Casselmann H.F., Dahmen G., Pohlenz R. “Environmental Physics in Construction”, Granada Publishing, London.
5. National Building Code of India 2005, Bureau of Indian Standard, New Delhi
6. Barrid, “Building Construction” Tata McGraw Hill, New Delhi

Unit wise Measurable Students Learning Outcomes:

ULO 1.1: Understand the properties of masonry materials.
ULO 1.2: Know the various types of bonds in brick masonry.
ULO 2.1: Understand the details of doors and windows
ULO 3.1: Identify the components of roofs.
ULO 3.2: Select appropriate types of roofing materials.
ULO 3.3: Understand green material.
ULO 4.1: Understand ingredients of concrete.
ULO 5.1: Understand the significance of different tests carried on concrete.
ULO 5.2: Carry out the concrete mix design.
ULO 6.1: Know the various types of special concrete.

Unit Learning Outcomes (UOs)

At the end of course students will be able to
UO 1.1: Explain the properties of masonry materials.
UO 1.2: Select type of masonry.
UO 2.1: Decide the appropriatetypes of doors and windows from their suitability.
UO 3.1: Identify the Green Materials.
UO 3.2: Decide the appropriate materials for roofing
UO 3.3: Select the building element from various alternatives to satisfy the requirements.
UO 4.1: Explain various ingredients of concrete and their importance
UO 4.2: Decide the suitability of admixtures
UO 5.1: Explain the significance of concrete testing.
UO 5.2: Design concrete mix for certain grades.
UO 6.1: Explain the applications of special concrete.
UO 6.2: State the applications of special concrete

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Audit Course – I : Environmental Studies **Course Code:** UCEE0361	**L**	**T**	**P**	**Credit**
	02 hours per week	---	---	02

Course Pre-Requisite:

Students shall have knowledge of:

- Science
- Technology

Course Description:

The objective of the course is imparting fundamental knowledge and awareness of Environmental science among students and importance of conservation of environment.

Course Learning Objectives:

At the end of the course students will be able to

1. Study scope and importance of natural resources, ecosystems, biodiversity for creating awareness and their conservation in multiple disciplines.
2. Learn various types of pollution, their impacts and control measures for minimizing pollution and sustainable development.
3. Understand social issues related environment, environmental ethics and human rights towards environment.
4. Study various laws and regulations related to environment and its applicability in society and industries.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Descriptor**
CO1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.	Cognitive (Understanding) L2
CO2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.	Cognitive (Understanding) L2
CO3	Discuss environmental ethics and their implementation for betterment of environment and human life.	Cognitive (Analyzing) L4
CO4	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.	Cognitive (Analyzing) L4

CO-PO Mapping:

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

COs	PSO1	PSO2
CO.1		
CO.2	1	1
CO.3		1
CO.4		1

Assessments :

Assessment	Weightage (Marks)
ESE	100

ESE: Assessment is based on 100% course content.

Course Contents:

Unit 1: Nature of Environmental Studies Definition, scope and importance, Multidisciplinary nature of environmental studies, Need for public awareness.	4 Hours
Unit 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, dams 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 agriculture effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and nonrenewable 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. Role of individuals in conservation of natural resources.	4 Hours
Unit 3: Ecosystems Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	4 Hours
Unit 4:Biodiversity and its conservation Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation, Western Ghat as a biodiversity region. Hot-spot of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	4 Hours

Unit 5:Environmental Pollution Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.	4 Hours
Unit 6: Social Issues and the Environment Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.	4 Hours
Unit 7:Environmental Protection From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Population Growth and Human Health, Human Rights.	4 Hours
Textbooks: 1. Environmental Studies by Dr. P.D.Raut (Shivaji University, Kolhapur)	
Reference Books: 1. Miller T.G. Jr., Environmental Science. Wadsworth Publications Co.(TB). 2. Odum, E.P.1971, Fundamentals of Ecology, W.B.Saunders Co. USA,574p 3. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines,Compliances and Standards, vol. I and II, Environmental Media (R)	
Unit wise Learning Outcomes: At the end of the course the students will be able to: UO 1: Describe scope and importance of environmental studies. UO 2: Describe types of natural resources, their use and conservation. UO 3: Explain structure and functions of ecosystem, their types and importance. UO 4: Discuss biodiversity, endangered species and methods of biodiversity conservation. UO 5: Explain causes, effects and solutions to pollution problems. UO 6: Discuss environmental ethics and various social issues related to environment. UO 7: Discuss laws and regulations for conservation of environment.	

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Surveying Laboratory **Course No.:** UCEE0331	**L**	**T**	**P**	**Credit**
	---	---	02 hours per week	01

Course Pre-Requisite:

Students shall have the basic knowledge of:

- Fundamentals of science and mathematics
- Principles of Surveying
- Purpose of Surveying

Course Description:

The course describes the fundamental principles of Surveying, Leveling with the help of various conventional and advanced instruments through Surveying practicals.

Course Learning Objectives:

1. To explain the students various methods and use of instruments of Surveying.
2. To operate various conventional and advanced instruments used for Surveying.
3. To compute field data from the Surveying observations.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Explain basic knowledge on minor and major surveying equipments.	Cognitive (Understanding) L2
CO.2	Apply equipments/instruments for conducting surveying, levelling, theodolite traversing for civil works.	Cognitive (Applying) L3

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1				2								2
CO2					1							2

COs	**PSO1**	**PSO2**
CO1		2
CO2		1

Assessments :

Assessment	**Weightage (Marks)**
ISE	50
ESE (OE)	50

- **ISE:** Based on practicals performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (OE):** Assessment is based on practical performed and oral examination.

Course Contents:

Experiment No. 1: Exercise based on use of Dumpy Level and Auto level: a) Revision Levelling exercise by Dumpy level. b) Levelling exercise by Auto level. **Learning Outcome:** To recall leveling procedure and operation of auto level.	4 Hours
Experiment No. 2: Exercise based on use of Theodolite: a) Study of different components of Transit Theodolite. b) Measurement of Horizontal Angle by various methods, measurement of Vertical Angle by Theodolite **Learning Outcome:** To apply theodolite for field work surveying.	4 Hours

Experiment No. 3: Exercise based on Horizontal Angle Measurement by using theodolite a) Measurement of Horizontal Angle by direct method b) Measurement of Horizontal Angle by repetition method c) Measurement of Horizontal Angle by reiteration method **Learning Outcome:** To apply theodolite for field work surveying	4 Hours
Experiment No. 4: Exercise based on Vertical Angle Measurement by using theodolite a) Measurement of Vertical Angle by direct method **Learning Outcome:** To apply theodolite for field work surveying	4 Hours
Experiment No. 5: Exercise based on use of Tacheometer: a) Determination of Tacheometric constants. b) Determination of horizontal and vertical distances by Tacheometer. **Learning Outcome:** To compute horizontal and vertical distances by field data.	4 Hours
Experiment No. 6: Demonstration of Plane table surveying a) Study of different components of plane table surveying b) Determination of various points by using Plane table survey-Radiation **Learning Outcome:** To plot various points by using plane table surveying.	6Hours
Experiment No. 7: Introduction of advanced instruments: a) Study of EDM , Electronic Theodolite b) Study of Total Station **Learning Outcome:** To explain various components and application of GPS and Total station.	4 Hours
Field Projects: 1. Block Contouring (Interpolation Calculations, Drawings, etc) 2. Theodolite Traversing. **Learning Outcome:** To produce contours and traverse of given site.	1 Day
Text Books: 1. A Text book of Advanced Surveying by R.Agor 2. Surveying and Leveling by Basak – Second Edition	
Reference Books 1.Surveying Vol.I, II and III by Dr. B.C. Punamia 2. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni 3. Surveying Vol. I, II and III by Dr. K.R. Arora 4. Surveying Vol. I and II by S. K. Duggal 5. Surveying and Levelling by N.N. Basak 6. Surveying and Levelling by R. Agor 7. Advanced Surveying by R. Agor. 8. Advanced Surveying by Satish Gopi, R. Sathikumar and N. Madhu 9. Surveying and Leveling by S.S. Bhavikatti 10. Surveying by S.K.DuggaL- Vol. I, Vol. II 11. Advanced Surveying by P. Som, B. N. Ghosh	

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Fluid Mechanics Laboratory **Course No.:** UCEE0332	**L**	**T**	**P**	**Credits**
	---	---	02 hours per week	01

Course Pre-Requisite:

Students shall have the basic knowledge of:

- Applied Mathematics
- Engineering Physics
- Engineering Mechanics
- Fluid Mechanics

Course Description:

The course explores the fundamental principles of fluid mechanics through laboratory experimentations and demonstrates and analyzes key hydraulic phenomena using hands-on physical devices.

Course Learning Objectives:

1. To introduce the students to a wide variety of fluid measurement systems.
2. To operate fluid flow equipments and instruments for a given purpose.
3. To analyze experimental data by work individually and as a team.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Exhibit basic principles and equations of fluid mechanics through experimentation.	Cognitive (Understanding) L2
CO.2	Calibrate various hydraulic measuring devices through standard laboratory procedures.	Cognitive (Analyzing) L4

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1				3	1					2		
CO2				3	1					2		

COs	**PSO1**	**PSO2**
CO1	-	-
CO2	-	1

Assessments :

Assessment	**Weightage (Marks)**
ISE	25
ESE (OE)	25

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (OE):** Assessment is based on oral examination.

Course Contents:

Experiment No. 1: Measurement of Discharge. **Learning Outcome:** To analyze the rate of flow of water using constant time, constant head and volumetric analysis methods.	2 Hours
Experiment No. 2: Stability of Floating Objects. **Learning Outcome:** To calculate metacentric height of a given ship model to check the stability condition.	2 Hours

Experiment No. 3: Verification of Bernoulli's Theorem. **Learning Outcome:** To illustrate Bernoulli's theorem by demonstrating the relationship between pressure head and kinetic energy head for a conduit of varying cross-section.	2 Hours
Experiment No. 4: Calibration of Venturimeter and Orificemeter. **Learning Outcome:** To determine the coefficients of discharge for given venturimeter and orificemeter using analytical and graphical methods.	2 Hours
Experiment No. 5: Calibration of Orifice. **Learning Outcome:** To evaluate the hydraulic coefficients (C_d, C_v, C_c and C_R) of orifice and their interrelationships.	2 Hours
Experiment No. 6: Pipe Friction Experiment. **Learning Outcome:** To determine the Darcy's Coefficient (Friction Factor) for different pipe materials.	2 Hours
Experiment No. 7: Reynolds Experiment. **Learning Outcome:** To demonstrate laminar, transitional (intermittently turbulent), and fully turbulent pipe flows, and the conditions under which these types of flow occur.	2 Hours
Experiment No. 8: Study of Moody's Chart. **Learning Outcomes:** To relates the Darcy-Weisbach friction factor f, Reynolds number Re, and relative roughness (K/D) for fully developed flow in a circular pipe.	2 Hours

Text Books:

1. Fluid Mechanics: Including Hydraulic Machines, A. K. Jain, Khanna Publishers, New Delhi.
2. Hydraulics and Fluid Mechanics, P. N. Modi and S. M. Seth, Standard Book House, New Delhi.
3. A Textbook of Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, Laxmi Publications, New Delhi, 2013.
4. A Textbook of Fluid Mechanics, R. K. Rajput, S. Chand and Company Pvt. Ltd., New Delhi.
5. Fluid Mechanics – I, M. M. Mujumdar and Akshay R. Thorvat, Electrotech Publications.

Reference Books:

1. Fluid Mechanics, Frank .M. White, McGraw Hill Publishing Company Ltd, New Delhi.
2. Fluid Mechanics: Fundamentals and Applications, Yunus, A. Cengel and John M. Cimbala Adapted by S. Bhattacharya, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som, Gautam Biswas, Suman Chakraborty, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Strength of Materials Laboratory **Course No.:** UCEE0333	**L**	**T**	**P**	**Credit**
	---	---	02 hours per week	01

Course Pre-Requisite:

Students must know basic concepts

- Applied Science
- Engineering Mechanics and
- Applied Mathematics

Course Description:

The course makes students understand experimental analysis of stress and strain in various structural materials. Study of behavior of structural materials, when subjected to different types of loads such as Bending, Shear, Torsion, Deflection, Energy absorption etc.

Course Learning Objectives:

- Study the basic properties of material when subjected to loading.
- Study the various stresses and strains in different types of structural material under individual action of load.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Demonstrate the properties of materials under action of various loads.	Cognitive (Explain) L2
CO.2	Interpret the behavior of various structural materials in terms of stress and strain and energy.	Cognitive (Identify) L4

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	2	-	-	2	-	-	-	-	-	-	-	1
CO2		3		3	-					2		

COs	**PSO1**	**PSO2**
CO1	-	-
CO2	-	1

Assessments :

Assessment	**Weightage (Marks)**
ISE	50

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Course Contents:

Experiment No. 1: Study of Universal Testing Machine **Learning Outcome:** To Identify the components and understand the operation of Universal Testing Machine.	2 Hours
Experiment No. 2: Tensile test on Mild steel and TMT steel. **Learning Outcome:** To determine tensile strength, percentage of elongation and other mechanical properties of Mild steel.	2 Hours

Experiment No. 3: Compression test on M.S. and C.I, cement bricks or paving blocks. **Learning Outcome:** Determine crushing strength of different materials.	2 Hours
Experiment No. 4: Compression test on timber. **Learning Outcome:** To determine compressive strength of timber.	2 Hours
Experiment No. 5: Direct shear test on M.S. **Learning Outcome:** To determine shear strength of mild steel.	2 Hours
Experiment No. 6: Charpy or Izod Impact test on different metals. **Learning Outcome:** Find out energy absorption by Charpy and Izod impact test on metal specimen.	2 Hours
Experiment No. 7: Torsion test on different metals. **Learning Outcome:** Find out effect of torsional force by torsion test on metal specimen.	2 Hours

Textbooks:

1. "Strength of Materials"- S. Ramamrutham, Dhanapat Rai Publications.
2. "Strength of Materials"- R. K. Bansal, Laxmi Publications.
3. Mechanics of Structure (Vol.I and II) - Dr. H. J. Shaha and Junnarkar S. B., Charotar Publication.
4. Mechanics of Materials Vol. I and II - B. C. Punmia and Jain, Laxmi Publications.
5. Strength of Materials - S. Ramamrutham, Dhanapat Rai Publications.
6. Strength of Materials - R. K. Bansal, Laxmi Publications.
7. Strength of Material – Debabrata Nag, A. Chanda, 2nd Edition, Wiley India publication.

Reference Books:

1. "Mechanics of Structure" (Vol. I and II) – Junnarkar S. B. and Advi, Charotar Publication.
2. "Mechanics of Materials" - R. C. Hibbler, Pearson Education.
3. "Mechanics of Materials" – Gere and Timoshenko, CBS publishers.
4. "Mechanics of Materials" Vol. I and II - Punmia, Jain, Laxmi Publications.
5. "Strength of Materials" – Bhavikatti S. S., New Age Publications.
6. "Strength of Materials" - R. K. Rajput, S. Chand Publications.
7. "Structural Analysis" – Bhavikatti S. S, Vikas Publications house New Dehli.
8. "Introduction to Mechanics of Solids" - J. B. Popov, Prentice–Hall publication.
9. "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
10. "Mechanics of Material" - Beer and Johnston, M.
11. "Strength of Materials" - R. S. Khurmi and N. Khurmi, S. Chand Publications.

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Concrete Technology Laboratory **Course No.:** UCEE0334	**L**	**T**	**P**	**Credit**
	---	---	02 hours per week	01

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Building Materials and Concrete Technology

Course Description:

The course explores the basic knowledge and fundamental principles of concrete testing. In this course students will be introduced to various properties of concrete through laboratory testing.

Course Learning Objectives:

- To develop technical skills for handling concrete through Laboratory experiments.
- Impart practical consideration for selection of appropriate materials for concrete work.

Course Outcomes:

Cos	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Examine properties of concrete and various concrete ingredients.	Cognitive (Analyzing) L4
CO.2	Design concrete mix as per standard.	Cognitive (Creating) L6

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1											1	1
CO2	2		2									1

COs	**PSO1**	**PSO2**
CO1	-	1
CO2	-	1

Assessments :

Assessment	**Weightage (Marks)**
ISE	25
ESE (OE)	25

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (OE):** Assessment is based on oral examination.

Course Contents:

Experiment No. 1: Particle size distribution of fine aggregates	2 Hours
Experiment No. 2: Flakiness index of aggregates	2 Hours
Experiment No. 3: Crushing strength of aggregates	2 Hours
Experiment No. 4: Determination Specific gravity of aggregates	2 Hours
Experiment No. 5: Experiment on Silt content of fine aggregates	2 Hours

Experiment No. 6: Test on bulking of sand	2 Hours
Experiment No. 7: Consistency test	2 Hours
Experiment No. 8: Initial and final settling time	2 Hours
Experiment No. 9: Soundness Test of cement	2 Hours
Experiment No. 10: Concrete mix design	2 Hours
Experiment No. 11: Workability (Slump) test	2 Hours
Experiment No. 12: Compressive Strength Test on concrete mix	2 Hours

Textbooks:

1. M. S. Shetty, “Concrete Technology”, S. Chand Publications, 2005
2. M. L. Gambhir, “Concrete Technology”, Tata McGraw Hill Publications, Fifth edition 2013

Reference Books:

1. Neville A. M., "Properties of Concrete", Pearson Education India,
2. R.S. Varshney, “Concrete Technology”, Oxford and IBH.
3. P. Kumar Mehta, “Microstructure and properties of concrete”, Prentice Hall. Tata McGraw Hill
4. IS codes
5. Schild E, Casselmann H.F., Dahmen G., Pohlenz R. “Environmental Physics in Construction”, Granada Publishing, London.
6. National Building Code of India 2005, Bureau of Indian Standard, New Delhi.

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Building Drawing Laboratory **Course No.:** UCEE0335	**L**	**T**	**P**	**Credit**
	---	---	02 hours per week	01

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Basic building components and building services
- Principles of building planning
- AutoCAD software

Course Description:

The course explores the basic knowledge and fundamental principles of building planning through drawing building drawings during lab sessions. The course imparts the drawing skills in submission drawing, drawing various components of building.

Course Learning Objectives:

- To develop technical drawing skills of students
- Impart practical consideration in planning a building through site exposure and drawings

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Plan different components of building.	Cognitive (Applying) L3
CO.2	Design Residential building using Auto-CAD.	Cognitive (Creating) L6

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	1	1			1					1		
CO2	1	2			2					2	2	1

COs	**PSO1**	**PSO2**
CO1		
CO2		1

Assessments :

Assessment	**Weightage (Marks)**
ISE	50

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Course Contents:

Exercise No. 1: Building Components Study of Building Components (Draw the sketches of various types of foundation)	2 Hours
Exercise No. 2: Principles of planning Assignments based upon Principles of planning and building Bye laws.	2 Hours
Exercise No. 3: Doorand Window Detail drawing of doorand window showing all components of door and window (Section and Elevation)	4 Hours
Exercise No. 4: Design and drawing of Staircase: Dog legged and Open well Staircase	4 Hours

Exercise No. 5: Drawing of Measurement plan of any residential building	6 Hours
Exercise No. 6:Building drawing Detailed Design and drawing for one residential building Using AutoCAD. Providing following details • Plan • Foundation / Centre Line Drawing. • Furniture layout plan. • Electrification plan • Water supply and drainage plan.	10 Hours

Textbooks:

1. Building Planning by Shah Kale
2. Building Construction – B.C.Punmia (Laxmi Publications)
3. Text Book of Building Construction – S.P. Arora, S.P. Bindra (DhanpatRai Publications)
4. Civil Engineering Drawing – M. Chakraborty.

Reference Books:

1. A to Z of Practical Building Construction and Its Management- SandeepMantri (SatyaPrakashan, New Delhi)
2. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
3. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
4. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)

SYLLABUS

S. Y. B. Tech

Civil and Environmental Engineering

SEMESTER – IV

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Environmental Chemistry and Microbiology **Course Code:** UCEE0401	**L**	**T**	**P**	**Credit**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students shall have knowledge of:

- Engineering Chemistry
- Applied Mathematics
- Biology

Course Description:

The objective of the course is imparting fundamental knowledge of Environmental chemistry and fundamental concepts of microbiology. This subject will also cover experimental procedures of various water quality parameters and wastewater parameters.

Course Learning Objectives:

At the end of the course students will be able to

1. Study concepts of quantitative, physical, colloidal and bio-chemistry required in Environmental Engineering.
2. Understand working principles of different instruments related to Environmental Engineering.
3. Learn effect of toxic and trace contaminants on environment.
4. Study characteristic of different microorganisms in water and wastewater engineering.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive Descriptor**
CO1	Explain the concepts of quantitative, physical, colloidal and bio- chemistry required in Environmental Engineering and environmental significance of various parameters.	Cognitive (Understanding) L2
CO2	Illustrate working principles of different instruments related to Environmental Engineering and to identify the environmental characteristics of organic compound.	Cognitive (Understanding) L2
CO3	Identify the effect of toxic and trace contaminants on environment.	Cognitive (Understanding) L2
CO4	Examine applications of environmental microbiology in water and wastewater engineering.	Cognitive (Analyzing) L4

CO-PO Mapping:

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

CO	PSO1	PSO2
CO1		
CO2		
CO3	1	
CO4	1	

Assessments :

Assessment	Weightage (Marks)
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units).
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Significance of Chemistry in Environmental Engineering, Basic concepts from general chemistry: Properties of chemical compounds- atomic structure, molecular weight, equivalent weight, normality, molarity, standard solutions, Introduction to Stoichiometric reactions, oxidation-reduction equations, basics of mass balance. Environmental significance of pollutant parameters- Temperature, pH, Hardness, Iron, Manganese, Fluoride, Nitrogen, Phosphorous, Carbon, Sulphate, DO, BOD, COD, TOC.	7 Hours
Unit 2: **Basic Concepts from Colloidal Chemistry:** Size, methods of formation, general properties, environmental significance, colloidal dispersion in liquids, colloidal dispersion in air **Basic concept from Instrumental Analysis:** Absorption Spectroscopy- UV-visible, atomic absorption spectroscopy, flame photometry, Mass Spectroscopy and Gas Chromatography- Chromatography and its types, mass spectroscopy and gas chromatography. Colourimetric analysis: Lambert's and Beer's law, photoelectric colourimeters, Spectrophotometers, colour comparison tubes, Flame photometer,	7 Hours
Unit 3: **Toxic effects of organic compound** such as phenols, pesticides, surfactants, tannin, lignin and hydrocarbon. Heavy metals and trace contaminants- significance and health effects, Characteristics of hazardous material. **Environmental Characteristics of organic compounds:** saturation concentration, solubility, hydrolysis, photolysis. **Bio-Geo Cycles:** Phosphorous Cycle, Carbon Cycle, Nitrogen Cycle.	6 Hours
Unit 4: **Basic Concepts from Quantitative Chemistry:** Significance of quantitative measurements, gravimetric analysis, volumetric analysis, physical methods of analysis **Basic Concepts from physical chemistry**: Thermodynamics – Heat and work, energy,	8 Hours

enthalpy, entropy, Vapour pressure of liquids, Binary mixtures, Solutions of solids in liquids, Oxidation, reduction, Osmosis, Dialysis, Electrodialysis, Principles of solvent extraction, Electro Chemistry, Chemical Kinetics Catalysis, Adsorption, Ion exchange.	
Unit 5: **General Microbiology:** Microscopic flora and fauna concerned to environmental engineering, classification and characteristics of bacteria, (cytology, cells structure, chemical composition, metabolism (photosynthesis, chemosynthesis, autotrophic and hetrotopic), and morphology of bacteria, reproduction and growth of bacteria-modes of cell division, normal growth cycle of bacteria. **Culture techniques-** selective methods, pure cultures, methods of isolating pure cultures, culture characteristics, gram staining, microscopic examination of microorganisms **Indicator organisms of water pollution:** Coliform group, their significance in environmental engineering, bacteriological techniques-MPN, Standard plate count, microorganisms other than coliform group.	6 Hours
Unit 6: **Biochemistry:** Classification, Characteristics, Environmental significance of carbohydrates, high energy compounds, proteins, lipids. **Enzyme catalysis-** characteristics, chemical and physical properties, its Classification, the nature and mechanism of enzyme action (Enzyme catalyzed reaction, energy diagram, Michalius - Menten equation), Factors affecting rate of enzymatic reaction. Enzyme inhibition, source enzyme and enzyme formation, dissociation, denaturation,	6 Hours

Textbooks:

1. Sawyer. C.N. and Mc Carty. P.L., "Chemistry for Environmental Engineers", Tata McGraw-Hill Publishing Company Limited, 4th Edition, 1994.
2. Dr. R. C. Dubey, Dr. D. K. Maheshwari, "A Text Book of Microbiology", S. Chand and Company Ltd., New Delhi, 2015.
3. Dr. S. S. Dara and Dr. S. S. Umare, "A Text Book of Engineering Chemistry", S. Chand and Company Ltd., New Delhi, 2017.

Reference Books:

1. Pelczar, Jr, M.J., E.C.S., Krieg, R.Noel., and PelczarMerna Foss. "Microbiology", Tata McGraw Hill Publishing Company Limited, 5th edition., 1996.
2. E.W. Rice, R.B. Baird, A.D. Eaton, L.S. Clesceri, "Standard Methods for the Examination of Water and Wastewater", 22nd Edition
3. Metcalf and Eddy "Wastewater Engineering Treatment and Reuse", Tata McGraw Hill Publication, 6th Reprint. 2003.
4. Conn. E.E. and Stumpf, P.K., "Outlines of Biochemistry", Wiley Eastern Limited, 5th Edition,1997.
5. IS (3025) "Methods of sampling and test (physical and chemical) for water and wastewater"

Unit wise Measurable Students Learning Outcomes:

Learning Outcomes:

UO 1: Explain basic concepts of quantitative chemistry in Environmental Engineering.

UO 2: Explain working principles and applications of advanced instruments like AAS, UV

spectrophotometer etc

UO 3: Discuss colloids and their significance in environmental engineering.

UO 4: Analyze pollution parameters in laboratory and explain their significance and applications.

UO 5.1: Explain the microorganisms (bacteria, viruses, fungi, mould and protozoa) on basis of their classification and their role in treatment of wastewater.

UO 5.2: Discuss staining and microscopic methods.

UO 6.1: Describe characteristics of different biomolecules.

UO 6.2: Discuss enzymes- Lock and Key model, enzyme formation, factors affecting enzyme reaction

Class: S.Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Hydrology and Water Resources Engineering **Course No.:** UCEE0402	**L**	**T**	**P**	**Credit**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students shall have knowledge of:

- Applied Mathematics
- Elements of Hydrological Cycle

Course Description:

Hydrology and Water Resources Engineering is a branch of Civil Engineering which deals with the occurrence, movement, distribution of water on earth surface and underground. The course emphasizes on methods of measurement of rainfall; abstraction losses; runoff; groundwater flows; irrigation water requirements; watershed management etc.

Course Learning Objectives:

1. To emphasize the importance of study of Hydrology and necessity of conservation of Water Resources.
2. To develop the ability among students to synthesize data and understanding technical concepts of Water Resource Engineering
3. To build up the skills to determine discharge of flood, Runoff.

Course Outcomes:

CO	**After the completion of the course the student will be able to**	**Bloom's Cognitive Descriptor**
CO 1	Explain the elements of Hydrological Cycle and Surface Water Hydrology.	Cognitive (Understanding) L2
CO 2	Summarize the concepts of Groundwater Hydrology, Groundwater Flow to Wells and Groundwater Contamination.	Cognitive (Understanding) L2
CO 3	Illustrate the components and requirements of Water Resources Structures, Irrigation Systems and measures to control Water Logging.	Cognitive (Understanding) L2
CO 4	Make use of data for calculating Average Rainfall, Runoff, Flows to Wells and Water Requirements for Irrigation.	Cognitive (Applying) L3

CO-PO Mapping:

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

CO	**PSO1**	**PSO2**
CO 1		
CO 2		
CO 3		
CO4		

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Hydrology Definition, Importance and Scope of Hydrology, Hydrologic Cycle, Forms and Types of Precipitation, Methods of Measurement, Hyetograph, Mass Rainfall Curve, Factors Affecting Precipitation, Estimating Missing Data, Double Mass Curve Analysis, Determination of Average precipitation over a catchment, Evaporation and Evapotranspiration and Factors affecting, Infiltration: Process, Measurement and Factors affecting, Infiltration Indices.	7 Hours
Unit 2: Runoff Classification of Runoff, Factors affecting Runoff, Catchment Yield Calculations, Hydrograph: Storm Hydrograph, Base flow and Separation of Base flow, Direct Runoff Hydrograph, Unit Hydrograph Theory – Assumptions and Limitations, Derivation and Use of Unit Hydrograph, S-Curve, Design Flood Hydrograph, Introduction to Synthetic Unit Hydrograph (SUH).	7 Hours
Unit 3: Water Resources Structures Reservoir Planning, Sediment Control, Floods Routing, Introduction to Dams, Spillways, Energy Dissipation, Diversion Head Works, Canal Structures, Cross Drainage Works, River Training.	6 Hours
Unit 4: Groundwater Hydrology Occurrence and Distribution of Groundwater, Types of Aquifers, Specific Yield of Aquifer, Movement of Groundwater, Darcy‘s law, Permeability, Hydraulics of Well under Steady Flow Conditions in Confined and Unconfined Aquifers, Estimation of flows to wells. Sources of Groundwater Contamination, Contaminant Plumes, Transport Mechanism, Control of Groundwater Contamination.	8 Hours
Unit 5: Irrigation Definition and Necessity of Irrigation, Types of Irrigation, Different Systems of Irrigation, Methods of Application of Water to Soil for Irrigation, Concept of Lift irrigation. Classes and Availability of Soil water, Depth and Frequency of Irrigation, Crops Classification and Crop Rotation, Command Area-Calculations. Duty, Delta, Factors affecting Duty, Methods of improving Duty, Assessment and Efficiencies of Irrigation Water.	8 Hours
Unit 6: Water Logging and Control Water logging and Salinity, Causes (Natural and Artificial), Effects, Remedial Measures, Soil Efflorescence, Drainage Arrangement, Management of Saline and Alkaline Soils.	4 Hours

Textbooks:

1. Water Resources Engg. – Dr. P.N.Modi (Standard Book House)
2. Engineering Hydrology – H. M . Raghunath

3. Engineering Hydrology – K. Subramanya
4. Engineering Hydrology – Jay rami Reddy

Reference Books:

1. Applied Hydrology – V. T. Chaw
2. Hydrology and Soil Conservation – Ghanshyam Das , (PHI)
3. Water resources systems – R. S. Varshney.

Unit Outcomes (UOs)

At the end of course students will be able to

UO 1.1: Explain the elements of hydrological cycle.
UO 1.2: Explain the methods of measurement of abstraction losses.
UO 2.1: Make use of data for calculation of runoff volumes.
UO 2.2: Make use of data for derivation of Flood Hydrograph and Unit Hydrograph.
UO 3.1: Illustrate the requirements of Water Resources Structures.
UO 3.2: Illustrate the necessity of River Training and Flood Routing.
UO 4.1: Summarize the sources of groundwater contamination.
UO 4.2: Summarize the distribution of groundwater and movement of groundwater.
UO 5.1: Make use of data for calculation of water requirements for crops.
UO 5.2: Make use of data for calculation of canal water requirements and reservoir capacity.
UO 6.1: Illustrate the causes for saline or alkaline soils.
UO 6.2: Illustrate the benefits of techniques to avoid the water logging and salinity.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Structural Analysis **Course No.:** UCEE0403	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	03

Course Pre-Requisite:

- Engineering Mechanics
- Applied Mathematics
- Solid Mechanics

Course Description:

Structural Mechanics forms a core subject which is taught to students of all non-circuit disciplines of engineering. The study of this subject is aimed at developing the ability to interpret the response of structural elements towards combined straining effects in terms of static and kinematic aspect.

Course Learning Objectives:

- To evaluate combined effect of direct and bending stresses.
- To study effect of Two Dimensional stresses and principal stresses and strains.
- To analyze the fixed beams.
- To determine slope and deflection of beams due to different loads.
- To study the analysis of continuous beams.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Extend the responses towards combined effect of loads and stresses.	Cognitive (Understanding) L2
CO.2	Analyze the stresses due to perpendicular load effects on structural parts and sections.	Cognitive (Analyzing) L4
CO.3	Analyze simple structures for deformation studies by conventional and/or energy concepts.	Cognitive (Evaluating) L5
CO.4	Evaluate the continuous beams and frames for typical determinate structures.	Cognitive (Evaluating) L5

CO-PO Mapping:

COs	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO.1	2	3	3	-	-	-	-	-	-	-	-	-
CO.2	2	3	2	-	2	-	-	-	-	-	-	-
CO.3	2	3	2	-	2	-	-	-	-	-	-	-
CO.4	2	3	2	-	-		-	-	-	-	-	-

COs	**PSO1**	**PSO2**
CO.1	-	-
CO.2	-	-
CO.3	-	2
CO.4	-	2

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Combined direct and bending stresses Direct and Eccentric loads, Stress distribution at base, No Tension condition, Middle Third rule, Limit of Eccentricity, Combined direct and bending stresses, Columns subjected to eccentric loading, Chimney, Earth Retaining wall, Masonry Dam, Stability of masonry dam.	08 Hours
Unit 2: Principal planes and stresses Principal planes and stress in two dimensions, Analytical and Mohr's circle method. Principal stress in beams. Combined bending, torsion and axial thrust effects on Solid and Hollow Shafts. Concept of Equivalent moment and equivalent torque.	06 Hours
Unit 3: Analysis of Fixed Beams Definition of Fixed beam, Comparison with simply supported beams, Advantages and Disadvantages of Fixed beams, Principle of Super-position. Analysis of Fixed beams (SFD and BMD of fixed beams).	06 Hours
Unit 4: Slope and deflection of determinate beams: Slope and deflection of determinate beams-Double integration method, Macaulay's method, moment-area method and conjugate beam method, three hinged parabolic arches.	08 Hours
Unit 5: Continuous Beams **Three Moment Theorem:** Introduction to continuous beams, Advantages and Disadvantages of continuous beams, Claporon's Three Moment theorem, Analysis of continuous beams (SFD and BMD of continuous beams) **Moment Distribution Method:** Introduction to moment distribution, Flexural rigidity, Stiffness factor, Distribution factor, Carry over, Moment distribution table. BMD and SFD of beams, Portal frames	08 Hours
Unit 6: Energy Theorem Castiglione's theorem, Betti'slaw, Maxwell's reciprocal theorem. Deformations of determinate beams, bents and portal frames by unit load method. Simple examples	04 Hours

Textbooks:

1. "Strength of Materials"- S. Ramamrutham, Dhanapat Rai Publications.
2. "Strength of Materials"- R. K. Bansal, Laxmi Publications.
3. Mechanics of Structure (Vol.I and II) - Dr. H. J. Shaha and Junnarkar S. B., Charotar Publication.
4. Mechanics of Materials Vol. I and II - B. C. Punmia and Jain, Laxmi Publications.
5. Strength of Materials - S. Ramamrutham, Dhanapat Rai Publications.

6. Strength of Materials - Bhavikatti S. S., New Age Publications.
7. Strength of Materials - R. K. Rajput, S. Chand Publications.
8. Strength of Materials - R. K. Bansal, Laxmi Publications.
9. Structural Analysis - Bhavikatti S. S, Vikas Publications house New Delhi.
10. Strength of Material – Debabrata Nag, A. Chanda, 2nd Edition, Wiley India publication.

Reference Books:

1. "Mechanics of Structure" (Vol. I and II) – Junnarkar S. B. and Advi, Charotar Publication.
2. "Mechanics of Materials" - R. C. Hibbler, Pearson Education.
3. "Mechanics of Materials" – Gere and Timoshenko, CBS publishers.
4. "Mechanics of Materials" Vol. I and II - Punmia, Jain, Laxmi Publications.
5. "Strength of Materials" – Bhavikatti S. S., New Age Publications.
6. "Strength of Materials" - R. K. Rajput, S. Chand Publications.
7. "Structural Analysis" – Bhavikatti S. S, Vikas Publications house New Dehli.
8. "Introduction to Mechanics of Solids" - J. B. Popov, Prentice–Hall publication.
9. "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
10. "Mechanics of Material" - Beer and Johnston, M.
11. "Strength of Materials" - R. S. Khurmi and N. Khurmi, S. Chand Publications.

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Hydraulics **Course No.:** UCEE0404	**L**	**T**	**P**	**Credit**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students shall have the knowledge of:

- Applied Mathematics
- Engineering Physics
- Engineering Mechanics
- Fluid Mechanics

Course Description:

The course is imparting fundamental knowledge of environmental hydraulics as applicable in environmental engineering. The course will cover the hydraulics of pipes under pressure, (water mains and networks), and open channel flow (sewers, drains, and channel sections). Students will learn how to apply basic hydraulics principles, laws and equations in solving practical design problems. The course will cover the fundamentals of open channel flow, depth energy relationships, flow measurement through channels, impact of jets, demonstrations and practical design problems.

Course Learning Objectives:

1. To understand the basic principles of environmental hydraulics for the analysis and design of water and sewerage system.
2. To recognize the physical description and hydraulic illustrations of flow systems.
3. To study types of open channel flow, depth energy relationships and flow profiles.
4. To learn the basic principles and assumptions of dynamic equations applied to fluid flow systems.
5. To identify the rational approaches for determination of flow characteristics and forces acting on plates and vanes.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain the basic hydraulics principles used in the analysis and design of pipe flow and open channel flow systems.	Cognitive (Understanding) L2
CO.2	Solve problems on water and sewerage systems, impact of jet, flow profiles and flow measurement through open channels using acquired knowledge, facts, and techniques.	Cognitive (Analyzing) L4
CO.3	Derive functional expressions considering various parameters in a phenomenon using principles of hydraulics.	Cognitive (Evaluating) L5
CO.4	Interpret the use of basic laws and equations to determine velocities, flow rates, flow characteristics through theoretical and standard laboratory procedures.	Cognitive (Evaluating) L5

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	3	2	1	-	-	-	-	-	-	-	-	-
CO.2	3	2	2	-	-	-	-	-	-	-	-	-
CO.3	-	-	-	3	2	-	-	-	-	-	-	-
CO.4	-	-	2	2	1		-	-	-	-	-	-

COs	PSO1	PSO2
CO.1	-	-
CO.2	-	1
CO.3	-	-
CO.4	-	-

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: **Uniform Flow in Open Channel:** Difference between Pipe Flow and Open Channel Flow, Types of Open Channel, Types of Open Channel Flows, Geometric Elements of Open Channel, Velocity Distribution, Measurement of Velocity using Chezy's and Manning's Formula, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal and Circular), Depth Energy Relationship, Specific Energy, Specific Energy Curve, Concept of Froude Number, Critical, Sub-Critical, Super-Critical Flows.	07 Hours
Unit 2: **Fundamentals of Fluid Flow:** **Gradually Varied Flow (GVF):** Classification of Channel Slopes, Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF Profiles, Direct Step Method of Computation of GVF Profiles, Circular Arc Method. **Rapidly Varied Flow (RVF):** Definition, Hydraulic Jump: Phenomenon, Conjugate Depth Relationship, Characteristics, Uses and Types of Hydraulic Jump.	07 Hours
Unit 3: **Notches and Weirs:** Types, Derivation of Discharge Equation, Errors in Measurement of Discharge, Time of Emptying Tank with Notch or Weir, Calibration of Notches and Weirs, Velocity of Approach, Francis Formula, Effect of End Contraction, Sharp Crested, Broad Crested, Narrow Crested and Ogee Weir.	06 Hours
Unit 4: **Impact of Jet:** Impulse Momentum Principle, Impact of Jet on Vanes- Flat, Curved (Stationary and Moving), Series of Flat, Curved Vanes Mounted on Wheel, Inlet and Outlet Velocity Triangles.	06 Hours
Unit 5: **Water Distribution System:** Classification of Distribution System: Pumping, Gravity and Dual System, Layout of Distribution Pipe Network: Dead End, Ring, Grid, Radial System, Continuous and Intermittent Water Supply, Pressure in the Distribution System, Capacity of Distribution, Mass Curve Method, Design of Distribution System, Design Period and Factors Affecting, Methods of Networks Analysis.	07 Hours
Unit 6: **Sewerage System:** Types of Sewer Systems, Types of Sewerage System: Combined, Separate and Partially Separate System, Patterns of Collection Systems:	07 Hours

Perpendicular, Zone, Interceptor, Radial, Fan Pattern, Design Period, Design Discharge, Quantity of Sewage, Infiltration, Storm Runoff, Hydraulic Formulae, Free Board, Minimum and Maximum Velocity, Nomograms and Tables of Hydraulic Computations, Hydraulic Characteristics of Circular Sewer.	

Textbooks:

1. Fluid Mechanics: Including Hydraulic Machines, A. K. Jain, Khanna Publishers, New Delhi.
2. Hydraulics and *Fluid Mechanics*, P. N. Modi and S. M. Seth, Standard Book House, New Delhi.
3. A Textbook of Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, Laxmi Publications, New Delhi, 2013.
4. Water Supply and Sanitary Engineering, G. S. Birdie, J. S. Birdie, Dhanpat Rai Publishing Company, New Delhi.
5. Environmental Engineering – 1, Water Supply Engineering, B. C. Punmia, Arun K. Jain and Ashok K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.
6. Environmental Engineering – 2, Wastewater Engineering, B. C. Punmia, Arun K. Jain and Ashok K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.

Reference Books:

1. Fluid Mechanics, Frank .M. White, McGraw Hill Publishing Company Ltd, New Delhi.
2. Fluid Mechanics and Machinery, C. P. Kothandaraman and R. Rudramoorthy, New Age International Publishers.
3. Flow in Open Channels, K. Subramanya, McGraw Hill Education India Pvt. Ltd., New Delhi.
4. Open Channel Flow, M. Hanif Chaudhry, Pentice Hall, Boston.
5. Open Channel Hydraulics, V. T. Chow, Tata McGraw Hill.

Unit wise Measurable Students Learning Outcomes:

Unit Learning Objectives:

1. To understand the uniform flow through open channel and depth energy relationships.
2. To imbibe in detail GVF profiles, hydraulic jump and concept of SVF.
3. To recognize the methods for measurement of flow through open channels.
4. To determine impact of jet on flat and curved plates / vanes for various conditions.
5. To study the water distribution system, layout and types of networks.
6. To learn basic principles of hydraulics, laws and equations for the analysis and design of sewerage system.

Unit Outcomes:

Students will be able to

1. **Derive** the conditions for most economical channel section and **Solve** problems on flow through open channels and depth energy relationships. **(CO.1, CO.2, CO.3)**
2. **Develop** dynamic equations for non uniform flows and Solve problems on water surface profiles, hydraulic jump. **(CO.1, CO.2, CO.3)**
3. **Derive** functional expressions and **Solve** problems on flow measurement through open channel using theoretical and standard laboratory procedures. **(CO.2, CO.3, CO.4)**
4. **Derive** functional expressions and **Solve** problems on force exerted by jet on flat and curved plates (stationary and moving). **(CO.2, CO.3)**
5. **Explain** methods of water distribution, layout and types of networks and **Solve** problems on water distribution networks. **(CO.1, CO.2)**
6. **Select** and **Apply** basic hydraulics principles, laws and equations and appropriate methods in the analysis and design of sewerage system. **(CO.1, CO.2)**

Class: S. Y. B. Tech Civil and Environmental Engineering	**L**	**T**	**P**	**Credit**
Title of the Course: Professional Elective –I : Ecology and Environmental Sanitation **Course No.:** UCEE0421	03 hours per week	01 hour per week	-	04

Course Pre-Requisite:

- Environmental Studies
- Building Materials and Concrete Technology
- Building Drawing
- Fluid Mechanics

Course Description:

The course covers vital aspects of ecology, ecosystem, interactions, factors influencing and effect of human activities, Role and functions of local to global agencies in sanitation, Bylaws and sanitation requirements of public places, control of communicable disease, vital statistics, concept of healthful housing, Government policies and initiatives for urban and rural sanitation, waste to energy conversion technologies for minimizing environmental pollution.

Course Learning Objectives:

1. To understand ecology, ecosystem, ecological interactions and effects of human activities.
2. To understand role of environmental engineer in control of epidemics, milk and food sanitation and study of sanitation requirements of public places as well as use of vital statistics.
3. To study requirements and principles of healthful housing, plumbing and house drainage.
4. To study aspects of rural sanitation and waste to energy conversion technologies.

Course Outcomes:

COs	**After the completion of the course students will be able to**	**Bloom's Cognitive Descriptor**
CO 1	Explain components of ecosystem, environmental cycles, human activities and factors causing imbalance as well importance of aquatic ecosystem.	Cognitive (Understanding) L2
CO2	Identify sanitation requirement of public places, provisions for milk and food sanitation, measures for control of an epidemic and importance of vital statistics.	Cognitive (Applying) L3
CO 3	Enlist housing standards, requirements of healthful and safe housing, principles house drainage and systems of plumbing.	Cognitive (Analysing) L4
CO 4	Explain significance of sanitation, government initiatives and waste to energy conversion options.	Cognitive (Evaluating) L5

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	CO.1	1	-	-	-	-	-	2	-	-	-	-
CO.2	CO.2	-	1	-	-	-	2	-	3	-	-	-
CO.3	CO.3	-	-	1	-	-	2	-	-	-	-	-
CO.4	CO.4	-	-	1	-	-	-	1	-	-	-	-

COs	**PSO1**	**PSO2**
CO 1	1	-
CO 2	1	-
CO 3	-	-
CO 4	-	2

Assessments:

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:	**Hours**
Unit1: **Ecology, Ecosystem and influencing factors** Ecosystem, its components, classification and energy flow in ecosystems. **Bio-geochemical cycles:** Sulfur, Carbon, Nitrogen, Phosphorus cycles etc. **Population Ecology:** Characteristics of population, Population age distribution and growth forms, limiting factors, Liebig's law, Interactions such as competition, co-existence, pray predator etc. among different species, **Factors causing imbalance and effect of human activities on environment:** Bio-magnification, Global warming, Climate change, Acid rain etc, Effect of agricultural activities and related problems, water logging **National plan for conservation of aquatic ecosystem:** Importance, benefits and conservation of natural wetlands, classification, RAMSAR convention, eutrophication of wetlands and ponds.	08 Hours
Unit2: **Sanitation of Public places, Function and Role of agencies:** Public health activities of WHO, Government and local bodies, Healthcare system in India, Role of environmental engineer in sanitation, Building byelaws for sanitation requirements of public places such as Swimming pool, Slaughter house, Market, Theatre, Institutional buildings etc.	05 Hours
Unit 3: **a) Communicable Diseases and Health:** Epidemics, Transmission of diseases, Diseases transmitted through air, water, food, contacts, General measures to control diseases and preventative measures, Environmental control of insect vector, rodents etc. **b) Vital Statistics:** Uses and sources of vital statistics, birth and death certification, indicators of community health, morbidity and mortality rates, causes and factors affecting morbidity, infant mortality rates.	07 Hours
Unit 4: **a) Milk and Food Sanitation:** Milk and food as vehicles of infection. Essential of milk sanitation, Pasteurization and its methods. Importance of food sanitation, food borne disease, food preservation methods. **b) Housing:** Concept of healthful housing, Causes of slum development, Criteria for good housing, Housing standards with respect to space, light, ventilation and safety, Types of fire and its suppression systems.	08 Hours
Unit 5: **Plumbing and House drainage:** Principles of Plumbing, Requirements of plumbing fixtures, materials for plumbing fixtures, Common terms in plumbing, Layout and systems of plumbing, Piping installation, testing of plumbing system. Sanitation facilities for areas without drainage system, Decentralized wastewater treatment DEWATS.	06 Hours

Unit6: **Sanitation policies and Concept of waste to energy:** Necessity and Importance, Various aspects of urban and rural sanitation, Government policies and programs for urban and rural sanitation. Septage management, Waste to Energy concept and technologies: Options, application and implementation, Biogas plant: Principle, types, comparison, advantages and applications.	06 Hours

Textbooks:

1. Fundamental of Ecology - E. P. Odum
2. Municipal Sanitation – Ethler and Steel
3. Environmental Sanitation: Salvato
4. Plumbing Engineering – Theory and practice - Prof. S. M. Patil, Seema publications

Reference Books:

1. Fundamentals of Ecology: M. C. Dash (TMH Publication)
2. Preventive and Social Medicine - J. E. Parks
3. Plumbing – Design and Practice: S. G. Deolalikar, TMH Publication

Unit wise Measurable Students Learning Outcomes:

Unit Learning Objectives:

1. To study the various aspects of and interactions in ecosystems, impact of human activities, conservation of aquatic ecosystems.
2. To understand the role and functions of various agencies in health care as well as sanitation requirements of public places.
3. To identify causes and preventive measures against communicable disease and understand importance of vital statics.
4. To study significance of milk and food sanitation, requirements of healthful and safe housing.
5. To study principles of house drainage, systems of plumbing and application of DEWATS.
6. To understand significance of urban and rural sanitation, government policies and waste to energy options.

Unit Outcomes:

Students will be able to

1. **Explain** various aspects of and interactions in ecosystems, impact of human activities, conservation of aquatic ecosystems. **(CO 1)**
2. **Identify** role and functions of various agencies in health care and sanitation requirements of public places. **(CO 2)**
3. **Identify** causes and preventive measures against communicable disease and list sources and uses of vital statistics. **(CO 2)**
4. **Enlist** methods of milk pasteurization and food sanitation, standards of healthful and safe housing. **(CO 3)**
5. **Classify** materials and types of plumbing fixtures, inspect systems of plumbing. **(CO3)**
6. **Explain** significanceof sanitation and waste to energy conversion technologies.**(CO 4)**

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Professional Elective - I: Green Buildings **Course No.:** UCEE0422	**L**	**T**	**P**	**Credit**
	03 hours per week	01 hour per week	-	04

Course Pre-Requisite:

Students shall have the knowledge of: Knowledge of,

- Basic Civil Engineering
- Building Material and Concrete Technology
- Building Planning and Design

Course Description:

The course is imparting fundamental knowledge of introduction to sustainable site selection, passive and active architecture, green rating of building, water efficiency, water efficient landscaping, indoor environmental quality, recycling of building materials.

Course Learning Objectives:

1. To understand the importance and necessity of green building.
2. To learn the various rating systems for green building.
3. To identify materials and technologies to improve energy efficiency of building.
4. To study a building on the norms available for green building.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain the importance and necessity of green building.	Cognitive (Understanding) L2
CO.2	Interpret the various rating systems for green building.	Cognitive (Understanding) L2
CO.3	Choose materials and technologies to improve energy efficiency of building.	Cognitive (Applying) L3
CO.4	Identify the recent techniques of water conservation.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	2	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	-	-	1	-	-	-	-	-	-	-	-
CO.3	-	-	-	-	-	-	2	-	-	-	-	-
CO.4	-	-	-	-	-	-	2	-	-	-	-	-

COs	**PSO1**	**PSO2**
CO.1	-	-
CO.2	-	-
CO.3	-	-
CO.4	-	-

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: **Introduction** Concept of green building, History of green building, Need of green building in present scenario, Importance of green building, merits and demerits. **Sustainable Site Selection**: Soil erosion and pollution control measures, alternate transportation strategies, storm water management, reduction of heat island effect, minimizing night sky pollution.	07 Hours
Unit 2: Concept of Passive and Active Architecture. Natural ventilation and air conditioning, Hybrid system of active and passive air conditioning. Indoor Environmental Quality for Occupant Comfort and Wellbeing: Day lighting, air ventilation, exhaust systems, low VOC paints and adhesives.	07 Hours
Unit 3: **Alternate energy sources :** Significance and utilization of solar energy, wind energy, biomass and bio-fuel for Green rating system of building. Comparison of various lighting devices- electric tubes, incandescent lamps, CFL and LED lamps.	06 Hours
Unit 4: **Water conservation and efficiency** Water Efficient Landscaping –Rain water harvesting, potable water and bore well recharging methods. Minimization of water use: Dual flush, waterless urinals, smart controlled water taps. **Segregation and treatment of wastewater**: Various treatment technologies, recycling of treated wastewater for different non potable purpose. Domestic solid waste – Segregation, earthworm composting and other options.	07 Hours
Unit 5: **Building materials**: Concept of Embodied Energy, Embodied energy of various common building materials, Thermal properties of building components, Thermal storage, emissivity, reflectivity. Selection of materials and surface treatment for improvement in thermal comfort with minimum energy input. Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board etc Use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, foundry sand, other inert solid wastes in buildings, Reuse of waste and salvaged materials.	06 Hours

Unit 6: **Green Rating of building**: LEED India and GRIHA (Green Rating for Integrated Habitat Assessment), Study of existing green buildings. Concept of CDM and Carbon trading, Energy audit of building, Concept of Life cycle analysis.	07 Hours
Textbooks: 1. Green Home Building: Money-Saving Strategies for an Affordable, Healthy, HighPerformance Home by Miki Cook and Doug Garrett 2. Handbook of Green Building Design and Construction: LEED, BREEAM, and Green Globes by Sam Kubba 3. Sustainable Construction: Green Building Design and Delivery by Charles J Kibert 4. Sustainable Energy System Engineering: The Complete Green Building Design Resource by Peter Gevorkian	
Reference Books: 1. Handbook of Green Building Design and Construction: LEED, BREEAM, and Green Globes by Sam Kubba 2. Integrated Life Cycle Design of Structures – By Asko Sarja – SPON Press 3. Non conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age International Publishers 4. Buildings How to Reduce Cost – Laurie Backer - Cost Ford	

Class: S.Y.B.Tech Civil and Environmental Engineering	**L**	**T**	**P**	**Credit**
Title of the Course: Professional Elective – I: Construction Practices **Course No.:** UCEE0423	03 hours per week	01 hour per week	-	04

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Building Materials and Concrete Technology

Course Description:

- The course comprises of engineering practices involve on construction sites.
- The course includes details of steps involved in various construction work.
- The course also deals with application of advance technologies involved in construction work.

Course Learning Objectives:

1. To aware the student with a wide range of construction practices involved in construction project
2. To aware the student about technical aspects of various construction activities.
3. To aware the student about methods of construction and quality required for construction works.
4. To develop a practical approach for monitoring various construction activity.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Illustrate types of buildings and roles of agencies involved in construction project	Cognitive (Understanding) L2
CO.2	Explain practices involved in building services.	Cognitive (Understanding) L2
CO.3	Demonstrate procedures involved in construction project.	Cognitive (Understanding) L2
CO.4	List safety measures according to construction activities.	Cognitive (Analyzing) L4

CO-PO Mapping:

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
1	1											1
1	1	1	1							1		1
		1			2						1	
		1										

COs	**PSO1**	**PSO2**
CO.1		
CO.2		1
CO.3		1
CO.4		

Assessments :

Assessment	Weightage (Marks)
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction (A)Introduction, Types of buildings based upon occupancy. Sequence of activities in a building project, Functions and role of various agencies: Owner, Architect, Civil Engineer, Structural Engineer, and Contractor.	06Hours
Unit 2: Temporary Structure (A)Purpose, scaffolding and shuttering. Scaffolding: Types of scaffolding (Single, Double, Cantilever etc.) and Their applications, Material used for scaffolding, procedure of erection of scaffolding, safety measure and precautions (B)Shuttering: Types of shuttering (steel, wooden, Aluminum), procedure of erection of shuttering, safety measure and precautions	06 Hours
Unit 3: Earthwork (A)Earthwork: Layout/setting out for surface excavation, safety measure and precautions. (B)Procedure of Excavation of foundation, types of excavation: - Manual and Machine, Equipment's required for excavation work. (C)Trenches: - requirement and application, dewatering: - Requirement of dewatering, Methods of dewatering (D)Pile foundation: - Cast in place pile construction methods, Methods of Installation of precast piles	08 Hours
Unit 4: Installation of Roof, Floor and Cladding (A)Floor Construction: - Detail procedure of installation of flooring tiles. (B)Wall Cladding: - Introduction to wall cladding, purpose and application, Detail procedure of installation of wall cladding in bathroom and external wall, advantages of wall cladding (C)Roof Construction: - Installation of pitched roof in residential and industrial buildings, safety measure and precautions (D)Water proofing:Introduction, Material used for water proofing, Techniques of water proofing. Terrace water proofing, water proofing in W.C. and bathrooms, water proofing of basement. Curing of concrete: Importance and types	08 Hours
Unit 5: Building Services (A)Ventilation and Air Conditioning: Need, Types and requirements and Installation of various types of ventilation systems. (B)Electrification of building: - Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing, Installation of concealed wiring (C)House Drainage: Concept of Plumbing, Drainage facilities and plan, Need of Septic Tank. Introduction to rainwater harvesting. Rainwater outlet and Down Tank Systems. Installation procedure of various plumbing work	08 Hours

Unit 6: Building Finishes (A)Wall finishes: cladding, paneling, wall papers etc. (B)Paints: Necessity of paints, Different types paints, procedure of painting, precautions and safety of painter (C)Varnishes and application methods.	06 Hours

Textbooks:

1. Building Construction – B.C.Punmia (Laxmi Publications)
2. Basic Civil Engineering – G. K. Hiraskar (DhanpatRai Publications)
3. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
4. A Text Book of Building Construction – AroraandBindra (DhanpatRai Publications)
1. 5. A Text Book of Building Construction – Dr. S. K. Sharma, S. Chand Publications

Reference Books:

1. P. Kumar Mehta, "Microstructure and properties of concrete", Prentice Hall. Tata McGraw Hill
2. Jain V.K. "Fire safety in Buildings" new Age International Publisher
3. Barrid, "Building Construction" Tata McGraw Hill, New Delhi
4. Ghosh,"Materials of Construction" Tata McGraw Hill
5. Callender," Times Savers Standards of Architectural Design Data", Tata McGraw Hill

Unit wise Measurable Students Learning Outcomes:

At the end of course students will

ULO 1.1: Understand functions of agencies involved in construction project

ULO 1.2: Study the types of buildings.

ULO 2.1: Know the importance of temporary structures.

ULO 2.2: Study the types of Scaffolding and Shuttering.

ULO 3.1: Understand the practices involved in Earthwork.

ULO 3.2: know the safety measures involved in Earthwork.

ULO 4.1: Understand the practices involved in floor finishes, wall cladding and roof construction.

ULO 4.2: know the safety measures involved in roof construction.

ULO5.1: Understand the concepts of ventilation and air Conditioning, house Drainage and electrification of a building.

ULO 6.1: Study the procedures of wall finishes.

ULO 6.2: know the safety measures involved in wall finishes.

Unit Learning Outcomes (UOs)

At the end of course students will be able to

UO 1.1: Classify Responsibilities of every agency involved in construction project

UO 1.2: Compare different types of public buildings.

UO 2.1: Explain procedure involved in temporary structures.

UO 2.2: Select types of Scaffolding and Shuttering.

UO 3.1:Carry out practices involved in Earthwork.

UO 3.2: Explain safety measures involved in earthwork.

UO 4.1: Carry out practices involved in floor finishes, wall cladding and roof construction.

UO 4.2: Explain safety measures involved in roof construction.

UO 5.1: Explain the concepts of ventilation and air Conditioning, house Drainage and electrification of a building.

UO 6.1: Carry out building finish work.

UO 6.2: Explain safety measures involved in wall finishes.

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course :** Audit Course II: Surveying and Geospatial Technology **Course No.:** UCEE0462	**L**	**T**	**P**	**Credit**
	02 hours per week	--	--	2

Course Pre-Requisite:

- Basic Civil Engineering
- Engineering Physics
- Surveying

Course Description:

Course will impart knowledge about basic principles of field surveying procedures and practices for Civil and Environmental Engineering application and also to impart knowledge on advanced surveying, photogrammetric survey, remote sensing, and Geographic Information Systems (GIS).

Course Learning Objectives:

1. To understand working principle and use of GPS in Surveying.
2. To perceive knowledge of photogrammetric survey and its use in Remote Sensing.
3. To learn process of Remote Sensing and its use in Surveying.
4. Understand different components of GIS and Learning about map projection and coordinate system.

Course Outcomes:

COs	**After the completion of the course students will be able to**	**Bloom's Cognitive Descriptor**
CO 1	Explain use of GPS in Surveying.	Cognitive (Understanding) L2
CO2	Apply their knowledge in using Photogrammetric process in surveying.	Cognitive (Applying) L3
CO 3	Make use of their knowledge and select appropriate process of remote sensing in surveying.	Cognitive (Applying) L3
CO 4	Utilize their knowledge of GIS technology in surveying process.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	2		1									
CO.2	2											
CO.3					2							
CO.4			1		2							

COs	**PSO1**	**PSO2**
CO.1		
CO.2		
CO.3		
CO.4		2

Assessments :

Assessment	**Weightage (Marks)**
ESE	100

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

Course Contents:	
Unit–1 Triangulation: Figures or systems, Signals, Satellite station, Baseline and its importance, corrections, Trigonometric levelling, Accessible and inaccessible objects. Global Positioning System (GPS)- Introduction, principle, and applications of GPS in different fields of Surveying.	7 Hours
Unit–2 Photogrammetric Survey: basic principles, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope and stereoscopic views, parallax equations, Introduction to digital photogrammetry.	7 Hours
Unit–3 Remote Sensing: Concepts and physical basis of Remote Sensing, Electromagnetic spectrum, atmospheric effects, image characteristics. Remote sensing systems, spectral signatures and characteristics spectral reflectance curves. Salient features of some of Remote Sensing satellites missions. Digital image processing: Introduction, image rectification and restoration.	7 Hours
Unit–4 Geographical Information System: Introduction, Definition, Objectives, Components (people, procedure, hardware, software and data) and functions (input, manipulation, management, querry and analysis and visualization) of GIS. Coordinate systems and projections, Georeferencing, GIS data – spatial (Raster and vector) and a spatial data. Introduction to vector and raster data Applications of GIS, Limitations of GIS.	7 Hours
Textbooks: 1. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001. 2. Arora, K.R., Surveying, Vol- III, Standard Book House. 3. Punmia BC et al: Surveying Vol. II, Laxmi Publication	
Reference Books: 1. Chandra AM and Ghosh SK: Remote Sensing and Geographical Information System, Alpha Science 2. Ghosh SK: Digital Image Processing, Alpha Science	
Unit wise Measurable Students Learning Outcomes: **Unit Learning Objectives:** Unit 1- To learn the use of GPS in surveying and its working principle. Unit 2- To understand basics of photogrammetric survey. Unit 3- To learn modern surveying technique remote sensing and its basics. Unit 4- To acquire knowledge of GIS and its use in the field of surveying. **Unit Outcomes:** Students will be able to Unit 1- Use GPS in surveying.(CO1) Unit 2- Explain basics of photogrammetric survey.(CO2) Unit 3- Use modern surveying technique, remote sensing in surveying process.(CO3) Unit 4- Demonstrate use of GIS in surveying process.(CO4)	

Class: S.Y.B.Tech Civil and Environmental Engineering	**L**	**T**	**P**	**Credit**
Title of the Course: Environmental Chemistry and Microbiology Laboratory **Course Code:** UCEE0431	-	-	02 hours per week	01

Course Pre-Requisite:

Students shall have knowledge of:

- Engineering Chemistry
- Biology

Course Description:

This subject will provide actual experimental analysis of various water quality parameters based on laboratory procedures for water or wastewater samples.

Course Learning Objectives:

1. To provide hands-on practice for analyzing the water quality parameters or wastewater parameters by physical, chemical and biological methods.
2. To impart knowledge of bacterial identification.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive Descriptor**
CO1	Carry out water or wastewater quality analysis through physical, chemical, biological methods.	Cognitive (Understanding) L2
CO2	Identify types of cells, bacteria by using staining methods.	Cognitive (Understanding) L2

CO-PO Mapping:

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

CO	**PSO1**	**PSO2**
CO1	1	
CO2		

Assessments :

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

Assessment	**Weightage (Marks)**
ISE	25
ESE (OE)	25

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (OE):** Assessment is based on oral examination.

Course Contents:	
Experiment No. 1: Alkalinity and Acidity **Learning Outcome:** To determine alkalinity and acidity of given water sample by pH meter	2 Hours
Experiment No. 2: Turbidity and Conductivity **Learning Outcome:** To determine turbidity and conductivity of given water sample	2 Hours
Experiment No. 3: Solids **Learning Outcome:** To determine total solids, suspended solids and dissolved solids of given water sample	2 Hours
Experiment No. 4: Dissolved Oxygen **Learning Outcome:** To determine dissolved oxygen of given water sample by Winkler method	2 Hours
Experiment No. 5: Biochemical Oxygen Demand **Learning Outcome:** To determine Biochemical Oxygen Demand of given sample	2 Hours
Experiment No. 6: Demonstration of Atomic Absorption Spectroscopy **(AAS)** **Learning Outcome:** To determine Iron and Manganese (Demonstration using Atomic Absorption Spectroscopy)	2 Hours
Experiment No. 7: Gram staining **Learning Outcome:** To study gram's characteristics of given bacterial suspension	2 Hours
Experiment No. 8: Introduction to Microscope **Learning Outcome:** To understand parts, function and working of microscope	2 Hours
Experiment No. 9: Standard Plate Count **Learning Outcome:** To estimate bacterial density by plate count method	2 Hours
Experiment No. 10: Most Probable Number **Learning Outcome:** To determine bacteriological quality of potable water	2 Hours

Textbooks:

1. Sawyer. C.N. and Mc Carty. P.L., "Chemistry for Environmental Engineers", Tata McGraw-Hill Publishing Company Limited, 4th Edition, 1994.

Reference Books:

1. Pelczar, Jr, M.J., E.C.S., Krieg, R.Noel., and PelczarMerna Foss. "Microbiology", Tata McGraw Hill Publishing Company Limited, 5th edition., 1996.
2. Metcalf and Eddy *"Wastewater Engineering Treatment and Reuse",* Tata McGraw Hill Publication, 6th Reprint. 2003.
3. Conn. E.E. and Stumpf, P.K., "Outlines of Biochemistry", Wiley Eastern Limited, 5th Edition,1997.
4. E.W. Rice, R.B. Baird, A.D. Eaton, L.S. Clesceri, "Standard Methods for the Examination of Water and Wastewater", 22nd Edition
5. IS (3025) "Methods of sampling and test (physical and chemical) for water and wastewater"

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Building Planning and Design Laboratory **Course No.:** UCEE0432	**L**	**T**	**P**	**Credit**
	---	---	04 hours per week	2

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Basic Building Components and Building Services
- Principles of Building Planning
- Computer Aided Design (CAD)

Course Description:

The course explores the basic knowledge and fundamental principles of building planning through drawing building drawings during lab sessions. The course imparts the drawing skills in submission drawing, drawing various working drawings of building.

Course Learning Objectives:

- To develop technical drawing skills of students for public building and working drawings.
- To impart practical consideration in planning a building through site exposure and drawings.

Course Outcomes:

Cos	After the completion of the course the students will be able to	Bloom's Cognitive Descriptor
CO.1	Plan Public buildings by taking into consideration principles of planning and building byelaws.	Cognitive (Applying) L3
CO.2	Design various units of public buildings as per the space requirements and utilization purpose.	Cognitive (Create) L6

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	1	1			1					1		
CO2	1	2			2					2	2	1

COs	PSO1	PSO2
CO1	-	-
CO2	-	1

Assessments :

Assessment	Weightage (Marks)
ISE	50
ESE (OE)	50

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (OE):** Assessment is based on oral examination.

Course Contents:

Exercise No. 1: Study of requirements of different public buildings. (Principles, Site selection and Amenities).	4 Hours
Exercise No. 2: Planning of public buildings: Preparation of line plans on graph papers for residential buildings – four assignments on graph papers.	12 Hours

Exercise No. 3: Detailed design and drawing for one public building using AutoCAD with following details: • Submission Drawing • Foundation / Centre Line Drawing. • Furniture layout plan. • Electrification plan • Water supply and drainage plan	12 Hours
Exercise No. 4: 3D Drawing of public building plan using AutoCAD	8 Hours
Exercise No. 5: Visit to a public building and a report based on the visit.	4 Hours
Textbooks: 1. Building Planning by Shah Kale 2. Building Construction – B.C. Punmia (Laxmi Publications) 3. Text Book of Building Construction – S.P. Arora, S.P. Bindra (Dhanpat Rai Publications) 4. Civil Engineering Drawing – M. Chakraborty.	
Reference Books: 1. A to Z of Practical Building Construction and Its Management- Sandeep Mantri (Satya Prakashan, New Delhi) 2. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi 3. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings 4. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)	

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Open Channel Hydraulics Laboratory **Course No.:** UCEE0433	**L**	**T**	**P**	**Credits**
	---	---	02 hours per week	01

Course Pre-Requisite:

Students shall have the knowledge of:

- Applied Mathematics
- Engineering Physics
- Engineering Mechanics
- Fluid Mechanics
- Hydraulics

Course Description:

The course explores the basic knowledge and fundamental principles of Environmental Hydraulics through laboratory experiments. The course imparts the experimental skills in flow measurement, real fluid flow problems and calibration of hydraulic devices.

Course Learning Objectives:

1. To introduce the students to a wide variety of flow measurement through open channels.
2. To learn to conduct experiments to verify fundamental principles of hydraulics and calibrate measuring devices.
3. To analyze experimental data to develop empirical relations when appropriate.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Exhibit hydraulic principles, laws and equations through experimentation.	Cognitive (Understanding) L2
CO.2	Standardize various hydraulic measuring devices through experimental procedures.	Cognitive (Analyzing) L4

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1				3	1					2		
CO2				3	1					2		

COs	**PSO1**	**PSO2**
CO1	-	-
CO2	-	1

Assessments :

Assessment	**Weightage (Marks)**
ISE	25
ESE (OE)	25

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (OE):** Assessment is based on oral examination.

Course Contents:

Experiment No. 1: Study of Specific Energy Curve. **Learning Outcome:** To investigate the relationship between specific energy (E) and depth of flow (y) in a rectangular channel.	2 Hours

Experiment No. 2: Study of Hydraulic Jump. **Learning Outcome:** To compare measured flow depths with theoretical results based on the application of continuity and momentum principles.	2 Hours
Experiment No. 3: Calibration of Rectangular and Triangular Notch. **Learning Outcome:** To determine the coefficient of discharge for a rectangular notch and 60° triangular notch using analytical and graphical methods.	2 Hours
Experiment No. 4: Calibration of Trapezoidal Notch. **Learning Outcome:** To determine the coefficient of discharge for a trapezoidal notch using analytical and graphical methods.	2 Hours
Experiment No. 5: Calibration of Weirs. **Learning Outcome:** To determine the coefficients of discharge for ogee and broad crested weir using analytical and graphical method.	2 Hours
Experiment No. 6: Determination of Roughness Coefficients for Given Pipe Material. **Learning Outcome:** To compute Chezy's 'C' and Manning's 'N' for the given pipe material.	2 Hours
Experiment No. 7: Determination of Roughness Coefficients for Open Channel. **Learning Outcome:** To compute Chezy's 'C' and Manning's 'N' in a Laboratory Flume.	2 Hours

Textbooks:

1. Fluid Mechanics: Including Hydraulic Machines, A. K. Jain, Khanna Publishers, New Delhi.
2. Hydraulics and *Fluid Mechanics,* P. N. Modi and S. M. Seth, Standard Book House, New Delhi.
3. A Textbook of Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, Laxmi Publications, New Delhi, 2013.
4. Water Supply and Sanitary Engineering, G. S. Birdie, J. S. Birdie, Dhanpat Rai Publishing Company, New Delhi.
5. Environmental Engineering – 1, Water Supply Engineering, B. C. Punmia, Arun K. Jain and Ashok K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.
6. Environmental Engineering – 2, Wastewater Engineering, B. C. Punmia, Arun K. Jain and Ashok K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.

Reference Books:

1. Fluid Mechanics, Frank .M. White, McGraw Hill Publishing Company Ltd, New Delhi.
2. Fluid Mechanics and Machinery, C. P. Kothandaraman and R. Rudramoorthy, New Age International Publishers.
3. Flow in Open Channels, K. Subramanya, McGraw Hill Education India Pvt. Ltd., New Delhi.
4. Open Channel Flow, M. Hanif Chaudhry, Pentice Hall, Boston.
5. Open Channel Hydraulics, V. T. Chow, Tata McGraw Hill.

Class: S. Y. B. Tech Civil and Environmental Engineering **Title of the Course:** Spreadsheets Laboratory **Course No.:** UCEE0434	**L**	**T**	**P**	**Credit**
	---	---	02 hours per week	1

Course Pre-Requisite:

Students shall have the knowledge of:

- Engineering Mathematics
- Basics of Computer Operation

Course Description:

This course offers an introduction to spreadsheet design and application. The purpose of this course is to teach students to identify spreadsheet terminology and concepts; create formulas and functions; use formatting features; and generate charts, graphs, and reports.

Course Learning Objectives:

1. To apply formatting options and handle worksheets.
2. To use functions such as those associated with logical, statistical, financial and mathematical operations.
3. To work with charts and tables and lists to analyze, filter and sort data.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO 1	Analyze use of logical and data presentation functions in standard spreadsheet for processing a data.	Cognitive (Analyzing) L4
CO 2	Design a spreadsheet for a user with presentation of data.	Psychomotor (Origination) L7

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	2				2							
CO2	2				2							

COs	**PSO1**	**PSO2**
CO1		2
CO2		2

Assessments :

Assessment	**Weight age (Marks)**
ISE	50

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Course Contents:

Experiment No. 1: **Start Excel and Navigate the Worksheet.** a. Start Excel and identify the components of the Excel window. b. Locate and open an existing workbook. c. Navigate a worksheet. d. Select cells, columns, and rows.	**2 Hours**

e. Insert, reposition, and delete worksheets. f. Save a workbook.	
Experiment No. 2: **Enter, Edit Data and Build Worksheets**. a. Create new workbooks. b. Enter text and numbers in cells. c. Edit cell contents. d. Copy the content of a cell, cell range and Move the cell content. e. Rename a sheet tab. f. Create and revise formulas. g. Copy formulas with relative, absolute, and mixed cell references. h. Use basic functions.	**2 Hours**
Experiment No. 3: **Enhance, Preview and Print Worksheets**. a. Arrange cells, rows, and columns. b. Use Paste Special. c. Manipulate rows, columns, and cells. d. Filter lists using AutoFilter. e. Use Find and Replace. f. Set print options and print worksheets. g. Print an entire workbook.	**2 Hours**
Experiment No. 4: **Linking and Managing Worksheets and Workbooks**. a. Group worksheets to share data, formatting, and formulas. b. Consolidate data from multiple worksheets. c. Work with multiple workbooks. d. Insert, delete rows and columns. e. Modify column widths, row heights to a specified value, to optimal width or height. f. Freeze, unfreeze row and/or column titles.	**2 Hours**
Experiment No. 5: **Formulas and Functions.** a. Recognize good practice in formula creation: refer to cell references rather than type numbers into formulas. b. Create formulas using cell references and arithmetic operators (addition, subtraction, multiplication, division). c. Use sum, average, minimum, maximum, count, counta, round functions. d. Use the logical function if (yielding one of two specific values) with comparison operator: =, >, <. e. Autosum, value, if, hyperlink, count, max, vlookup , IF, AND, OR, Nested IF and NOT, etc.	**2 Hours**
Experiment No. 6: **Formatting.** a. Format cells to display numbers to a specific number of decimal places, to display numbers with, without a separator to indicate thousands.	**2 Hours**

b. Format cells to display a date style, to display a currency symbol. c. Format cells to display numbers as percentages. d. Change cell content appearance: font sizes, font types. e. Apply text wrapping to contents within a cell, cell range. f. Alignment, Merge cell and Border effects. g. Conditional Formatting	
Experiment No. 7: **Create Charts and Share Information**. a. Use the Chart Wizard to create a chart. b. Format and modify a chart. c. Insert, resize, and move a graphic. d. Create different types of charts from spreadsheet data: column chart, bar chart, line chart, pie chart etc. e. Add, remove, edit a chart title, add data lables, change chart area, edit layout etc. f. Preview and print charts. g. Use Go To.	**2 Hours**
Experiment No. 8: **Tracking, Reviewing and Security.** a. Turn on, off track changes. Track changes in a worksheet using a specified display view. b. Accept, reject changes in a worksheet. c. Compare and merge spreadsheets. d. Add, remove password protection for a spreadsheet: to open, to modify. e. Protect, unprotect cells, worksheet with a password. f. Hide, unhide formulas.	**2 Hours**
Term Work: • Spreadsheet Assignments based on syllabus content.	
Textbook: 1. Microsoft Excel 2016: Comprehensive, Freund, Starks, and Schmieder, Cengage Learning, 2017, ISBN: 9781305870727.	

Class: S.Y.B.Tech Civil and Environmental Engineering **Title of the Course:** Geospatial Laboratory **Course No.:** UCEE0435	**L**	**T**	**P**	**Credits**
	---	---	02 hours per week	01

Course Pre-Requisite:

Students shall have the basic knowledge of:

- Applied Mathematics
- Surveying
- Surveying and Geospatial Technology

Course Description:

This course offers an opportunity for the students to understand the basics of geospatial technology for developing an interest in the principles, practical uses, and resources related to geospatial technologies. This course will enable the students to get an insight into the diverse geospatial database concepts, creating and implementing of the same, GIS theory and spatial analysis, supplemented by extensive practical exercises. Also, it will help the students to acquire skills for further studies and to enter the professional world.

Course Learning Objectives:

1. To impart the basic knowledge to students to compile, analyze, and present geospatial data.
2. To develop creative thinking among students for solving real problems commonly addressed with Geospatial Technology.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Classify the maps, coordinate systems and projections to process spatial and attribute data.	Cognitive (Analyzing) L4
CO.2	Create maps and other geographic representations to extract, analyze, interpret and present spatial information.	Cognitive (Creating) L6

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3			3				2			2
CO2	3	2		2	2				1			2

COs	**PSO1**	**PSO2**
CO1		
CO2		2

Assessments :

Assessment	**Weightage (Marks)**
ISE	50

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Course Contents:

Experiment No. 1: Introduction to GIS Environment **Learning Outcome:** Installing GIS, working with navigation tools, visualizing attribute and spatial data, coordinate system types, map projection and distortion.	2 Hours
Experiment No. 2: Working with Symbology, Styling and Labeling **Learning Outcome:** Layer Properties, styling vector layers, displaying lables, setting up scale based visibility.	2 Hours

Experiment No. 3: Georeferencing **Learning Outcome:** Use of toposheets, activating Georeferencing tool in GIS, adding control points, transformation settings.	2 Hours
Experiment No. 4: Data Creation and Editing (Digitization) **Learning Outcome:** Introduction to vector layers, creating shape files in GIS, editing tools and functionalities.	2 Hours
Experiment No. 5: Integrating Google Earth data - Integrating data created using Google Earth and its integration in GIS, working with KML files.	2 Hours
Experiment No. 6: Spatial data gathering techniques (Mobile/ GPS) **Learning Outcome:** GPS data collection and mapping, use of smart phone for data collection, settings for initialization, geo tagging, integration in GIS.	2 Hours
Experiment No. 7: Digital Elevation Model (DEM) and Terrain Analysis **Learning Outcome:** Preparation of DEM, contour map, slope map and other terrain maps.	2 Hours
Experiment No. 8: Merging of Raster Layers, Importing and Exporting Data **Learning Outcome:** Merging of raster layers, importing and exporting spreadsheets or CSV files in GIS environment.	2 Hours
Experiment No. 9: Production and Management of Geospatial Database **Learning Outcome:** Analysis of geospatial data with GIS, computation of length, perimeter, area and other geometrical features.	2 Hours
Experiment No. 10: Map Publishing **Learning Outcome:** Creating map layout in GIS, exporting the map to various formats, components and details of map.	2 Hours

Text Books:

1. Jensen, J.R. (2006): Remote Sensing of the Environment: An Earth Resource Perspective (2nd Ed.), Prentice Hall, New Jersey.
2. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W. (2007): Remote Sensing and Image Interpretation (6th Ed.). Wiley, New Jersey.
3. Reddy, M.A. (2008): Textbook of Remote Sensing and Geographical Information System (3rd Ed.), BS Publications, Hyderabad.

Reference Books:

1. Nair, N. B. (1996): Encyclopaedia of Surveying, Mapping and Remote Sensing. Rawat Publications., Jaipur and New Delhi.
2. Bernhardensen, Tor. 1999. Geographic Information Systems: An Introduction. Toronto: John Wiley and Sons, Inc.

Websites:

1. Indian institute of remote sensing, (IIRS). India: https://www.iirs.gov.in/
2. National Remote Sensing Centre (NRSC), India: http://www.nrsc.gov.in
3. Bhuvan: http://www.bhuvan.nrsc.gov.in
4. National Aeronautics and Space Administration (NASA), USA: http://www.nasa.gov
5. United States Geological Survey (USGS), USA: http://www.usgs.gov
6. International Society for Photogrammetry and Remote Sensing (ISPRS): http://www.isprs.org